Swan River System

Landscape Description

Report
(Western Australia.
Swan River Trust)
28

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Landscape Description

SWAN RIVER TRUST 1997

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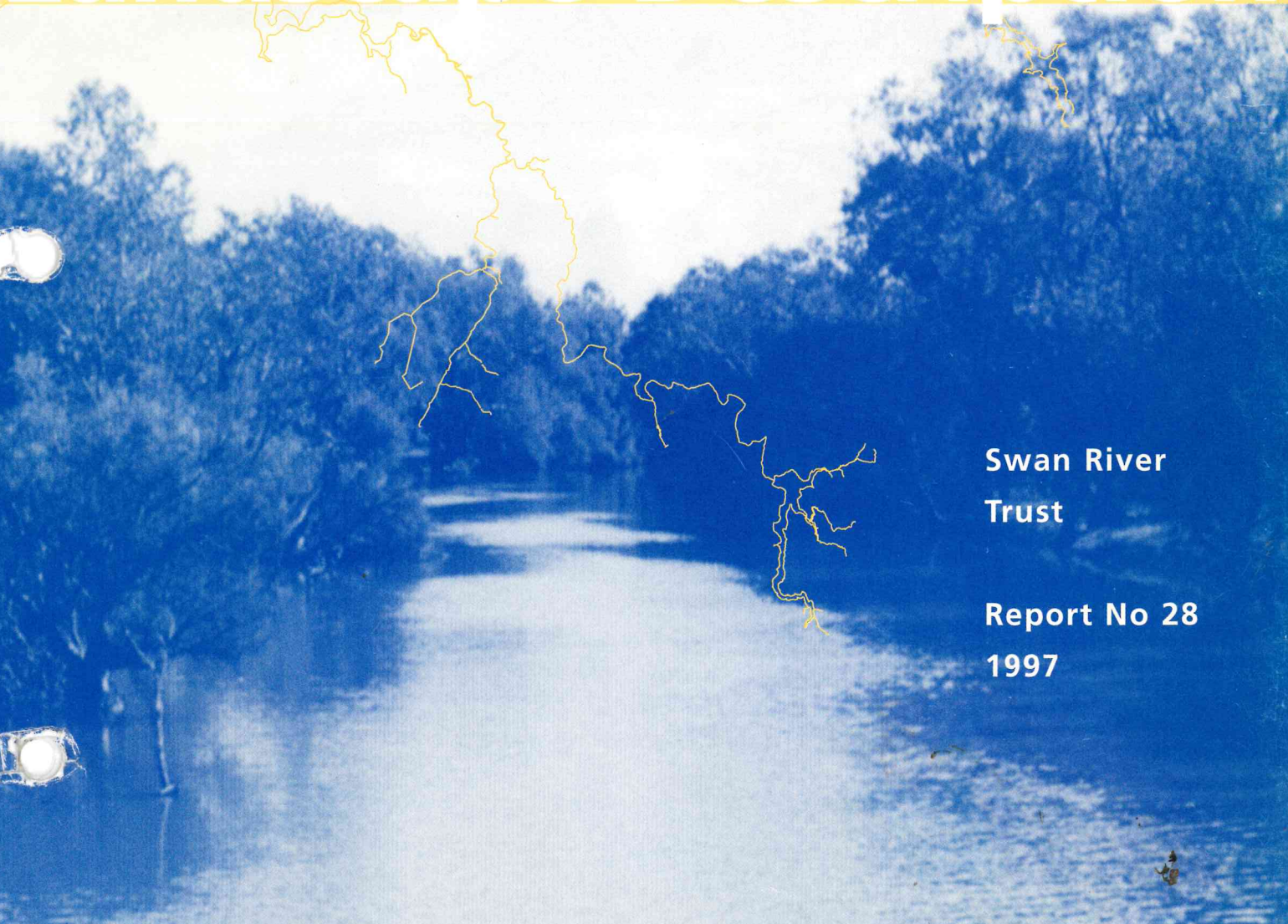

Swan River Trust

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1997

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Landscape Description

Report to the Swan River Trust

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WATER AND RIVERS COMMISSION

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Report No 27, September 1997

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The Swan River Estuary and its tributaries are integral to Perth's cultural and environmental identity. The river system has a natural beauty which must be preserved and managed for the enjoyment of all West Australians, as well as for visitors to our State.

The Swan River Trust's 1988 *Swan River Management Strategy* contains six recommendations relating to landscape management including a proposal to prepare a landscape plan for the river.

This landscape description is the first step towards implementing the vision to respect the Swan River setting as a prime community resource through planning and development processes. The landscape description is designed to encourage and assist the protection and enhancement of the character and beauty of the environment by highlighting the main landscape elements. This document presents detailed resource and landscape character descriptions for the Swan and Canning Rivers and their major tributaries. Biophysical elements, past and present land use and sites of significance are all summarised. Detailed reference lists are provided for future studies. The descriptions will be used as a resource on which sound landscape management techniques and policies can be developed in conjunction with the Ministry for Planning and local government authorities.

Retaining these natural and cultural elements makes the Swan River unique and defines its regional identity. This landscape description is a significant step towards achieving our vision of retaining a healthy and attractive Swan River system.

Summary

The Swan River Trust has a vision to respect the Swan River System as a prime resource through planning and development processes. To achieve this, the Trust has implemented a staged program to define the landscape and develop necessary planning actions for the Swan Region.

The *Swan River System Landscape Description* is the first step towards achieving landscape protection. Initial work has divided the river system into 23 precincts. Resource information pertaining to the Swan and Canning Rivers has been collected including geology, topography, vegetation, hydrology, flooding, public access, recreational elements and nodes, as well as changes to the environment from a land use perspective. Local history and cultural significance has also been summarised.

The inventory also provides a description of each precinct in terms of dominant landscape features, viewscapes and important elements in the environment. Maps of sites of significance have been prepared for each precinct. The classification of the landscape types has required a methodology to be developed. The landscape types are classified in groups according to their industrial, suburban or natural character, whichever is considered the dominant character of the landscape.

Landscape elements that are conforming and non conforming to the present landscape character types are outlined in this document. This is an objective description and it will be up to a group of experts to determine whether the present landscape character is one that needs to be retained or enhanced. The landscape character boundaries will be used as a basis for determining 'an area of influence' to guide the community, government and individual landowners in making sound management planning decisions about the river environment.

The *Swan River System Landscape Description* is a working document that will provide background information for the formulation of landscape and development control policies. It is envisaged that these policies will be developed by a working group of experts and other stakeholders including Aboriginal representatives, community groups, and river users' representatives. The draft policies would be revised as required.

The final stage is planned to involve the development of a program for implementing policies and assessing their effectiveness. The policies will need to empower the community, landowners and decision making agencies to be responsible for the conservation of natural and cultural elements of the river system.

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1. Introduction

The Swan and Canning Rivers and their immediate surroundings can be considered the most important landscape features of the Perth Metropolitan Region. The Swan River system landscape has changed since European settlement and is subject to ever increasing pressure for change. The river holds 'icon' status and has become a focus for the quality of the perceived environment in the metropolitan region. Previous studies of the Swan River landscape have been of some use in defining issues and pressures for change, however there has been no comprehensive inventory of the resource. This study seeks to describe the Swan River landscape and its area of influence as the basis for a more comprehensive and lucid landscape conservation strategy.

The *Swan River System Landscape Description* will serve as a foundation for developing a coherent strategy for the Swan River landscape. In developing a strategy the Swan River Trust seeks to involve the community to set values and assign priorities managing future development. The Swan River Landscape Program will need to be supported by all of government and implemented as a part of their daily responsibilities. Local government has traditionally focused upon urban design and terrestrial landscapes rather than acknowledging the river as a landscape setting of which their municipality is but one important part. It is expected that the Trust will assume the role of advocate for the development of a landscape conservation strategy for the Swan River system and to improve cooperation through all levels of government and between the public and private sectors.

Defining Landscape

Any analysis of a landscape requires an appreciation of the conceptual aspects of landscape in its entirety, for example the entire Swan and Canning River system and also an appreciation of its component viewsheds and landscape units which carry their own local significance.

Appleton (1980) noted that '*Landscape* is not synonymous with environment, it is the *environment perceived,* especially visually *perceived*'. Unlike other aesthetic objects, such as buildings and paintings, landscape is not a discrete object; rather it is an unwieldy aesthetic object with an indeterminate form (Bourassa, 1994). Landscape is more than physical features. It is the interpretation, interaction, and emotions generated by the experience of the environment's natural and cultural elements.

The Swan River system is made up of a series of settings or a sequence of viewsheds. The landscape setting is defined by an area and its geology, landform, vegetation, built form, human activity, and climate and their influences on its processes. The values associated with landscape protection are complementary to those values traditionally ascribed to environmental protection, including economic efficiency, clean air and water, species protection, availability for public enjoyment and sustainability. The community appreciation of the landscape resource is a synthesis of individual perceptions, some acute, some subliminal, others based upon historical and childhood appreciations of activities and cultural values. The landscape can be appreciated at a local level or for its regional significance. Rather than competing, these overlapping parameters enhance the power of the landscape to affect individual lives and the appreciation of the broader community.

Perception and Interpretation of Landscape

Just as there is a broader community perception of the Swan River landscape and its importance, there are localised community perceptions of precincts along the river. For example, the limestone cliffs at Blackwall Reach, Bicton, are an important landscape element to most people who use the area whether they have a conscious appreciation or not. The limestone cliffs provide a range of experiences such as awareness of nature, recreation, spiritual significance and/or a reference point for local identity. Individual experience of Blackwall Reach will vary but, for all, the cliffs and their appearance would be a key or important landscape feature. The values attributed to the broader Swan River System resource are well expounded even though they may yet to have been documented. Local values and perceptions of the river landscape have varied support and sometimes compete, especially in the face of development proposals.

There is a wide range of literature on methods of rating value judgments of people in relation to the landscape and natural resources, for example Leopold

(1969) and Prinease and Allen (1992). Value judgments can provide useful information for the development of guidelines, for the assessment of land use development proposals and assigning relative values.

Landscape perception may also be defined by visual, geographical, social and cultural influences. The many personal experiences of the Swan River have led to broad support for landscape conservation, however this support has been based upon many different personal unrecorded but nevertheless important perceptions of the landscape.

Fredrick Steiner (1991) noted the need for an emotional investment with the landscape to conserve the environment. The importance of a site reflects not just a physical link to the land, but also a spiritual or emotional link. People are more likely to conserve and preserve a place that has some sort of significance to them. By utilising the enthusiasm people have for particular sites, the Swan River Trust will be able to work with them to enhance and maintain the integrity of the landscape.

Values have changed over time and the effect of this has been to change the landscape. This is especially pronounced with the Swan River. Removal of the coralline bar at Fremantle Harbour, Mosman Park quarries, rubbish disposal sites, dredging and general urban development have all shaped the present Swan River landscape. Community attitudes have has changed from the initial desire of Europeans to alter the natural landscape surrounding the river. It is important to understand the value processes that have brought about the contemporary Swan River landscape. What remains of the original natural landscape is fragmented throughout the study area. Where land has retained its basic topography or biological character it is mainly by chance, rather than consideration for environmental or aesthetic values. Aesthetic decisions are in general made at an intuitive level, defined by the cultural upbringing of an individual. In the colonial period, much of the natural landscape was regarded as unattractive by Europeans and development took place with little regard to the environment and aesthetics. A typical settler's perspective is reflected by Samuel Taylor, a visitor from Sydney, who in 1829 wrote of the Swan River Colony where *'you have one of the most delightful demi-panoramic view, I suppose, in the world; but this is all that could be said of it. Not a blade of grass to be seen - nothing but sand, scrub, shrubs and stunted trees, from the verge of the river to the tops of the hills'* (In Stannage, 1979). The continual influence of people whose values were formed in different environments, and the inability to recognise the intrinsic value of the unfamiliar landscape, have resulted in the dramatically modified landscape of the present day Swan River system.

With changes in social values, it is now recognised that the Swan River system landscape is important for many reasons including local identity, cultural use, development and intrinsic values. The shift in community values toward the system are probably best reflected by George Seddon, whose works have contributed to raising awareness of the experience of the Swan River landscape, its uniqueness and value, and society's changing perceptions. In *Swan River Landscape* (1970) he promoted the care and management of the natural landscape rather than replacing it with an alien one. In more recent works he suggested that when planning for a 'sense of place', it should be asked 'Whose sense? and Whose place?' (Seddon, 1995).

Nyungars identify many elements of the Swan River system as being of special spiritual significance, giving a sense of ownership and identity with their surroundings. Richard Wilkes demonstrates the Nyungar awareness of landscape experience in *Bulmurn - A Swan River Nyoongar.* In this novel, Bulmurn, a medicine man, encounters a sacred cave in the Darling Ranges after killing a *bikuta* or red rock kangaroo. *'As Bulmurn approached the kill, he suddenly felt a strange and unique feeling, one that conveyed the message to him that this was a place he belonged to...Even though he had never been to this place before, he felt comfortable, as though it was his place. He felt he belonged here, that he had been in this sanctuary before perhaps in a different spirit form'.* Despite significance changes to the landscape, many Nyungars continue to access the river for sustenance, knowledge, and spiritual renewal, and practise distinctly Nyungar cultural associations with the river environment.

1.1 Aims and Objectives

1.1.1 Context and background for the Project

Previous land use plans and studies reflect the changing values of the community. The earliest recorded Perth town plan was printed in London, by J. Arrowsmith from a document given to the Colonial Office by the first Surveyor -General, John Septimus Roe, in 1833 (Stephenson, 1975). This early city centre plan is typical of the European desire to superimpose foreign ideals onto the indigenous landscape. The ever changing values of the community and planners are documented in plans and analyses by Bold (1938), Oldham (1961) and Seddon (1971). They have noted the change in values from entire disregard for existing natural landscape aesthetics, to the need to 'beautify' the indigenous landscape to European ideals, and to the more recent acknowledgment of the natural landscape beauty and developing local identity.

Much of Perth's unique natural landscape has given way to recent rapid development requirements resulting in unstructured and featureless urban growth. In the past, the inland wetlands were Perth's natural identity. These have been repeatedly infilled for urban development and their uniqueness and importance for conservation and scenic value been unrecognised. By recognising that the landscape has an important part to play in creating a local identity, we can coordinate development to protect those features which will enhance the landscape and diversity.

Perth's cultural landscape has been shaped by a multicultural population, resulting in a distinctively Australian landscape. Often significant cultural or identifiably ethnic landscape features have been superimposed on the physical landscape. For example, the Upper Swan area has a distinctively European cultural landscape with the vineyards and European building styles. The flatness of the Swan River Plain and remnant vegetation are recognisably local, but the land use reflects a distinctive European influence. It is important that these influences are recognised and taken into account when determining the desired landscape types.

Particular focus on the management of the Swan River system came in 1943 when the Swan River Advisory Body was formed. Later in 1958, when the Swan River Conservation Act was passed the Swan River Conservation Board was formed to address environmental and recreational issues within the management area. Today the present Swan River Trust is responsible for administering the *Waterways Conservation Act 1976* and the more specific *Swan River Trust Act 1988.*

The Swan River Trust believes that effective protection and proper management of the valuable river landscape resource should be achieved by careful planning to ensure long term community benefit.

In 1988, the Government of Western Australia released the *Swan River Management Strategy* for the future care and management of the river. The strategy was a landmark in that it recognised the need for development control which took into consideration the landscape of the Swan River system. It received national recognition in the 1989 *Australian Heritage Awards.* The report made a number of recommendations for further work including the development of a clause 5AA Policy (Metropolitan Region Scheme), model town planning schemes, and a management program for the river system. It contains six recommendations relating to landscape management including a proposal to prepare a landscape plan for the river.

In October 1990, the Swan River Trust held *The Swan River Landscape Conference.* The conference was well attended by participants from State and local government, landscape consultants, teachers and university lecturers and interested individuals. The conference brought people together to help determine important landscape components of the river, identify issues affecting the landscape and interested groups, and suggest how landscape problems could be addressed. It prepared the way for development of the landscape plan.

The Swan River Trust has now completed the landscape resource description and is preparing to develop policies which can be implemented by the Trust and local government authorities with community, expert and stakeholder consultation.

1.2 Vision, Purpose and Application

In developing a strategy for landscape protection, Swan River Trust aims to cater for a range of uses and diverse values and to promote sustainability in the management of the landscape. The *Swan River System Landscape Description* provides a landscape resource description and landscape interpretation, from which the next stage of landscape evaluation and criticism can be developed and implemented. The Swan River Trust has begun the project by defining the status of the contemporary Swan River system landscape through the collection of resource information pertaining to the Swan and Canning Rivers, on geology, topography, hydrology, vegetation, land use and sites of cultural significance. The landscape has been classified according to whether it is natural, suburban, industrial, recreational or rural in character. Significant viewscapes and conforming and non conforming elements have also been identified.

From this baseline description, the Swan River Trust, in conjunction with relevant stakeholders, can prepare a landscape planning policy which can be implemented by the Swan River Trust and local government authorities. The Swan River Trust will collaborate with the community to determine what landscape elements are important in evoking a favourable experience, and what landscape characters need to be enhanced, retained or modified. The landscape description, of necessity, has involved breaking the total experience into smaller physical elements. Describing the total experience is not possible at this stage because the experience is different for every individual. The final policy document will provide the basis for policies and guidelines for foreshore management to be incorporated into planning schemes so that the community's individual and collective 'perceptions and experiences' of the landscape can be protected and accommodated in the course of future development. It is acknowledged that managers and planners already investigate the environmental effects of any proposed changes to the Swan River landscape, but it is also necessary to determine how new developments will change the visual resource of the landscape. Then predicted changes must be quantified in a form acceptable to the community and decision makers. It is the planners' and managers' role to ensure that the community's sense of place and ownership, and enjoyable river landscape experience, is maintained.

1.2.1 Purpose of Landscape Program

The Swan River System Landscape Program has been developed in the context of an overall purpose to:

- Identify and explain dominant landscape features of the 'river setting' to aid awareness and understanding, and identify necessary planning actions for the Swan Region.
- Through a consultative process, outline appropriate development design and protect landscape features and enhance river setting.
- Improve the manner in which the river landscape is considered by State and local government in the planning assessment process.

1.2.2 Program Application

The Swan River System Landscape Program will provide the basis for plans and policies which guide the Swan River Trust, Western Australian Planning Commission and local government authorities on:

- development control
- zoning and use
- river management

to maintain the landscape amenity of the river setting and recognise the importance of the natural and built form and viewscapes of the Swan River Management Area and immediate lands which affect the river's viewshed or setting.

1.2.3 Program Vision

To respect the Swan River setting as a prime community resource through planning and development processes by:

- Maintaining a sense of place which nurtures and enhances the river's natural, historical and cultural sites of significance.
- Improving the community's visual and physical access to the river environment.
- Providing for expression of the local and regional context of places in the setting and acknowledging diversity of landscape character.

- Promoting sustainability in the management of the landscape.
- Catering for the range of uses for the river.

1.2.4 The Staged Process

The Swan River System Landscape Program will be achieved in stages. This present document is the implementation of the first stage.

Stage One - *Swan River System Landscape Description*

This comprehensive resource document describes the landscape of the Swan River System in precincts, and can be used to design strategies for its future management and protection by

1. Describing the resources of the Swan River system landscape, defined by geology, topography, water bodies, vegetation, the built and social environment.
2. Developing a landscape description methodology.
3. Describing the elements which make up the Swan River landscape.
4. Identifying the dominant landscape characters of the Swan River system.
5. Identifying significant viewscapes of the Swan River system.
6. Identifying conforming and non conforming elements of the Swan River landscape.
7. Identifying opportunities and constraints for enhancement of the landscape for discussion in the next stage.

Stage Two - Methodology Design and Testing

The Swan River Trust will implement the next stage of the landscape program by outlining a methodology to develop and implement planning policies as part of the third stage. A pilot program will be implemented to identify whether further information will be required to develop landscape policies for the entire Swan River system. The pilot program will test the scope and effectiveness of the methodology. Stage Two will:

1. Develop a brief which will include (but is not limited to):
    - The legislative administrative content of the policy plan including objectives, issues, policy measures and implementation requirements.
    - The methodology for preparing the policy plan and the process to assess the effectiveness of the plans and policies.
    - The proposed organisation of the study.
    - The process of liaison with the State government agencies, and local government authorities in the preparation of the policy plan.
    - The process of consultation with stakeholders and the general community in the preparation of the policy plan.
    - The range of skills and experience required to undertake the study.
2. Test the scope and effectiveness of the brief in relation to two precincts and make recommendations with reference to:
    - The boundary of the precinct or 'area of influence' for planning purposes.
    - Landscape character and river setting protection.
    - The statement of intent in terms of the priorities for recreation, landscape, nature conservation, access and other relevant matters.
    - Policy provisions including, but not limited to, appropriate land use controls, building design, height and setback provisions, landscaping guidelines, provision for public access, traffic and parking, flood management and protection, and pollution and erosion control.

Stage Three - Development and Implementation of Policies

Implementation of the tested project brief will allow the development of policies that require State and local government to take more account of the 'river setting' or 'area of influence' in assessment of planning applications:

1. Defining the 'area of influence' or river setting.
2. An assessment of the visual resource for each precinct developed from the *Swan River System Landscape Description* including:
    - Explaining planning significance of the river setting in visual terms.

- Explaining planning significance of the river setting for future development.
- Assigning priority to landscape elements.
- Establishing a cultural and heritage inventory.

3. An examination of local planning scheme controls and suggested modifications to more appropriately protect the river setting in the course of development.
4. An examination of existing policies of the Swan River Trust, WA Planning, and local governments and other agencies which impact on future development.
5. Development, through consultation, of planning and development control guidelines relating to:
   - land use
   - building design and height
   - landscaping requirements
   - provision for public access
   - traffic and parking
   - flood management and protection
   - pollution and erosion control.
6. Implementation of the policies and evaluation of their effectiveness

1.3 How to use this document

This document is intended to describe the Swan River system landscape resource.

Section 3 contains definitions of landscape in the context of natural resource planning. The term is used in many contexts by different disciplines so it is necessary that natural resources planners agree on their understanding of the landscape paradigm and on the methodology to be used in assessing landscape.

The resource inventory in Section 6 outlines the evolution of the natural environment of the Swan Coastal Plain and begins with an overview of the significance of the landscape for Aboriginal people, considers colonisation by the British, and concludes with the effect upon perception and treatment of the landscape of successive waves of migrants.

The Swan and Canning Rivers have been divided into 23 precincts to allow detailed analysis of the resources and the biophysical and cultural elements. In addition, landscape characters and significant viewscapes have been described for each precinct. Some elements do not conform to the present dominant landscape character types and these have been identified. It is recommended that planners and land use managers take into account the landscape interpretation when making decisions on land use. Once landscape protection policies are developed decisions about development on the river can better respect the river for its resource value. Users of this document are asked to read not only the precinct applicable to their site of interest but also the descriptions of adjoining precinct, so that the specific sites can be considered in a regional context. Management polices and plans can be developed to conserve and enhance the resource. This study may serve as an interim guide to planning decisions, however it is important that landscape policies for the river setting are developed with reference to government, experts and the community.

It is important in future work to identify desired outcomes for the Swan River landscape. These outcomes will be based upon the resource analysis, community values and the economic imperative for sustaining an attractive and healthy river landscape.

These outcomes can be achieved through government policies, guidelines, development controls and protocols which encourage an all of government and whole of community approach.

Areas of river will need to be assessed and considered for conservation listing. Local management plans for river precincts should be prepared to ensure compatibility of development within the 'area of influence' for the landscape.

The program will recommend a mechanism for empowering the community, landowners and decision making agencies to be responsible for the conservation of natural and cultural elements of the river system.

Defining the 'area of influence' or river setting.

The Swan River Trust will define 'an area of influence' within which recommendations on conserving the natural and cultural elements of the Swan River environment should be implemented. The area of influence, based on the identified natural and cultural elements, is to be determined by using the information in this landscape description, and by applying mapping techniques and a sensitivity assessment. It is recommended by Siero *et al* (1992) that the boundary of the river setting should in general run from the nearest ridge line thereby defining a visual envelope. This will determine the broad limits to the view from the water, and it is, less precisely, the land zone from which the river and its setting is actually or potentially visible. The boundary does not aim to be exclusive as there are elements outside the boundary which can be significant to the river landscape.

Principles and developing guidelines and policies

Before developing guidelines and policies on the landscape resource of the Swan River planners must identify landscape principles for their policies. A synopsis of existing policies and plans relating to the precincts should be compiled. Draft policy statements should be circulated so that the community and other stakeholders are involved in the landscape planning and management process. It is envisaged that these policies will be developed by a working group of experts and other stakeholders including Aboriginal representatives, local government, river users and other community representatives. The draft policies would be revised as required but their basic aim should be to promote development which protects and complements the river landscape in a way which is ecologically and socially sustainable.

To facilitate planning, dominant landscape characteristics have been broadly outlined for each precinct. Conforming and non conforming elements have been identified. The working group will determine whether the present landscape characteristics in a precinct should be retained, enhanced, mitigated or preserved and guidelines for these areas prepared accordingly. Local precinct issues could be addressed through strategic guidelines. Siero *et al* (1992) recommended a number of principles which should be considered when developing policies.

- Equity of access to the river, including both physical and visual access. At present, there is physical access to most but not all of the foreshore, but it varies in quality and ease of access. In contrast, visual access is very uneven and it must be noted here that visual access to the river, does not necessarily mean 'river views', rather being able to experience the fringing vegetation of the river and surrounding land uses and not to feel alienated from the river. Clearing vegetation so people can view the river has been a problem and is destructive of the river landscape and is seen by the Swan River Trust as inappropriate. The Swan River Trust has supported protection of access to the river which includes the provision of pedestrian access, and lookouts and scenic roads to access significant views of the river.
- Landscape policies need to be conservation orientated. The policies should aim to reduce inputs to air and water pollution and to maintain habitat and diversity. There is a high level of awareness of these goals in the scientific community and the broad

community, and this will need to be backed up by effective implementation.

• A guiding principle for a good landscape policy is that the landform and geology should be respected, even articulated (Siero *et al*, 1992). Where limestone cliffs are exposed, these should be conserved, and if building is considered necessary, structures should be set back from and complement the natural form. Floodplains are important river features and a necessary part of the river ecology. Intensive development and infill results in flat, unattractive and uniform landscape. Removal of the floodplain results in the loss of valuable and ecologically important floodplain flora and fauna.

• Policies should ensure that distinctly regional and local character is maintained and that the relationship between the natural and built environment is harmonious. The planting of endemic flora will enhance the local identity of the area. Unfortunately there are many examples of building where height and style detract from the landscape form or character. Sierio *et al* (1992) recommended strategies to improve the design of developments, for example by bestowing awards on successful examples of good planning for the landscape.

• Areas of outstanding visual importance merit stringent protection. These need to be identified but could include The Terrace at Mosman Park, Devils Elbow, Canning Beach Road view and Alfred Cove. Special vantage points and those views we encounter in everyday travel also need protection and possibly sensitive enhancement, and this should be coordinated by the managing bodies.

The policies should also recognise that landscape design and management is very location-specific. What is suitable for one location may be unsuitable for another because of visual impacts, land use patterns, existing and future anthropogenic modifications, and the perception and values of local residents. Having identified major landscape types, planners can evolve specific landscape guidelines in consultation with the community and other stakeholders. At the precinct level, the views of the local community will be especially important. However, the regional significance of any precinct must also be recognised and it is the responsibility of the Swan River Trust to ensure that local recommendations are not incompatible with a regional perspective.

Coordination of policy

The Swan River Trust, in conjunction with WAPC and local governments is a key agency in the land development and planning process in relation to the Swan River system landscape. At present there is no comprehensive policy approach to protecting and managing the Swan River landscape setting and development impacts are, at best considered on merit and in an adhoc manner.

By developing and stating the Government's planning intent for the Swan River landscape, including land within the 'area of influence' these agencies will establish a foundation for coordinated development policy across all levels of government and focused on achieving desired outcomes. Local government town planning schemes need to better address their section of the Swan River landscape through considering land uses, building codes and land management practices which meet regional and local outcomes. Table 1 sets out example issues which shape regional and local response to the river landscape. There is a wide range of literature on methods of rating value judgments of people in relation to the landscape and natural resources, for example Leopold (1969) and Prinease and Allen (1992). Peoples value judgments can provide useful information for the development of guidelines, and for the assessment of land use development proposals.

Fredrick Steiner (1991) noted the need for an emotional investment with the landscape to conserve the environment. The importance of a site reflects not just a physical link to the land, but also a spiritual or emotional link. People are more likely to conserve and preserve a place that has some sort of significance to them. By utilising the enthusiasm people have for particular sites, the Swan River Trust will be able to work with them to enhance and maintain the integrity of the landscape.

Landscape design and management is very location specific. What is suitable for one location may be unsuitable for another because of visual impacts, land use patterns, existing and future anthropogenic modifications, and the perception and values of local residents. Having identified major landscape types,

Table 1: Example Issues which may be considered when developing regional and local guidelines

- The need to ensure equity of access, including both physical and visual access.
- The need for the protection and conservation of endemic flora.
- The need to encourage the use of indigenous flora or drought tolerant species.
- The need to retain and improve public access to the foreshore in a manner which is sympathetic to the river landscape.
- The need to address the loss of rural character along the river.
- The need for protection of wildlife corridors along the waterways.
- The need for management of storm water runoff and fertiliser and wise water use.
- The need to raise awareness of the importance of wetlands, mudflats, and damplands.
- The need to establish public awareness of flood prone land and its role in the ecology of the river.
- The need consider effective erosion mitigation solutions with landscape design principles taken into consideration.
- The need for the recognition and protection of heritage and cultural sites.
- The need to address the aesthetic design of stormwater outlets, retaining walls and other riparian structures.
- The suitability of construction materials, colours and treatments.
- The suitability of styles and dimensions of buildings and other constructions.
- The design of signs and other interpretive materials.
- The suitability of and construction of private jetties in an area.
- The preservation and improvement of riparian amenity in the local area.
- The intensity of development in an area, such as minimum site area, maximum site coverage, maximum number of storeys, maximum floor area ratio and minimum distances from the site boundaries.
- The need to improve the appearance of properties as seen from the river.
- A positive future for the Swan River landscape.

planners can evolve specific landscape guidelines in consultation with the community and other stakeholders. At the precinct level, the views of the local community will be especially important. However, the regional significance of any precinct must also be recognised and it is the responsibility of the Swan River Trust to ensure that local recommendations are incompatible with a regional perspective.

The guidelines should ensure that the desirable character of the landscape is reinforced and the undesirable alleviated. This will require identifying the attributes which are rewarding and pleasing to the viewer. But the standards which should be applied are not easily established. For example, urban planners have great difficulty in interpreting 'good urban design'. The Urban Design Taskforce (1994) suggested this definition which defines 'Good urban design is concerned with visual meaning, functional efficiency and broad access to change in cities and towns. It does not depend on universal principles or national codes but is grounded in local characteristics and needs, so much so that it is often hard to notice, being distinguished by a natural fit with site and context. Urban design manifests itself in many ways, but it is always centred on the quality of the public realm'. If the interpretation of good urban design is up to urban designers and regulators, defining an attractive landscape is the responsibility of those who develop and implement landscape policies.

3.0 Landscape: Definitions and Paradigm

When planning and describing the landscape it is necessary to define the term 'landscape'. Appleton (1980) neatly encapsulated the concept by proposing that *'Landscape* is not synonymous with *environment,* it is the environment *perceived,* especially visually perceived'. Landscape is an aesthetic object which is the result of the interaction of the perceiver and the object. The *environment* comprises the physical attributes of an area and is not the result of the subject's selective interpretation. A *scene* is a section of the landscape which is viewed. The biophysical and cultural features of the landscape include the waterform, landform, soils, vegetation, fauna, land use and cultural features.

Steiner (1991) defines landscape as all the natural features such as fields, hills, forests, and water that separate one part of the earth from another part. Usually a landscape is that portion of land or territory which the eye can comprehend in a single view, including all its natural characteristics.

Landscape character is the nature or identity of the landscape (O'Brian and Ramsay, 1992). It is the combination of the natural and cultural elements and their processes. For example, the physical elements may be an estuary and the processes would be the tidal forces which shape the estuary. Cultural elements include the land use of the environment, such as the use of fire by Aboriginals to flush the fauna from bush. An appreciation of an object or landscape is the combination of all sensory experiences, which include visual, auditory, tactile and olfactory experiences.

Visual landscape character can be described by four component elements, which are texture, colour, form and line (Revell, 1991). Texture is the visual surface characteristics of the landscape features. Colour is the perception which allows the differentiation between objects based upon the concentration of hue. Form is the shape or structure of the landscape feature. Line is the extension of a point, such as a shoreline. This document does not address the other aesthetic landscape character elements, for example the auditory landscape would be described using form, periodicity and intensity. These are difficult descriptors to incorporate due to their temporal nature and the large area the project encompasses.

The landscape is not just individual elements, rather it is a composition of a number of landscape elements and these elements may be dynamic. Compositional attributes will include forms of different elements, contrasts between elements, relationships between elements, and spatial definition. It is also important to note that the landscape is dynamic and involves movement, sounds and smells. The psychological interpretation of a landscape by a viewer is determined by such elements as the mystery or potential information of a scene and the expectation that more information will be revealed around the corner. The ease with which a landscape can be comprehended by the viewer as a result of the diversity of its composition is known as the complexity of the landscape. Often the more complex a landscape the more interesting it is to the viewer, however an extremely complex landscape can be an unpleasant and daunting experience. Kaplan (1987) recognised that coherence or the capacity to predict a scene or the ease with which information in the scene can be organised into a small number of 'chunks', is an important factor in landscape perception. The level of comfort with the perceived landscape is determined by its legibility or the appearance that one could explore the landscape without getting lost. It is a landscape factor which has a special effect on preference (Kaplan, 1987).

How an individual perceives the landscape will be the result of a combination of factors. Zube *et al* (1982) suggested that an interpretation of the landscape may partly be the result of intuition which instinctively recognises those elements in the environment which are useful for survival, such as lush vegetation and areas of shelter. Cultural rules are transmitted socially and are often symbolic interpretations of landscape which ensure the self perpetuation of the social structure. An example is the ordered, romantic and balanced Arcadian landscape which many people of European cultures find attractive (Yang and Broun, 1992). A third factor in the mode of perception is the personal strategy which overrides the cultural rules and is creative, such as an artist's originality in presenting an environment. It is also important to note that the individual will perceive a landscape according to where he is in the landscape and how he is interacting with the environment. Every individual will use these modes of interpretation to varying

degrees and for this reason the same environment will be a different landscape for each individual, providing a different aesthetic experience.

An individual will interpret what he perceives as the landscape. The types of interpretation of the landscape identified by the Australian Heritage Commission (1992) include: as nature, as place, as history, as wealth, as ideology, as system and as problem. These can be encompassed in the broad categories of economic values, historic values, scientific paradigm and a sense of place. The individual will place a value on the landscape according to how he interprets what he perceives.

River Landscape Program can be used as a step towards Statewide waterways landscape protection.

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4.0 Study Area

The study area includes the Swan River estuary and the land areas adjoining these waters which are considered as being part of the visual features which impact on the estuary environment.

The study area includes the Swan River estuary from the Fremantle Harbour groynes upstream to Upper Swan at the confluence of the Moondyne Brook; the Southern River from Canning River confluence upstream to its source; Wungong Brook from its confluence with the Southern River upstream to Allen Road Crossing; and the Canning River from Canning Bridge upstream to its confluence with Stinton Creek. The study area is shown in Figure 1. The study area does not include more minor tributaries of the Swan River and it is hoped that the project could be expanded to areas outside the management of the Swan River Trust.

5.0 Method

The study area was divided into 23 workable precincts. The precincts are sections of river which are roughly similar in size and each precinct is not necessarily a homogenous landscape, rather it is likely to contain various different elements and scenes.

Surveys were carried out by boat where possible and also by foot in late 1995 to early 1996. This allowed data to be collected from the point of view of the river user and the foreshore user. It is important to recognise that an attempt was made to use descriptive and factual language and limit the use of emotive words to describe the landscape. Landscape criticism, and evaluation classifying elements as attractive or unattractive, should be done by a team of people and this will be addressed in the next stage.

5.1 Resource Description

For each precinct the physical and cultural resources were identified. Data was collected on different physical, natural and man-made elements by surveying the sites, and from other sources. Specific references sourced for each precinct are listed at the end of each precincts section. As shown in Table 2, cultural elements such as historical changes, conservation areas and precinct significance to Aboriginal people and the wider Australian community are also summarised. Significant cultural sites including some sites of historical and Nyungar significance are mapped. Sites of significance are defined as those areas which demonstrate some or all of the following characteristics: an important emotional link for society, rareness, intactness, excellence of type, cultural or historical importance, association with a particular cultural, historical or social period, association with a significant historical personality, or natural features which are ecologically or intrinsically important.

Table 2:
Resource Information for
Swan River Landscape Precincts

1) **Biophysical Processes**
   - a) Geological Processes
   - b) Hydrological Processes
     - i) Water features
     - ii) Bathymetry
     - iii) Flooding
     - iv) Erosion and accretion
   - c) Vegetation Communities
     - i) Native
     - ii) Exotic

2) **Historical Land Use and Resulting Environmental Changes**

3) **Present Land Use and Social Patterns**
   - a) Present Land use & Patterns
   - b) Recreation Nodes
   - c) Public Access

4) **Sites of Nyungar and Wider Australian Community Significance**
   - a) Nyungar Significance
   - b) Other Significance

5) **Conservation Areas**
   - a) Wetlands
   - b) System 6

5.2 Landscape Interpretation

5.2.1 Precinct Description

To describe the landscape within the precinct, it was first necessary to identify the elements in the landscape. An inventory of elements were identified and are listed in Table 3. Examples of the types of elements described in each precinct description are grouped into seven categories of Waterform, Riparian, Landform, Geology, Vegetation, Riparian Land Use and Cultural Land Use.

Table 3. Examples of Biophysical and Cultural Landscape Elements

Biophysical Inventory	Elements	Cultural Inventory	Elements
WATERFORM	• Open water • Rivers • Streams • Rapids • Confluences	RIPARIAN LAND USE	• Banks - built walls - levees - retaining structures • Other structures - navigation markers - wharfs - promontories - boat moorings - jetties - marinas - overwater buildings - crossings
NATURAL RIPARIAN ZONE	• Natural banks - Spits - Beaches - Islands - Marshes - Swamps		
LANDFORM	• Dunes • Foothills • Plains • Headlands • Cliffs • Promontories • Isthmuses • Caves • Hills	LAND USE	• Buildings - residential - commercial - rural - industrial - suburban - urban • Other amenities - kiosks - toilets - barbecues - picnic areas - play equipment • Formal recreation - parkland - reserves - buildings - clubs - ovals • Other structures - signs - powerlines - railway lines • Pedestrian access - water access - paths -walkways -dual use pathway • Vehicular access - barriers - overspill - roads • Agriculture/rural - type of agriculture/use • Historical artefacts • Significant sites
GEOLOGY	• Soil type • Geological appearance		
VEGETATION	• Natural - samphire - reeds - scrubland - open woodland - forest • Exotic - lawn - weedy field - agriculture - lawn and trees - formal gardens - residential		

The elements were described using four main attributes which are line, texture, colour and local form. Examples of the types of attributes for each of the element categories are shown in Table 4.

Table 4. Landscape Element Attribute Descriptors

Elements	Line	Texture	Colour	Local Form
WATERFORM	geometric elongated rounded meandering sinuous nesting	foaming rough smooth glassy		broad flat open closed shallow deep
NATURAL RIPARIAN ZONE	gradual junction abrupt junction line of junction	rough smooth		closed shape slope
LANDFORM	horizontal parallel bands curved ridges terraced nesting vertical	coarse smooth dusty rough		steep rounded flat inclined plains dune like spurs
GEOLOGY	geometric line of dominant elements	rough smooth sticky clays		form of any visually dominant elements
VEGETATION	layers vertical horizontal storeys	rough smooth scrubby prickly peeling bristly soft dusty	unusual	low stunted towering clumps solid shrubby open wide branching
RIPARIAN LAND USE	geometric vertical horizontal	building materials rough smooth reflective soft hard roof fencing	conforming non conforming colours	round rectangular solid size height style
CULTURAL LAND USE	geometric horizontal vertical	building materials rough smooth reflective fencing etc	conforming non conforming colours	round solid size height style un/sealed

The elements in the landscape were considered in context with each other under the headings of Compositional Attributes, Natural/Cultural Integrity and Landscape Condition. The way the landscape elements integrate is shown in Table 5.

Table 5: The Integration of Landsc ape Elements

Compositional Attibutes	Natural/Cultural Integrity	Landscape Condition
• FORM • SPATIAL DEFINITION • SCALE • HARMONY - non /conforming elements • FOCALITY • DIVERSITY	• CONSISTENCY OF CHARACTER • COMPLETENESS of natural/cultural elements • ETHNIC IDENTITY - architectural type, land use	• LANDSCAPE - wellbeing, urban pride, renewal, degradation, blight, erosion.

5.2.2 Dominant Landscape Character

The dominant landscape characters have been determined to assist the policy and planning process. The **landscape character** is the nature or identity of the landscape (O'Brian and Ramsay, 1992). It is the combination of the natural and cultural elements and their processes. The landscape character types are described below. The dominant landscape character for the area was assessed by survey and each precinct mapped. The boundaries on where a landscape character ends are often arbitrary however, in many cases there is a clear change in land use which can be used as a boundary. Often there are elements which do not conform to the overriding landscape character and these elements were noted.

Natural landscape is that which appears to be relatively natural, with the dominant vegetation being endemic to the site and the landform being relatively unaltered. The site will also have minimal development with the only land use being passive recreation or low impact structures. Unfortunately, the very nature of the Swan River is that there are few sites that have had minimal anthropogenic impact. The term natural landscape character was deliberately chosen as it has positive connotations. If a site appears to be natural it has the potential to be rehabilitated to improve the naturalness of the landscape. Relative to the surrounding landscape characters many of these 'natural' sites appear as 'remnants'. However, a 'remnant landscape character' has less positive connotations than a 'natural landscape'. It is this potential for improving the landscape which is important for the planning process and the ownership of the natural elements which helps create a sense of place.

Arcadian landscape is the man-made landscape which has either altered a natural landscape in way that appears to be natural or has been tamed. This is not particularly common in Perth as the indigenous vegetation is more typically left as 'bushland'. Sections of parklands with remnant vegetation could be considered arcadian as many trees are pruned to 'improve' their form, such as South Perth Foreshore melaleuca and flooded gum stands. This is the conscious 'improvement of the landscape' to create a more ordered natural environment. More commonly entire 'European' landscapes have been created to appear 'Naturalistic' such as Supreme Court Gardens

and University of Western Australia south of Hackett Hall. These landscapes are attractive to the European ideal - the trees have been carefully planted and pruned so as to appear natural (hand of man concealed), however no natural environment is so well ordered and proportioned.

The **modified landscape** is the rather derelict landscape that has been previously used and now is abandoned. The dominant vegetation is typically weeds and any remnant indigenous vegetation. Buildings and other structures have been typically cleared, but the soil of the building pads and discarded building material often remains. The modified landscape is typically an empty block that is awaiting redevelopment such as the Burswood peninsula.

The **suburban landscape** is characterised by those elements which are so familiar to the Perth population, streets of houses each with their own garden, shopping centres, carparks, administrative buildings, power poles, parklands and other amenities. The suburban landscape in the study area ranges from high density housing estates to large blocks with single houses. The relative youth of the city enables easy identification of the age of the suburbs, with dominant housing styles evident and characteristic of the time of establishment. Increasingly, riverfront properties are becoming more prestigious, and ribbons of high value properties are now edging the river landscape with lower value properties only blocks away.

The **urban landscape** is characterised by the dominance of the city skyscrapers. In Perth, this landscape is distinctive in that the high rise skyscrapers mainly house offices and rarely are residential. The style of the buildings reflects the non residential uses with balconies and small gardens not being prevalent. This is slowly changing with the local council supporting inner city residential buildings, however these are mainly on the edge of the city centre due to economic factors. Other features of the urban landscape the large carparks, communications infrastructure on buildings, and converging freeways and road infrastructure. Street art is often on a large scale or may take the form of patterned footpaths. One feature of the Perth urban landscape is the shopping malls, which are solely for pedestrian access and are typically lined by retail outlets.

The **industrial landscape** is becoming increasingly rare in the study area. It is characterised by industrial, functional style buildings and sheds. Often, smoke stacks and high tension powerlines dominate the skyline. In many cases after the industry has relocated from the area, the industrial buildings are retained and the landscape still has an industrial element such as the East Perth power station in the Claisebrook area.

The **parkland/recreational** landscape has been classified as those areas of open space with recreational facilities and infrastructure which typically have maintained lawn. The landscape is different from the natural landscape as areas have typically been cleared for recreational activities, dual use pathways have been provided and often there are permanent sporting club facilities such as club houses and infrastructure. The vegetation may range from indigenous species to entirely exotic plantings.

The **rural landscape** is identified by having broad-acre blocks with low residential density and some form of agricultural practice. Around the Swan River study area the rural activities are high intensity horticulture, grazing and horse agistments. The properties generally have ribbons of indigenous vegetation the land was not useful for agricultural purposes and these patches of indigenous vegetation are usually infested by weeds. Some properties have remnant mature trees within the paddocks.

5.2.3 Significant Viewscapes

Most precincts have locations which allow a large portion or significant element of the surrounding landscape to be viewed. These viewscapes are indicative of the precinct's local identity, and important for creating the user's association with a site. These viewscapes are often topographically high points, or areas with low density vegetation, however 'improving' significant viewscapes by pruning or clearing trees is not supported by the Swan River Trust. The presence of significant sites makes the viewscape an important feature of the landscape, for example the view of the South Perth foreshore from

King Park has the Old Mill as an important focal point. The viewscapes have been identified so that planners may consider the need to maintain or enhance the views when creating local action plans or policies and these viewing points are shown on the maps. The viewscapes can be panoramic or linear and can be viewed both to and from the river.

5.2.4 Conforming and Non Conforming Elements in the landscape

Prominent man-made elements which are important for maintaining the present landscape character have been noted. An example of a rural conforming element may be a traditional farm house or storage sheds. Those elements that do not conform to the present landscape character have been identified. These non conforming elements may themselves be attractive, however they are at odds with the present landscape character. A non conforming element may be an obtrusive building located on a very flat floodplain area. It is also important to note that the present landscape character may be considered undesirable by the planners.

5.2.5 Recommendations for maintenance and enhancement of the present landscape character

For each precinct, those elements of the landscape that detract from the present landscape have been identified and suggestions for their enhancement, removal or maintenance have been made. These suggestions are only a guide and starting point for debate by future planners and communities and are by no means indicative of Swan River Trust policy.

6.1 Natural Context of the Landscape

6.1.1 Geological History

The Swan River Landscape study area comprises two distinct geological zones separated by the Darling Fault, the Yilgarn Block to the east and the Perth Basin to the west. The Yilgarn Block is dominated by the ancient granitic rocks of the Western Shield which is a block of Precambrian crystalline rocks that forms the core of the continent and has remained basically stable for 570 million years. Phanerozoic sediments (younger than 570 million years) are rare in the Yilgarn Block and are confined to local depressions on the shield surface and to drainage channels.

The western margin of the Yilgarn Block is defined by the Darling Fault which is obscured by sediments but is now located approximately 1 to 3 km west of the Darling Scarp, which is its surface expression (DCE, 1980).

West of the Darling Fault and marginal to the Western Shield is the Perth Basin, a sedimentary trough filled with Phanerozoic rocks up to 15,000 m deep, which runs north and south slightly west of the Darling Scarp (Seddon, 1972). Mostly rocks of Cretaceous age (140-70 Ma B.P) or younger crop out in the Perth Basin although a portion of the Precambrian Western Shield has been preserved on the western side of the Basin and appears as the Leeuwin-Naturaliste Ridge.

At the beginning of the Phanerozoic (570 Ma B.P) Australia formed part of a single supercontinent, Gondwanaland, which subsequently broke up. The resulting land masses then became separated by the process of sea-floor spreading from mid-oceanic ridges. It is generally accepted that India and Antarctica were the land masses bordering Western Australia. As part of the breakaway from the Indian land mass, a rift-valley formed along the Perth Basin with the Darling Fault as its eastern margin. The floor of the rift-valley subsided deeply, so that sediments derived from erosion of both adjacent continents were deposited in it.

During the Permian (280-250 Ma B.P), Australia occupied a more polar position and widespread glaciation took place. The oldest rocks generally encountered in the Perth Basin are from this Permian age and there are thick glacial accumulations of similar age in India (Seddon, 1972). Separation of India from Australia is believed to have been completed during the Jurassic period.

The Darling Fault was very active throughout the Jurassic (205-140 Ma B.P), fluvial sediments accumulated on the subsiding basin and are believed to be at least 4200 m thick (Playford *et al*, 1976). A period of uplift and erosion occurred in the Perth Basin early in the Cretaceous (140 Ma B.P). The erosion was followed by a period of marine sedimentation to a thickness of as much as 12,000 m.

At the end of the Cretaceous period (65 Ma B.P) the whole continent began to rise, marine sediments deposited in the Tertiary (65-2.5 Ma B.P) now make up a subsurface layer of shale, limestone and dolerite to a thickness of up to 600 m. During this time the Kings Park Formation was also deposited. It is a shallow-marine to estuarine deposit laid down in the drowned river valley or submarine canyon of the ancient Swan River estuary and consists mainly of shale and siltstone overlain by Quaternary deposits (Playford *et al*, 1976).

The soil types of the Swan River System are shown in Figure 2. During the past 2.5 million years fluctuating sea levels have resulted in the deposition of sediments of marine, aeolian and alluvial origin which blanket most of the Perth Basin. They consist of coastal deposits, coastal dunes, alluvium, laterite and associated sands (Playford *et al*, 1976).

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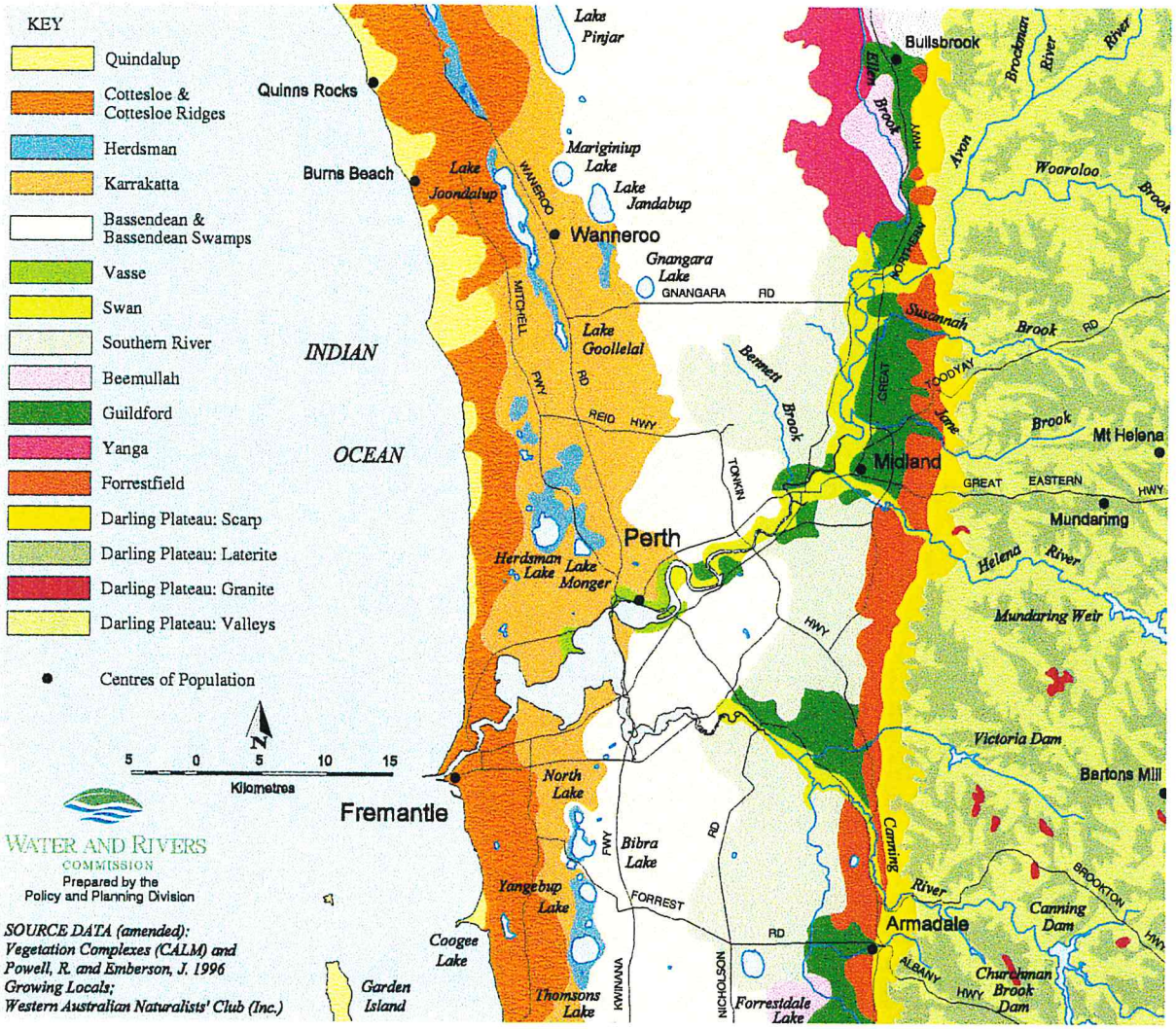
Figure 2

Soil types of the Swan River system and surrounding areas



Soil types of the Swan River system and surrounding areas

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6.1.2 Geomorphological Evolution

The Swan Coastal Plain consists of a large area within the Perth Basin bordered on the east by the Darling Scarp, on the west by the Indian Ocean, the Hill River Scarp to the north and Cape Naturaliste to the South. The Swan Coastal Plain has been built up by the accumulation of marine, aeolian and alluvial sediments over time.

Five main geomorphic units have been identified on the Swan Coastal Plain, the Ridge Hill Shelf, the Pinjarra Plain and the Bassendean, Spearwood and Quindalup Dune systems (Seddon,1972). These deposits generally show a progressive decrease in age and elevation passing from east to west and their locations are shown in Figure 3.

The easternmost unit of the Swan Coastal Plain is the Ridge Hill Shelf which forms the foothills of the Darling Scarp and consists of a series of laterite-covered spurs which are the remnants of a once continuous feature that has been eroded eastward over time (Pilgrim,1979). The Ridge Hill Shelf slopes gently westward and is dissected by many microscale channels. The soils generally have a high iron and alumina content and have good drainage capabilities. The slope and drainage of the shelf does not allow the ponding of water and therefore swamps are rare.

The Pinjarra Plain is an alluvial plain at the foot of the Darling Scarp. The Pinjarra Plain has been built up by the deposition of alluvial sediments brought down by the streams of the plateau. Deposition began with the retreat of the sea during the Riss glacial period about 240,000 years ago (McArthur and Bettenay, 1974). The plain is surfaced mainly by clays and loams in the valley flats and by poorly sorted clayey sands and gravels in the piedmont zone (Playford et al, 1976). These soils are relatively fertile, in comparison with other soils of the Swan Coastal Plain. The plain is dominated by various sized channels and although the soils are tolerably well drained the flatness of the plain results in the formation of small seasonal swamps (Seddon,1972).

The Bassendean Dune System is the oldest of the dune systems of marine origin and today consists of a series of low hills varying from 20 m to almost flat which rise to 110 m above sea level. They were formed as a belt of coastal dunes and associated shoreline deposits which accumulated mostly during a period of high sea level, about 115,000 years ago during the Riss-Würm interglacial period (McArthur and Bettenay, 1974). The dunes were probably largely calcareous with a smaller proportion of quartz sand but over time the soluble calcium carbonate has been leached out leaving the infertile grey quartz sand found today (Seddon, 1972). The present shape of the dunes is largely inherited from the original coastal dunes but the relief has been much diminished as a result of the leaching (Playford *et al,* 1976). The excessive permeability of the sands leads to a characteristic lack of drainage channels but the dunes lie over an almost impermeable organic hard pan which is close to the surface in many of the interdunal depressions, so while the sand ridges are excessively drained the swales become saturated with water, creating seasonally inundated basins (Semenuik, 1988).

Following the formation of the Bassendean Dunes there was a considerable break before the accumulation of the relatively youthful Spearwood Dunes began in the Würm I interstadial about 80,000 years ago (McArthur and Bettenay, 1974). The topography and composition of the Spearwood Dunes differ markedly from the Bassendean Dune System. The hills are higher and the soils are less leached, the yellow colour shows that there are still appreciable amounts of iron in the soil. The surface soils are leached and the carbonate has been precipitated below to form layers and columns of hard, compact limestone deposited from solution by percolating waters (Seddon, 1972). Along the western fringes of the Spearwood Dunes the limestone has been extensively exposed by wind

action with the material removed being deposited to the east. The dunes form linear, continuous parallel ridges and intervening narrow and steep-sided depressions (Semenuik, 1988). The contact between the eastern margin of the Spearwood Dunes and the Bassendean Dunes is marked by a line of swamps and lakes which may represent old lagoons cut off by foredunes from a prograding shoreline. The Spearwood Dunes are characterised by an absence of drainage channels and the wetlands tend to be irregular to elongate basins forming linear chains due to the strong inheritance in the lithified, parallel dune sets (Semenuik, 1988).

The Quindalup Dunes occur as a series of elongated dunes generally running parallel to the current coastline and are associated with a falling sea level over the past 5000 years. The dunes are restricted to a narrow coastal strip and are often separated from the Spearwood System by a line of lakes or inlets (McArthur and Bettenay, 1974). They consist of calcareous sands which are high in lime but low in soluble salts; the sands are mostly unconsolidated although there is some cementing in lower layers as lime dissolved from surface layers is redeposited at depth (Seddon, 1972).

The lakes, inlets and estuaries of the Swan Coastal Plain show a distinct lineation parallel to the coastline in relation to the three dune systems (Seddon, 1972). That they generally occur along the boundaries between adjacent dune systems shows that each dune system formed independently (McArthur and Bettenay, 1974). The estuarine reaches of the Swan and Canning Rivers show this relationship to the dune topography. The broadwaters of the Swan at Freshwater Bay and Melville Water and all of the lower Canning estuary to Bull Creek are north-south lake-like elongations that occupy interdunal depressions (Seddon, 1972).

The many small streams running off the Scarp flow in narrow, deep, steep-sided valleys. As the streams flow into the permeable sediments of the plain much of their water is lost, hence sediments are dropped and alluvial fans are formed. The formation of the alluvial fans which have coalesced with time has resulted in the gently undulating surface that we see on the Pinjarra Plain today (Seddon, 1972). A feature of the streams entering the Pinjarra Plain is that they are diverted either north or south and enter the ocean at a few select points. In some cases the dunes have diverted the streams, but McArthur and Bettenay (1974) believe that headward erosion and river capture is a more likely explanation.

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6.1.3 Changing Climate

South West Australia has not been glaciated since the Permian (260 Ma B.P) when the continents were merged as one land mass. During the Cretaceous period the continents of Gondwana separated and moved apart. Although Australia occupied a polar position the temperature gradient across latitudes was much less marked than today and the climatic conditions of Australia would have been broadly similar to those at present (Summerfield, 1991). Toward the end of the Cretaceous there is evidence of a slight cooling but this trend was reversed during the early Tertiary.

At the beginning of the Tertiary (65 Ma B.P)

Australia was still connected to Antarctica but the seas of the high latitudes would have been much warmer than today and there is no evidence of an icecap on Antarctica at that time (Barlow, 1981). The final separation of Australia from Antarctica approximately 40 Ma B.P initiated circumpolar oceanic currents, reducing heat transfer from equator to the pole and increasing the temperature gradient across latitudes. This resulted in an expansion of the Arctic ice sheet and in parts of Australia the levels of precipitation would have fallen with progressive aridity and the establishment of a Mediterranean climate as Australia drifted northwards (Hopper,1993). In the early Pliocene (5 Ma B.P) there is evidence of an ice-surge which would have resulted in a lowering of temperatures in Australia and an increase in dry anticyclonic circulation. This was followed by a Pliocene warming and then a second cooling in the late Pliocene (Barlow, 1981). Glacial-interglacial cycles resulting in large scale oscillations in temperature had now become established with the warm interglacials being wetter than the cool glacials (Kershaw,1981).

The fluctuations in ice sheet volume during glacial-interglacial cycles have been the primary control of global sea level change for at least the past 2 Ma. As discussed in the previous section these sea level changes resulted in the formation of the dune systems of the Swan Coastal Plain. Sea level and temperature changes are also major factors controlling precipitation levels. Lower sea levels caused by the expansion of the ice sheets expose the continental shelf. This combined with lower sea surface temperatures causes a reduction in the warm shallow water available to form atmospheric moisture which decreases precipitation (Kershaw, 1981).

Approximately 6500 Ma B.P. there was a warm, wet phase that was favourable for plant expansion and diversification. Since about 5000 BP there has been a recession of precipitation to present levels which are considered intermediately favourable to vegetation communities. Around 1800-1200 B.P. the climate was quite arid resulting in the building of the Quindalup Dune System and the regression of vegetation (Beard, 1981).

The south-west region which contains the study area has a current climate that is distinguished by its succession of abundant winter rains and intense summer drought which characterise the 'Mediteranean' climate. A subtropical belt of high pressure breaks down into anticyclonic cells which move south in the summer and north in the winter. The prevailing air circulation over the south west region is anticlockwise with a dominant westerly component in the winter and an easterly component in the summer (Gentilli,1972). Relief from the hot. dry easterly winds in summer comes from the south-westerly afternoon seabreeze.

Summer temperatures average 29°C maximum and 17∞C minimum. In the winter the average maximum temperature is 18°C with a 9°C minimum. The average annual rainfall recorded at the Perth Airport is 801 mm with the majority of the rain falling between May and August inclusive (Bureau of Meteorology, 1995). The combination of hot dry summers with afternoon south-westerly winds averaging about 20-40 km per hour creates an environment in which forest and bush fires are liable to occur (Rippey & Rowland, 1995).

Table 6: Climate Averages from Perth Airport Data Collected From 1944 - 1993 (Bureau of Meteorology,1995).

Parameters	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean monthly rainfall (mm)	7	17	15	45	107	176	162	118	69	47	26	12	801
Mean daily max (°C)	31.5	31.6	29.4	25.2	21.4	18.7	17.7	18.2	20	22.3	25.4	28.5	24.2
Mean daily min (°C)	16.8	17.4	15.8	12.8	10.3	9	8	8	8.8	10.1	12.4	14.7	12.0

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6.1.4 Plant Communities

The vegetation of a landscape is an essential element in defining local character and location. Dominant species are important key elements enabling the viewer to recognise the locality of the viewed scene. Many people, even if they do not know the names of plants, will recognise the difference between the low coastal species and open woodlands and scrub of the sandy coastal plain.

Vegetation can be classified according to the taxonomic classification; or by groups or classes according to characteristics such as main growth form, vegetation species dominance or structural dominance. There is no single correct way to classify plants and the type of classification used in this document has been chosen as it was considered the most useful for landscape interpretation. This document has used the Department of Conservation and Environment vegetation classification (1980). This system is based on the types of vegetation communities and how they relate to the landforms, soils and rainfall (Heddle, 1979; DCE 1980). The location of vegetation complexes is shown on Figure 4 and they are described in brief in Table 7.

Table 7: Vegetation Complexes of the Swan River Landscape Study Area. Modified from Department of Conservation and Environment WA (1980).

Bassendean Complex:	Vegetation ranges from woodland of *Eucalyptus marginata - Allocasuarina fraseriana - Banksia* species to low woodland of *Melaleuca* species, and sedgelands on the moister sites. This area includes the transition of *Eucalyptus marginata* to *Eucalyptus todtiana* in the vicinity of Perth. Occurs on the aeolian deposits of the Swan Coastal Plain.
Beemullah Complex:	Mixture of low open forest of *Casuarina obesa* and open woodland of *Eucalyptus calophylla - Eucalyptus wandoo - Eucalyptus marginata.* Minor components include closed scrub of *Melaleuca* species and occasional occurrence of swamp cyprus *(Actinostrobus pyramidalis).*
Bindoon Complex:	Woodlands of *Eucalyptus loxephleba* with *Eucalyptus wandoo - Eucalyptus accedens* on the upper slopes and breakaways. Found on the major valley floors and scarps of the Darling Plateau.

Cottesloe Complex: Mosaic of woodland of *Eucalyptus gomphocephala* and open forest of *Eucalyptus gomphocephala - Eucalyptus marginata - Eucalyptus calophylla*; closed heath on the limestone outcrops. The complex is found on the aeolian deposits of the Swan Coastal Plain.

Darling Scarp Complex: Vegetation ranges from low open woodland to lichens according to depth of soils. Woodland components chiefly *Eucalyptus wandoo* with *Eucalyptus laeliae* in the north, *Eucalyptus haematoxylon* in the south and *Eucalyptus calophylla* throughout the Darling Plateau region. Found on the major valley floors and scarps of the Darling Plateau.

Dwellingup Complex: Open forest of *Eucalyptus marginata - Eucalyptus calophylla* found on the lateritic uplands of the Darling Plateau. Understorey includes *Grevillea diversifolia* and *Adenanthos barbigerus.*

Forrestfield Complex: Vegetation ranges from open forest of *Eucalyptus calophylla - Eucalyptus wandoo- Eucalyptus marginata* to open forest of *Eucalyptus marginata - Eucalyptus calophylla - Casuarina fraseriana - Banksia* species. Fringing woodland of *Eucalyptus rudis* in the gullies that dissect the Ridge Hill Shelf.

Guildford Complex: A mixture of open forest to tall open forest of *Eucalyptus calophylla - Eucalyptus wandoo - Eucalyptus marginata* and woodland of *Eucalyptus wandoo* (with rare occurrences of *Eucalyptus lane-poolei*). Minor components include *Eucalyptus rudis - Melaleuca rhaphiophylla.* Occurs on fluviatile deposits of the Swan Coastal Plain.

Helena Complex: Vegetation ranges from open forest of *Eucalyptus marginata - Eucalyptus calophylla- Eucalyptus patens* through to heath and herbland to lichens on granite rock. Found in major valleys combining slopes and floors of the Darling Plateau.

Herdsman Complex: Sedgelands and fringing woodlands of *Eucalyptus rudis - Melaleuca* species. Found on the aeolian deposits of the Swan Coastal Plain.

Karrakatta Complex: Predominantly open forest of *Eucalyptus marginata - Eucalyptus calophylla* and woodland of *Eucalyptus marginata - Banksia* species. Found on aeolian deposits of the Swan Coastal Plain.

Murray Complex: Vegetation ranges from open forest of *Eucalyptus marginata - Eucalyptus calophylla* with *Eucalyptus patens* on the slopes to fringing woodland of *Eucalyptus rudis - Melaleuca rhaphiophylla* on the valley floors. It is found on the major valleys and slopes of the Darling Plateau.

Quindalup Complex: Coastal Dune Complex consisting mainly of two alliances - the strand and foredune alliance and the mobile and stable dune alliance. Local variations include the low closed forest of *Melaleuca lanceolata-Callitris preissii* and the closed scrub of *Acacia saligna.*

Southern River Complex: Open woodland of *Eucalyptus calophylla - Eucalytpus marginata - Banksia* species with fringing woodland of *Eucalyptus rudis - Melaleuca rhaphiophylla* along creek beds. This complex is found on aeolian deposits of the Swan Coastal Plain.

Swan Complex: Fringing woodland of *Eucalyptus rudis - Melaleuca rhaphiophylla* with localised occurrence of low open forest of *Casuarina obesa* and *Melaleuca cuticularis.* Found on the alluvial deposits of the Swan Coastal Plain.

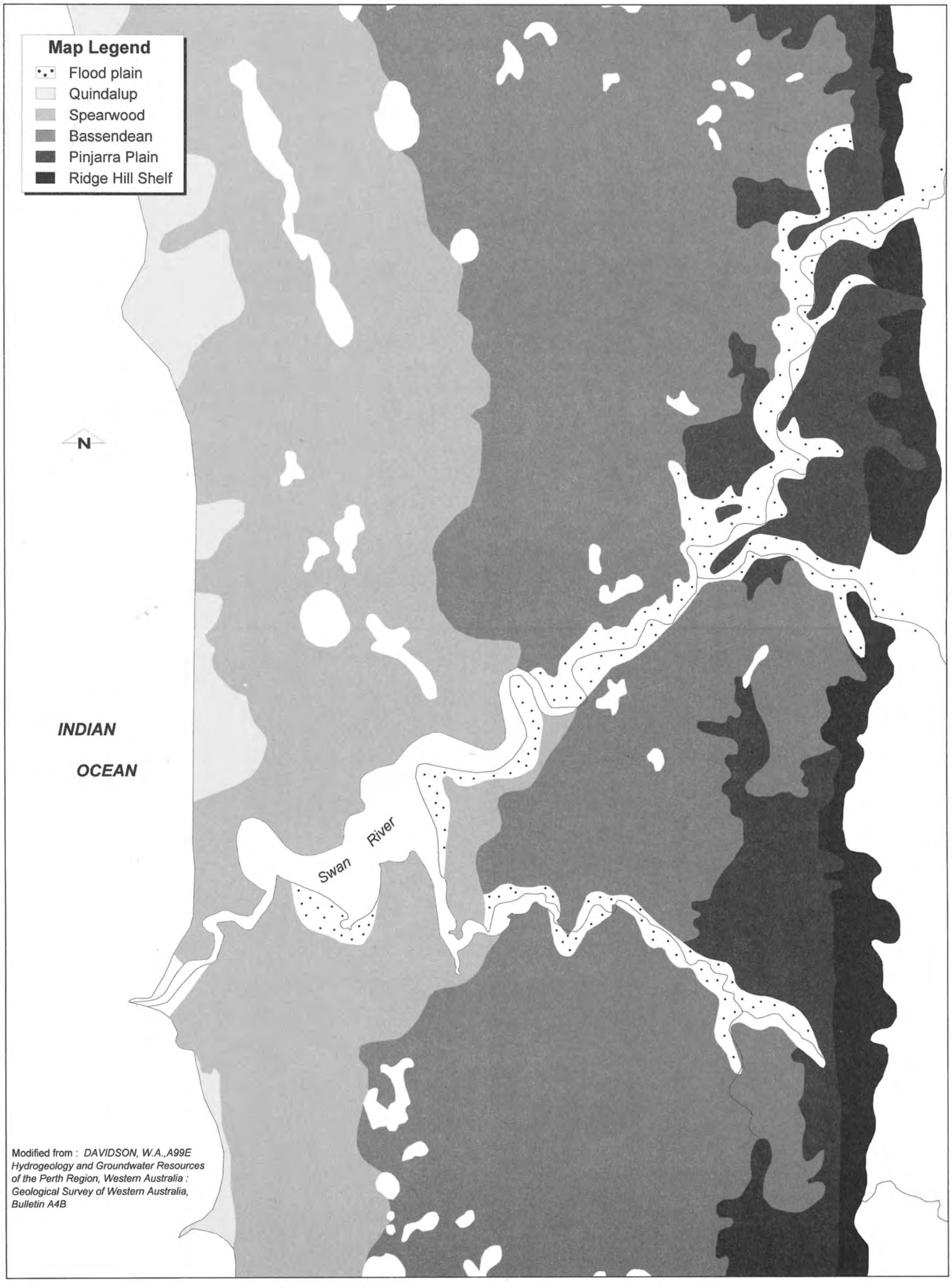
Vasse Complex: Mixture of the closed scrub of *Melaleuca* species; fringing woodland of *Eucalyptus rudis-Melaleuca* species and open forest of *Eucalyptus gomphocephala-Eucalyptus marginata-Eucalyptus calophylla.* Found on marine origin deposits of the Swan Coastal Plain.

Yanga Complex: Predominantly closed scrub of *Melaleuca* species and low open forest of *Casuarina obesa* on the flats subject to inundation. On drier sites the vegetation reflects the adjacent to the Bassendean Complex.

Yarragil Complex: Open forest of *Eucalyptus marginata - Eucalyptus calophylla.* Typically found in the minor valleys of the Darling Plateau.

Figure 3

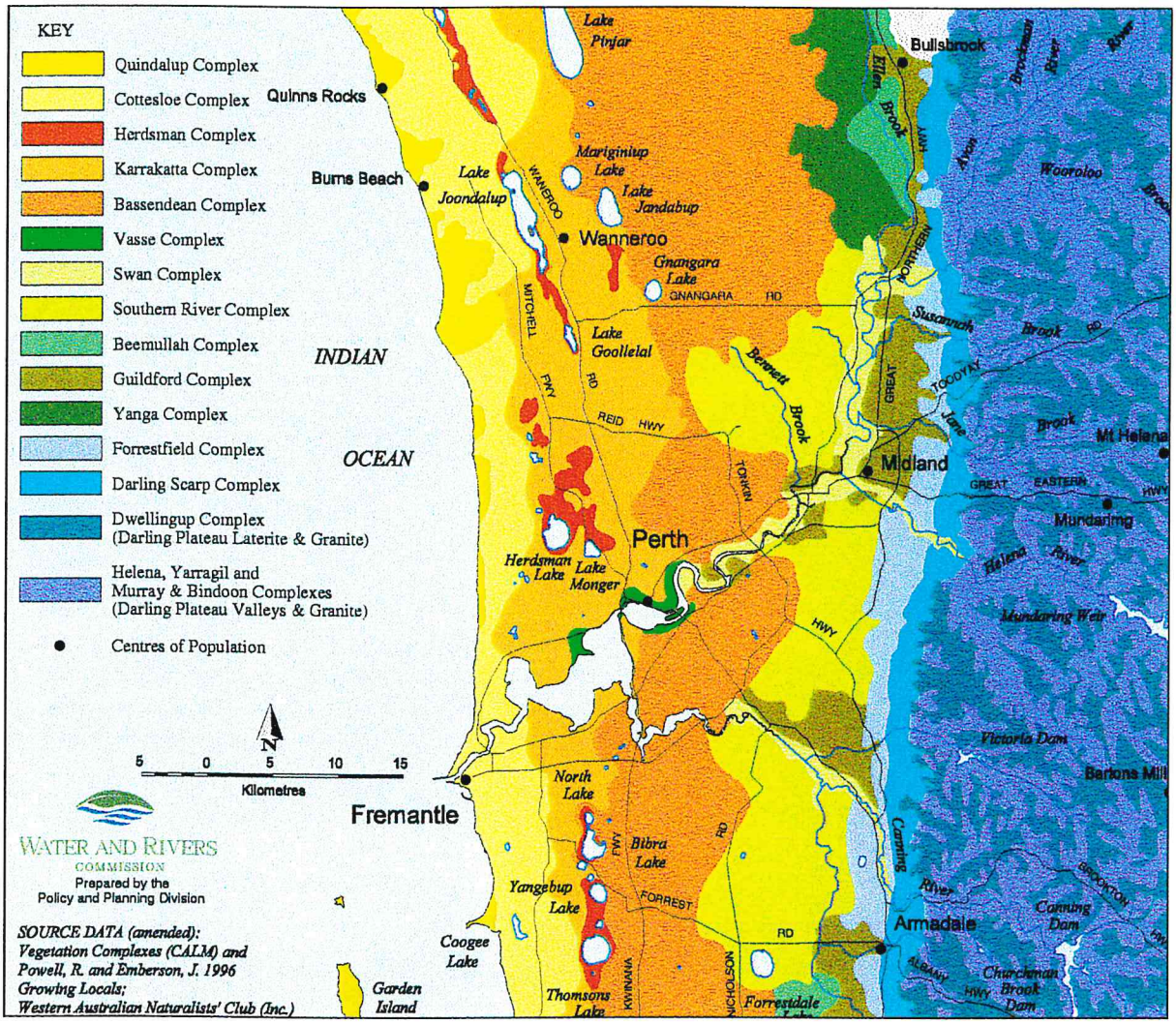
Geomorphology of the Swan River System and surrounding areas



Modified from : *DAVIDSON, W.A.,A99E Hydrogeology and Groundwater Resources of the Perth Region, Western Australia : Geological Survey of Western Australia, Bulletin A4B*

Figure 4

Vegetation complexes of the Swan River system and surrounding areas



For the landscape description, it was considered that a classification which took soils and landform into consideration would be useful in areas where there has been dramatic modification of plant communities. If rehabilitation were to be considered, the soil and landform alone would be sufficient guide to which species would be appropriate to an area. The main plants associated with soil types of the Swan Coastal Plain are listed in Section 9. This list is not intended to be comprehensive, rather it provides a starting point for people considering establishing indigenous plants. As a background description, the types of plant communities found in the study area are outlined below.

Background

The composition and structure of south-west Western Australia is dependent on several factors. The importance of climate as a controlling influence on the vegetation type is quite evident and the seasonality of the Mediterranean climate has resulted in a uniquely adapted flora. The different landforms and the generally nutrient-poor soils are also important factors in determining plant types and distribution. In evolutionary terms, this area is the product of highly leached nutrient-poor soils, cool to warm Mediterranean climate, and physical isolation, and many of the species and complexes are unique to the region. Recognisable features of this area include the predominance of sclerophyllous trees and shrubs, the unique floristic diversity of these shrub communities, the paucity of herbaceous plants and the high degree of endemism or uniqueness to this region (Beard, 1990).

The plant communities and complexes on the Swan Coastal Plain and Darling Ranges are clearly associated with soil types which in turn are associated with the geomorphic elements, distance from the coast, and elevation. The dominant flora is mainly Banksia low woodland on leached sands with Melaleuca swamps where the land is poorly drained. Woodlands of tuart *(Eucalyptus gomphocephala),* jarrah *(Eucalyptus marginata)* and marri *(Eucalyptus calophylla)* occur on less leached soils (Beard, 1990).

The Quindalup Dune System is composed of generally unconsolidated calcareous sand, and supports several plant communities in a landward progression from the shoreline. Indigenous species include the grasses *Spinifex hirsutus* and *S. longifolius* (Erickson *et al,* 1988). Two species which commonly colonise the beaches are sea rocket (**Cakile maritima*) and **Arctotheca populifolia,* which are both introduced and are able to withstand the windy, alkaline and saline conditions of the beach environment, and so contribute to the formation of sand mounds and ridges. The dune heath may consist of grasses, succulents, sedges or shrubs, and some typical species are *Spinifex hirsutus;* sea spinach (*Tetragonia decumbens*); *Lepidosperma gladiatum;* and coastal daisy (*Olearia axillaris*). On the windward slopes of the stable dunes a low dense thicket vegetation occurs and is dominated by *Acacia lasiocarpa* and *Melaleuca acerosa.*

Underlying the Spearwood Dune System is the Tamala Limestone that is the parent rock of the Cottesloe and Karrakatta Soil Associations. Beard (1990) has described the plant formations for the tuart-jarrah-marri tall open forest, and closed heath. The closed heath formation is found in the shallow soils and limestone outcrop areas of western Spearwood Dunes and is characterised by dense shrubs, with some of the more common species being cockies tongues (*Templetonia retusa*), chenile honeymyrtle (*Melaleuca huegelii*) and woolly bush (*Adenanthos sericeus*). Sedges may also be present. The tall open forest forms a belt approximately 10 - 12 km wide and the shallow, yellow and brown Cottesloe Soils in the west generally support tuart-dominant forest. This formation exhibits a small-tree layer, including peppermint (*Agonis flexuosa*),slender banksia (*Banksia attenuata*) and sheoak (*Allocasuarina fraseriana*). A tall-shrub layer, a low-shrub layer, and ground flora such as orchids and lilies comprise species such as blackboy (*Xanthorrhoea preissii*), slender myoporum *(Myoporum caprarioides)* and the zamia (*Macrozamia reidlei*) (Beard, 1990). The deeper sands of the Karrakatta Soil Association in the eastern part of the Spearwood Dunes allow species such as jarrah (*Eucalyptus marginata*) and marri (*Eucalyptus calophylla*).

A woodland formation of jarrah-banksia is also found over the Karrakatta Soils, and is very similar in structure to the tall open forest of the Cottesloe Soils.

However, the small-tree layer is very well developed with *Banksia* species being equally dominant with jarrah. The tall shrub-layer of the woodland is less prominent than that of the tuart-jarrah-marri forest, but includes similar common species such as *Jacksonia furcellata* and *Acacia saligna.*

The leached, grey quartz sands of the Bassendean System form low hills up to 50 - 60 m high with interdunal swamps, and support a low open forest formation (Seddon, 1972). The understorey layers are very diverse, and the dominant tree species are *Banksia attenuata, B. menziesii, Allocasuarina fraseriana* and *Eucalyptus todtiana.* A formation confined to the Bassendean System is the marri-jarrah-banksia open woodland, in which the small tree and tall shrub strata are similar to those found in other formations. Jarrah is generally found on the higher slopes with marri occurring on lower slopes.

In the interdunal depressions there are many small swamps, and these occur within Spearwood and Bassendean geomorphic elements. There may be fringing woodland of flooded gum (*Eucalyptus rudis*) or swamp and low closed forest of paperbark. The common freshwater swamp paperbark (*Melaleuca rhaphiophylla*) is the dominant tree, and the saltwater paperbark (*Melaleuca cuticularis*) is also common, especially around salt and brackish water bodies. The moonah (*Melaleuca preissiana*) may occur on the drier swamp margins, in an open formation with an understorey of shrubs such as holly leaf banksia (*Banksia ilicifolia*). Belts of sedges and/or bulrushes extend into the water bodies and may include Gahnia sp, *Baumea articulata*, and the introduced **Typha orientalis.*

The Pinjarra Plain is composed of alluvial sediments that have been transported off the adjacent Darling Plateau by many small streams. Tall open forest of marri-wandoo-jarrah, is restricted to certain soil types of the Pinjarra Plain and the geomorphic element known as the Ridge Hill Shelf. The relatively fertile soil associated with this vegetation formation has determined that most of the original forest formation has been cleared to some extent, with stands of marri and wandoo remaining amongst pasture.

The Darling Scarp is the western edge of the Darling Plateau. Where erosion on the slopes of the Scarp has exposed granite and laterite, shallow soils around the outcrops support communities of shrubs and herbs. The Darling Scarp receives almost the highest rainfall in the Perth Metropolitan Region. Where the soil is deep there are woodlands of marri (*Eucalyptus calophylla*), wandoo (*Eucalyptus wandoo*), flooded gum (*Eucalyptus rudis*) and jarrah (*Eucalyptus marginata*).

The Darling Plateau can be broadly classified into uplands, major valleys and minor valleys (Powell, 1990). The uplands are gently undulating and the soil surface is gravelly and supports jarrah dominated forest. Some marri (*Eucalyptus calophylla*), bull banksia (*Banksia grandis*), sheoak (*Allocasuarina fraseriana*) are found in this forest. Major valleys of the plateau are deep and broad and support marri, jarrah and wandoo on the higher sections and flooded gum and freshwater paperbark (*Melaleuca rhaphiophylla*) on the valley floor. In the study area, there are a number of granite outcrops that support the types of shrubs and herbs typically found in the lower storeys of the surrounding vegetation complexes. The minor valleys of the Plateau are made up of tributary streams that support a forest of jarrah, marri and Swan River blackbutt (*Eucalyptus patens*) on the higher sections, while the valley floors support swamp peppermint (*Agonis linearifolia*) and shrubs and woodlands of *Melaleuca preissiana* and swamp banksia (*Banksia littorialis*).

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6.2 Cultural Context

6.2.1 The Nyungar Landscape

The *Swan River System Landscape Description* includes a brief literature review of places of significance to Nyungars (indigenous people of the south-west of Western Australia) in the *Derbal Yarragan* or Swan River area. It is not a comprehensive account of Nyungar significance of the area and mainly focuses on Nyungar use of the river prior to and immediately after colonisation. It is recognised that, as a part of the Swan River Trust's public consultation phase when developing landscape policies, further studies into Nyungar contemporary use of the river will be necessary. Today, many Nyungars continue to access the river for sustenance, knowledge, and spiritual renewal and to practise distinctly Nyungar cultural forms (Collard, pers com, 1997).

It is important to note that the records made by historians and early colonists reflected their own personal interpretation of Nyungar lifestyle, culture and language (Green, 1984). Few reports are reliable, most are lacking in detail, and often contradictory, and all are by non-Aboriginals (Green, 1984). The colonists were writing of customs that they often understood little about and these were explained in a language that was foreign to them. In addition, the colonists' own opinions and views were strongly reflected in the writings. When Nyungar accounts were documented, it is certain that they were strongly mediated by the non-Aboriginal writers.

It is also important to note that the spelling of the Nyungar words in this document may vary from other sources. This reflects the fact that Nyungar has only recently been put in written form. Due to the lack of uniform system of spelling many early documenters have interpreted Nyungar speech differently.

Len Collard (pers com, 1997) notes that non-Aboriginal cartographical conventions and systems of boundary making are not directly nor easily transferable into Nyungar systems of naming and land use. By placing a Nyungar name on a map, it tends to imply that places have fixed names over time, that there is only one 'true' name for a place and that all Nyungars have a shared consensus of meaning around that one name. On the contrary, Nyungar names depend on the context of use, and who uses them. All names are equally correct. For example Len Collard (pers comm, 1997) notes that he has heard different Nyungars refer to 'Kings Park' as *Karrakatta* (hill of the crabs); *Yongarinyup* (place for catching kangaroos); *Geenungin Bo* (the place for looking a long way) and *Karlkarniny* (fire place). In accepting non-Aboriginal mapping conventions, it must be recognised that there is the risk of making our understanding of Nyungar sites too simple and open to possible misinterpretation.

Background

Indigenous people whose country lies in the south-west corner of Western Australia are collectively known as Nyungars. Indigenous people with familial ties to this country share a common culture, language, history and affiliation with land (Green, 1984). Most refer to themselves as Nyungars (Green, 1962). When in 1940, Norman Tindale developed a schema for setting out indigenous 'tribal' boundaries he claimed that there were 14 different Nyungar groups based on social and linguistic characteristics and location (Bindon and Walley, 1993) as shown in Figure 5. Whadjuk Nyungars consider their *boodjar* or territory to be the land south of the Swan River, while Juet Nyungar land is to the north of the Swan River according to Lyon (O'Connor *et al*, 1989). Juet boodjar or land immediately north of the Swan River at the time of settlement was known as Mooro, the territory of Yellagonga. Green (1984) claims that Yellagonga's people moved their hunting and gathering area further north to the Lake Monger area when Stirling arrived to colonise the present site of the City of Perth.

Whadjuk land south of the Swan River and between the Canning River and the coast is called Beeliar. According to Lyon (1833), at the time of colonial settlement the land was the territory of Midgegooroo, who was the father of Yagan. Both of these men and their extended families offered much resistance to the white colonists. According to Lyon land between the Swan and Canning Rivers was known as Beeloo or river dwellers, the territory of Munday's people. Munday also gave strong resistance to the colonisation of the Beeloo lands.

Figure 5

Nyungar tribal boundaries of the South West of WA (After Tindale 1940)

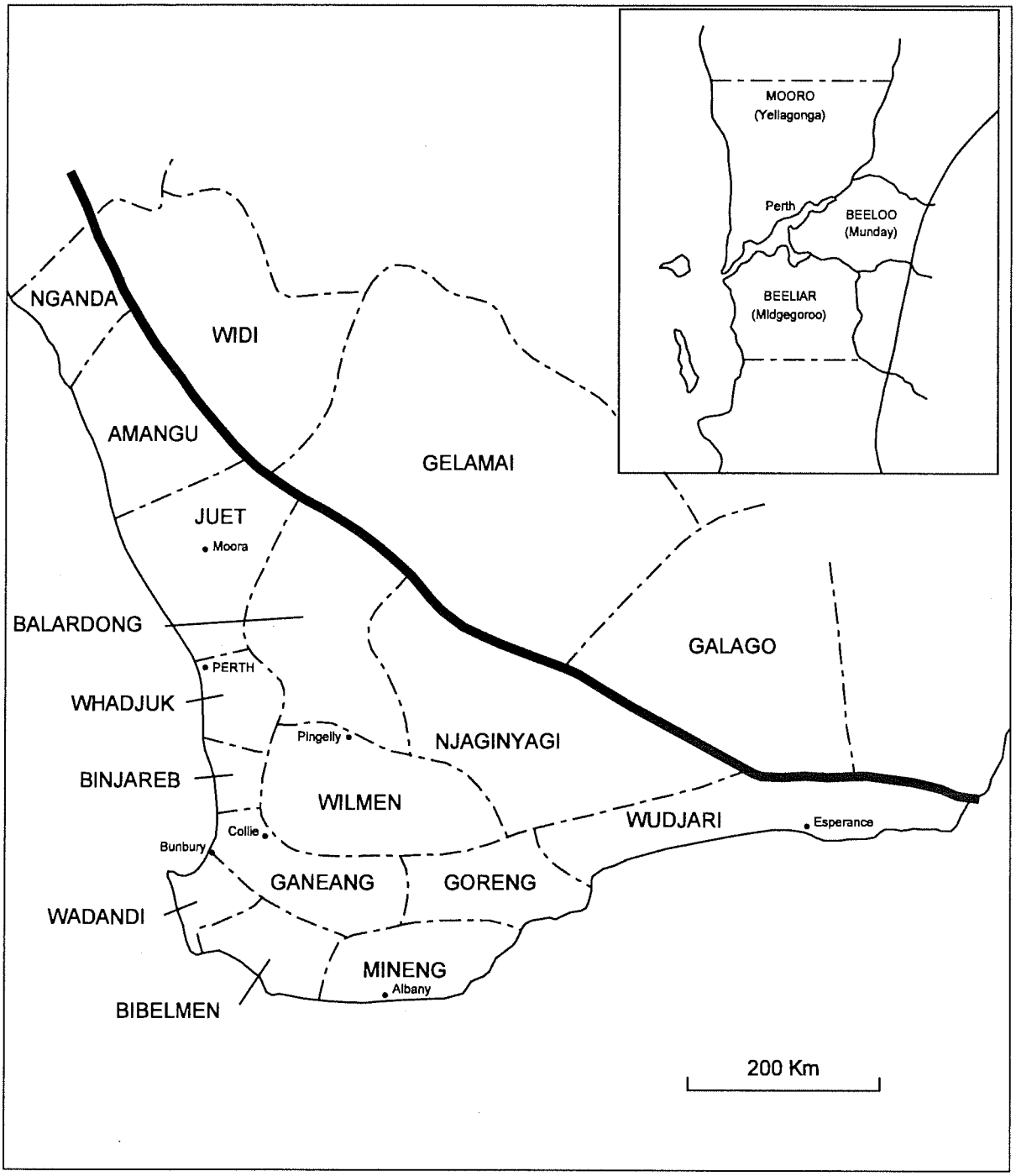

Table 7: Nyungar Seasons and Activities Which Relate to the Seasonal Changes in the Environment. After Bindon and Walley, (1993), and Green (1984).

Nyungar seasons	Time of year	Activities and significance
Bunuru Hot easterly and north winds	February to March	• The dry conditions meant that Nyungars moved to the coast and estuaries, where fish constituted a large proportion of the diet of this season. Fish, such as tailor and mullet were trapped in shallow water and easily caught. Marron, gilgies, *kooyal* (frogs) and tortoises were collected from wetlands. • The fruits of the zamia, *Macrozamia riedlei*, were collected and the toxin removed. The horizontal rhizomes of the bulrush, *Typha domingensis*, were pounded to a flattened cake and roasted. • *Haemodorum spicatum* (a bulb) was collected and roasted for use as a spice. Wattle, banksia blossom and various roots were collected. • Climbing trees for *koormul* (possums) took place.
Djeran Becoming cooler with winds from the south-west	April to May	• Fishing of the estuaries and other waters continued. • Bulbs and seeds were collected for food. • Group fishing in inland lakes and at weirs took place.
Makuru Cold and wet with westerly gales	June to July	• Nyungars moved to inland hunting areas once the rains had replenished inland water resources. • *Tribonanthes* sp (tuberous plants) were collected. • *Kuljak* (swans) began moulting making them unable to fly and easy to catch. • By holding a smouldering bull banksia branch (*Banksia grandis*) beneath their skin cloaks (*bookas*) Nyungars were able to keep warm.
Djilba Becoming warmer the	August to September	• The tubers of *Platysace cirrosa* were dug from beneath wandoo. *Waitch* (emus), quenda, *koormul* (possums) and *yonga* (kangaroos) were hunted. • *Meen* and *djakat* (roots) were collected.

Nyungar seasons	Time of year	Activities and significance
Kambarang Rain decreasing	October to November	• Families moved towards the coast. The moodjar or Christmas Tree *Nuytsia floribunda* provided sweet gum when the bark was removed. • The *Astroloma* sp and *Santalum acumiatum* were in fruit and the yam *Dioscorea hastifolia* and *Platysacea cirrosa* were collected. • Waterfowl and other bird eggs were connected. • *Kooyal* (frogs), *yaarkin* (tortoises) and *gilgie* (freshwater crayfish) were caught. • Pits and traps were used to collect possums and kangaroos.
Birak Hot and dry with easterly winds during the day and south-west sea breezes in the late afternoon	December to January	• Nyungar burnt sections of scrubland to force kangaroos, wallabies, goannas and small marsupials into the open. The fires were lit until Bunuru to reduce undergrowth and encourage the lush growth of grasses and young plants in *Djilba*. • Banksia flowers were gathered for the honey. • Bronze wing pigeons caught.

Boodjar or land is important to Nyungars because of its economic, social and spiritual significance. The south-west of the State prior to colonisation, was a plentiful area being well watered, with a mild climate and abundant natural foods. The Swan River and its freshwater tributaries were surrounded by the lightly wooded plains abundant in food and water to those who knew plants, birds and seasonal fluctuations. Each Nyungar group had their *kaleep* or favoured camping locality that held for them a special significance. Beyond this there was a more extensive area over which they foraged and hunted (Green, 1984). Bindon and Walley (1993) discuss how local Nyungar relied on seasonal changes shown in the landscape as indicators for the collection of food and provision of shelter. The Nyungar year is divided into six seasons. These and the key activities for the season are shown in Table 7 below. Table 7 shows Whadjuk Nyungar (or Perth) words for the seasons. Other Nyungars have different words. It is important to remember when planning for the landscape and natural resource management, that many Nyungar continue to use the natural resources mentioned in the table and that continuity of access to these resources is important to Nyungars.

The spiritual significance of the landscape is also important for specific Nyungar stories about landscape. Nyungars have a sense of respect and kinship with the biota and environment and regard themselves as inseparable from the eternal process of nature (Green, 1984). Various sites which have Waugal and other beliefs associated with the Swan River are described in each precinct. Nyungar attitudes and minimal impact on the river environment resulted in a *Beeloo* or river ecology that was in a relatively undisturbed state of equilibrium until colonial settlement.

Nyungar Native Title Claims

Native Title is the name of the law given to the traditional ownership of land and waters that have always belonged to Aboriginal people and Torres Strait Islanders according to their traditions, laws and customs (National Native Title Tribunal, pers com, 1997). Native Title may be found to exist where it has not already been extinguished by an inconsistent government grant to a third party. It may also be found to exist where the Native Title claimants have maintained their connection over the land. The information on the National Native Title Tribunal Register only reflects the information provided by the applicants and a determination will only be made if all the parties to the application agree. Where the registrar of the tribunal 'accepts' a native title application, this does not mean that Native Title has been granted, rather that it has been accepted for mediation. Native Title cannot displace existing interests in land and waters that have been validly granted. It is possible for Native Title rights to co-exist with other interests over the land or waters. Existing interests, such as pastoral leases, other leases, licences and permits will continue to apply even if there is a determination of Native Title. The tribunal does not accept applications over present freehold. The exception to this is where the freehold is held either by the Crown or Aboriginal people.

Presently, there are several Native Title claims in the Swan and Canning Rivers areas, some of which overlap. Some of the accepted claims fall within the Swan River Management Area and are described below. It is important that the most up to date information is collected from the National Native Title Tribunal when planners make land use decisions.

The Swan Valley Nyungah Community and other Nyungah Peoples have registered claim to Native Title pursuant to the Native Title Act 1993 over an area of land including the Swan River and its foreshores. The area of interest is almost 3 000 square kilometres. The claim is number WC95/81 and is registered by Mr Robert Bropho. It follows the Swan and Canning River foreshores, from the Fremantle Port Authority boundary, to just north of Heirisson Island and the Canning River to Salter Point, excluding Bullsbrook confluence. The claim includes the right to protect the area from activities inconsistent with Native Title interests in this area. The applicants note that they have had and continue to have an interest in occupying, using and enjoying the land and water claimed. They want to protect from injury, desecration, excavation, damage, destruction or alteration, sites and areas which are significant to the applicants in accordance with Aboriginal tradition within the interest area (National Native Title Tribunal records, 1997).

The claim WC95/85 has been registered by Mr Terry Cornwall on behalf of Nyungars. The claim covers an area over 700 square kilometres. It includes a broad area from Wanneroo through to Geographe Bay and the mouth of the Donnelly River. The claim covers the Swan and Canning Rivers in a line from east of Perth City. The applicants have stated that they do not claim any areas of freehold title within the claim area granted prior to 1 January 1994. The Native Title rights include the use and enjoyment of the land and waters including the protection of Aboriginal sites (National Native Title Tribunal records, 1997).

Mr Corrie Bodney has registered claim WC95/86 for the Bodney Family Group Ballaruks. The area includes the land, islands and ocean generally within a 60 mile radius of Perth being the Whadjuk territorial boundary. The land includes South Port Kennedy, Jarrahdale, Mount Cook, Balladon, and Clackline to the confluence of Moore River and Gingin Brook to Guilderton. It includes the ocean and islands from 3 nautical miles west of Rottnest Island excluding all private freehold and residential leases and special leases. The living descendants of the Ballaruk people of the Whadjuk Territory claim the rights and interests of the Ballaruks pursuant to their traditional laws and customs based on mythological, spiritual, social and economic association and ties to relevant estates and ranges. The applicants retain substantive ritual and other cultural knowledge of the region and the people have maintained regular visits to relevant areas for purposes including travelling, cultural maintenance and development and use the land and water tracts (National Native Title Tribunal records, 1997).

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6.2.2 The Swan River Colony and a new cultural landscape

The development of Perth has been strongly influenced by the Swan and Canning Rivers since the time of the settlement of the Swan River Colony in 1829. Perth was founded in August 1829 by Captain James Stirling (Stannage, 1979). With the unexpected arrival of settlers on 5 August 1829, Stirling felt compelled to make a decision on a site for the capital and he chose the northern bank of what is now known as Perth Water. His reasoning varies in his reports but included the attractiveness of the site, fresh water and the availability of building materials. He wrote of delaying his survey of the general coast and country *'for the purpose of laying out the town of Fremantle at the entrance to Melville Water as a landing port and also the town of Perth near the island of the Swan River, with a view to its being in the neighbourhood of those who may wish to cultivate the rich lands immediately above it on the river'* (in Markey, 1979). The decision to have the Swan River Colony on the northern side of Perth Water has been a key factor in development patterns of Perth.

By the 1860s the physical and social shape of Perth had been largely determined. In the early years of colonial settlement, the Swan and Canning Rivers dictated the development of the area by playing an important transport role, both for communication links and as a means of conveyance. Riverfront properties were essential for successful communication and trade. As a result these properties were rationed to allow an average river frontage of approximately 800 metres to maximise the number of owners who could utilise the river (Markey, 1979). The properties were generally long and narrow, which is reflected in the present day road layouts of the inner suburbs. Details of the first landowners are described in the precinct sections and the subdivisions are shown in Figure 6. The original landowners' influence on the nature of today's land use ranges from minimal to quite substantial. For example, the time of subdivision of their properties dictated urban expansion.

The Swan River Colony administrative, political, business and military centres were in the immediate vicinity of the Barrack Street and St Georges Terrace, Perth (Stephenson, 1975). Hay Street developed as a lesser commercial and shopping precinct, while north of Wellington Street were workshops, cottages and stockyards. Perth Port was built at the foot of William Street. Due to the shallow waters shipping and industry were restricted to the Fremantle and Perth Ports and adjoining areas. The small ports of Fremantle, Perth and Guildford provided these first isolated settlements with vital communication and trading links.

By the 1860s, Perth was also becoming more accessible by overland routes which were being built by the convicts, the first of which arrived in 1850 (Stannage, 1979). Many of the notable public buildings of Perth were constructed in the convict era including the Town Hall, Cloisters, Trinity Church and Government House. The convicts provided much needed labour for a struggling colony, however their arrival meant that the free people had to learn to live with the presence of convicts and the social effects of the system including fear and often violence. During this time Queen Victoria proclaimed Perth as a city (1856), however the population of the colony was quite small and development was hardly flourishing (Stannage, 1979).

The most of the land around Perth was used for agriculture with varied success. The upper reaches of the Swan and Canning Rivers were more favourable to agriculture having richer alluvial soils. The lower reaches, particularly of the Swan River, were favoured for residential development due to poor soils, and gradually, as transport improvements were made, the original large rural blocks were subdivided.

In the 1880s, the railroad between Fremantle-Perth-Guildford was constructed expediting business and allowing suburban development along the lines north of the Swan River. During the same decade, river infilling along the Esplanade was to shape the linear foreshore in front of the city which has dominated the city landscape ever since.

It was not until the western gold rush of the 1890s that Perth started to expand with the increased population and money. Great social and structural changes were undertaken as a result of the increased population and the considerable effort to increase development on the part of Sir John Forrest's

Government. A colony-wide railway system centred on Perth was built, and drainage, sewerage, lighting and road construction increased. The newly found wealth allowed the construction of lavish buildings such as His Majesty's Theatre and the Fremantle Railway Station (Apperly *et al*, 1989). At this time, the Perth city area began to lose its residential character and localised suburban communities were forming.

Ferries allowed suburban developments on the southern side of Perth to expand during the early 1900s. By the 1920s, horse drawn carriages had almost been replaced by buses, trams and the occasional motor car. Along with an increasing population, there was an increased demand for access to the river and for riverside developments and amenities. As a result in 1928, planning legislation was put in place to counteract the previous decades of uncontrolled and uncoordinated development (Webb, 1979).

With the rest of the world, Perth suffered the Depression of the 1930s. Many people became homeless and unemployed. The Government initiated public works to create employment. Sections of the foreshore including Riverside Drive, Langley Park and Mounts Bay Road were infilled and walled using unemployed labour (Stannage, 1981).

During and immediately after World War II, there were very few major building developments in the city or surrounding suburbs. Increasing numbers of city users were travelling to work in motor cars and public transport use began to decline.

The 1955 *Stephenson-Hepburn Plan for Perth* and Fremantle recognised the need to balance urban development, public open space, recreation, communications and industry. The plan was used as the major guide in the Metropolitan Region Scheme in 1963. In 1959 with the opening of the Narrows Bridge and Kwinana Freeway, the pace of land subdivision and suburban development increased and Perth began to stretch in a north-south direction along the coastline.

The *Corridor Plan for Perth*, prepared by the Metropolitan Region Planning Authority (1970), set the direction and shape of the metropolitan area till the turn of the century. Its objectives were to maximise economic efficiency in the future development of Perth, enhance the urban environment and preserve the essential character of non urban areas. In 1990, Department of Planning and Urban Development prepared the Metroplan - Strategic Metropolitan Growth to the Year 2021. It indicates the general location and extent of major land uses in the region including future urban growth areas, major transport corridors, location of activity centres, rural areas and regional open space. It is supported by policy statements and structure plans.

On a more detailed scale, local government authorities in collaboration with the Swan River Trust are responsible for developing the policies which shaping the land use of the Swan River System. Differences in planning policies have resulted in a range of cultural and natural landscapes along the river system which are outlined in more detail in the precinct descriptions.

Values and the Swan River System Landscape

The present day Swan River System Landscape strongly reflects the community's past and present values. The natural landform and vegetation that helps give a 'sense of place' and regional identity have been altered dramatically by urban development. Despite these dramatic changes it is river's waterform among the low undulating plains and the relative rise of the Darling Plateau as a linear backdrop which are the features that help us associate the surrounding landscape as being Perth. Retaining and enhancing the physical landscape features would be one way to improve the visual amenity and ecological integrity of the Swan River System.

For most of the Swan and Canning River the built form contributes little to creating regional identity as Perth's suburban residences and amenities are indistinguishable from most parts of suburban Australia. There has been little use of identifiably local building materials in our modern environment and in particular the Perth city landscape is dominated by international styles and building materials from external sources. Hough (1990) claimed that a city constructed from materials which have no connection with local site is an expression of wealth and denial of regionalism. It may be

indicative, of our society's values or priorities, that the city sky-rise is dominated by the conservative highrise offices of financial institutions and multinational companies. These past decisions on land use amenity should guide planners to not shy away from new built design ideas which take into consideration the natural advantages of the Swan River and will give some local identity.

The Swan River System landscape will continue to reflective of the values of our community and the Swan River Landscape Program will provide an opportunity to guide the implementation of values such as local identity, ecological integrity, land use diversity and adequate public access to the river environment.

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8.0 Glossary of Terms

Arcadian Landscape: The man-made landscape which has altered a natural landscape in a way which appears to be natural but tamed.

Art Deco Style: An inter-war architectural style with key characteristics of the suggestion of vertical motion, with less glassy appearance than moderne style and stylised decoration. An example is the First Church of Christ Scientists, St Georges Tce, Perth.

Bassendean Complex: Vegetation ranges from woodland of *Eucalyptus marginata - Allocasuarina fraseriana - Banksia* species to low woodland of *Melaleuca* species, and sedgelands on the moister sites. This area includes the transition of *Eucalyptus marginata* to *Eucalyptus todtiana* in the vicinity of Perth. Occurs on the aeolian deposits of the Swan Coastal Plain. (DCE, 1980).

Bassendean Soils: Sand plains with low dunes made up of deep, pale-grey sand.

Bassendean Swamps Soils: Black peaty soils formed around swamps within the Bassendean belt.

Beermullah Complex: Mixture of low open forest of *Casuarina obesa* and open woodland of *Eucalyptus calophylla - Eucalyptus wandoo - Eucalyptus marginata.* Minor components include closed scrub of Melaleuca species and occasional occurrence of swamp cyprus *(Actinostrobus pyramidalis)* (DCE, 1980).

Beermullah Soils: Poorly drained plain of sand and loam over clay, in a flat plain, waterlogged in winter, often saline.

Brutalist style: A late twentieth century architectural style instigated by Le Corbusier after WWII. In general it exibits an aggreessive largeness of scale and a hefty blocky character. Mainly constructed with reinforced concrete or textured brickwork. An example is the WA Fire Brigade Board Headquarters, Hay St Perth (Apperly *et al*, 1989).

Coherence: The capacity to predict a scene or the ease with which information in the scene can be organised into a small number of 'chunks. It is a landscape factor which has a special effect on preference. (Kaplan, 1987).

Colonial Style: A period of Australian architectural style referring to 1788 to cira 1840. In WA most of the buildings were fairly primative and built from mainly local matterials. Those buildings built with some architectural concern, may have elements of Georgian characteristics which were usually a rectangular form with classical details. Apperly et al, 1995.

Complexity: The ease with which a landscape can comprehended by the viewer as a result of the diversity of its composition. It is a landscape factor which has a special effect on preference. Kaplin, 1987.

Conforming Element: Those elements which complement or conform to the surrounding landscape character.

Cottesloe Complex: Mosaic of woodland of *Eucalyptus gomphocephala* and open forest of *Eucalyptus gomphocephala - Eucalyptus marginata - Eucalyptus calophylla*; closed heath on the limestone outcrops. The complex is found on the aeolian deposits of the Swan Coastal Plain (DCE, 1980).

Cottesloe Ridges: Very shallow brown or bright yellow sand or loam over limestone, with limestone cropping out in places.

Cottesloe Soils: Shallow brown or bright yellow sand over limestone forming low hilly landscape.

Dardanup Soils: Dark brown, loamy alluvial soils, flat terrain, except for ridges on western side of the association which form fans.

Darling Plateau: Made up of granites and metamorphic roacks which are more than 2 000 million years old from the Precambrian age.

Darling Scarp: The edge of the Darling Plateau which is a retreat fault scarp.

Darling Scarp Complex: Vegetation ranges from low open woodland to lichens according to depth of soils. Woodland components chiefly *Eucalyptus wandoo* with *Eucalyptus laeliae* in the north, *Eucalyptus haematoxylon* in the south and *Eucalyptus calophylla* throughout the Darling Plateau region. Found on the major valley floors and scarps of the Darling Plateau. (DCE, 1980).

Diversity: The amount of visual interest as viewed from any one location.

Dominant Landscape Character: The overall or predominant nature or identity of the landscape.

Dwellingup Complex: Open forest of *Eucalyptus marginata - Eucalyptus calophylla* occurring on the lateritic uplands of the Darling Plateau. Understorey includes *Grevillea diversifolia* and *Adenanthos barbigerus* (DCE, 1980).

Environment: Is the physical attributes of an area and is not the result of the subject's selective interpretation.

Federation Style: Architectural period referring to cira 1890 - cira 1915. Many civic buildings were constructed during this time and there were many influences from overseas on which local modifications were made. Examples include the Railway Station, Fremantle; Titles Office, Cathedral Avenue, Perth; His Majesty's Theatre, Perth; Swan Barracks, Francis Street Perth; St Patricks Roman Catholic Cathedral, Adelaide St, Fremantle (Apperly *et al*, 1995).

Forrestfield Complex: Vegetation ranges from open forest of *Eucalyptus calophylla - Eucalyptus wandoo-Eucalyptus marginata* to open forest of *Eucalyptus marginata - Eucalyptus calophylla - Casuarina fraserana - Banksia spp.* Fringing woodland of *Eucalyptus rudis* in the gullies that dissect the Ridge Hill Shelf (DCE, 1980).

Forrestfield Soils: Lateritised foothills of the Darling Scarp made up of sandy and gravelly soils, well drained.

Guildford Complex: A mixture of open forest to tall open forest of *Eucalyptus calophylla - Eucalyptus wandoo - Eucalyptus marginata* and woodland of *Eucalyptus wandoo* (with rare occurrences of *Eucalyptus lane-poolei*). Minor components include *Eucalyptus rudis - Melaleuca rhaphiophylla.* Occurs on fluviatile deposits of the Swan Coastal Plain (DCE, 1980).

Guildford Soils: Flat plain with medium textured, yellow duplex soils (sand/loam over clay), in flat plain, may be waterlogged in winter.

Helena Complex: Vegetation ranges from open forest of *Eucalyptus marginata - Eucalyptus calophylla-Eucalyptus patens* through to heath and herbland to lichens on granite rock. Found in major valleys combining slopes and floors of the Darling Plateau (DCE, 1980).

Herdsman Complex: Sedgelands and fringing woodlands of *Eucalyptus rudis - Melaleuca species.* Found on the aeolian deposits of the Swan Coastal Plain (DCE, 1980).

Herdsman Soils: Black, peaty sand, loam or clay, occurring around lakes and swamps within the Cottesloe and Karrakatta units.

Industrial Landscape It is characterised by industrial, functional style buildings and sheds, often smoke stacks and high tension powerlines dominate the skyline.

Inter War Style: An architectural period between circa 1915 - 1940. Buildings were highly eclectic and generally conservative. Examples include Atlas Building, The Esplanade, Perth; The General Post Office, Forrest Place, Perth, Police Traffic Branch, Wellington Street, East Perth; Karrakatta Cemetery Crematorium, Karrakatta; Former R&I Bank, St Georges Terrace, Perth; The Cygnet Cinema, Como; First Church of Christ Scientists, St Georges Tce, Perth, and Winthrop Hall, University of WA (Apperly *et al*, 1995).

Karrakatta Complex: Predominantly open forest of *Eucalyptus marginata - Eucalyptus calophylla* and woodland of *Eucalyptus marginata - Banksia* species. Found on aeolian deposits of the Swan Coastal Plain. (DCE, 1980).

Karrakatta Soils: Undulating landform made up of deep, pale grey sand.

Landscape Character: The nature or identity of the landscape (O'Brian and Ramsay, 1992). It is the combination of the natural and cultural elements and their processes.

Landscape: *Landscape* is not synonymous with '*environment*', it is 'the environment *perceived*, especially visually perceived (Appleton, 1980).

Late Twentieth Century Style: The architectural period from circa 1960 to the present. A period where traditional conventions have been broken and buildings were mainly with out excessive detail. Examples are Parliament House, Perth; Reid Library, University of Western Australia; City of Bayswater Administration Centre, Broun Avenue, Morley; Student Guild, University of Western Australia; WA Fire Brigades Board, Hay Street, Perth and the Hyatt Centre, Adelaide Tce, Perth (Apperly *et al*, 1995).

Legibility: The appearance that one could explore the landscape without getting lost. It is a landscape factor which has a special effect on preference (Kaplan, 1987).

Moderne style: Referring to a functional and 'clean line' style of the Interwar period. Generally having long horizonal lines, large glass areas and curves and shadow lines, often giving an nauticle air. An example is the original section of the Raffles Motel, Canning Bridge (Apperly *et al*, 1995).

Modified Landscape: The rather derelict landscape which has been previously used by any land use and now is abandoned. The dominant vegetation is typically weeds and any remnant indigenous vegetation.

Murray Complex: Vegetation ranges from open forest of *Eucalyptus marginata - Eucalyptus calophylla* with *Eucalyptus patens* on the slopes to fringing woodland of *Eucalyptus rudis - Melaleuca calophylla* with *Eucalyptus patens* on the slopes to fringing woodland of *Eucalyptus rudis - Melaleuca rhaphiophylla* on the valley floors. It is found on the major valleys and slopes of the Darling Plateau (DCE, 1980).

Mystery: Reflects the potential information of a scene and the expectation that more information will be revealed around the corner. It is landscape factor which has a special effect on preference (Kaplin, 1987).

Natural Landscape Character: Areas which appear to be relatively natural, with the dominant vegetation being endemic to the site and the landform being relatively unaltered.

Non Conforming Element: An element which detracts or is unsympathetic with the surrounding landscape character.

Parkland/Recreational Landscape: Those areas of open space with recreational facilities and infrastructure which typically have maintained lawn.

Post War Style: Refering to those buildings between circa 1940 -1960. The influences from modernism and functional design are apparent. Examples include St Mary's Church, Ridge St, South Perth; Council House, St Georges Tce, Perth; and Agnes Walsh Nurses Home, Bagot Road, Subiaco (Apperly *et al,* 1995).

Precinct: A section of the study area which has boundaries based on size rather than similar landscape character or municipal boundaries.

Quindalup Complex: Coastal Dune Complex consisting mainly of two alliances - the strand and foredune alliance and the mobile and stable dune alliance. Local variations include the low closed forest of *Meleleuca lanceolata-Callitris preissii* and the closed scrub of *Acacia salinga.* (DCE, 1980).

Quindalup Soils: Dunes and beach ridges composed of white calcareous and limy sand and deposited by aeolian processes.

River Setting: The river and land which can be viewed as part of the river landscape. The area of influence as determined visually from the river.

Ridge Hill Shelf: The narrow strip of laterite covered spurs forming the foothills of the Darling Scarp.

Rural landscape: Those areas which have broad acre blocks with low residential density and some form of agricultural practice.

Scene: A section of the landscape which is viewed.

Serpentine River Soils: Poorly drained plain with fine textured, alluvial soils.

Significant Viewscape: An field of view which has local or regional significance, often containing a site of significance within the range of view.

Sites of Significance: Those areas which demonstrate some of or the following characteristics including an important emotional link for society, rareness, intactness, excellence of type, association with cultural or historical importance, reflecting a particular cultural, historical or social period, association with a significant historical personality or natural features which are ecologically or intrinsically important.

Southern River Complex: Open woodland of *Eucalyptus calophylla - Eucalytpus marginata - Banksia* species with fringing woodland of *Eucalyptus rudis - Melaleuca rhaphiophylla* along creek beds. This complex is found on aeolian deposits of the Swan Coastal Plain (DCE, 1980).

Southern River Soils: Sand plain with low dunes and many intervening swamps. Higher ground similar to Bassendean; lower ground (associated with swamps and drainage lines) similar to Guildford.

Swan Coastal Plain: Is the geomorphic element formed as the result of accumulation of aeolian and fluviatile derived sediments built up over the last 2.5 million years in front of the Darling Plateau. It is a small part of the Perth Basin.

Swan Complex: Fringing woodland of *Eucalyptus rudis - Melaleuca rhaphiophylla* with localised occurrence of low open forest of *Casuarina obesa and Melaleuca cuticularis.* Found on the alluvial deposits of the Swan Coastal Plain. (DCE, 1980).

Swan Soils: Alluvial loam and clay, often reddish, forming terraces along the Swan and Canning Rivers upstream from the Swan Estuary.

Transformist landscape: A landscape from which any indication of the origninal character has been removed and been replaced entirely by a foreign landscape. For example; a Japanese garden.

Urban landscape: Those areas which are dominated by urban land use such as city skyscrapers, retail outlets, administrative functions, freeway convergence and very little residential land use.

Vasse Complex: Mixture of the closed scrub of Melaleuca species; fringing woodland of *Eucalyptus rudis - Melaleuca species* and open forest of *Eucalyptus gomphocephala - Eucalyptus marginata - Eucalyptus calophylla.* Found on marine orgin deposits of the Swan Coastal Plain (DCE, 1980).

Vasse Soils: Poorly drained alluvial terrain and plains with variable and undifferentiated soils, possibly saline, bordering the estuaries.

Victorian Style A period of architecture referring to the period of circa 1840 - 1890. A bewildering variety of classical and romantic elements all reflect confidence, material progress and prosperity. In WA this period was boosted with goldrush money which allowed many municipal buildings to be constructed. Examples include Town Hall, High Street, Fremantle; Railway Station, Wellington Street, Perth; Terrace Houses along Point Street Femantle; Central Government Offices, St Georges Tce, Perth; St Mary's Cathedral, Victoria Square, Perth; and Perth Town Hall, Hay Street, Perth. (Apperly *et al,* 1995).

View: The range or portion of landscape which can be taken in by an observer from one location.

Viewshed: An enclosed area of landscape which can viewed as an single entity.

Yanga Complex: Predominantly closed scrub of Melaleuca species and low open forest of *Casuarina obesa* on the flats subject to inundation. On drier sites the vegetation reflects the adjacent vegetation complex of the Bassendean (DCE, 1980).

Yanga Soils: Poorly drained sandy plains with intervening swamps.

Yarragil Complex: Open forest of *Eucalyptus marginata - Eucalyptus calophylla.* Typically found in the minor valleys of the Darling Plateau (DCE, 1980).

9.0 Plant Species Found on Soil Associations

Using the species lists.

The catchments in the Perth region have been subject to great pressures from urban and agricultural development and expansion. As a result, valuable vegetation communities have been degraded or cleared for new land uses. Increasingly, there is a need to rehabilitate these catchment areas to improve water quality, waterways environments and bushland communities. In addition, urban environments can benefit from planting of native species in parklands, gardens and roadsides.

The Swan River Trust has complied the tables of common species found on various soil associations shown in Figure 2. The tables have been complied from the sources listed at the end of this section. The tables are not intended to be a comprehensive species list rather they are a guide to the types of plants associated with the soils. They can be used to compile suitable planting programs to maintain and improve natural vegetation communities or to revegetate cleared areas.

Benefits of Implementing an Endemic Planting Program

- Maintaining areas of ecological significance and providing conservation corridors.
- Continuing biodiversity and species evolution.
- Limits soil erosion - direct runoff into revegetated areas.
- High stream control, moderate stream bank erosion control and low peak discharge control.
- Moderate to high ground water recharge capability.
- High habitat creation.
- High passive recreational value.
- High aesthetic value.
- In keeping with the landscape of the area.
- Keeps shallow water channels cool.
- Trees absorb noise, screen scenery, act as wind breaks and shelter beds, moderate air temperatures.
- Can group plants with similar watering needs together to prevent over-watering.
- Maintenance is low once established. First few years need weed suppression, rodent protection and watering.
- Provide shelter and privacy.
- Tourism and local identity, enhances the urban environment.
- Less watering and maintenance costs.

Application

Maintaining areas of natural vegetation

Where natural vegetation communities occur, they should be conserved and maintained as an important resource for vegetation community conservation, fauna habitats, genetic resources, recreation, aesthetics and soil conservation. Most of these communities will have some degree of degradation and may require weeding and rehabilitation, particularly understorey species. This can be achieved by direct seeding of local seed stock or alternatively planting seedlings of local species. Remnant vegetation on roadside areas can be linked to other roadsides, or blocks of bushland making corridors of vegetation. This is particularly important for fauna movement but also provides a good genetic pool for future evolution and adaptation and therefore long term survival of the vegetation community. In rural areas, the vegetation can provide an important windbreak and reduce soil loss. Natural vegetation is also aesthetically pleasing and local species give an area a local identity.

Revegetating cleared areas

If the area has already been cleared of vegetation then revegetating with local species has numerous advantages. Not only is it better for conservation purposes, the local plants will require less maintenance. Cleared areas may include urban blocks, road verges, parklands, pastured land and other rural areas. The cleared site will usually require some weeding and possibly some erosion and soil maintenance. If salt intrusion has occurred it many be necessary to plant salt tolerant species which did not originally occur at the site. A list of salt tolerant Western Australian species is included.

Steps to planting local species

There are several ways to ensure that the plants used for rehabilitation and replanting are suitable for the chosen site.

- Identify your aims and objectives for the site. Consider your purpose for planting such as rehabilitation, regeneration, salinity control, erosion control, and habitat protection. By doing this you will focus your program and be able to evaluate it.
- Identify the site and its natural environmental conditions. Once a site has been identified for rehabilitation or revegetation, consider the environmental conditions. A quick sketch map of its soil types, groundwater salinity, moisture conditions and slopes will be useful for identifying what species to plant. (A basic map of the soil is shown on Figure 2, however you may wish to check with the Agriculture Department of WA for more detailed information). Identify any remnant vegetation communities, natural features such as rocky outcrops and drainage lines. If replanting a cleared area, such as a roadside verge, consider runoff and soil conditions.
- Identify areas which have specific problems, such as a big weed invasion, erosion, and steep slopes, or which require removal of rubbish. It may be necessary to clean up the site before planting. In an urban environment, it may be necessary to identify areas where large trees are not suitable for due to the closeness of utility infrastructure or buildings.
- Selection of species. The object of replanting cleared areas is to recreate an area of local flora. Plants can be selected from the lists for your soil conditions. Identifying other species from adjoining remnant vegetation communities may also guide your plant selection. At urban sites, it may be wise to select the hardy species from which would have originally grown in that area according to the soil map. In many cases, the land use has dramatically changed the ecology of the environment by erosion and salt encroachment and a plant list of salt tolerant Western Australian plants has been provided.
- Prepare a planting guide using site conditions and taking into consideration the height and spread of the plants and any formal garden patterns you may require in an urban area.
- Preparing stock. Consider whether direct seeding or planting advanced stock is the most suitable for your project. Advanced stock is more suitable for small scale projects as seedlings will require some initial maintenance. One technique is to collect seeds and cuttings, with approval, from adjoining remnant vegetation communities with similar environmental conditions. These seeds and cuttings can be propagated for planting using a number of techniques. Propagation techniques of local species have been well developed and many rehabilitation groups can advise on the most suitable techniques for a plant type. Creating a good plant nursery or a seed bank is one way of ensuring that the plants propagated are suitable for the chosen site. It can also ensure that if the planting program is over several years the costs of acquiring plants is reduced and that planting can occur as required.
- Alternatively, there are several plant nurseries which can supply local species and advise on which species to plant. In many cases, large numbers of plants can be ordered, (may need to order well ahead of the planting season) and in some cases help with planting can also be given by volunteers or at a small cost. If ordering from a nursery, it is important to identify which species you require as although a species may be local to south Western Australia, it may not be suitable for your site.
- Timing. Planning when to plant is extremely important for growing success. It is usually best to plant prior to the first wet season rains. This will ensure that the plants have had time to establish prior to the dry summer.
- Site preparation. Most sites will require weeding to ensure that the newly planted seedlings are not competing with weeds. Depending on the weeds present different techniques will be required. Techniques can include a combination of manual, biological and chemical controls and the applications of these techniques will depend on

site conditions and the severity of weed infestation. Weed control will be a long term program, however, an initial program of intensive weed control will reduce the number of weeds to be removed after local species have been planted. It is useful to record what techniques have been used for future reference on which techniques work best for your site.

- If direct seeding, the soil will need to be prepared. Large areas should have the top soil with weed, seed stock removed. Alternatively, weed management techniques such as spraying with a carefully chosen fertiliser may be the best option. Plough the soil several times and create furrows at a suitable depth and direction according to the slope and if possible mix the seed with a mulch.
- Plant care. Ensure that your plant stock has good root growth and it is disease free and healthy at the time of planting. Transport plants straight form the nursery to the site to reduce double handing and plant stress. Ensure that all plants in pots are watered prior to and immediately after planting to compact the soil around the plants and remove air pockets. Plants should be planted so that water is retained around the plant but is not flooded in the wet season. The hole should be the same size as the pot. The application of mulch will be beneficial to the young plant as it will keep the soil moist and cool. It will also reduce the regrowth of weeds during the early stages.
- Ongoing maintenance. Ensure that all your hard work is not wasted and make sure that your plants receive enough water. Most native plants will survive the summer period without water once established. If it is possible a trickle irrigation system is an easy watering method. One of the benefits of planting local species is that they will not require fertiliser. Most native plants do not grow well if the crown has been pruned. It is best to ensure that the plants are the right size for your site rather than prune.

Considerations for future vegetation care.

Because it takes a lot of work to re establish native flora community, existing plant communities should be well managed. When possible native flora should be retained. Identification of local species in bushland and riparian locations aids on going maintenance and regeneration programs. Areas of bushland is usually better than several small isolated bushland areas because it is easier to manage and better for flora conservation. If subdividing or clearing, stockpile the topsoil which has valuable seeds and nutrients which can be used when revegetating the subdivision. If clearing, collect seeds and cuttings for propagation. If the land is already cleared, developers and owners should be encouraged to use local flora or their landscaping.

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Bassendean

Scientific Name		Common Name	Form	Height (m)	Flowers	Planting
Moist Depressions						
Acacia	*cyclops*	Coastal wattle	Shrub	3	Sep-Jan	Direct seeding
Acacia	*huegelli*	no common name	Shrub	1	Oct-Dec	Direct seeding
Acacia	*saligna*	Coojong	Shrub	6	Aug-Oct	Direct seeding
Adenanthos	*obovatus*	Basket flower	Shrub	2	Aug-Nov	Plant seedlings
Agonis	*linearifolia*	Swamp peppermint	Shrub	4	all year	Direct seeding
Banksia	*attenuata*	Slender banksia	Tree	8	Sep-Feb	Direct seeding
Banksia	*grandis*	Bull banksia	Tree	8	Sep-Dec	Direct seeding
Banksia	*ilicifolia*	Holly-leafed banksia	Tree	10	Jun-Sep	Plant seedlings
Banksia	*littoralis*	Swamp banksia	Tree	10	Mar-Jul	Direct seeding
Banksia	*menziesii*	Firewood banksia	Tree	8	Sep-Feb	Direct seeding
Baumea	*juncea*	Bare twigrush	Sedge	1	Oct-Jan	Plant seedlings
Baumea	*vaginalis*	Sheath twigrush	Sedge	1	Oct-Nov	Plant seedlings
Dampiera	*linearis*	Common dampiera	Shrub	0.5	Jul-Nov	Plant seedlings
Eucalyptus	*rudis*	Flooded gum	Shrub	15	Apr-Nov	Plant seedlings
Hibbertia	*stellaris*	Orange stars	Herb	0.2	Sep-Dec	Plant seedlings
Hypocalymma	*angustifolium*	White myrtle	Shrub	1	Jul-Oct	Plant seedlings
Jacksonia	*furcellata*	Grey stinkwood	Shrub	3	Aug-Mar	Plant seedlings
Kunzea	*recurva*	no common name	Shrub	1.5	Aug-Nov	Plant seedlings
Kunzea	*vestita*	Spearwood	Shrub	2	Sep-Nov	Plant seedlings
Melaleuca	*preissiana*	Moonah	Tree	10	Nov-Jan	Direct seeding
Melaleuca	*rhaphiophylla*	Swamp paperbark	Tree	8	Sep-Jan	Direct seeding
Nuytsia	*floribunda*	Christmas tree	Tree	8	Nov-Dec	Plant seedlings
Pericalymma	*ellipticum*	Swamp tea-tree	Shrub	1	Sep-Dec	Direct seeding
Regelia	*ciliata*	no common name	Shrub	2	Nov-Feb	Direct seeding
Verticordia	*acerosa*	no common name	Shrub	1	Aug-Nov	Plant seedlings
Sand Dunes						
Acacia	*puchella*	Prickly moses	Shrub	2	Jun-Oct	Direct seeding
Acacia	*saligna*	Coojong	Shrub	6	Aug-Oct	Direct seeding
Adenanthos	*cygnorum*	Wooly bush	Shrub	3	Sep-Feb	Direct seeding
Adenanthos	*obovatus*	Basket flower	Shrub	2	Aug-Nov	Plant seedlings
Allocasuarina	*fraseriana*	Sheoak	Tree	10	May-Sep	Direct seeding
Allocasuarina	*humilis*	Dwarf sheoak	Shrub	1.5	May-Nov	Direct seeding
Anigozanthos	*manglessii*	Mangles kangaroo paw	Shrub	0.5	Sep-Nov	Plant seedlings
Banksia	*attenuata*	Slender banksia	Tree	8	Sep-Feb	Direct seeding
Banksia	*grandis*	Bull banksia	Tree	8	Sep-Dec	Direct seeding
Banksia	*menziesii*	Firewood banksia	Tree	8	Sep-Feb	Direct seeding
Boronia	*crenulata*	no common name	Shrub	0.3	Jan-Dec	Plant seedlings
Calothamnus	*quadrfidus*	One-sided bottlebrush	Shrub	2	Aug-Dec	Direct seeding
Calytrix	*fraseri*	Pink summer calyrix	Shrub	1	Apr-May	Direct seeding
Conostylis	*candicans*	Grey cottonheads	Shrub	0.5	Aug-Sep	Direct seeding

Bassendean

Scientific Name		Common Name	Form	Height (m)	Flowers	Planting
Sand Dunes						
Conostylis	*candicans*	Grey cottonheads	Shrub	0.5	Aug-Sep	Direct seeding
Dampiera	*linearis*	Common dampiera	Shrub	0.5	Jul-Nov	Plant seedlings
Eucalyptus	*marginata*	Jarrah	Tree	30	Sep-Feb	Direct seeding
Eucalyptus	*totiana*	Prickley bark	Tree	10	Feb	Direct seeding
Hardenbergia	*comptoniana*	Native wisteria	Creeper	-	Jun-Sep	Direct seeding
Hemiandra	*pungens*	Snakebush	Shrub	0.5	Oct-Apr	Direct seeding
Hovea	*pungens*	Devils pins	Shrub	1.5	Jun-Nov	Plant seedlings
Hypocalymma	*angustifolium*	White myrtle	Shrub	1	Jul-Oct	Plant seedlings
Hypocalymma	*robustum*	Swan River myrtle	Shrub	1	Jul-Oct	Plant seedlings
Jacksonia	*furcellata*	Grey Stinkwood	Shrub	3	Aug-Mar	Direct seeding
Jacksonia	*sternbergiana*	Green Stinkwood	Shrub	4	Aug-Mar	Direct seeding
Kennedia	*prostrata*	Scarlett runner	Creeper	0.1	Jul-Nov	Direct seeding
Kunzea	*vestita*	Spearwood	Shrub	2	Sep-Nov	Plant seedlings
Macrozamia	*riedlei*	Zamia	Shrub	2	May-Sep	Direct seeding
Melaleuca	*seriata*	no common name	Shrub	1	Oct-Dec	Direct seeding
Melaleuca	*thymoides*	no common name	Shrub	1	Sep-Jan	Direct seeding
Nuytsia	*floribunda*	Christmas tree	Tree	8	Nov-Dec	Plant seedlings
Patersonia	*occidentalis*	Western patersonia	Shrub	0.5	Sep-Dec	Plant seedlings
Pimelea	*rosea*	Rose banjine	Shrub	1.5	Aug-Nov	Plant seedlings
Platytheca	*galiodes*	no common name	Shrub	0.5	Jul-Nov	Plant seedlings
Regelia	*inops*	no common name	Shrub	2	Oct-Jan	Direct seeding
Thysanotus	*manglesianus*	Fringed lily	Shrub	0.5	Aug-Jan	Direct seeding
Verticordia	*acerosa*	no common name	Shrub	1	Aug-Nov	Plant seedlings
Verticordia	*drummondii*	no common name	Shrub	0.7	Feb-Apr	Plant seedlings
Verticordia	*nitens*	Morrison featherflower	Shrub	2	Nov-Jan	Plant seedlings

Beermullah

Scientific Name		Common Name	Form	Height (m)	Flowers	Planting
Actinostrobus	*pyramidalis*	Swamp cypress	Shrub	2	Aug-Nov	Direct seeding
Baumea	*juncea*	Bare twigrush	Sedge	1	Oct-Jan	Plant seedlings
Beaufortia	*squarrosa*	Sand bottlebrush	Shrub	1.5	Jan-Apr	Plant seedlings
Casuarina	*obesa*	Swamp sheoak	Tree	10	all year	Direct seeding
Centella	*cordifolia*	Centella	Herb	0.2	all year	Plant seedlings
Danthonia	*occidentalis*	Wallaby grass	Herb	0.5	Sep-Nov	Direct seeding
Eucalyptus	*marginata*	Jarrah	Tree	30	Sep-Feb	Direct seeding
Eucalyptus	*wandoo*	Wandoo	Tree	15	Dec-Apr	Direct seeding
Euchilopsis	*linearis*	Swamp pea	Creeper		Jun-Dec	Direct seeding
Gahnia	*trifida*	Coast saw-sedge	Sedge	1	Aug-Oct	Direct seeding
Hakea	*prostrata*	Harsh hakea	Shrub	3	Aug-Nov	Direct seeding
Hakea	*varia*	Variable-leaved hakea	Shrub	4	Jul-Oct	Direct seeding
Kunzea	*ericifolia*	Spearwood	Shrub	3	Sep-Nov	Direct seeding
Leptocarpus	*coangustus*	A twine-rush	Sedge	1	Aug-Oct	Plant Seedlings
Melaleuca	*hamulosa*	no common name	Shrub	3	Sep-Nov	Direct seeding
Melaleuca	*lateritia*	Robin redbreast bush	Shrub	1.5	Sep-Apr	Direct seeding
Melaleuca	*viminea*	Mohan	Tree	5	Aug-Oct	Direct seeding
Pericalymma	*elliptica*	Swamp teatree	Shrub	1	Sept-Dec	Direct seeding
Regelia	*ciliata*	no common name	Shrub	2	Nov-Feb	Direct seeding
Trachymeme	*pilosa*	Native parsnip	Herb	0.3	Aug-Oct	Direct seeding
Viminaria	*juncea*	Swishbush	Shrub	4	Oct-Dec	Direct seeding

Cottelsoe						
Scientific Name		Common Name	Form	Height (m)	Flowers	Planting
Deep Sands						
Acacia	*cochlearis*	Rigid wattle	Shrub	2	Aug-Sep	Direct seeding
Acacia	*cyclops*	Coastal wattle	Shrub	3	Sep-Jan	Direct seeding
Acacia	*lasiocarpa*	Dune moses	Shrub	1	Jun-Oct	Direct seeding
Acacia	*pulchella*	Prickly moses	Shrub	2	Jun-Oct	Direct seeding
Acacia	*rostellifera*	Summer-scented wattle	Shrub	2	Aug-Oct	Direct seeding
Acacia	*saligna*	Coojong	Shrub	6	Aug-Oct	Direct seeding
Acacia	*stenoptera*	Narrow winged wattle	Shrub	1	May-Sep	Direct seeding
Acacia	*truncata*	No common name	Shrub	2	Jun-Sep	Direct seeding
Acacia	*willdenowiana*	Grass wattle	Shrub	0.5	Jun-Oct	Direct seeding
Acacia	*xanthina*	White-stemmed wattle	Shrub	4	Aug-Oct	Direct seeding
Agonis	*flexuosa*	Peppermint	Tree	12	Aug-Dec	Direct seeding
Allocasuarina	*fraseriana*	Sheoak	Tree	12	May-Nov	Direct seeding
Allocasuarina	*humilis*	Dwarf sheoak	Shrub	1.5	May-Nov	Direct seeding
Anigozanthos	*humilis*	Catspaw	Shrub	0.5	Aug-Oct	Direct seeding
Anigozanthos	*manglesii*	Mangles kangaroo paw	shrub	0.5	Sep-Nov	Direct seeding
Arthropodium	*capillipes*	No common name	Shrub	1	Nov-Mar	Direct seeding
Arthropodium	*preissii*	Nodding chocolate lilly	Herb	0.5	Sep-Oct	Direct seeding
Banksia	*attenuata*	Candle banksia	Tree	8	Sep-Feb	Direct seeding
Banksia	*grandis*	Bull banksia	Tree	8	Sep-Dec	Direct seeding
Banksia	*menziesii*	Firewood banksia	Tree	8	Feb-Aug	Direct seeding
Banksia	*prionotes*	Saw-tooth banksia	Tree	8	Feb-Aug	Direct seeding
Banksia	*iberidifolia*	Swan-River daisy	Herb	0.5	Aug-May	Plant seedlings
Callitris	*preissii*	Rottnest cypress	Shrub	6	Oct-Nov	Direct seedings
Calocephalus	*brownii*	Cushion bush	Herb	0.5	all year	Plant seedlings
Calothamnus	*quadrifdus*	One-sided bottlebrush	Shrub	2	Aug-Dec	Direct seeding
Calothamnus	*sanguineus*	Silky-leaved bloodflower	Shrub	1	Mar-Nov	Direct seeding
Chamelaucium	*uncinatum*	Geraldton waxflower	Shrub	3	Aug- Nov.	Plant seedlings
Clematis	*microphylla*	Old mans beard	Creeper	-	Jul-Sep	Plant seedlings
Clematis	*pubescens*	White clematis	Creeper	-	Jul-Oct	Direct seeding
Conostylis	*aculeata*	Prickly conostylis	Herb	0.5	Sep-Oct	Direct seeding
Conostylis	*candicalts*	Grey cottonheads	Herb	0.5	Aug-Sep	Direct seeding
Cryptandra	*arbutiflora*	Waxy cryptandra	Shrub	1	May-Oct	Plant seedlings
Dianella	*divaricata*	Flax lily	Herb	1	Jun-Aug	Plant seedlings
Diplopeltis	*huegelii*	no common name	Shrub	1.5	Jul-Nov	Plant seedlings
Dodonaea	*aptera*	Coast hopbush	Shrub	3	Apl-Jul	Direct seeding
Dodonaea	*hackettiana*	Perth hopbush	Shrub	4	Jul-Oct	Plantseedlings
Dryandra	*nivea*	Couch honeypot	Shrub	-	May-Sep	Plant seedlings
Dryandra	*sessilis*	Parrot bush	Shrub	4	May-Nov	Direct seeding
Enchylaena	*tomentosa*	Ruby saltbush	Herb	1	May-Sep	Direct seeding
Eremophila	*glabra*	Tar bush	Herb	0.5	Jul-Jan	Direct seeding
Eucalyptus	*calophylla*	Marri	Tree	35	Jan-May	Direct seeding

Cottesloe						
Scientific Name		Common Name	Form	Height	Flowers	Planting
Eucalyptus	*decipiens*	Limestone marlock	Tree	6	Sep-Nov	Direct seeding
Eucalyptus	*foecunda*	Fremantle mallee	Shrub	3	Nov-May	Direct seeding
Eucalyptus	*gomphocephala*	Tuart	Tree	40	Jan-Apr	Direct seeding
Eucalytpus	*marginata*	Jarrah	Tree	30	Sep-Feb	Direct seeding
Frankenia	*pauciflora*	Seaheath	Herb	-	all year	Plant seedlings
Gompholobium	*aristatum*	no common name	Herb	0.5	Jul- Dec	Direct seeding
Gompholobium	*tomementosum*	Yellow pea	Herb	1	Aug-Dec	Direct seeding
Grevillea	*crithmifolia*	no common name	Shrub	1	Jul-Sep	Plant seedlings
Grevillea	*thelemanniana*	Spider net grevillea	Shrub	1	May-Sep	Plant seedlings
Grevillea	*vestita*	no common name	Shrub	1.5	Jun-Sep	Plant seedlings
Gyrostemon	*ramulosus*	Corkybark	Shrub	4	May-Oct	Plant seedlings
Haemodorum	*laxum*	Bloodroot	Shrub	0.5	Nov	Plant seedlings
Haemodorum	*panociculatam*	Mardia	Shrub	0.5	Oct-Dec	Plant seedlings
Haemodorum	*spicatum*	Matje	Shrub	0.5	Nov-Dec	Plant seedlings
Hakea	*ceratophylla*	Horned leaved hakea	Shrub	1	Sep-Dec	Direct seeding
Hakea	*lissocarpha*	Honey bush	Shrub	1.5	Jun-Sep	Direct seeding
Hakea	*prostrata*	Harsh hakea	Shrub	3	Aug-Nov	Direct seeding
Hakea	*trifurcata*	Two-leaf hakea	Shrub	2	Jul-Oct	Direct seeding
Hardenbergia	*comptonialta*	Native wisteria	Creeper	-	Jun-Sep	Direct seeding
Hemiandra	*pungens*	Snakebush	Herb	0.5	all year	Plant seedings
Hibbertia	*racemosa*	Stalked guinea flower	Herb	0.3	Jul-Nov	Plant seedings
Hovea	*pungens*	Devils pins	Herb	0.5	Jun-Sep	Plant seedlings
Hovea	*trisperma*	Common hovea	Shrub	0.5	Jun-Sep	Plant seedlings
Hypocalymma	*robustum*	Swan River myrtle	Shrub	1	Jul-Oct	Plant seedlings
Isolepis	*nodosa*	Knotted club rush	Sedge	1	Nov-Mar	Plant seedlings
Isotropis	*cuneifolia*	Granny bonnets	Shrub	0.3	Aug-Oct	Plant seedlings
Jacksonia	*furcellata*	Grey stinkwood	Shrub	3	Aug-Mar	Direct seeding
Jacksonia	*sericea*	Waldjumi	Shrub	0.6	Dec-Feb	Direct seeding
Jacksonia	*sternbergiana*	Green stinkwood	Shrub	3	all year	Direct seeding
Kennedia	*prostrata*	Scarlett runner	Creeper	-	Jul-Nov	Direct seeding
Kunzea	*ericifolia*	Spearwood	Shrub	3	Sep-Nov	Direct seeding
Lechenaultia	*linarioides*	Yellow leschenaultia	Shrub	1	Jun-Nov	Plant seedlings
Lepidosperma	*gladiatum*	Coast sword-sedge	Sedge	1	Nov-Jan	Plant seedlings
Leptosperumum	*spinescens*	No common name	Shrub	1.5	Sep-Nov	Direct seeding
Lobelia	*tenuoir*	Slender lobelia	Herb	0.5	Oct-Jan	Plant seedlings
Logania	*vaginalis*	White spray	Shrub	2	Aug-Nov	Plant seedlings
Macrozamia	*riedlei*	Zamia	Shrub	2	Sep-Oct	Direct seeding
Melaleuca	*acerosa*	Coastal honeymyrtle	Shrub	1	Sep-Dec	Direct seeding
Melaleuca	*cardiophylla*	Tangling melaleuca	Shrub	1.5	Jul-Jan	Direct seeding
Melaleuca	*huegelii*	Chenille honeymyrtle	Shrub	3	Nov-Jan	Direct seeding
Melaleuca	*lanceolata*	Rottnest tea tree	Tree	5	Oct-Mar	Direct seeding

Cottesloe						
Scientific Name		**Common Name**	**Form**	**Height (m)**	**Flowers**	**Planting**
Melaleuca	*incana*	Grey honey myrtle	Shrub	3	Jul-Oct	Direct seeding
Myoporum	*caprarioides*	Slender myoporum	Shrub	1.5	All Year	Plant seedlings
Myoporum	*insulare*	Blueberry tree	Shrub	2	Aug-Nov	Plant seedings
Nemcia	*capitatum*	Bacon and eggs	Herb	0.5	Jun-Sep	Direct seeding
Olearia	*axillaris*	Coastal daisy bush	Herb	1.5	Mar-Aug	Plant seedlings
Olearia	*rudis*	Bristly daisy bush	Shrub	1.5	May-Dec	Plant seedlings
Orthrosanthus	*laxus*	Morning iris	Herb	0.5	Aug-Oct	Direct seeding
Petrophile	*serruriae*	A pixie mop	Herb	1	Aug-Nov	Direct seeding
Phyllanthus	*calycintes*	False boronia	Shrub	3	Jun-Nov	Direct seeding
Pittosporum	*phyllireoides*	Native apricot	Shrub	3	Jun-Aug	Direct seeding
Rhagodia	*baccata*	Berry salt bush	Shrub	0.5	Mar-Jun	Direct seeding
Santalum	*acuminatum*	Quandong	Shrub	5	Nov-Mar	Plant seedlings
Scaevola	*crassifolia*	Thick leaved fan flower	Shrub	0.5	Nov-Jan	Plant seedlings
Spyridium	*globulosum*	Basket bush	Shrub	3	Jun-Sep	Direct seeding
Stipa	*elegantissima*	Feather spear grass	Herb	2	Aug-Jan	Direct seeding
Stipa	*flavecsens*	No common name	Herb	0.5	Sept-Oct	Direct seeding
Templetonia	*retusa*	Cockies' tongues	Shrub	2	Apr-Sep	Plant seedlings
Trachymene	*coerulea*	Blue lace flower	Shrub	0.5	Oct-Feb	Direct seeding
Trymalium	*ledifolium*	no common name	Shrub	1.2	Jul-Oct	Plant seedlings
Xanthorrhoea	*preissii*	Grass tree	Shrub	3	Nov-Jan	Direct seeding
Limestone Outcrops						
Acacia	*cyclops*	Coastal wattle	Shrub	3	Sep-Jan	Direct seeding
Acacia	*lasiocarpa*	Dune moses	Shrub	1	Jun-Oct	Direct seeding
Clematis	*microphylla*	Old mans beard	Creeper	-	Jul-Sep	Plant seedlings
Clematis	*pubescens*	White clematis	Creeper	-	Jul-Oct	Direct seeding
Conostylis	*aculeata*	Prickly conostylis	Herb	0.5	Sep-Oct	Direct seeding
Conostylis	*candicans*	Grey cottonheads	Herb	0.5	Aug-Sep	Direct seeding
Dianella	*divaricata*	Flax lily	Herb	1	Jun-Aug	Plant seedlings
Diplopeltis	*huegelii*	no common name	Shrub	1.5	Jul-Nov	Plant seedlings
Dryandra	*nivea*	Couch honeypot	Shrub	-	May-Sep	Plant seedlings
Dryandra	*sessilis*	Parrot bush	Shrub	4	May-Nov	Direct seeding
Grevillea	*thelemanniana*	Spider net grevillea	Shrub	1	May-Sep	Plant seedlings
Grevillea	*vestita*	no common name	Shrub	1.5	Jun-Sep	Plant seedlings
Hakea	*prostrata*	Harsh hakea	Shrub	3	Aug-Nov	Direct seeding
Hardenbergia	*comptoniana*	Native wisteria	Creeper	-	Jun-Sep	Direct seeding
Hemiandra	*pugens*	Snakebush	Herb	0.5	all year	Plant seedlings
Hibbertia	*racemosa*	Stalked guinea flower	Herb	0.3	Jul-Nov	Plant seedlings
Isolepis	*nodosa*	Knotted club rush	Sedge	1	Nov-Mar	Plant seedlings
Isotropis	*cuneifolia*	Granny bonnets	Shrub	0.3	Aug-Oct	Plant seedlings
Jacksonia	*fucellata*	Grey stinkwood	Shrub	3	Aug-Mar	Direct seeding
Jacksonia	*sericea*	Waldjumi	Shrub	0.6	Dec-Feb	Direct seeding
Jacksonia	*sternbergiana*	Green stinkwood	Shrub	3	all year	Direct seeding

Cottesloe						
Scientific Name		**Common Name**	**Form**	**Height (m)**	**Flowers**	**Planting**
Limestone Outcrops (cont.)						
Lepidosperma	*gladiatum*	Coast sword sedge	Sedge	1	Nov-Jan	Plant seedlings
Macrozamia	*riedlei*	Zamia	Shrub	2	Sep-Oct	Direct seeding
Melaleuca	*acerosa*	Coastal honeymyrtle	Shrub	1	Sep-Dec	Direct seeding
Melaleuca	*cardiophylla*	Tangling Melaleuca	Shrub	1.5	Jul-Jan	Direct seeding
Melaleuca	*huegelii*	Chenille honeymyrtle	Shrub	3	Nov-Jan	Direct seeding
Olearia	*axillaris*	Coastal daisy bush	Herb	1.5	Mar-Aug	Plant seedlings
Rhagodia	*baccata*	Sea berry salt bush	Shrub	0.5	Mar-Jun	Direct seeding
Scaevola	*crassifolia*	Thick-leaved fanflower	Shrub	0.5	Nov-Jan	Plant seedlings
Stipa	*elegantissima*	Feather spear grass	Herb	2	Aug-Jan	Direct seeding
Stipa	*flavescsens*	no common name	Herb	0.5	Sep-Oct	Direct seeding
Templetonia	*retusa*	Cockies' tongues	Shrub	2	Apr-Sep	Plant seedlings
Trymalium	*ledifolium*	no common name	Shrub	1.2	Jul-Oct	Plant seedlings
Xanthorrhoea	*preissii*	Grass tree	Shrub	3	Nov-Jan	Direct seeding

Forrestfield						
Scientific Name		Common Name	Form	Height (m)	Flowers	Planting
Acacia	*pulchella*	Prickly moses	Shrub	2	Jun-Oct	Direct seeding
Acacia	*saligna*	Coojong	Shrub	6	Aug-Oct	Direct seeding
Acacia	*willodenowiana*	Grass wattle	Shrub	0.4	Jun-Oct	Direct seeding
Adenthos	*cygnorum*	Woolly bush	Shrub	3	Sep-Feb	Plant seedlings
Allocasuarina	*fraseriana*	Common sheoak	Tree	12	May-Nov	Direct seeding
Allocasuarina	*humilis*	Dwarf sheoak	Shrub	1.5	May-Nov	Direct seeding
Anigozanthos	*bicolor*	Little kangaroo paw	Herb	0.5	Aug-Oct	Direct seeding
Anigozanthos	*humilis*	Catspaw	Herb	0.3	Aug-Oct	Plant seedlings
Anigozanthos	*manglesii*	Mangles kangaroo paw	Herb	0.5	Sep-Nov	Plant seedlings
Banksia	*attenuata*	Candle banksia	Tree	8	Sep-Feb	Plant seedlings
Banksia	*grandis*	Bull banksia	Tree	8	Sep-Dec	Direct seeding
Banksia	*littoralis*	Swamp banksia	Tree	12	Mar-Jul	Direct seeding
Banksia	*menziesii*	Firewood banksia	Tree	10	Feb-Aug	Direct seeding
Beaufortia	*elegans*	no common name	Shrub	1	Nov-Feb	Direct seeding
Bossiaea	*eriocarpa*	Common brown pea	Herb	0.5	Jul-Oct	Direct seeding
Calothamnus	*quadrifdus*	One-sided bottlebrush	Shrub	2	Aug-Dec	Direct seeding
Calothamnus	*sanguineus*	Silky leaved blood flower	Shrub	1	Mar-Nov	Direct seeding
Calytrix	*angulata*	Yellow starflower	Shrub	1	Sep-Dec	Direct seeding
Conostylis	*aculeata*	Prickly conostylis	Shrub	0.5	Sep-Oct	Plant seedlings
Conostylis	*candicans*	Grey cottonheads	Shrub	0.5	Aug-Sep	Plant seedlings
Conostylis	*setigera*	Bristly cottonhead	Shrub	0.5	Sep-Oct	Plant seedlings
Dampiera	*linearis*	Common dampiera	Shrub	0.5	Jul-Nov	Plant seedlings
Davisia	*nudifora*	no common name	Shrub	1	Jul-Aug	Plant seedlings
Dryandra	*armata*	Prickly dryandra	Shrub	2	Jun-Oct	Plant seedlings
Dryandra	*nivea*	Couch honeypot	Herb	0.1	May-Sep	Plant seedlings
Dryandra	*sessilis*	Parrot bush	Shrub	4	May-Nov	Plant seedlings
Dryandra	*pauciflora*	no common name	Shrub	1	Sep-Dec	Plant seedlings
Eucalyptus	*calophylla*	Marri	Tree	35	Jan-May	Direct seeding
Eucalyptus	*lane-poolei*	Salmon white gum	Tree	12	Feb-May	Direct seeding
Eucalyptus	*marginata*	Jarrah	Tree	30	Sep-Feb	Direct seeding
Eucalyptus	*rudis*	Flooded gum	Tree	15	Apr-Nov	Direct seeding
Eucalyptus	*wandoo*	Wandoo	Tree	25	Dec-Apr	Direct seeding
Gompholobium	*marginatum*	no common name	Shrub	0.3	Aug-Sep	Direct seeding
Grevillea	*bipinnatifida*	Fuchsia grevillea	Shrub	1	Mar-Nov	Direct seeding
Haemodorum	*laxum*	Bloodroot	Shrub	0.5	November	Plant seedlings
Haemodorum	*paniculatum*	Mardja	Shrub	0.5	Oct-Dec	Plant seedlings
Hakea	*lissocarpha*	Honey bush	Shrub	1.5	Jun-Dec	Direct seeding
Hakea	*prostrata*	Harsh hakea	Shrub	3	Aug-Nov	Direct seeding
Hakea	*ruscifolia*	Candle hakea	Shrub	3	Dec-Mar	Direct seeding
Hakea	*stenocarpa*	Narrow-fruited hakea	Shrub	1	Jul-Nov	Direct seeding
Hakea	*trifurcata*	Two-leaf hakea	Shrub	2	Jul-Oct	Direct seeding
Hakea	*undulata*	Wavy-leaved hakea	Shrub	2	Aug- O ct	Direct seeding
Hakea	*varia*	Variable leaved hakea	Shrub	4	Jul-Oct	Direct seeding
Hardenbergia	*comptoniana*	Native wisteria	Creeper		Jun-Sep	Direct seeding
Hibbertia	*racemosa*	Stalked guinea flower	Herb	0.3	Jul-Nov	Plant seedlings

Forrestfield						
Scientific Name		Common Name	Form	Height (m)	Flowers	Planting
Hovea	*chorizemifolia*	Holly-leaved hovea	Shrub	0.5	Jun-Sep	Direct seeding
Hovea	*pungens*	Devils pins	Shrub	1	Jun-Nov	Direct seeding
Hovea	*trisperma*	Common hovea	Shrub	0.5	Jun-Sep	Direct seeding
Hypocalymma	*robustum*	Swan River myrtle	Shrub	1	Jul-Oct	Direct seeding
Isopogon	*asper*	no common name	Shrub	1	Jul-Oct	Direct seeding
Isopogon	*dubius*	Pincushion coneflower	Shrub	1	Jul-Oct	Direct seeding
Isopogon	*sphaerocephalus*	Drumstick isopogon	Shrub	1.5	Aug-Nov	Direct seeding
Isotropis	*cuneifolia*	Granny bonnets	Herb	0.3	Aug-Oct	Plant seedlings
Jacksonia	*furcellata*	Grey stinkwood	Shrub	3	all year	Direct seeding
Jacksonia	*sternbergiana*	Green stinkwood	Shrub	3	all year	Direct seeding
Kennedia	*coccinea*	Coral vine	Creeper	-	Aug-Nov	Direct seeding
Kennedia	*prostrata*	Running postman	Creeper	-	Jul-Nov	Direct seeding
Kennedia	*stirliotgii*	Bushy kennedia	Creeper	-	Aug-Sep	Direct seeding
Kunzea	*recurva*	Mountain kunzea	Shrub	1.5	Aug-Nov	Plant seedlings
Labichea	*punctata*	Lance-leaved cassia	Shrub	1	Aug-Oct	Plant seedlings
Lambertia	*multiflora*	Many-flowered honyesuckle	Shrub	2	Jun-Dec	Plant seedlings
Lechenaultia	*biloba*	Blue leschenaultia	Shrub	0.5	Jul-Nov	Plant seedlings
Macrozamia	*riedlei*	Zamia	Shrub	2	Sep-Oct	Direct seeding
Melaleuca	*lateritia*	Robin redbreast bush	Shrub	1.5	Sep-Apr	Direct seeding
Melaleuca	*rhaphiophylla*	Swamp paperbark	Tree	8	Sep-Jan	Direct seeding
Melaleuca	*scabra*	Rough honeymyrtle	Shrub	0.5	Sep-Dec	Direct seeding
Melaleuca	*seriata*	no common name	Shrub	1	Oct-Dec	Direct seeding
Melaleuca	*trichophylla*	no common name	Shrub	0.5	Nov-Jan	Direct seeding
Nemcia	*capitatum*	Bacon and eggs	Shrub	0.5	Jun-Sep	Direct seeding
Nuytsia	*floribunda*	Christmas tree	Tree	8	Nov-Dec	Direct seeding
Orthrosanthus	*laxus*	Morning iris	Shrub	0.5	Aug-Oct	Direct seeding
Patersonia	*occidentalis*	Western patersonia	Shrub	0.5	Sep-Dec	Plant seedlings
Petrophile	*linearis*	Pixie mops	Herb	0.5	Sep-Nov	Plant seedlings
Petrophile	*macrostachya*	no common name	Shrub	1	Aug-Nov	Plant seedlings
Pimelia	*rosea*	Rose banjine	Shrub	1	Aug-Nov	Plant seedlings
Pimelia	*sulphurea*	Yellow banjine	Shrub	0.5	Oct-Nov	Plant seedlings
Phyllanthus	*calycinus*	False boronia	Shrub	0.3	Jun-Nov	Direct seeding
Regelia	*ciliata*	no common name	Shrub	2	Nov-Feb	Direct seeding
Scholzia	*involucata*	Spiked scholtzia	Shrub	1	Dec-Mar	Direct seeding
Stylidium	*brunonianum*	Pink fountain triggerplant	Herb	0.1	Sep-Nov	Plant seedings
Stylidium	*calcaratum*	Book triggerplant	Herb	0.1	Sep-Nov	Plant seedlings
Stylidium	*schoenoides*	Cow licks	Herb	0.1	Aug-Oct	Plant seedlings
Templetonia	*biloba*	no common name	Shrub	0.5	September	Direct seedings
Thysanotus	*multiforus*	Many flowered fringed lily	Shrub	0.5	September	Direct seeding
Thysanotus	*manglesianus*	*Fringed lily*	*Creeper*	-	*Aug-Nov*	*Direct seeding*
Verticordia	*acerosa*	no common name	Shrub	1	Aug-Nov	Plant seedlings
Verticordia	*plumosa*	no common name	Shrub	1	Sep-Dec	Plant seedlings
Xanthorrhoea	*gracilis*	Graceful grass Tree	Shrub	1	Sep-Nov	Direct seeding
Xanthorrhoea	*preissii*	Blackboy	Shrub	3	Nov-Jan	Direct seeding

Guildford						
Scientific Name		Common Name	Form	Height (m)	Flowers	Planting
Acacia	*pulchella*	Prickly moses	Shrub	2	Jun-Oct	Direct seeding
Acacia	*saligna*	Coojong	Shrub	6	Aug-Oct	Direct seeding
Acacia	*willodenowiana*	Grass wattle	Shrub	0.4	Jun-Oct	Direct seeding
Allocasuarina	*fraseriana*	Common sheok	Tree	12	May-Nov	Direct seeding
Allocasuarina	*humilis*	Dwarf sheoak	Shrub	1.5	May-Nov	Direct seeding
Anigozanthos	*bicolor*	Little kangaroo paw	Herb	0.5	Aug-Oct	Direct seeding
Anigozanthos	*humilis*	Catspaw	Herb	0.3	Aug-Oct	Plant seedlings
Anigozanthos	*manglesii*	Mangles kangaroo paw	Herb	0.5	Sep-Nov	Plant seedlings
Banksia	*attenuata*	Candle banksia	Tree	8	Sep-Feb	Plant seedlings
Banksia	*grandis*	Bull banksia	Tree	8	Sep-Dec	Direct seeding
Banksia	*littoralis*	Swamp banksia	Tree	12	Mar-Jul	Direct seeding
Banksia	*menziesii*	Firewood banksia	Tree	10	Feb-Aug	Direct seeding
Beaufortia	*elegans*	no common name	Shrub	1	Nov-Feb	Direct seeding
Bossiaea	*eriocarpa*	Common brown pea	Herb	0.5	Jul-Oct	Direct seeding
Calothamnus	*quadrifdus*	One-sided bottlebrush	Shrub	2	Aug-Dec	Direct seeding
Calothamnus	*sanguineus*	Silky-leaved blood flower	Shrub	1	Mar-Nov	Direct seeding
Calytrix	*angulata*	Yellow starflower	Shrub	1	Sep-Dec	Direct seeding
Conostylis	*aculeata*	Prickly conostylis	Shrub	0.5	Sep-Oct	Plant seedlings
Conostylis	*candicans*	Grey cottonheads	Shrub	0.5	Aug-Sep	Plant seedlings
Conostylis	*setigera*	Bristly cottonhead	Shrub	0.5	Sep-Oct	Plant seedlings
Dampiera	*linearis*	Common dampiera	Shrub	0.5	Jul-Nov	Plant seedlings
Davisia	*nudifora*	no common name	Shrub	1	Jul-Aug	Plant seedlings
Dryandra	*armata*	Prickly dryandra	Shrub	2	Jun-Oct	Plant seedlings
Dryandra	*nivea*	Couch honeypot	Herb	0.1	May-Sep	Plant seedlings
Dryandra	*sessilis*	Parrot bush	Shrub	4	May-Nov	Plant seedlings
Dryandra	*pauciflora*	no common name	Shrub	1	Sep-Dec	Plant seedlings
Eucalyptus	*calophylla*	Marri	Tree	35	Jan-May	Direct seeding
Eucalyptus	*lane-poolei*	Salmon white gum	Tree	12	Feb-May	Direct seeding
Eucalyptus	*marginata*	Jarrah	Tree	30	Sep-Feb	Direct seeding
Eucalyptus	*rudis*	Flooded gum	Tree	15	Apr-Nov	Direct seeding
Eucalyptus	*wandoo*	Wandoo	Tree	25	Dec-Apr	Direct seeding
Gompholobium	*marginatum*	no common name	Shrub	0.3	Aug-Sep	Direct seeding
Grevillea	*bipinnatifida*	Fuchsia grevillea	Shrub	1	Mar-Nov	Direct seeding
Haemodorum	*laxum*	Bloodroot	Shrub	0.5	November	Plant seedlings
Haemodorum	*paniculatum*	Mardja	Shrub	0.5	Oct-Dec	Plant seedlings
Hakea	*lissocarpha*	Honey bush	Shrub	1.5	Jun-Dec	Direct seeding
Hakea	*prostrata*	Harsh hakea	Shrub	3	Aug-Nov	Direct seeding
Hakea	*ruscifolia*	Candle hakea	Shrub	3	Dec-Mar	Direct seeding
Hakea	*stenocarpa*	Narrow-fruited hakea	Shrub	1	Jul-Nov	Direct seeding
Hakea	*trifurcata*	Two-leaf hakea	Shrub	2	Jul-Oct	Direct seeding
Hakea	*undulata*	Wavy-leaved hakea	Shrub	2	Aug-Oct	Direct seeding
Hakea	*varia*	Variable-leaved hakea	Shrub	4	Jul-Oct	Direct seeding
Hardenbergia	*comptoniana*	Native wisteria	Creeper	-	Jun-Sep	Direct seeding
Hibbertia	*racemosa*	Stalked guinea flower	Herb	0.3	Jul-Nov	Plant seedlings

Guildford

Scientific Name		Common Name	Form	Height (m)	Flowers	Planting
Hovea	*chorizemifolia*	Holly-leaved hovea	Shrub	0.5	Jun-Sep	Direct seeding
Hovea	*pungens*	Devils pins	Shrub	1	Jun-Nov	Direct seeding
Hovea	*trisperma*	Common hovea	Shrub	0.5	Jun-Sep	Direct seeding
Hypocalymma	*robustum*	Swan River myrtle	Shrub	1	Jul-Oct	Direct seeding
Isopogon	*asper*	no common name	Shrub	1	Jul-Oct	Direct seeding
Isopogon	*dubius*	Pincushion coneflower	Shrub	1	Jul-Oct	Direct seeding
Isopogon	*sphaerocephalus*	Drumstick isopogon	Shrub	1.5	Aug-Nov	Direct seeding
Isotropis	*cuneifolia*	Granny bonnets	Herb	0.3	Aug-Oct	Plant seedlings
Jacksonia	*furcellata*	Grey stinkwood	Shrub	3	All year	Direct seeding
Jacksonia	*sternbergiana*	Green stinkwood	Shrub	3	All year	Direct seeding
Kennedia	*coccinea*	Coral vine	Creeper	-	Aug-Nov	Direct seeding
Kennedia	*prostrata*	Running postman	Creeper	-	Jul-Nov	Direct seeding
Kennedia	*stirliotgii*	Bushy kennedia	Creeper	-	Aug-Sep	Direct seeding
Kunzea	*recurva*	Mountain kunzea	Shrub	1.5	Aug-Nov	Plant seedlings
Labichea	*punctata*	Lance-leaved cassia	Shrub	1	Aug-Oct	Plant seedlings
Lambertia	*multiflora*	Many-flowered honyesuckle	Shrub	2	Jun-Dec	Plant seedlings
Lechenaultia	*biloba*	Blue leschenaultia	Shrub	0.5	Jul-Nov	Plant seedlings
Macrozamia	*riedlei*	Zamia	Shrub	2	Sep-Oct	Direct seeding
Melaleuca	*lateritia*	Robin redbreast bush	Shrub	1.5	Sep-Apr	Direct seeding
Melaleuca	*rhaphiophylla*	Swamp paperbark	Tree	8	Sep-Jan	Direct seeding
Melaleuca	*scabra*	Rough honeymyrtle	Shrub	0.5	Sep-dec	Direct seeding
Melaleuca	*seriata*	no common name	Shrub	1	Oct-Dec	Direct seeding
Melaleuca	*trichophylla*	no common name	Shrub	0.5	Nov-Jan	Direct seeding
Nemcia	*capitatum*	Bacon and eggs	Shrub	0.5	Jun-Sep	Direct seeding
Nuytsia	*floribunda*	Christmas tree	Tree	8	Nov-Dec	Direct seeding
Orthrosanthus	*laxus*	Morning iris	Shrub	0.5	Aug-Oct	Direct seeding
Patersonia	*occidentalis*	Western patersonia	Shrub	0.5	Sep-Dec	Plant seedlings
Petrophile	*linearis*	Pixie mops	Herb	0.5	Sep-Nov	Plant seedlings
Petrophile	*macrostachya*	no common name	Shrub	1	Aug-Nov	Plant seedlings
Pimelia	*rosea*	Rose banjine	Shrub	1	Aug-Nov	Plant seedlings
Pimelia	*sulphurea*	Yellow banjine	Shrub	0.5	Oct-Nov	Plant seedlings
Phyllanthus	*calycinus*	False boronia	Shrub	0.3	Jun-Nov	Direct seeding
Regelia	*ciliata*	no common name	Shrub	2	Nov-Feb	Direct seeding
Scholzia	*involucata*	Spiked scholtzia	Shrub	1	Dec-Mar	Direct seeding
Stylidium	*brunonianum*	Pink fountain triggerplant	Herb	0.1	Sep-Nov	Plant seedings
Stylidium	*calcaratum*	Book triggerplant	Herb	0.1	Sep-Nov	Plant seedlings
Stylidium	*schoenoides*	Cow-licks	Herb	0.1	Aug-Oct	Plant seedlings
Templetonia	*biloba*	no common name	Shrub	0.5	September	Direct seedings
Thysanotus	*multiforus*	Many flowered fringed lily	Shrub	0.5	September	Direct seeding
Thysanotus	*manglesianus*	Fringed lily	Creeper	-	Aug-Nov	Direct seeding
Verticordia	*acerosa*	no common name	Shrub	1	Aug-Nov	Plant seedlings
Verticordia	*plumosa*	no common name	Shrub	1	Sep-Dec	Plant seedlings
Xanthorrhoea	*gracilis*	Graceful grass tree	Shrub	1	Sep-Nov	Direct seeding
Xanthorrhoea	*preissii*	Blackboy	Shrub	3	Nov-Jan	Direct seeding

Herdsman						
Scientific Name		Common Name	Form	Height (m)	Flowers	Planting
Swamp Soils						
Acacia	*cyclops*	Coastal wattle	Shrub	3	Sep-Jan	Direct seeding
Acacia	*pulchella*	Prickly moses	Shrub	2	Jun-Oct	Direct seeding
Acacia	*saligna*	Coojong	Shrub	6	Aug-Oct	Direct seeding
Anigozanthos	*viridis*	Green kangaroo paw	Shrub	0.5	Aug-Oct	Plant seedlings
Aotus	*gracillima*	no common name	Shrub	1	Oct-Nov	Direct seeding
Astartea	*fascicularis*	no common name	Shrub	1.5	Dec-Feb	Plant seedlings
Banksia	*littoralis*	Swamp banksia	Tree	10	Mar-Jul	Direct seeding
Baumea	*articulata*	Jointed twig-rush	Sedge	1	Nov-Dec	Plant seedlings
Baumea	*juncea*	Bare twig-rush	Sedge	1	Oct-Jan	Plant seedlings
Centella	*cordifolia*	Centella	Herb	0.1	all year	Plant seedlings
Eucalyptus	*calophylla*	Marri	Tree	35	Jan-May	Direct seeding
Eucalyptus	*gomphocephala*	Tuart	Tree	40	Jan-Apr	Direct seeding
Eucalyptus	*rudis*	Flooded gum	Tree	15	Apr-Nov	Direct seeding
Ectaxia	*virgata*	no common name	Shrub	1	Aug-Nov	Direct Seeding
Hibbertia	*stellaris*	Orange stars	Shrub	1	Sep-Dec	Plant Seedlings
Hypocalymma	*angustifolium*	White myrtle	Shrub	1	Jul-Oct	Direct seeding
Isolepis	*nodosa*	Knotted club rush	Sedge	1	Nov-Mar	Direct seeding
Jacksonia	*fucellata*	Grey stinkwood	Shrub	3	Aug-Mar	Direct seeding
Jacksonia	*sternbergiana*	Green stinkwood	Shrub	3	all year	Direct seeding
Juncus	*krausii*	Sea rush	Sedge	2	Nov-Dec	Direct seeding
Juncus	*pallidus*	Pale rush	Sedge	2	Oct-Nov	Direct seeding
Kunzea	*ericifolia*	Spearwood	Shrub	3	Sep-Nov	Direct seeding
Leptosperma	*longitudinale*	Pithy sword-sedge	Sedge	1	Nov-Jan	Plant seedlings
Lobelia	*alata*	no common name	Shrub	0.2	Mar-Apr	Plant seedlings
Melaleuca	*preissiana*	Modong	Tree	10	Nov-Jan	Direct seeding
Melaleuca	*rhaphiophylla*	Swamp paperbark	Tree	8	Sep-Jan	Direct seeding
Melaleuca	*teretifolia*	Banbar	Shrub	4	Oct-Jan	Direct seeding
Myoporum	*caprarioides*	Slender myoporum	Shrub	1	all year	Plant seedlings
Triglochin	*striata*	Streaked arrowgrass	Herb	0.2	Jun-Oct	Plant seedlings
Typha	*domingensis*	Narrow-leaf cumbungi	Sedge	3	Dec-Feb	Direct seeding
Viminaria	*juncea*	Swishbush	Shrub	5	Oct-Dec	Direct seeding
Xanthorrhoea	*preissii*	Blackboy	Shrub	3	Nov-Jan	Direct seeding

Karrakatta

Scientific Name		Common Name	Form	Height (m)	Flowers	Planting
Shallow Sands						
Acacia	*cochlearis*	Rigid wattle	Shrub	2	Aug-Sep	Direct seeding
Acacia	*cyclops*	Coastal wattle	Shrub	3	Sep-Jan	Direct seeding
Acacia	*pulchella*	Prickly moses	Shrub	2	Jun-Oct	Direct seeding
Acacia	*saligna*	coojong	Shrub	6	Aug-Oct	Direct seeding
Acacia	*stenoptera*	Narrow-winged wattle	Shrub	1	May-Sep	Direct seeding
Acacia	*willdenowiana*	Grass wattle	Shrub	0.5	Jun-Oct	Direct seeding
Acacia	*xanthina*	White-stemmed wattle	Shrub	4	Aug-Oct	Direct seeding
Agonis	*flexuosa*	Peppermint	Tree	12	Aug-Dec	Direct seeding
Allocasuarina	*fraseriana*	Sheoak	Tree	12	May-Nov	Direct seeding
Allocasuarina	*humilis*	Dwarf sheoak	Shrub	1.5	May-Nov	Direct seeding
Andersonia	*invoucrata*	no common name	Shrub	0.3	Sep-Nov	Plant seedlings
Angiozanthos	*humilis*	Catspaw	Shrub	0.5	Aug-Oct	Direct seeding
Angiozanthos	*manglesii*	Mangles kangaroo paw	Shrub	0.5	Sep-Nov	Direct seeding
Arthropodium	*capillipes*	No common name	Shrub	1	Nov-Mar	Direct seeding
Arthropodium	*preissii*	Nodding chocolate lilly	Herb	0.5	Sep-Oct	Direct seeding
Astroloma	*ciliatum*	Candle cranberry	Herb	0.3	Sep-Nov	Direct seeding
Banksia	*attenuata*	Candle banksia	Tree	8	Sep-Feb	Direct seeding
Banksia	*grandis*	Bull banksia	Tree	8	Sep-Dec	Direct seeding
Banksia	*menziesii*	Firewood banksia	Tree	8	Feb-Aug	Direct seeding
Banksia	*prionotes*	Saw-tooth banksia	Tree	8	Feb-Aug	Direct seeding
Banksia	*iberidifolia*	Swan River daisy	Herb	0.5	Aug-May	Plant seedlings
Beaufortia	*elegans*	Elegant beaufortia	Shrub	1	Nov-Feb	Plant seedlings
Billardiera	*variifolia*	Billardiera	Creeper	-	Jan-May	Direct seeding
Bossiaea	*eriocarpa*	Common brown pea	Herb	0.5	Jul-Oct	Direct seeding
Burchardia	*umbellata*	Milkmaids	Herb	0.5	Aug-Oct	Plant seedlings
Callitris	*preissii*	Rottnest cypress	Shrub	6	Sep-Oct	Direct seedings
Calothamnus	*quadrifdus*	One-sided bottlebrush	Shrub	2	Aug-Dec	Direct seeding
Calothamnus	*sanguineus*	Silky-leaved bloodflower	Shrub	1	Mar-Nov	Direct seeding
Calytrix	*fraseri*	Pink summer calytrix	Shrub	1.5	Nov-May	Plant seedlings
Chamelaucium	*uncinatum*	Geraldton wax	Shrub	3	Aug- Nov	Plant seedlings
Clematis	*microphylla*	Old man's beard	Creeper	-	Jul-Sep	Plant seedlings
Clematis	*pubescens*	White clematis	Creeper	-	Jul-Oct	Direct seeding
Conostylis	*aculeata*	Prickly conostylis	Herb	0.5	Sep-Oct	Direct seeding
Conostylis	*candicalts*	Grey cottonheads	Herb	0.5	Aug-Sep	Direct seeding
conostylis	*setigera*	Bristly cottonhead	Herb	0.5	Sep-Oct	Direct seeding
Cryptandra	*arbutiflora*	Waxy cryptandra	Shrub	1	May-Oct	Plant seedlings
Dampiera	*linearis*	Common damperia	Shrub	0.5	Jul-Nov	Plant seedlings
Daviesia	*divaricata*	Marno	Shrub	1	May-Oct	Plant seedlings
Daviesia	*triflora*	no common name	Shrub	0.5	May-Sep	Direct seeding
Dianella	*divaricata*	Flax lily	Herb	1	Jun-Aug	Plant seedlings
Diplopeltis	*huegelii*	no common name	Shrub	1.5	Jul-Nov	Plant seedlings

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Scientific Name		Common Name	Form	Height (m)	Flowers	Planting
Dodonaea	*aptera*	Coast hopbush	Shrub	3	Apr-Jul	Direct seeding
Dodonaea	*hackettiana*	Perth hopbush	Shrub	4	Jul-Oct	Plant seedlings
Dryandra	*nivea*	Couch honeypot	Shrub	-	May-Sep	Plant seedlings
Dryandra	*sessilis*	Parrot bush	Shrub	4	May-Nov	Direct seeding
Enchylaena	*tomentosa*	Ruby saltbush	Herb	1	May-Sep	Direct seeding
Eremaea	*pauciflora*	no common name	Shrub	1	Sep-Dec	Direct seeding
Eremophilla	*glabra*	Tar bush	Herb	0.5	Jul-Jan	Direct seeding
Eriostemon	*spicatus*	Salt and pepper	Shrub	0.5	Aug-Sep	Plant seedlings
Eucalyptus	*calophylla*	Marri	Tree	35	Jan-May	Direct seeding
Eucalyptus	*decipiens*	Limestone marlock	Tree	6	Sep-Nov	Direct seeding
Eucalyptus	*foecunda*	Fremantle mallee	Shrub	3	Nov-May	Direct seeding
Eucalyptus	*gomphocephala*	Tuart	Tree	40	Jan-Apr	Direct seeding
Eucalytpus	*marginata*	Jarrah	Tree	30	Sep-Feb	Direct seeding
Eucalytpus	*todtiana*	Pricklybark	Tree	10	Feb	Direct seeding
Frankiana	*pauciflora*	Sea heath	Herb	-	all year	Plant seedlings
Gompholobium	*aristatum*	no common name	Herb	0.5	Jul- Dec	Direct seeding
Gompholobium	*tomementosum*	Yellow pea	Herb	1	Aug-Dec	Direct seeding
Grevillea	*vestita*	no common name	Shrub	1.5	Jun-Sep	Plant seedlings
Gyrostemon	*ramulosus*	Corkybark	Shrub	4	May-Oct	Plant seedlings
Haemodorum	*panociculatam*	Mardia	Shrub	0.5	Oct-Dec	Plant seedlings
Haemodorum	*spicatum*	Matje	Shrub	0.5	Nov-Dec	Plant seedlings
Hakea	*ceratophylla*	Horned leaved hakea	Shrub	1	Sep-Dec	Direct seeding
Hakea	*lissocarpha*	Honey bush	Shrub	1.5	Jun-Sep	Direct seeding
Hakea	*prostrata*	Harsh hakea	Shrub	3	Aug-Nov	Direct seeding
Hakea	*trifurcata*	Two-leaf hakea	Shrub	2	Jul-Oct	Direct seeding
Hardenbergia	*comptoniana*	Native wisteria	Creeper	-	Jun-Sep	Direct seeding
Hemiandra	*pungens*	Snakebush	Herb	0.5	all year	Plant seedings
Hibbertia	*racemosa*	Stalked guinea flower	Herb	0.3	Jul-Nov	Plant seedings
Hovea	*pungens*	Devils pins	Herb	0.5	Jun-Sep	Plant seedlings
Hovea	*trisperma*	Common hovea	Shrub	0.5	Jun-Sep	Plant seedlings
Hypocalymma	*robustum*	Swan River myrtle	Shrub	1	Jul-Oct	Plant seedlings
Isotropis	*cuneifolia*	Granny bonnets	Shrub	0.3	Aug-Oct	Plant seedlings
Jacksonia	*furcellata*	Grey stinkwood	Shrub	3	Aug-Mar	Direct seeding
Jacksonia	*sericea*	Waldjumi	Shrub	0.6	Dec-Feb	Direct seeding
Jacksonia	*sternbergiana*	Green stinkwood	Shrub	3	all year	Direct seeding
Kennedia	*prostrata*	Scarlett runner	Creeper	-	Jul-Nov	Direct seeding
Kunzea	*ericifolia*	Spearwood	Shrub	3	Sep-Nov	Direct seeding
Lobelia	*tenuoir*	Slender lobelia	Herb	0.5	Oct-Jan	Plant seedlings
Macrozamia	*riedlei*	Zamia	Shrub	2	Sep-Nov	Direct seeding
Melaleuca	*seriata*	no common name	Shrub	1	Oct-Dec	Direct seeding
Melaleuca	*thymoides*	no common name	Shrub	1	Sep-Jan	Direct seeding
Nemcia	*capitatum*	Bacon and eggs	Herb	0.5	Jun-Sep	Direct seeding

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Scientific Name		Common Name	Form	Height (m)	Flowers	Planting
Olearia	*axillaris*	Coastal daisy bush	Herb	1.5	Mar-Aug	Plant seedlings
Olearia	*rudis*	Bristly daisy bush	Shrub	1.5	May-Dec	Plant seedlings
Orthrosanthus	*laxus*	Morning iris	Herb	0.5	Aug-Oct	Direct seeding
Patersonia	*occidentalis*	Western patersonia	Shrub	0.5	Sep-Dec	Plant seeding
Persoonia	*saccatta*	Snottygobble	Shrub	1.5	Jul-Jan	Plant seedings
Petrophile	*linearis*	Pixie mops	Herb	0.5	Sep-Nov	Direct seeding
Petrophile	*serruriae*	A pixie mop	Herb	1	Aug-Nov	Direct seeding
Phyllanthus	*calycintes*	False boronia	Shrub	3	Jun-Nov	Direct seeding
Pimelea	*rosea*	Rose banjine	Shrub	1	Aug-Nov	Direct seeding
Pittosporum	*phyllireoides*	Native apricot	Shrub	3	Jun-Aug	Direct seeding
Pronaya	*fraseri*	Elegant pronaya	Creeper	-	Jan-Feb	Plant seedings
Regelia	*inopse*	no common name	Shrub	2	Oct-Jan	Plant seedlings
Thysanotus	*mangelesianus*	Fringed lily	Herb	0.5	Aug-Nov	Direct seeding
Thysanotus	*multiflorus*	Many flowered fringed lily	Herb	0.5	Sep-Jan	Direct seeding
Thysanotus	*thyrsoideus*	Fringed lily	Herb	0.5	Sep-Jan	Direct seeding
Trachymene	*coerulea*	Blue lace flower	Shrub	0.5	Oct-Feb	Direct seeding
Trymalium	*ledifolium*	no common name	Shrub	1.2	Jul-Oct	Plant seedlings
Xanthorrhoea	*preissii*	Grass tree	Shrub	3	Nov-Jan	Direct seeding
Deeper Soils						
Acacia	*cochlearis*	Rigid Wattle	Shrub	2	Aug-Sep	Direct seeding
Acacia	*cyclops*	Coastal Wattle	Shrub	3	Sep-Jan	Direct seeding
Acacia	*pulchella*	Prickly Moses	Shrub	2	Jun-Oct	Direct seeding
Acacia	*saligna*	Coojong	Shrub	6	Aug-Oct	Direct seeding
Acacia	*stenoptera*	Narrow-winged Wattle	Shrub	1	May-Sep	Direct seeding
Acacia	*willdenowiana*	Grass Wattle	Shrub	0.5	Jun-Oct	Direct seeding
Acacia	*xanthina*	White-stemmed Wattle	Shrub	4	Aug-Oct	Direct seeding
Agonis	*flexuosa*	Peppermint	Tree	12	Aug-Dec	Direct seeding
Allocasuarina	*fraseriana*	Sheoak	Tree	12	May-Nov	Direct seeding
Allocasuarina	*humilis*	Dwarf Sheoak	Shrub	1.5	May-Nov	Direct seeding
Andersonia	*invoucrata*	no common name	Shrub	0.3	Sep-Nov	Plant seedlings
Angiozanthos	*humilis*	Catspaw	Shrub	0.5	Aug-Oct	Direct seeding
Angiozanthos	*manglesii*	Mangles Kangaroo Paw	Shrub	0.5	Sep-Nov	Direct seeding
Arthropodium	*capillipes*	No common name	Shrub	1	Nov-Mar	Direct seeding
Arthropodium	*preissii*	Nodding Chocolate Lilly	Herb	0.5	Sep-Oct	Direct seeding
Astroloma	*ciliatum*	Candle Cranberry	Herb	0.3	Sep-Nov	Direct seeding
Banksia	*attenuata*	Candle Banksia	Tree	8	Sep-Feb	Direct seeding
Banksia	*grandis*	Bull Banksia	Tree	8	Sep-Dec	Direct seeding
Banksia	*menziesii*	Firewood Banksia	Tree	8	Feb-Aug	Direct seeding
Banksia	*prionotes*	Saw-tooth Banksia	Tree	8	Feb-Aug	Direct seeding
Banksia	*iberidifolia*	Swan River Daisy	Herb	0.5	Aug-May	Plant seedlings
Beaufortia	*elegans*	Elegant Beaufortia	Shrub	1	Nov-Feb	Plant seedlings

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Scientific Name		Common Name	Form	Height (m)	Flowers	Planting
Billardiera	*variifolia*	Billardiera	Creeper	-	Jan-May	Direct seeding
Bossiaea	*eriocarpa*	Common Brown Pea	Herb	0.5	Jul-Oct	Direct seeding
Burchardia	*umbellata*	Milkmaids	Herb	0.5	Aug-Oct	Plant seedlings
Callitris	*preissii*	Rottnest Cypress	Shrub	6	Oct-Nov	Direct seedings
Calothamnus	*quadrifdus*	One-sided Bottlebrush	Shrub	2	Aug-Dec	Direct seeding
Calothamnus	*sanguineus*	Silky-leaved Bloodflower	Shrub	1	Mar-Nov	Direct seeding
Calytrix	*fraseri*	Pink Summer Calytrix	Shrub	1.5	Nov-May	Plant seedlings
Chamelaucium	*uncinatum*	Geraldton Wax	Shrub	3	Aug- Nov.	Plant seedlings
Clematis	*microphylla*	Old Mans Beard	Creeper	-	Jul-Sep	Plant seedlings
Clematis	*pubescens*	White Clematis	Creeper	-	Jul-Oct	Direct seeding
Conostylis	*aculeata*	Prickly Conostylis	Herb	0.5	Sep-Oct	Direct seeding
Conostylis	*candicaIts*	Grey Cottonheads	Herb	0.5	Aug-Sep	Direct seeding
conostylis	*setigera*	Bristly Cottonhead	Herb	0.5	Sep-Oct	Direct seeding
Cryptandra	*arbutiflora*	Waxy Cryptandra	Shrub	1	May-Oct	Plant seedlings
Dampiera	*linearis*	Common Damperia	Shrub	0.5	Jul-Nov	Plant seedlings
Daviesia	*divaricata*	Marno	Shrub	1	May-Oct	Plant seedlings
Daviesia	*triflora*	no common name	Shrub	0.5	May-Sep	Direct seeding
Dianella	*divaricata*	Flax Lily	Herb	1	Jun-Aug	Plant seedlings
Diplopeltis	*huegelii*	no common name	Shrub	1.5	Jul-Nov	Plant seedlings
Dodonaea	*aptera*	Coast Hopbush	Shrub	3	Apr-Jul	Direct seeding
Dodonaea	*hackettiana*	Perth Hopbush	Shrub	4	Jul-Oct	Plant seedlings
Dryandra	*nivea*	Couch Honeypot	Shrub	-	May-Sep	Plant seedlings
Dryandra	*sessilis*	Parrot Bush	Shrub	4	May-Nov	Direct seeding
Enchylaena	*tomentosa*	Ruby Saltbush	Herb	1	May-Sep	Direct seeding
Eremaea	*pauciflora*	no common name	Shrub	1	Sep-Dec	Direct seeding
Eremophilla	*glabra*	Tar Bush	Herb	0.5	Jul-Jan	Direct seeding
Eriostemon	*spicatus*	Salt and Pepper	Shrub	0.5	Aug-Sep	Plant seedlings
Eucalyptus	*calophylla*	Marri	Tree	35	Jan-May	Direct seeding
Eucalyptus	*decipiens*	Limestone Marlock	Tree	6	Sep-Nov	Direct seeding
Eucalyptus	*foecunda*	Fremantle Mallee	Shrub	3	Nov-May	Direct seeding
Eucalyptus	*gomphocephala*	Tuart	Tree	40	Jan-Apr	Direct seeding
Eucalytpus	*marginata*	Jarrah	Tree	30	Sep-Feb	Direct seeding
Eucalytpus	*todtiana*	Pricklybark	Tree	10	Feb	Direct seeding
Frankiana	*pauciflora*	Sea Heath	Herb	-	all year	Plant seedlings
Gompholobium	*aristatum*	no common name	Herb	0.5	Jul- Dec	Direct seeding
Gompholobium	*tomementosum*	Yellow Pea	Herb	1	Aug-Dec	Direct seeding
Grevillea	*vestita*	no common name	Shrub	1.5	Jun-Sep	Plant seedlings
Gyrostemon	*ramulosus*	Corkybark	Shrub	4	May-Oct	Plant seedlings
Haemodorum	*panociculatam*	Mardia	Shrub	0.5	Oct-Dec	Plant seedlings
Haemodorum	*spicatum*	Matje	Shrub	0.5	Nov-Dec	Plant seedlings
Hakea	*ceratophylla*	Horned-leaved Hakea	Shrub	1	Sep-Dec	Direct seeding
Hakea	*lissocarpha*	Honey Bush	Shrub	1.5	Jun-Sep	Direct seeding

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Scientific Name		Common Name	Form	Height (m)	Flowers	Planting
Hakea	*prostrata*	Harsh Hakea	Shrub	3	Aug-Nov	Direct seeding
Hakea	*trifurcata*	Two-leaf Hakea	Shrub	2	Jul-Oct	Direct seeding
Hardenbergia	*comptoniana*	Native Wisteria	Creeper	-	Jun-Sep	Direct seeding
Hemiandra	*pungens*	Snakebush	Herb	0.5	all year	Plant seedings
Hibbertia	*racemosa*	Stalked Guinea Flower	Herb	0.3	Jul-Nov	Plant seedings
Hovea	*pungens*	Devils Pins	Herb	0.5	Jun-Sep	Plant seedlings
Hovea	*trisperma*	Common Hovea	Shrub	0.5	Jun-Sep	Plant seedlings
Hypocalymma	*robustum*	Swan River Myrtle	Shrub	1	Jul-Oct	Plant seedlings
Isotropis	*cuneifolia*	Granny Bonnets	Shrub	0.3	Aug-Oct	Plant seedlings
Jacksonia	*furcellata*	Grey Stinkwood	Shrub	3	Aug-Mar	Direct seeding
Jacksonia	*sericea*	Waldjumi	Shrub	0.6	Dec-Feb	Direct seeding
Jacksonia	*sternbergiana*	Green Stinkwood	Shrub	3	all year	Direct seeding
Kennedia	*prostrata*	Scarlett Runner	Creeper	-	Jul-Nov	Direct seeding
Kunzea	*ericifolia*	Spearwood	Shrub	3	Sep-Nov	Direct seeding
Lobelia	*tenuoir*	Slender Lobelia	Herb	0.5	Oct-Jan	Plant seedlings
Macrozamia	*riedlei*	Zamia	Shrub	2		Direct seeding
Melaleuca	*seriata*	no common name	Shrub	1	Oct-Dec	Direct seeding
Melaleuca	*thymoides*	no common name	Shrub	1	Sep-Jan	Direct seeding
Nemcia	*capitatum*	Bacon and Eggs	Herb	0.5	Jun-Sep	Direct seeding
Olearia	*axillaris*	Coastal Daisy Bush	Herb	1.5	Mar-Aug	Plant seedlings
Olearia	*rudis*	Bristly Daisy Bush	Shrub	1.5	May-Dec	Plant seedlings
Orthrosanthus	*laxus*	Morning Iris	Herb	0.5	Aug-Oct	Direct seeding
Patersonia	*occidentalis*	Western Patersonia	Shrub	0.5	Sep-Dec	Plant seeding
Persoonia	*saccatta*	Snottygobble	Shrub	1.5	Jul-Jan	Plant seedings
Petrophile	*linearis*	Pixie Mops	Herb	0.5	Sep-Nov	Direct seeding
Petrophile	*serruriae*	A Pixie Mop	Herb	1	Aug-Nov	Direct seeding
Phyllanthus	*calycintes*	False Boronia	Shrub	3	Jun-Nov	Direct seeding
Pimelea	*rosea*	Rose Banjine	Shrub	1	Aug-Nov	Direct seeding
Pittosporum	*phyllireoides*	Native Apricot	Shrub	3	Jun-Aug	Direct seeding
Pronaya	*fraseri*	Elegant Pronaya	Creeper	-	Jan-Feb	Plant seedings
Regelia	*inopse*	no common name	Shrub	2	Oct-Jan	Plant seedlings
Thysanotus	*mangelesianus*	Fringed Lily	Herb	0.5	Aug-Nov	Direct seeding
Thysanotus	*multiflorus*	Many Flowered Fringed Lily	Herb	0.5	Sep-Jan	Direct seeding
Thysanotus	*thyrsoideus*	Fringed Lily	Herb	0.5	Sep-Jan	Direct seeding
Trachymene	*coerulea*	Blue Lace Flower	Shrub	0.5	Oct-Feb	Direct seeding
Trymalium	*ledifolium*	no common name	Shrub	1.2	Jul-Oct	Plant seedlings
Xanthorrhoea	*preissii*	Grass Tree	Shrub	3	Nov-Jan	Direct seeding

Quindalup Dune System

Scientific Name		Common Name	Form	Height (m)	Flowers	Planting
Foredune Species						
Acanhocarpus	*preissii*	Prickle lily	Shrub	1	Apr-Aug	Plant seedlings
Angianthus	*cunninghamii*	Coast angianthus	Shrub	0.5	Feb-Jun	Plant seedlings
Arctotheca	*populifolia*	Dune cabbage	Creeper	0.2	May-Nov	Plant seedlings
Atriplex	*isatidea*	no common name	Shrub	3	Mar-Jun	Plant seedlings
Calocephalus	*brownii*	Cushion bush	Shrub	0.5	All year	Plant seedlings
Carpobrotus	*virescens*	Pig-face	Creeper	0.2	Aug-Sep	Plant seedlings
Oleria	*axillaris*	Costal daisy bush	Shrub	2	Mar-Aug	Plant seedlings
Rhagodia	*baccata*	Sea berry saltbush	Shrub	2	Mar-Jun	Plant seedlings
Salsola	*kali*	Sea kale	Herb	0.5	Aug-Feb	Plant seedlings
Senecio	*lautus*	Variable groundsel	Herb	0.5	Aug-Jan	Plant seedlings
Spinifex	*hirsutus*	Hairy spinifex	Grass	1.5	Jul-Jan	Plant seedlings
Spinifex	*longifolius*	Long-leaved spinifex	Grass	2	Jul-Jan	Plant seedlings
Spyridium	*globulosum*	Basket bush	Shrub	0.5	Jun-Sep	Plant seedlings
Tetragonia	*implexicoma*	Bower spinach	Creeper	0.5	Aug-Oct	Plant seedlings
Stable Dunes						
Acacia	*cochlearis*	Rigid wattle	Shrub	2	Aug-Sep	Direct seeding
Acacia	*cyclops*	Coastal wattle	Shrub	3	Sep-Jan	Direct seeding
Acacia	*lasiocarpa*	Dune moses	Shrub	1	Jun-Oct	Direct seeding
Acacia	*littorea*	no common name	Shrub	3	Aug-Dec	Direct seeding
Acacia	*pulchella*	Prickley moses	Shrub	1.5	Jul-Sep	Direct seeding
Acacia	*rostellifera*	Summer-scented wattle	Shrub	2	Aug-Oct	Direct seeding
Acacia	*saligna*	Coojong	Shrub	6	Aug-Oct	Direct seeding
Agonis	*flexuosa*	Peppermint	Tree	12	Aug-Dec	Direct seeding
Allocasuarina	*humilis*	Dwarf sheoak	Shrub	1.5	May-Nov	Direct seeding
Allocasuarina	*lehmanniana*	Dune sheoak	Shrub	1.5	Sep-Dec	Direct seeding
Alyxia	*buxifolia*	Dysentry bush	Shrub	1.5	Oct-Nov	Plant seedling
Angianthus	*cunninghamii*	Coast angianthus	Herb	0.5	March	Plant seedling
Banksia	*attenuata*	Slender banksia	Tree	8	Sep-Feb	Direct seeding
Callitris	*preissii*	Rottnest cypress	Tree	6	Oct-Nov	Direct seeding
Calocephalus	*brownii*	Cushion bush	Herb	0.5	all year	Plant seedlings
Calothamnus	*quadrifidus*	One-sided bottlebrush	Herb	2	Aug-Dec	Direct seeding
Chamelaucium	*uncinatum*	Geraldton wax	Shrub	3	Aug-Nov	Plant seedlings
Clematis	*microphylla*	Old man's beard	Herb		Jul-Sep	Direct seeding
Conostylis	*candicans*	Grey cottonheads	Herb	0.5	Aug-Sep	Direct seeding
Dianella	*divaricata*	Flax lily	Herb	1	Jun-Aug	Direct seeding
Dichondra	*repens*	Kidney weed	Herb		Sep-Oct	Direct seeding
Diplolaena	*damperia*	Southern diplolaena	Shrub	2	Jul-Sep	Direct seeding
Diplopeltis	*huegelii*	no common name	Shrub	1.5	Jul-Nov	Plant seedlings
Dodonaea	*aptera*	Coast hop bush	Shrub	2	Apr-Jun	Plant seedlings
Eremophila	*glabra*	Tar bush	Shrub	0.5	Jul-Jan	Plant seedlings

Quindalup Dune System						
Scientific Name		Common Name	Form	Height (m)	Flowers	Planting
Stable Dunes (cont.)						
Eucalyptus	*gomophocephala*	Tuart	Tree	40	Jan-Apr	Direct seeding
Exocarpus	*sparteus*	Broom ballart	Shrub	3	Feb-Oct	Plant seedlings
Frankenia	*pauciflora*	Sea heath	Herb	-	all year	Direct seeding
Gompholobium	*tomentosum*	Yellow pea	Shrub	1	Aug-Dec	Direct seeding
Grevillea	*crithmifolia*	no comon name	Herb	1	Jul-Sep	Plant seedling
Grevillea	*thelmanniana*	Spider net grevillea	Shrub	1	May-Sep	Plant seedling
Guichenoltia	*ledifolia*	no common name	Shrub	1	Jul-Oct	Direct seeding
Hakea	*prostrata*	Harsh hakea	Shrub	3	Aug-Nov	Direct seeding
Hardenbergia	*comptoniana*	Native wisteria	Creeper	-	Jun-Sep	Direct seeding
Hemiandra	*pungens*	Snake bush	Herb	-	all year	Plant seedling
Isolepis	*nodosa*	Knotted club rush	Sedge	1	Nov-Mar	Plant seedling
Jacksonia	*furcellata*	Grey stinkwood	Shrub	3	Aug-Mar	Direct seeding
Jacksonia	*sternbergiana*	Green stinkwood	Shrub	3	all year	Direct seeding
Lepidosperma	*gladiatum*	Coastal sword-sedge	Sedge	1	Nov-Jan	Direct seeding
Lobelia	*tenuior*	Slender lobelia	Herb	0.5	Oct-Jan	Plant seedling
Melaleuca	*acerosa*	Coastal honeymyrtle	Shrub	1	Sep-Dec	Direct seeding
Melaleuca	*cardiophylla*	Tangling melaleuca	Shrub	2	Jul-Jan	Direct seeding
Melaleuca	*heugelli*	Chenille honeymyrtle	Shrub	3	Nov-Jan	Direct seeding
Melaleuca	*lanceolata*	Rottnest tea tree	Shrub	5	Oct-Mar	Direct seeding
Myoporum	*insulare*	Blueberry tree	Shrub	2	Aug-Nov	Plant seedlings
Olearia	*axillaris*	Coastal daisy bush	Shrub	1.5	Mar-Aug	Plant seedling
Parietaria	*debilis*	Pellitory	Herb	0.3	Aug-Oct	Direct seeding
Pittosporum	*phillyraeoides*	Weeping pittosporu	Shrub	4	Jun-Oct	Plant seeding
Phyllanthus	*calycinus*	False boronia	Herb	0.3	Jun-Nov	Direct seeding
Rhagodia	*baccata*	Berry salt bush	Shrub	0.5	Mar-Jun	Plant seedling
Scaevola	*crassifolia*	Thick leaved fan flower	Shrub	0.5	Nov-Jan	Plant seedling
Spyridium	*globulosum*	Basket bush	Shrub	3	Jun-Sep	Direct seeding
Stipa	*elegantissima*	Feather speargrass	Herb	2	Aug-Jan	Direct seeding
Stipa	*flavescens*	no common name	Herb	0.5	Sep-Oct	Direct seeding
Templetonia	*retusa*	Cockies tongues	Shrub	2	Apr-Sep	Direct seeding
Threlkeldia	*diffusa*	no common name	Shrub	0.3	Aug-Jan	Direct seeding
Trachymene	*coerulea*	Blue lace flower	Shrub	0.5	Oct-Feb	Direct seeding
Wilsonia	*backhousei*	Narrowed-leaf wilsonia	Shrub	0.5	Oct-Dec	Plant seedlings

Southern River						
Scientific Name		Common Name	Form	Height (m)	Flowers	Planting
Acacia	*huegelli*	no common name	Shrub	1	Oct-Dec	Direct seeding
Acacia	*pulchella*	Prickly moses	Shrub	2	Jun-Oct	Direct seeding
Acacia	*saligna*	Coojong	Shrub	6	Aug-Oct	Direct seeding
Acacia	*willdenowiana*	Grass wattle	Shrub	0.5	Jun-Oct	Direct seeding
Actinostrobus	*pyramidalis*	Swamp cypress	Shrub	2	Aug-Nov	Direct seeding
Adenanthos	*cygnorum*	Woollybush	Shrub	3	Sep-Feb	Plant seedlings
Agrostocrinim	*scarbrum*	Bluegrass lilly	Shrub	0.5	Sep-Dec	Plant seedling
Allocasuarina	*fraseriana*	Common sheoak	Tree	12	May-Nov	Direct seeding
Allocasuarina	*humilis*	Dwarf sheoak	Shrub	1.5	May-Nov	Direct seeding
Andersonia	*involucrata*	no common name	Shrub	0.3	Sep-Nov	Plant seedling
Anigiozanthos	*humilis*	Catspaw	Shrub	0.5	Aug-Oct	Plant seedlings
Anigiozanthos	*manglesii*	Mangles kangaroo paw	Shrub	0.5	Sep-Nov	Plant seedlings
Anigiozanthos	*viridis*	Green kangaroo paw	Shrub	0.5	Aug-Oct	Plant seedlings
Arthropodium	*preissii*	no common name	Shrub	0.5	Sep-Oct	Plant seedlings
Astartea	*fascicularis*	no common name	Shrub	1.5	Dec-Feb	Plant seedlings
Astroloma	*ciliatum*	Candle cranberry	Shrub	0.3	May-Oct	Plant seedlings
Baeckea	*camphorosmae*	Camphor myrtle	Shrub	1	Jul-Feb	Plant seedlings
Banksia	*attenuata*	Candle banksia	Tree	8	Sep-Feb	Direct seeding
Banksia	*grandis*	Bull banksia	Tree	8	Sep-Dec	Direct seeding
Banksia	*littoralis*	Swamp banksia	Tree	10	Mar-Jul	Direct seeding
Banksia	*menziesii*	Firewood banksia	Tree	8	Feb-Aug	Direct seeding
Banksia	*sphaerocarpa*	Fox banksia	Tree	2	Jan-Jul	Direct seeding
Beaufortia	*elegans*	Elegant beaufortia	Shrub	1	Nov-Feb	Direct seeding
Beaufortia	*squarrosa*	Sand bottlebrush	Shrub	1.5	Jan-Apr	Direct seeding
Bossiaea	*eriocarpa*	Common brown pea	Herb	0.5	Jul-Oct	Direct seeding
Burchardia	*umbellata*	Milkmaids	Herb	0.5	Aug-Sep	Plant seedlings
Calothamnus	*hirsutus*	no common name	Shrub	1.5	Sep-Dec	Direct seeding
Calothamnus	*lateralis*	no common name	Shrub	1	Aug-Dec	Direct seeding
Calothamnus	*sanguineus*	Silky-leaved blood flower	Shrub	1	Mar-Nov	Direct seeding
Calothamnus	*villosus*	Woolly net bush	Shrub	1	Sep-Dec	Direct seeding
Calytrix	*angulata*	Yellow starflower	Shrub	1	Sep-Dec	Direct seeding
Calytrix	*fraseri*	Pink summer calytrix	Shrub	1.5	Dec-Mar	Direct seeding
Chamaescilla	*corymbosa*	Blue squill	Shrub	0.3	Aug-Oct	Plant seedlings
Conostylis	*aculeata*	Prickly conostylis	Herb	0.5	Sep-Oct	Direct seeding
Conostylis	*candicans*	Grey cottonheads	Herb	0.5	Aug-Sep	Direct seeding
Conostylis	*juncea*	no common name	Herb	0.5	September	Direct seeding
Conostylis	*setigera*	Bristly cottonhead	Herb	0.5	Sep-Oct	Direct seeding
Dampiera	*linearis*	Common dampiera	Shrub	0.5	Jul-Nov	Plant seedlings
Daviesia	*triflora*	no common name	Shrub	0.5	May-Sep	Direct seeding
Dryandra	*nivea*	Couch honeypot	Herb	0.5	May-Sep	Plant seedlings
Eremaea	*pauciflora*	no common name	Shrub	1	Sep-Dec	Plant seedlings
Eucalyptus	*calophylla*	Marri	Tree	35	Jan-May	Direct seeding

Southern River						
Scientific Name		Common Name	Form	Height (m)	Flowers	Planting
Eucalyptus	*marginata*	Jarrah	Tree	30	Sep-Feb	Direct seeding
Eucalyptus	*rudis*	Flooded gum	Tree	15	Apr-Nov	Direct seeding
Eucalytpus	*todtiana*	Prickly bark	Tree	10	February	Direct seeding
Gompholobium	*confertum*	no common name	Shrub	1	Sep-Dec	Direct seeding
Gompholobium	*tomentosum*	Yellow pea	Shrub	0.5	Aug-Dec	Direct seeding
Grevillea	*thelemanniana*	Spider net grevillea	Shrub	1	May-Sep	Direct seeding
Hakea	*candolleana*	no common name	Shrub	0.7	Jun-Sep	Direct seeding
Hakea	*ceratophylla*	Horned leaved hakea	Shrub	1	Sep-Dec	Direct seeding
Hakea	*sulcata*	Furrowed hakea	Shrub	1.5	Aug-Sep	Direct seeding
Hakea	*varia*	Variable leaved hakea	Shrub	3	Jul-Oct	Direct seeding
Hardenbergia	*comptoniana*	Native wisteria	Shrub	-	Jun-Sep	Direct seeding
Hemiandra	*pungens*	Snake bush	Shrub	0.5	all year	Direct seeding
Hibbertia	*racemosa*	Stalked guinea flower	Herb	0.3	Jun-Nov	Plant seedlings
Hovea	*pungens*	Devils pins	Shrub	0.5	Jun-Sep	Plant seedlings
Hovea	*trisperma*	Common hovea	Shrub	0.5	Jun-Sep	Plant seedlings
Hypocalymma	*angustifolium*	White myrtle	Shrub	1	Jul-Oct	Direct seeding
Hypocalymma	*robustum*	Swan River myrtle	Shrub	1	Jul-Oct	Direct seeding
Isolepis	*nodosa*	Knotted club rush	Shrub	1	Nov-Mar	Direct seeding
Isotropis	*cuneifolia*	Granny bonnets	Shrub	0.5	Aug-Oct	Plant seedlings
Jacksonia	*furcellata*	Grey stinkwood	Shrub	3	Aug-Mar	Direct seeding
Jacksonia	*sternbergiana*	Green stinkwood	Shrub	3	all year	Direct seeding
Juncus	*holoschoenus*	Jointleaf rush	Shrub	1.5	Sep-Dec	Direct seeding
Kennedia	*prostrata*	Running postman	Creeper	0.1	Jul-Nov	Direct seeding
Kunzea	*ericifolia*	Spearwood	Shrub	3	Sep-Nov	Direct seeding
Kunzea	*vestita*	Spearwood	Shrub	2	Sep-Nov	Plant seedlings
Leptospermum	*spinescens*	no common name	Shrub	1.5	Sep-Nov	Direct seeding
Melaleuca	*hamulosa*	no common name	Shrub	3	Oct-Sep	Direct seeding
Melaleuca	*lateriflora*	Gorada	Shrub	4	Jan-Mar	Direct seeding
Melaleuca	*lateritia*	Robin redbreast bush	Shrub	2	Sep-Apr	Direct seeding
Melaleuca	*incana*	Grey honey myrtle	Shrub	3	Jul-Oct	Direct seeding
Melaleuca	*preissiana*	Mondong	Tree	10	Nov-Jan	Direct seeding
Melaleuca	*rhaphiophylla*	Swamp paperbark	Tree	8	Sep-Jan	Direct seeding
Melaleuca	*seriata*	no common name	Shrub	1	Oct-Dec	Direct seeding
Melaleuca	*scabra*	Rough honeymyrtle	Shrub	0.5	Sep-Dec	Direct seeding
Melaleuca	*teretifolia*	Banbar	Shrub	4	Oct-Jan	Direct seeding
Melaleuca	*thymoides*	no common name	Shrub	1	Sep-Jan	Direct seeding
Melaleuca	*viminea*	Mohan	Shrub	5	Aug-Oct	Direct seeding
Nemcia	*capitatum*	Bacon and eggs	Shrub	0.5	Jun-Sep	Direct seeding
Neurachne	*alopecuroidea*	Fox-tail mulga grass	Shrub	0.5	Aug-Nov	Direct seeding
Nuytsia	*floribunda*	Christmas tree	Tree	8	Nov-Dec	Plant seeding
Orthrosanthus	*laxus*	Morning iris	Shrub	0.5	Aug-Oct	Plant seeding
Patersonia	*occidentalis*	Westem patersonia	Shrub	0.5	Sep-Dec	Direct seeding

Southern River						
Scientific Name		Common Name	Form	Height (m)	Flowers	Planting
Patersonia	*umbrosa*	Shade patersonia	Shrub	0.5	Aug-Oct	Direct seeding
Pericalymma	*ellipticum*	Swamp tea tree	Shrub	1	Sep-Dec	Plant seeding
Petrophile	*linearis*	Pixie mops	Shrub	0.5	Sep-Nov	Direct seeding
Pimelia	*rosea*	Rose banjine	Shrub	1	Aug-Nov	Direct seeding
Platytheca	*galloides*	no common name	Shrub	0.5	Jul-Nov	Plant seedlings
Regelia	*ciliata*	no common name	Shrub	2	Nov-Feb	Direct seeding
Regelia	*inops*	no common name	Shrub	2	Oct-Jan	Direct seeding
Scholtzia	*involucrata*	Spiked scholtzia	Shrub	2	Dec-Jan	Direct seeding
Stipa	*elegantissima*	Feather spear grass	Herb	2	Sep-Nov	Direct seeding
Stylidium	*brunonianum*	Pink fountain triggerplant	Herb	0.5	Aug-Dec	Direct seeding
Stylidium	*junceum*	Reed triggerplant	Herb	0.5	Aug-Oct	Direct seeding
Stylidium	*schoenoides*	Cow licks	Herb	0.1	Aug-Dec	Direct seeding
Thysanotus	*multiflorus*	Large-fruited thomasia	Shrub	1.5	Aug-Nov	Direct seeding
Thysanotus	*manglesianrtus*	Fringed lily	Shrub	0.1	Sep-Jan	Direct seeding
Thysanotus	*multiflorus*	Many flowered fringed lilly	Shrub	0.5	Aug-Nov	Direct seeding
Verticordia	*acerosa*	no common name	Shrub	1	Sep-Jan	Plant seedlings
Verticordia	*drummondii*	no common name	Shrub	0.7	Feb-Apr	Plant seedlings
Verticordia	*nitens*	Morrison featherflower	Shrub	2	Nov-Jan	Plant seedlings
Verticordia	*plumosa*	no common name	Shrub	1	Aug-Nov	Plant seedlings
Viminaria	*juncea*	Swish bush	Shrub	1	Oct-Dec	Plant seedlings
Xanthorrhoea	*preissii*	Grass tree	Shrub	3	Nov-Jan	Plant seedlings
Xylomeleum	*occidentale*	Woody pear	Tree	8	Dec-Feb	Plant seedlings

Swan						
Scientific Name		Common Name	Form	Height (m)	Flowers	Planting
Acacia	*pulchella*	Prickly moses	Shrub	2	Jun-Oct	Direct seeding
Acacia	*saligna*	Coojong	Shrub	6	Aug-Oct	Direct seeding
Agonis	*linearifolia*	Swamp peppermint	Shrub	4	all year	Direct seeding
Astartea	*fascicularis*	no common name	Shrub	1.5	Dec-Feb	Plant seedlings
Banksia	*littoralis*	Swamp banksia	Tree	10	Mar-Jul	Direct seeding
Baumea	*juncea*	Bare twig-rush	Sedge	1	Oct-Jan	Plant seedlings
Casuarina	*obesa*	Swamp sheoak	Tree	10	all year	Direct seeding
Eucalyptus	*calophylla*	Marri	Tree	35	Jan-May	Direct seeding
Eucalyptus	*rudis*	Flooded gum	Tree	15	Apr-Nov	Direct seeding
Haemodorum	*paniculatum*	Mardja	Shrub	0.5	Oct-Dec	Plant seedlings
Hakea	*prostrata*	Harsh hakea	Shrub	3	Aug-Nov	Direct seeding
Hakea	*varia*	Variable leaved hakea	Shrub	3	Jul-Oct	Direct seeding
Hypocalymma	*angustifolium*	White myrtle	Shrub	1	Jul-Oct	Direct seeding
Jacksonia	*furcellata*	Grey stinkwood	Shrub	3	Aug-Mar	Direct seeding
Jacksonia	*stergenbergiana*	Green stinkwood	Shrub	3	all year	Direct seeding
Juncus	*krausii*	Sea rush	Sedge	1.5	Nov-Dec	Direct seeding
Juncus	*pallidus*	Pale rush	Sedge	2	Oct-Nov	Direct seeding
Kunzea	*ericifolia*	Spearwood	Shrub	3	Sep-Nov	Direct seeding
Kunzea	*recurva*	Mountain kunzea	Shrub	1.5	Aug-Nov	Direct seeding
Leptosperma	*longitudinale*	Pithy sword-sedge	Sedge	1	Nov-Jan	Plant seedlings
Leptospermum	*spinescens*	no common name	Shrub	1.5	Sep-Nov	Direct seeding
Melaleuca	*cuticularis*	Saltwater paperbark	Tree	7	Sep-Nov	Direct seeding
Melaleuca	*lateritia*	Robin redbreast bush	Tree	2	Sep-Apr	Direct seeding
Melaleuca	*preissiana*	Mondong	Tree	10	Nov-Jan	Direct seeding
Melaleuca	*rhaphiophylla*	Swamp paperbark	Tree	8	Sep-Jan	Direct seeding
Melaleuca	*viminea*	Mohan	Tree	5	Aug-Oct	Direct seeding
Nuytsia	*floribunda*	Christmas tree	Tree	8	Nov-Dec	Plant seeding
Patersonia	*umbrosa*	Shade patersonia	Shrub	0.5	Aug-Oct	Plant seedlings
Regelia	*ciliata*	no common name	Shrub	2	Nov-Feb	Plant seedlings
Schoenoplectus	*validus*	Lake club-rush	Sedge	2	Dec-Jan	Plant seedlings
Suadea	*australis*	Seablite	Shrub	1	Jan-Jun	Plant seedlings
Viminaria	*juncea*	Swish bush	Shrub	4	Oct-Dec	Plant seedlings

Vasse

Scientific Name		Common Name	Form	Height (m)	Flowers	Planting
Acacia	*cyclops*	Coastal wattle	Shrub	3	Sep-Jan	Direct seeding
Acacia	*saligna*	Coojong	Shrub	6	Aug-Oct	Direct seeding
Casuarina	*obesa*	Swamp sheoak	Tree	10	all year	Direct seeding
Eucalyptus	*calophylla*	Marri	Tree	35	Jan-May	Direct seeding
Eucalyptus	*rudis*	Flooded gum	Tree	15	Apr-Nov	Direct seeding
Eucalyptus	*gomphocephala*	Tuart	Tree	40	Jan-Apr	Direct seeding
Haloscarcia	*halocnemoides*	Shrubby samphire	Shrub	0.3	Nov-Apr	Plant seedlings
Haloscarcia	*indica*	A samphire	Shrub	2	Nov-Apr	Plant seedlings
Juncus	*krausii*	Sea rush	Sedge	1.5	Nov-Dec	Direct seeding
Melaleuca	*cuticularis*	Saltwater paperbark	Tree	7	Sep-Nov	Direct seeding
Melaleuca	*lateritia*	Robin redbreast bush	Tree	2	Sep-Apr	Direct seeding
Melaleuca	*preissiana*	Mondong	Tree	10	Nov-Jan	Direct seeding
Melaleuca	*rhaphiophylla*	Swamp paperbark	Tree	8	Sep-Jan	Direct seeding
Melaleuca	*viminea*	Mohan	Tree	5	Aug-Oct	Direct seeding
Nuytsia	*floribunda*	Christmas tree	Tree	8	Nov-Dec	Plant seeding
Sarcocornia	*blackiana*	A samphire	Shrub	1	Oct-Feb	Plant seedlings
Sarcocornia	*quingueflora*	Beaded samphire	Shrub	0.5	Nov-Mar	Plant seedlings
Suadea	*australis*	Seablite	Shrub	1	Jan-Jun	Plant seedlings

Yanga

Scientific Name		Common Name	Form	Height (m)	Flowers	Planting
Moist Areas						
Actinostrobus	*pyramidalis*	*Swamp cypress*	*Shrub*	*2*	*Aug-Nov*	*Plant seedlings*
Allocasuarina	*obesa*	*Sheoak*	*Tree*	*12*	*May-Nov*	*Direct seeding*
Melaleuca	*hamulosa*	*no common name*	*Shrub*	*3*	*Oct-Nov*	*Direct seeding*
Melaeuca	*lateritia*	*Robin redbreast bush*	*Shrub*	*2*	*Sep-Apr*	*Direct seeding*
Drier Areas						
Acacia	*saligna*	*Coojong*	*Shrub*	*6*	*Aug-Oct*	*Direct seeding*
Allocasuarina	*humilis*	*Dwarf sheoak*	*Shrub*	*1.5*	*May-Nov*	*Direct seeding*
Banksia	*attenuata*	*Slender banksia*	*Tree*	*8*	*Sep-Feb*	*Direct seeding*
Banksia	*menziesii*	*Firewood banksia*	*Tree*	*8*	*Sep-Feb*	*Direct seeding*
Calothamnus	*sanguineus*	*Silky-leaved bloodflower*	*Shrub*	*1*	*Mar-Oct*	*Direct seeding*
Conospermum	*huegelii*	*Slender smoke bush*	*Shrub*	*1*	*Jul-Aug*	*Difficult to grow*
Eucalyptus	*todtiana*	*Prickly bark*	*Tree*	*10*	*September*	*Direct seeding*
Grevillea	*obtusifolia*	*no common name*	*Shrub*	*1*	*Sep-Oct*	*Plant seedlings*
Hakea	*varia*	*Variable leaved hakea*	*Shrub*	*3*	*Jul-Oct*	*Direct seeding*
Hibbertia	*hypericoides*	*Buttercup*	*Shrub*	*0.3*	*Apr-Nov*	*Plant seedlings*
Hypocalymma	*angustifolium*	*White myrtle*	*Shrub*	*1*	*Jul-Oct*	*Direct seeding*
Melaleuca	*scabra*	*Rough honeymyrtle*	*Shrub*	*1*	*Oct-Dec*	*Direct seeding*
Melaleuca	*seriata*	*no common name*	*Shrub*	*1*	*Oct-Dec*	*Direct seeding*
Melaleuca	*uncinata*	*Broom honeymyrtle*	*Shrub*	*1*	*Jul-Dec*	*Direct seeding*
Melaleuca	*viminea*	*Mohan*	*Tree*	*5*	*Aug-Oct*	*Direct seeding*
Nuytsia	*floribunda*	*Christmas tree*	*Tree*	*8*	*Nov-Dec*	*Plant seedlings*
Persoonia	*saccatta*	*Snotty gobble*	*Bush*	*1.5*	*Jul-Jan*	*Plant seedlings*
Pericalymma	*ellipicticum*	*Swamp tea-tree*	*Shrub*	*1*	*Sep-Jan*	*Direct seeding*
Petrophile	*linearis*	*Pixie mops*	*Shrub*	*0.7*	*Sep-Nov*	*Direct seedling*
Petrophile	*serruriae*	*no common name*	*Shrub*	*1*	*Jul-Jan*	*Direct seeding*
Stirlingia	*latifolia*	*Blueboy*	*Shrub*	*1.5*	*Aug-Oct*	*Plant seedlings*
Viminaria	*juncea*	*Swish bush*	*Shrub*	*4*	*Oct-Dec*	*Plant seedlings*

Darling Scarp & Plateau

Scientific Name		Common Name	Form	Height (m)	Flowers	Planting
Damp Soils & Streamlines						
Acacia	*alata*	Winged wattle	Shrub	1.5	Jun-Sept	Direct seeding
Acacia	*saligna*	Coojong	Shrub	6	Aug-Oct	Direct seeding
Acacia	*horridula*	Prickly wattle	Shrub	1	May-Jul	Direct seeding
Agonis	*linearifolia*	Swamp pepermint	Shrub	3	All year	Direct seeding
Banksia	*littoralis*	Swamp banksia	Tree	6	Sep	Direct seeding
Billardiera	*floribunda*	White spray	Creeper	-	Sep-Oct	Direct seeding
Bossiaea	*puchella*	no common name	Shrub	1	Aug-Sep	Direct seeding
Callistemon	*phoeniceus*	Lesser bottlebrush	Shrub	3	Oct-Dec	Direct seeding
Eucalyptus	*patens*	Swan River blackbutt	Tree	40	Aug-Jan	Direct seeding
Eucalytpus	*rudis*	Flooded gum	Tree	20	August	Direct seeding
Gahnia	*trifida*	Saw sedge	Sedge	1.5	Sep-Oct	Direct seeding
Gastrolobium	*bilobum*	Heart leafed poison	Shrub	4	Sep-Oct	Plant seedlings
Hakea	*prostrata*	Harsh hakea	Shrub	3	Aug-Nov	Direct seeding
Hakea	*varia*	Variable leaved hakea	Shrub	2	Jul-Aug	Direct seeding
Isopepis	*nodosa*	Nodding club-rush	Sedge	1	Oct-Nov	Direct seeding
Isotropis	*cuneifolia*	Granny bonnets	Shrub	1	Sep-Dec	Plant seedlings
Juncus	*holoschoenus*	Jointleafed rush	Sedge	1.5	Sep-Nov	Direct seeding
Juncus	*pallidis*	Pale bush	Sedge	1.5	Oct-Nov	Plant seedling
Juncus	*effusus*	no common name	Sedge	1	Oct-Nov	Plant seedlings
Kunzea	*recurva*	no common name	Shrub	1.5	Aug-Nov	Plant seedlings
Lepidosperma	*tetraquetrum*	Square sedge	Sedge	2.5	All year	Plant seedlings
Melaleuca	*incana*	Grey honeymyrtle	Shrub	1	Oct-Dec	Direct seeding
Oxylobium	*linneare*	Narrow leafed oxylobium	Shrub	3	Nov-Jan	Plant seedlings
Schoenus	*unispicatus*	no common name	Sedge	0.65	Aug-Nov	Plant seedlings
Thomasia	*glutinosa*	Sticky thomasia	Shrub	0.8	Aug-Nov	Plant seedlings
Thomasia	*macrocarpa*	Large fruited thomasia	Shrub	1.5	Aug-Dec	Plant seedlings
Thomasia	*pauciflora*	Few flowered thomasia	Shrub	1.5	Sept-Nov	Plant seedlings
Viminaria	*juncea*	Swishbush	Shrub	4	Oct-Dec	Plant seedlings
Drier areas						
Acacia	*lateriticola*	no common name	Shrub	1	Jul-Nov	Direct seeding
Acacia	*pulchella*	Prickly moses	Shrub	2	Jun-Oct	Direct seeding
Acacia	*urophylla*	no common name	Shrub	3	May-Sept	Direct seeding
Allocasuarina	*fraseriana*	Common sheoak	Tree	12	May-Nov	Direct seeding
Allocasuarina	*humilis*	Dwarf sheoak	Shrub	1.5	May-Nov	Direct seeding
Andersonia	*involucrata*	no common name	Herb	0.1	Sep-Nov	Direct seeding
Andersonia	*lemanniana*	no common name	Herb	0.1	Jun-Oct	Direct seeding
Anigiozanthos	*bicolor*	Little kangaroo paw	Shrub	0.5	Aug-Oct	Direct seeding
Anigiozanthos	*humilis*	Catspaw	Shrub	0.5	Aug-Oct	Direct seeding
Anigiozanthos	*manglesii*	Mangles kangaroo paw	Shrub	0.5	Sep-Nov	Direct seeding
Anigiozanthos	*viridus*	Green kangaroo paw	Shrub	0.5	Aug-Oct	Direct seeding

Darling Scarp & Plateau						
Scientific Name		Common Name	Form	Height (m)	Flowers	Planting
Drier areas (cont.)						
Astroloma	*ciliatum*	Moss-leaved heath	Herb	0.1	May-Oct	Direct seeding
Astroloma	*foliosum*	Candle cranberry	Herb	0.3	Jun-Sep	Direct seeding
Banksia	*attenuata*	Candle banksia	Tree	8	Sep-Feb	Direct seeding
Banksia	*grandis*	Bull banksia	Tree	8	Sep-Dec	Direct seeding
Banksia	*menziessi*	Firewood banksia	Tree	8	Feb-Aug	Direct seeding
Bossiaea	*aquifolium*	Nedik	Shrub	2.5	Aug-Sep	Plant seedlings
Bossiaea	*eriocarpa*	Common brown pea	Herb	0.5	Jul-Oct	Plant seedlings
Billardiera	*variifolia*	Variable billardia	creeper	2	Sep-Oct	Plant seedlings
Calothamnus	*hirsutus*	no common name	Shrub	1	Sep-Dec	Plant seedlings
Calothamnus	*rupestris*	Cliff net bush	Shrub	1.5	Mar-Oct	Direct seeding
Calothamnus	*quadrifdus*	One-sided bottlebrush	Shrub	2	Aug-Dec	Direct seeding
Calothamnus	*torulosus*	no common name	Shrub	0.5	Aug-Nov	Direct seeding
Chorizema	*dicksonii*	Yellow-eyed flame pea	Shrub	1	Aug-Oct	Direct seeding
Chorizemna	*illicifoliunm*	Holly flame pea	Shrub	0.5	Jul-Nov	Direct seeding
Clematis	*pubescens*	White clematis	Creeper	-	Jul-Oct	Direct seeding
Conostylis	*setigera*	Bristly cottonhead	Shrub	0.5	Sep-Oct	Direct seeding
Damperia	*alata*	Winged stem dampieri	Shrub	0.5	Aug-Nov	Plant seedlings
Darwinia	*citriodora*	Lemon scented darwinia	Shrub	1	Jul-Dec	Plant seedlings
Daviesia	*decurrens*	no common name	Shrub	0.5	Jun-Aug	Direct seeding
Daviesia	*horrida*	Prickly bitter pea	Shrub	1	Jul-Sep	Direct seeding
Daviesia	*nudiflora*	no common name	Shrub	0.5	Sep-Nov	Direct seeding
Daviesia	*triflora*	no common name	Shrub	0.5	May-Sep	Direct seeding
Dryandra	*nivea*	Couch honeypot	Herb	0.1	May-Sep	Direct seeding
Dryandra	*sessilis*	Parrot bush	Shrub	4	May-Nov	Direct seeding
Eleocharis	*acuta*	Common spikerush	Sedge	1.5	Sep-Dec	Plant seedlings
Eremaea	*pauciflora*	no common name	Shrub	1	Sept-Dec	Plant seedlings
Eucalyptus	*calophylla*	Marri	Tree	35	Jan-May	Plant seedlings
Eucalyptus	*haematoxylon*	Mountain marri	Tree	9	Jan-Feb	Direct seeding
Eucalyptus	*laeliae*	Darling Range ghost gum	Tree	20	unknown	Direct seeding
Eucalyptus	*lane-poolei*	Salmon white gum	Tree	15	May-Sep	Direct seeding
Eucalyptus	*marginata*	Jarrah	Tree	30	Sep-Feb	Direct seeding
Eucalyptus	*wandoo*	Wandoo	Tree	15	Dec-Apr	Direct seeding
Gastrolobium	*calycinum*	York Road poison	Shrub	0.3	Jul-Oct	Direct seeding
Grevillea	*binnatifida*	Fuchsia grevillea	Shrub	1	Mar-Nov	Plant seedlings
Grevillea	*glabrata*	Smooth grevillea	Shrub	2	Jul-Oct	Plant seedlings
Grevillea	*wilsonii*	Native fuchsia	Shrub	2	Jun-Sept	Plant seedlings
Hakea	*cristata*	Snail hakea	Shrub	3	May-Sep	Direct seeding
Hakea	*cyclocarpa*	Ramshorn	Shrub	2	Aug-Oct	Direct seeding
Hakea	*erinacea*	Hedgehog hakea	Shrub	1	May-Sep	Direct seeding
Hakea	*lissocarpha*	Honey bush	Shrub	3	Jun-Sep	Direct seeding
Hakea	*prostrata*	Harsh hakea	Shrub	3	Aug-Nov	Direct seeding

Darling Scarp & Plateau

Scientific Name		Common Name	Form	Height (m)	Flowers	Planting
Drier areas (cont.)						
Hakea	*undulata*	Wavy-leaved hakea	Shrub	2	Aug-Oct	Direct seeding
Hardenbergia	*comptoniana*	Native wisteria	Creeper	-	Jul-Sep	Direct seeding
Hovea	*chorizemifolia*	Holly leaved hovea	Shrub	0.5	Jun-Sep	Direct seeding
Hypocalymma	*robustum*	Swan River myrtle	Shrub	1	Jul-Oct	Direct seeding
Isopogon	*dubius*	Pincushion coneflower	Shrub	1	Jul-Oct	Direct seeding
Isopogon	*sphaerocephalus*	Drumstick isopogon	Shrub	1.5	Aug-Nov	Direct seeding
Juncus	*holoschoenus*	Jointleafed rush	Sedge	1.5	Sep-Nov	Direct seeding
Kennedia	*coccinea*	Coral-vine	Creeper	-	Aug-Nov	Direct seeding
Kennedia	*prostrata*	Running postman	Creeper	-	Jul-Nov	Direct seeding
Kennedia	*stirlingii*	Bushy kennedia	Creeper	-	Aug-Nov	Direct seeding
Lambertia	*multifora*	Many flowered honeysuckle	Shrub	2.5	Jun - Oct	Direct seeding
Lasiopetalum	*floribundum*	Free flowering lasiopetalum	Shrub	1	Aug-Jan	Direct seeding
Leschenaultia	*biloba*	Blue leschenaultia	Shrub	0.6	Oct-Dec	Direct seeding
Lhotskya	*acutifolia*	no common name	Shrub	1	Oct-Nov	Plant seedlings
Macrozamia	*riedlii*	Zamia	Shrub	2	Oct-Nov	Direct seeding
Melaleuca	*radula*	Graceful honeymyrtle	Shrub	2	Sep-Nov	Direct seeding
Melaleuca	*scabra*	Rough honeymyrtle	Shrub	0.5	Sep-Dec	Direct seeding
Nuytsia	*floribunda*	Christmas tree		8	Nov-Dec	Plant seedlings
Opercularia	*echinocephala*	Bristly headed stinkweed	Herb	0.1	Aug-Nov	Plant seedlings
Patersonia	*occidentalis*	Western patersonia	Shrub	0.5	Sept-Dec	Direct seeding
Patersonia	*umbrosa*	Shade patersonia	Shrub	0.5	Aug-Oct	Direct seeding
Persoonia	*saccata*	Snottygobble	Shrub	1.5	Jul-Jan	Plant seedlings
Petrophile	*linearis*	Pixie mops	Shrub	0.5	Sep-Nov	Direct seeding
Petrophile	*serruriae*	no common name	Shrub	1	Aug-Nov	Direct seeding
Petrophile	*squamata*	no common name	Shrub	1.5	Aug-Nov	Direct seeding
Phyllanthus	*calycinus*	False boronia	Shrub	0.3	Jun-Nov	Direct seeding
Sphaerolobium	*medium*	Globe pea	Shrub	0.5	Aug-Nov	Direct seeding
Tetrarrhena	*lavis*	Forest rice grass	Shrub	0.5	Sep-Nov	Direct seeding
Thysanotus	*dichotontus*	Branching fringed lily	Shrub	0.5	Sep-Dec	Direct seeding
Thysanotus	*manglesiansu*	Fringe lily	Climber	-	Aug-Nov	Direct seeding
Thysanotus	*multiflorus*	Many flowered fringed lilly	Shrub	0.5	Sep-Jan	Direct seeding
Trymalium	*ledifolium*	no common name	Shrub	1	Jul-Oct	Direct seeding
Trymalium	*floribundum*	Karri hazel	Shrub	3	Aug-Sep	Direct seeding
Verticordia	*acerosa*	no common name	Shrub	1	Aug-Nov	Plant seedlings
Verticordia	*plumosa*	Plumed feather flower	Shrub	1	Sep-Dec	Plant seedlings
Xanthorrhoea	*gracilis*	Graceful grass tree	Shrub	1	Oct-Dec	Direct seeding
Xanthorrhoea	*preissii*	Grass tree	Shrub	3	Nov-Jan	Direct seeding
Xylomeleum	*occidentale*	Woody pear	Tree	8	Dec-Feb	Direct seeding

Fringing Estuarine Species

Scientific Name		Common Name	Form	Height (m)	Flowers	Planting
Agonis	*flexuosa*	Peppermint	Tree	15	Sep-Dec	Direct seeding
Allocasuarina	*fraseriana*	Sheoak	Tree	15	May-Oct	Direct seeding
Atriplex	*hypoleuca*	Saltbush	Shrub	2	Dec-Apr	Direct seeding
Bamea	*vaginalis*	Sheath twig sedge	Sedge	2.5	Oct-Nov	Plant seedlings
Banksia	*littoralis*	Swamp banksia	Tree	12	Mar-Jul	Direct seeding
Baumea	*juncea*	Bare twigrush	Sedge	1.2	Jan-Apr	Plant seedlings
Bolboschoenus	*caldwelli*	Marsh club rush	Sedge	1.2	Aug-Nov	Direct seeding
Carex	*inversa*	Knob sedge	Sedge	1.5	Sep-Oct	Direct seeding
Carex	*appressa*	Tall sedge	Sedge	2	Sep-Oct	Direct seeding
Casuarina	*obesa*	Swamp sheoak	Tree	15	All year	Direct seeding
Eucalyptus	*rudis*	Flooded gum	Tree	25	Apr-Nov	Direct seeding
Frankenia	*pauciflora*	Southern sea heath	Shrub	0.5	All year	Plant seedlings
Gahnia	*trifida*	Coast saw sedge	Sedge	1	Aug-Oct	Plant seedlings
Haloscarcia	*indica*	A samphire	Shrub	2	Nov-Apr	Plant seedlings
Haloscarcia	*halocnemoides*	Shrubby samphire	Shrub	0.3	Nov-Apr	Plant seedlings
Haloscarcia	*lepiosperma*	A samphire	Shrub	1	Mar-Apr	Plant seedlings
Juncus	*kraussi*	Shore rush	Sedge	1.5	Nov-Dec	Plant seedlings
Melaleuca	*cuticularis*	Saltwater paperbark	Tree	7	Sep-Dec	Direct seeding
Melaleuca	*rhaphiophylla*	Swamp paperbark	Tree	10	Sep-Jan	Direct seeding
Melaleuca	*thymoides*	A myrtle	Tree	2	Sep-Jan	Direct seeding
Melaleuca	*vinimea*	Mohan	Tree	3	Aug-Oct	Direct seeding
Myporum	*caprariodes*	Slender myporium	Shrub	2	All year	Plant seedlings
Sarcocornia	*blackiana*	A samphire	Shrub	1	Oct-Feb	Plant seedlings
Sarcocornia	*quingueflora*	Beaded samphire	Shrub	0.5	Nov-Mar	Plant seedlings

Salt Tolerant Species

Scientific Name		Common Name	Form	Height (m)	Flowers	Planting
Acacia	*cyclops*	Red-eyed wattle	Shrub	3	Sep-Jan	Direct seeding
Acacia	*lasiocarpa*	Dune moses	Shrub	1	Jun-Oct	Direct seeding
Acacia	*restellifera*	Summer-scented wattle	Shrub	2	Aug-Oct	Direct seeding
Acacia	*saligna*	Coojong	Shrub	6	Aug-Oct	Direct seeding
Atriplex	*cinerea*	Berry salt bush	Shrub	1	Sep-Oct	Direct seeding
Atriplex	*insatidea*	Coast salt bush	Shrub	2	Mar-Jun	Direct seeding
Casuarina	*obesa*	Swamp sheoak	Tree	10	May-Oct	Direct seeding
Eucalyptus	*angustissina*	Mallee	Tree	8	December	Direct seeding
Eucalyptus	*astringens*	Brown mallee	Tree	15	Oct-Nov	Direct seeding
Eucalyptus	*campaspe*	Silver-topped gimlet	Tree	10	Nov-Jan	Direct seeding
Eucalyptus	*kondininensis*	Kondinin blackbutt	Tree	25	Oct-Nov	Direct seeding
Eucalyptus	*occidentalis*	Flat-topped yate	Tree	20	Nov-Dec	Direct seeding
Eucalyptus	*platypus*	Moort	Tree	6	Jun-Jan	Direct seeding
Eucalyptus	*rudis*	Flooded gum	Tree	15	Apr-Nov	Direct seeding
Eucalyptus	*salubris*	Gimlet	Tree	25	Oct-Jan	Direct seeding
Eycalyptus	*sargentii*	Salt-river gum	Tree	8	Sep-Nov	Direct seeding
Frankenia	*pauciflora*	Seaheath	Shrub	0.5	all year	Direct seeding
Halosarcia	*halocnemoides*	Shrubby samphire	Shrub	0.5	Nov-Apr	Plant seedlings
Halosarcia	*indica*	Samphire	Shrub	2	Nov-Apr	Plant seedlings
Melaleuca	*cuticularis*	Saltwater paperbark	Teee	7	Sep-Nov	Direct seeding
Nitraraia	*billardierei*	Nitre bush	Shrub	2	Sep-Nov	Direct seeding
Threlkeldia	*diffusa*	no common name	Shrub	0.3	Aug-Jan	Plant seedlings

Note: Not all these species are indigenous to the Swan River System and should only be planted when salt problems are severe.

Common Weed Species

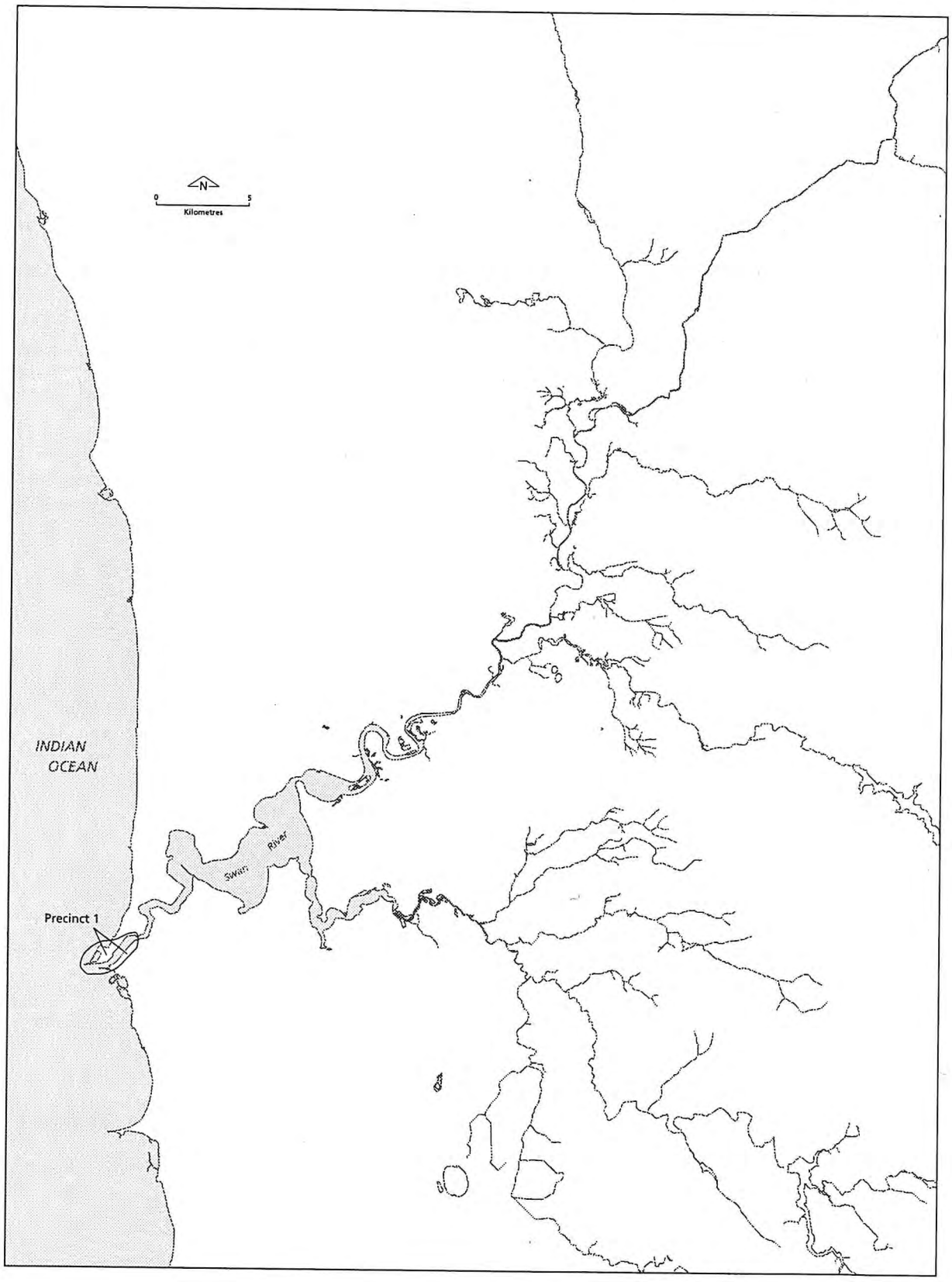
Scientific Name		Common Name	Form	Height (m)	Flowers
**Acanthocarpus*	*preissii*	Prickly lily	Herb	1	Apr-Aug
**Arctotheca*	*calenula*	Capeweed	Herb	0.3	Jul-Oct
**Arundo*	*donax*	Giant reed	Grass	3	Apr-Jun
**Ascepias*	*curassavica*	Redhead cottonbush	Herb	1	Mar-Jun
**Atriplex*	*prostrata*	no common name	Shrub	1	Dec-May
**Avena*	*fatua*	Wild oats	Grass	0.5	Aug-Dec
**Avena*	*barbata*	Bearded oat	Grass	1	Aug-Oct
**Bambusa*	*sp*	Bamboo	Grass	3	-
**Brachychiton*	*acerifolius*	Flame trees	Tree	30	Nov-Feb
**Briza*	*maxima*	Blowfly grass	Grass	0.5	Sep-Oct
**Briza*	*minor*	Quaking grass	Grass	0.5	Sep-Nov
**Canna*	*x orchiodes*	Canna lily	Herb	2.5	Nov-Mar
**Carpobrotus*	*edulis*	Pigface	Herb	0.3	Aug-Oct
**Cassytha*	*sp*	Golden dodder	Twiner	-	-
**Casuarina*	*glauca*	Swamp oak	Tree	15	Sep-Oct
**Chenopodium*	*glaucum*	Glaucous goosefoot	Herb	0.5	Mar-Jun
**Cortaderia*	*selloana*	Pampas grass	Grass	3	Jun-Sep
**Cynodon*	*dactylon*	Couch	Grass	0.2	Oct-Nov
**Cyperus*	*sp*	Sedge nutgrass	Sedge	1	
**Dipogon*	*lignosus*	Dolichos pea	Twiner	-	Sep-Nov
**Echium*	*plantagineum*	Paterson's curse	Herb	1	Sep-Nov
**Ehrharta*	*calycina*	Perennial veldtgrass	Grass	0.5	Apr-Sep
**Eragrosits*	*curvula*	African lovegrass	Grass	1	Dec-May
**Eritjroma*	*caffra*	Coral tree	Tree	20	
**Eucalyptus*	*camaldulensis*	River red gum	Tree	50	Jun-Oct
**Eucalyptus*	*citriodora*	Lemon scented gum	Tree	40	Jun-Oct
**Eucalyptus*	*cladocalyx*	Sugargum	Tree	20	Nov-Feb
**Ficus*	*caraca*	Fig	Tree	10	Aug-Nov
**Foeniculum*	*vulgare*	Fennel	Herb	2.5	Jul-Jan
**Gladiolus*	*angustatus*	Long tubed painted lady	Herb	0.6	Oct-Nov
**Gladiolus*	*caryophyllaceus*	Gladiolus	Herb	0.8	Aug-Oct
**Gomphocarpus*	*fruticosus*	Cottonbush	Shrub	1	Nov-Apr
**Hastate*	*orache*		Shrub	1	Dec-May
**Helianthus*	*annuus*	Sunflowers	Herb	3	Feb-May
**Homeria*	*breyniana*	Cape tulip	Herb	0.7	Sep-Nov
**Homeria*	*flaccida*	One leafed cape tulip	Herb	0.7	Sep-Nov
**Ipomoea*	*indica*	Morning glory	Twiner	-	Nov-Apr
**Jacaranda*	*minosifolia*	Jacaranda	Tree	10	Nov-Feb
**Lagurus*	*ovatus*	Cats tails	Herb	0.2	Aug-Dec
**Lantana*	*camara*	Lantana	Shrub	3	Jun-Aug
**Leptospemum*	*laevigatum*	Victorian tea-tree	Shrub	3	Sep-Oct
**Lobulariea*	*maritima*	Sweet alyssum	Herb	0.2	Sep-Oct
**Lolium*	*perenne*	Rye grass	Grass	0.5	Sep-Dec

Common Weed Species

Scientific Name		Common Name	Form	Height (m)	Flowers
**Lophostemon*	*confera*	Queensland box tree	Tree	20	
**Lupinus*	sp	Lupin	Herb	0.3	
**Melia*	*azedarach*	Cape lilac	Tree	15	Sep-Oct
**Mentha*	*piperita*	Mint	Herb	0.5	Mar
**Oenothera*	sp	Evening primrose	Herb	0.5	Oct-Nov
**Olea*	*europaea*	Olive Trees	Tree	15	Oct-Nov
**Oxalis*	*per-caprae*	Soursob	Herb	1	Jun-oct
**Paspalum*	*distichum*	Water couch	Grass	1	Dec-Apr
**Paspalum*	*dilatatum*	Saltwater couch	Grass	15	Oct-Apr
**Pelargonium*	*rosea*	Guildford grass	Grass	0.3	Aug-Oct
**Pennisetum*	*macrourum*	African feathergrass	Grass	0.1	Oct-Feb
**Pennisetum*	*setaceum*	Fountain grass	Grass	0.1	Jul-Nov
**Pennistetum*	*clandestinum*	Kikuyu grass	Grass	0.1	Oct-Mar
**Philodendron*	*hastatum*	Elephant ear	Shrub	1	
**Phoenix*	*dactylifera*	Date palms	Tree	30	
**Pinus*	*radiata*	Radiata pine	Tree	20	
**Platanus*	X *acerifolia*	London plain tree	Tree	20	Sep-Nov
**Polypogon*	sp	Beard grass	Grass	0.6	May-Nov
**Populis*	sp	Poplars	Tree	30	Aug-Sept
**Raphanus*	*raphanistrum*	Wild radish	Herb	0.5	Jul-Jan
**Ricinus*	*communis*	Castor oil bush	Shrub	3	Dec-Mar
**Romulae*	*rosea*	Guildford grass	Herb	0.3	Aug-Oct
**Rubus*	sp	Blackberry	Shrub	2	Dec-Mar
**Rumex*	*acetosella*	Sorrel	Shrub	0.5	Aug-Dec
**Rumex*	*crispus*	Curled dock	Herb	1	Sep
**Salix*	*babylonica*	Weeping willow	Tree	10	Sep-Oct
**Salix*	sp	Willow	Tree	15	Sep-Oct
**Scabiosa*	*atropurpurea*	Pincushion	Herb	0.1	Oct-Jan
**Shinus*	*terebinthifolius*	Japanese pepper	Tree	15	-
**Solanum*	*sodomeum*	Sodam's apple	Shrub	1.5	Aug-Jan
**Stenotaphrum*	*secundatum*	Buffalo grass	Grass	0.1	Aug-Dec
**Taraxecum*	*officinale*	Dandelion	Grass	0.1	irregular
**Tetragonia*	*decumbens*	Sea spinach	Herb	0.3	Apr-Nov
**Thunbergia*	*alata*	Blackeyed susan	Twiner	-	Nov-Mar
**Trifolium*	*repens*	Clover	Herb	0.2	Aug-Jan
**Trifolium*	*subterraneum*	Subterranean clover	Herb	0.3	Aug-Nov
**Tropaeolum*	*majus*	Nasturtiums	Herb	0.5	Aug-Nov
**Typha*	*orientalis*	Bulrush	Sedge	4.5	Dec-Jan
**Vinca*	*major*	Blue periwinkle	Herb	0.2	Aug-Oct
**Vitis*	sp	Grape vine	Twiner	-	Aug-Nov
**Washingtonia*	sp	Cotton Palm	Tree	25	Aug-Sep
**Watsonia*	*bulbillifera*	Watsonia	Herb	1.5	Oct-Dec
**Zanthedeschia*	*aethiopica*	Arum lily	Herb	1	Aug-Sep

Precinct 1

Fremantle Harbour Groynes to Railway Bridge



Summary

Fremantle Harbour Groynes to Railway Bridge

The precinct is defined as the section of river from the Fremantle moles to the Railway Bridge. This section is the Port of Fremantle and is characterised by industrial, commercial and marine activities. The original beach and river banks were filled during the construction of the Fremantle Harbour last century.

The harbour has dramatically affected the natural river environment by changing the channel characteristics and therefore the degree of water flushing. Today, the estuary banks are bound by high retaining walls constructed with large blocks of limestone and rubble from Rous Head to the Fremantle Bridge. There is little remaining natural vegetation as clearing has been extensive. Exotic vegetation is present in the form of weeds and those species intentionally planted.

The area is heavily used by recreational fishermen and as an access route for recreational boating. The dominant land use is the industrial activities of the harbour precinct, although there are some commercial and retail activities within the area.

The main visually defining elements of the landscape are the linear walls of the harbour channel, the cranes and storage sheds. The harbour walls are constructed with rough angular blocks of limestone. The quays accentuate the geometric forms as they are built using timber and steel pillars and planks. The linear forms and textures of rock and steel are visually consistent with the industrial land use. The river viewer is prepared for the industrial landscape by colourful angular forms of the loading cranes which rise above the skyline of holding sheds. The harbour precinct is visually and physically separated from the Fremantle city by the railway. However, the port land use is linked to the city centre by the restoration of old storage sheds for new activities. The river user is not able to view the town centre due to the harbour buildings and the relatively flat topography.

Biophysical Processes and Features

Geological Processes

The precinct occurs within the Tamala Limestone formation which extends from the coast to Mount Helena. Tamala Limestone was formed in the Quaternary period (12 000 - 15 000 years ago) by aeolian processes (McArthur and Bettenay, 1974). The ancient dune system of quartz and marine calcareous shell fragments has been cemented by calcium carbonate and the resulting rock is referred to as aeolianite. Originally, both Rous Head and Arthur Head were hilly outcrops of calcarenite and caprock. Much of this has been removed by quarrying and the construction of the harbour .

The Cottesloe Soil Association consists of shallow yellow and brown sands which are derived from Tamala Limestone. The top soil is shallow with a low water retention capacity and low nutrient status. Alluvial soils were originally found along the foreshore areas and were the result of river sediment transportation. On the ocean side of the precinct there would have been a white sandy beach that is part of the coastal belt system, however, this was excavated with the harbour development. The coastal belt is a 10 -15 km wide zone of calcareous sand dunes, calcarenite, calcrete and leached siliceous sand hills that is part of the Safety Bay geological unit and corresponds to the Quindalup Soil Unit (Collins, 1987).

Topography

The precinct is classified geomorphically as part of the Spearwood Dune system and it has parallel dune ridges and limestone outcrops (McArthur and Bettenay, 1974). Rous Head and Arthur Head were both hilly outcrops of calcarenite and caprock. Originally, at the confluence of the river and ocean was a bar of dense coralline limestone which was in most places less than 2 metres below the surface of the water (Riggert, 1979). The foreshore was very irregular and the promontory leading to Ferry Point on the south side of the river was made up of swamp, reed beds, a salt lagoon, samphire flats and undulating white sand with bushes.

Hydrological Processes

Water features

The confluence of the Swan River estuary and the Indian Ocean occurs between the once high rocky outcrops of Arthur and Rous Heads. At the confluence, the channel was originally 1.8 to 2.5 metres deep and 15 metres across (Riggert, 1979). The river mouth was blocked by a coralline bar which greatly restricted water access into the channel. At low tide the rocky bar was visible as a broad outcrop, and as the tide rose water would flow over it to a narrow channel up the Swan River. These features have been dramatically altered with the construction of the harbour, including the removal of the bar and the extension of the channel into the ocean.

Bathymetry

The river originally reached a depth of approximately 5-7 metres, however due to dredging the channel is now approximately 11 meters in depth. The river channel is now approximately 500 metres across and bound by the limestone moles. The mean tidal range at Fremantle is approximately 0.8 metres, the effect of which has been increased in the river due to the removal of the bar at the river mouth. The flow of the river has been historically restricted by the old Railway Bridge at North Fremantle. Until the bridge was removed in 1968, it had acted as a submerged weir, distorting the lower levels of the tide and lessening the high water in the estuary (Riggert, 1978). The outflow of the water was so restricted that boats could 'surf' down on the outflowing tide.

The water salinity is equivalent to normal sea salinity in the Swan estuary mouth due to tidal influx of ocean water. The surface salinity does not noticeably decrease in winter in this section of the estuary despite the increase in fresh water from the seasonal rainfall in the catchment.

Flooding

This precinct is rarely subject to seasonal fluvial flooding as the harbour walls are deep and are capable of supporting most flood waters which would have once overflowed the natural channel banks. The area originally supported samphire flats which were subject to seasonal inundation. The offshore wave climate is mild, with an average significant wave

height of 1.5 metres (Eliot *et al,* 1982). Wave heights of more than 4 metres are likely to be exceeded less than 1% of the time, while heights of less than 1.0 m occur more than 80% of the time. Closer to the shore the swell is refracted by offshore reef systems and greatly attenuated by shoaling in the inner continental shelf and nearshore environment (Eliot *et al,* 1982). The highly variable wind - wave climate is superimposed on this swell regime and as a result the overall wave size is often increased due the wind wave climate. The harbour has been designed so that the incoming waves into the harbour channel are substantially reduced in size.

Erosion and accretion

A sand bank or promontory, known as Willis Point, had formed at the river mouth. This was the result of the slowing of the fluvial waters as they reached the ocean confluence. The promontory extended from the southern side almost to the northern bank, however, this feature was dredged early this century. It is likely that due to the rocky and stable nature of the limestone heads at the river mouth, the morphology of the river mouth was fairly stable with only small seasonal changes in the erosion and accretion of sandy beaches.

Vegetation Communities

Native

Cottesloe Complex

The original vegetation would have ranged from a woodland of tuart *(Eucalyptus gomphocephala),* jarrah *(Eucalyptus marginata)* and marri *(Eucalyptus calophylla)* to a closed heath around limestone outcrops (Beard, 1990). The understorey includes chenille honeymyrtle *(Melaleuca huegelii),* tangling melaleuca *(Melaleuca cardiophylla),* hazel *(Trymalium ledifolium),* spider net grevillea *(Grevillea thelemanniana),* stinkwood *(Jacksonia sternbergiana)* and tree smoke bush *(Conospermum triplinervium).*

There is little original vegetation remaining in the precinct. The area once supported a tall stand of eucalyptus close to the river foreshore (City of Fremantle, 1992). Early photos showed that Arthur Head had small scrubby bushes on the sandy patches between the limestone rocks which may have been similar to that of Bathers Beach today. It is likely that salt tolerant species such as coast daisy bush *(Olearia axillaris)* and sea-berry salt bush *(Rhagodia baccata)* would have prevailed in the harsh conditions. Willis Point is recorded as having samphire *(Sarcocornia quinqueflora)* and rushy flats. The area was also recorded as having Geraldton wax *(Chamaelaucium unicinatum).*

Charles Fraser in 1827 observed quantities of

Brunonia (probably common dampiera, Dampiera linearis) growing in great luxuriance on the margin of a salt marsh, its flowers of a brilliant sky blue. Here I likewise gathered a magnificent species of Melaleuca (probably one sided bottle brush, Calothamnus quadrifudus) with scarlet flowers and species of Metrosideros, and various other plants which, their being neither in flower nor in fruit I could not attempt to describe

(in Seddon, 1972).

Exotic

Exotic species have been introduced into the precinct by ship ballasts and other accidental processes. Weeds, such as, bearded oat *(*Avena barbata),* sweet alyssum *(*Lobularia maritima)* and tree tobacco *(*Nicotiana glauca)* occur in small pockets of soil adjacent to buildings. Other species, such as fennel *(*Foeniculum vulgare),* may have been intentionally introduced for food, and now are common weeds in industrial sites in the precinct. The recently built Rous Head harbour has blocks of land which have yet to be built upon. These sites support clumps of weeds and some salt tolerant exotics such as sea spinach *(*Tetragonia decumbens).*

Historical Land Use & Resulting Environmental Changes

The harbour precinct has been dramatically altered from its original form. From the beginning of colonial settlement access to the river mouth by large vessels was impossible. Augustus H. Gilbert, ship's clerk of the Success, wrote an optimistic account in his journal about the possibilities of constructing access by canal to the Swan River (Hitchcock & Stevens, 1929). He considered that if this canal

PRECINCT 1

Significant Land Use Features

N

0 100 300 500

Metres

* Fremantle Port Authority

INDIAN OCEAN

ROUS HEAD HARBOUR

FREMANTLE HARBOUR

SWAN RIVER

railway

railway bridge

Fremantle Bridge

Pt Brown

Stirling Bridge

HWY

CANNING

EAST

ST

RD

BEACH

HEAD

PORT

ROUS

QUAY

North Quay

Victoria Quay

VICTORIA

QUEEN

ORD

PARRY

ADELAIDE

HIGH

MARKET

CLIFF

SLIP

FLEET

SOUTH

NORFOLK

TCE

ALMA

10 shed

9 shed

8 shed

7 shed

6 shed

5 shed

4 shed

3 shed

2 shed

J shed

F and G shed

E shed

D shed

C shed

B shed

A shed

FPA*

Container storage area

Elders woolstore

Woolstores Shopping Centre

Railway station

St Johns Anglican Church

National Hotel

Rottnest Ferry Terminal

Rous Head

North Mole

South Mole

Arthur Head

Aqua Culture

Fleet St TAFE

Round House

Bather's Beach

access could be constructed through to Rocky Bay it would form the best harbour in the world, safe from 'enemy bombardment'.

Our expectations of the advantages of a settlement at Swan River are now fully confirmed, and although it would be impossible for vessels of above ten tons to enter the river at any state of the tide in safety, at the present entrance, it would be practicable at small expense to cut a canal at about four miles [actually two miles] from the mouth of the river to the sea.

The distance necessary to cut, is only 1 mile, and would immediately lead into water of 12 fathoms both in the river and in the sea. The land is rocky and would afford excellent sides to the canal. [The area referred to is between Leighton Beach and Rocky Bay.]

The original harbour shoreline was a thin white sandy beach from Arthur Head to Market Street. Arthur Head was originally a headland but was quarried back to a cliff face (Hitchcock & Stevens, 1929). On the southern side from Market Street was a sand bank covered in bushes and rushes stretched half a kilometre into the river. This promontory, known as Willis Point, almost reached out to the northern shore leaving only a narrow deep channel. The bank and associated ephemeral salt lagoon was removed during the construction of the harbour (Hitchcock and Stevens, 1929).

In 1849, due to the restriction of ships entering and anchoring the estuary mouth the first attempt to remove the bar was made (Riggert, 1978). Efforts to blast out the rocky bar which blocked the mouth of the river were unsuccessful. A new jetty giving better protection was built in 1873 and known as Long Jetty. In 1891, C.Y.O'Connor was appointed Engineer in Chief of Public Works and Manager of Railways. His first project was building a suitable harbour for the small colony. It involved levelling the south side of Arthur Head and blasting away the rocky bar blocking the harbour's entrance. The plan also included a scheme to dredge a 130 metre channel to a depth of 9 metres which was later further deepened by 2 metres (Riggert, 1978). In 1892, the Governor's wife, Lady Robinson, pulled the handle to tip the first load of stone on Rous Head to commence construction of the north mole. The sand spoil from the dredging was used to construct Victoria and North quays, making the total area of reclamation 50 hectares. The port was used by cargo ships, great passenger liners and mail-ships, some of these activities continue to the present day. The overseas passenger terminal was used up until the 1960s as the main gateway for visitors and migrants to Western Australia (Ewers, 1971).

The Fremantle town site was planned in March 1833 by John S. Roe (Seddon, 1972). The site neatly fits into the point between South Bay and the mouth of the Swan River. To the east and west were some limestone cliffs which helped to restrict the town's growth and create the compact urban environment, still evident today.

Present Land Use and Social Patterns

Today, the Fremantle Port plays a less important transportation role than in the earlier half of this century. Large warships, cruise liners, livestock ships and cargo ships all use the harbour, however, the role of passenger transport has been largely filled by aeroplanes and motor vehicles. Much of the land on the southern mole is under-utilised by shipping activities. However, new land uses have recently been encouraged by the local city council. The sheds, which dominate the riverscape, are currently being used as a small shopping complex, a market, a base for sailing ship training, a historic boats museum, a convention display centre and an area for music concerts.

The water adjacent to Arthur Head is currently being used by the Western Australian Fishing and Aquaculture Centre to house trial fish farms. The cages are used to trial aquaculture techniques and to grow fish species, such as bream.

The North Quay has ten berths and the riverscape is dominated by the container holdings and the cranes used to download the container ships. The newly completed Rous Head Harbour has a number of light industrial and commercial developments, including the new Rottnest Ferry Terminal and a helicopter landing area.

The town site of Fremantle is cut off from the river and harbour precinct by the railway. The town has

retained many of the turn of the century limestone buildings which are both important landscape features and sites of historical interest. The town centre is mainly made up of two storey buildings and the pedestrian scale of the centre has been maintained due to the lack of redevelopment up until the 1980s. Recent plans by the local council and the Department of Planning and Urban Development (1994) have ensured that the city retains its historic buildings and character

Recreation nodes

Both the groynes and walled banks of the harbour are popular areas for recreational fishing. South Mole is a popular spot for scuba diving due to its sheltered water and easy access. The new Rous Head Harbour holds the Rottnest Ferry Terminal which is the site of embarkation for many daytrippers and holiday makers. The recently converted storage sheds are now a popular market place which bustles with weekend shoppers.

Public access

The mouth of the Swan River is easily accessed by sealed road which runs along the groynes. Victoria Quay is accessible to pedestrians as the area is bituminised and the local authority is in the process of designating a zone of public use. The northern mole is mainly restricted access due to the harbour activities.

The use of the harbour precincts by recreational boaters is restricted by the shipping lanes, however it is heavily used by small craft to access the ocean. There is ample parking along both Arthur and Rous Heads for users of the recreation nodes and the TAFE college.

Sites of Nyungar & wider Australian community significance

Nyungar significance

Nyungar refer to the Fremantle coast and limestone hills as *Booyeembara* (Gibbs, 1988). The river confluence with the ocean is known as *Majarree* and both sides of inland Fremantle area as *Walyalup* meaning place of the eagle (Collard *et al,* 1996). The Swan River from the ocean confluence to Melville Water is named *Derbal Yaragan* and is a significant fishing area for Nyungars (O'Connor *et al,* 1984). Nyungars frequently traversed a track from Perth Water to North Fremantle. Before the Fremantle Harbour was altered, in summer, it was only a short swim from the northern shore to the southern banks from where the track continued to Bibra Lakes (O'Connor *et al,* 1989). The original Willis Point was known as *Walyubup* 'place of the kangaroo rat' (Collard *et al,* 1996). Before colonisation, the area was mainly frequented in summer when the estuary was a plentiful fishing resource and the coastal plain was relatively dry. Green (1986) notes that a popular fishing technique was for groups of 20 or more women and children armed with branches to drive schools of mullet into the shallows to be speared by the men. The dry vegetation was easily burnt which encouraged the propagation of young vegetation which in turn attracted game for hunting. In winter, local Nyungars moved inland to avoid the flooding of the coastal plain and river banks. There was a freshwater spring approximately one kilometre from Arthur Head which was an important resource for Nyungars and this point served as a meeting place.

Other significance

Arthur Head was named after Governor Arthur of Van Diemens Land. On 2 May 1829, Captain Stirling of *HMS Challenger* hoisted the Union Jack flag and laid a formal claim to the entire western half of New Holland.

Rous Head was named by Captain Stirling after Captain H.J. Rous who was based in New South Wales and later explored the northern rivers of that State (Seddon, 1970).

There are a number of buildings in the Fremantle City Centre that are significant to the European history of the area. The Fremantle Goal (Round House) was built on the rocky cliff of Arthur Head and once dominated the town and riverscape. It is the oldest surviving public building in the State. There are also a number of elegant public buildings such as St Johns Church (Kings Square), National Hotel and the Lionel Samson and Son Building (Apperly *et al,* 1989). The city has been designated as an area of historic value and its early Federation styled buildings are now recognised as worthy of being retained to ensure this atmosphere is maintained.

PRECINCT 1

Sites of Significance

N

100 0 200 400

Metres

Walyalup Sites of Nyungar Significance

• Round House Other Australian Community Significance

INDIAN OCEAN
(Gabee Warden)

Booyembara

RD

BEACH

original foreshore

FREMANTLE HARBOUR

Willis Pt

QUAY

VICTORIA

ST

QUEEN

ORD

Pt Brown

Stirling Bridge

SWAN RIVER
(Derbal Yaragan)

Fremantle Bridge

HWY

CANNING

EAST

Cantonment Hill Lookout

Dwerdaweelardinup

ROUS HEAD HARBOUR

HEAD

PORT

ROUS

Majarree
(old confluence)

Rous Head

Arthur Head

WW2 Antisubmarine defence between 2 moles

FLEET

CLIFF

The Fremantle Gaol

Round House

Walyalup

PARRY

ADELAIDE

HIGH

MARKET

SOUTH

NORFOLK

TCE

ALMA

The once busy harbour has slowed as other forms of transport have emerged. The Fremantle Passenger Terminal was once the first place of disembarkment for the many migrants to Western Australia. Most of the storage buildings have been demolished or used for other purposes such as the Fremantle Woolstore Shopping Centre.

Conservation areas

Wetlands

There are no remaining wetlands in this precinct.

System 6

This precinct has no areas recommended for management by the System 6 Report (1983).

Landscape Description

Waterform

The Swan River confluences with the Indian Ocean at this precinct. Despite the confluence being walled by the harbour, the water body is still one of the most attractive landscape elements. The wide and deep channel allows the ocean waves to continue through the precinct and the tidal influence creates attractive flow patterns. Depending on the weather conditions the water surface is either dull or highly reflective.

Riparian land use

The river channel has limestone banks which are made up of rough angular blocks derived from quarrying. They form straight, roughly textured moles which due to their linearity give the viewer the impression of functionality rather than naturalism. The individual limestone blocks are subject to weathering and erosive processes and have begun to take on a more rounded and natural form, despite the overall artificial form. The loading jetties are supported by timber and steel pillars which are visually dominant to the water user. The linear forms and the textures of rock and steel are visually consistent with the industrial land use and the riparian zone is not expected to have a natural form.

Land use

The most prominent feature of the landscape is the colourful angular forms of the loading cranes which rise above the buildings. These metallic and linear forms dictate to the viewer the industrial landscape. The landform is flat with large bituminised areas for cargo holding bays. Cargo containers stacked on the North Mole provide regularly shaped and multiple coloured nuclei. There are several sheds which are wooden and steel and of a functional style. The Fremantle Port Authority building is a simple 1960s style building which towers above the city and harbour sky line. In the context of the harbour, the building does not detract from the landscape. The harbour is usually holding several boats which have smooth steel surfaces which also contribute to the artificial and industrial character of the area. At the end of South Mole there is a lighthouse and toilet block which are both prominent features of the landscape.

The harbour precinct is visually and physically separated from the Fremantle city by the railway. Visually the overhead electric lines provide a linear barrier between these land uses, and these give the impression of separate entities. However, the port land use is linked to the city centre by buildings, such as Elders Wool Store, the Woolstore Shopping Centre and the Harbourside Hotel. These were built in a Federation functional and industrial style and the uniformity of style helps visual continuity. The Victoria Quay sheds are now being used for commercial and other land uses. The sheds, linear and wooden and steel forms have not been altered and therefore are still indicative of their previous land use. The Railway Station is built in a Federation free classical style and its location and preservation provide visual continuity with the surrounding city centre buildings which were built during a similar era.

The water user is not able to view the town centre from the river as the high linear wharf and buildings block the view to the topographically flat town centre. However, the residential area behind the city is on a hill and is visible as background. The pedestrian viewer has also limited views, however, the view of the harbour is made interesting by the angular and dynamic forms of the harbour activities.

Dominant Landscape Character

The dominant landscape character type for this precinct is an industrial character. The original natural landscape has been dramatically altered leaving little of the original calcareous sands and limestone outcrops which would have been covered by the low coastal dune vegetation. The present industrial character is typified by several elements. These are the linear concrete harbour walls which provide an unnatural interface of water and land; the tall cranes and numerous ocean carriers; the wooden sheds, the lack of vegetation, and the man-made flat landform.

Significant Viewscapes

A narrow and attractive viewscape, is the view from the harbour sheds to the ocean which is focused by the harbour groynes. Similarly, the view from the harbour groynes facing eastward, shows the harbour landscape with the backdrop of East Fremantle.

Conforming and Non Conforming Elements in the Landscape

The Fremantle Harbour precinct is an important element to the Swan River. Apart from being the confluence to the ocean it is also the only harbour landscape. *The Fremantle Regional Strategy (1994)* identifies the uniqueness of the landscape and the need to enhance and maintain the historic theme and harbour land use. There have been efforts to reduce the effect of the railway visually and physically separating the harbour from the rest of the city. The Fremantle City Council has planned to revitalise the port area by designating some of the Victoria Quay sheds to new land uses. This enterprise has been quite successful with the nautical theme being maintained in the shopping complex and the Historic Boats Museum. The merging and overlapping of land uses by retaining the original buildings has helped develop a physical continuity between the entities. Visually, however, the buildings' original forms are still evident so the visual distinction is still present. This raises the question whether it is preferable that the visual distinction be maintained or minimised.

On the northern mole there has been successful mixing of industrial and commercial outlets within the new Rous Head Harbour. Their land use link is that they all have a nautical and industrial interest. Visually, most of the buildings are functional, however, there are a few offices which are built in a style which is indicative of modern and prestigious companies. Visually, the viewer is conditioned by the port activities to expect functional and minimalist buildings. The new harbour is visually congruous with the adjacent land use.

The recreational user is restricted in the harbour to certain navigation channels due to the industrial nature of this precinct. However, this is hardly restrictive to the water viewer as the whole precinct is such a small length of the river and is interesting as limited and restricted water use. There has been improved access to the moles for the land based recreational user. These provide the viewer a panoramic view of the industrial landscape and the ocean and it is important that this access be encouraged and maintained.

Recommendations for Maintenance and Enhancement of the Present Landscape Character

To maintain the unique and attractive industrial character type of this precinct, the following recommendations may be considered.

- Maintain the wooden sheds and ensure that future development is in keeping with the style and form of the sheds.
- Maintain the linear harbour walls and moles.
- Retain the vibrant colours of the cranes. The cranes are an essential dynamic element.
- In the adjoining Fremantle city area encourage sympathetic building designs in the utilitarian styles of the turn of the century. This does not necessarily mean mimicking the styles, rather having similar heights and sympathetic building materials.
- If in the new harbour development vegetation landscaping is considered desirable, indigenous plants may be considered. They would not only be a reminder of the past vegetation, they would be suitable for the harsh conditions of this industrial landscape.

Precinct Specific References

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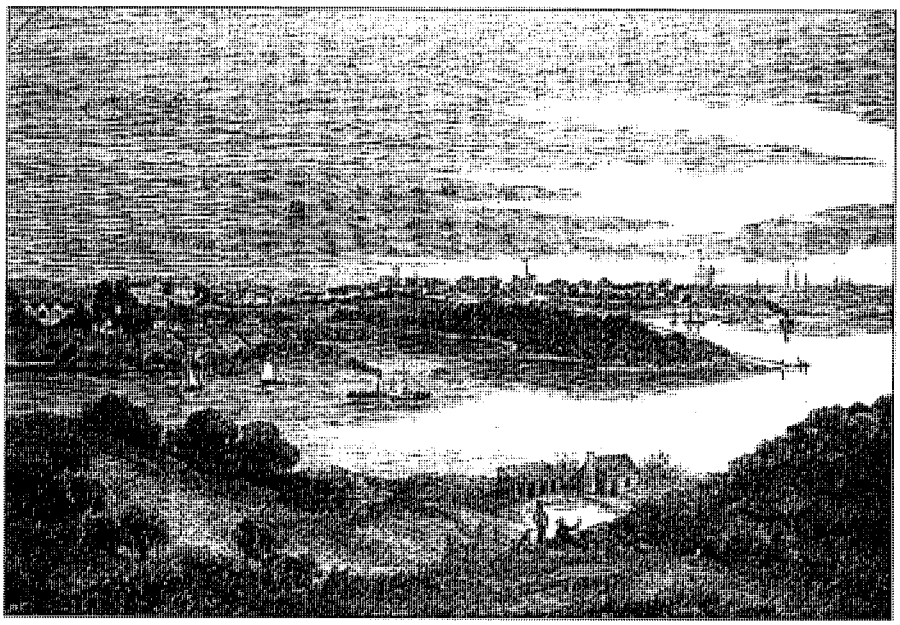
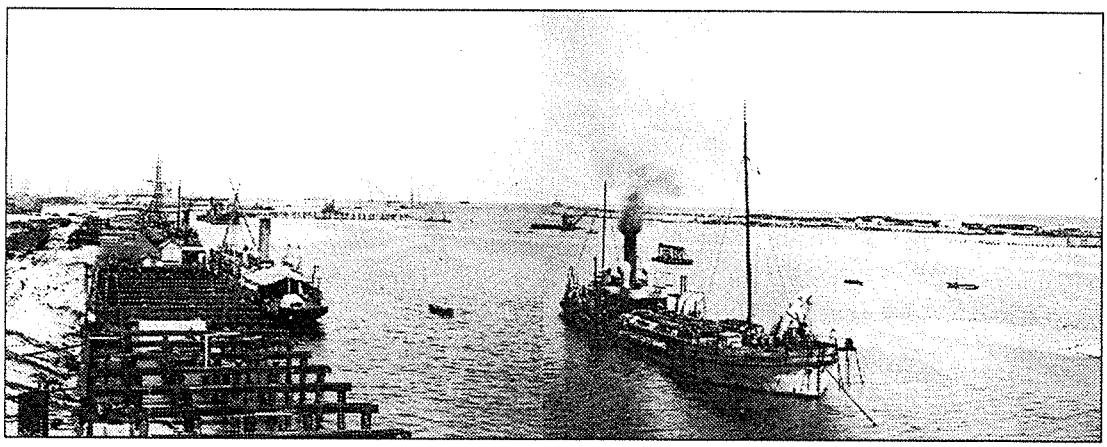


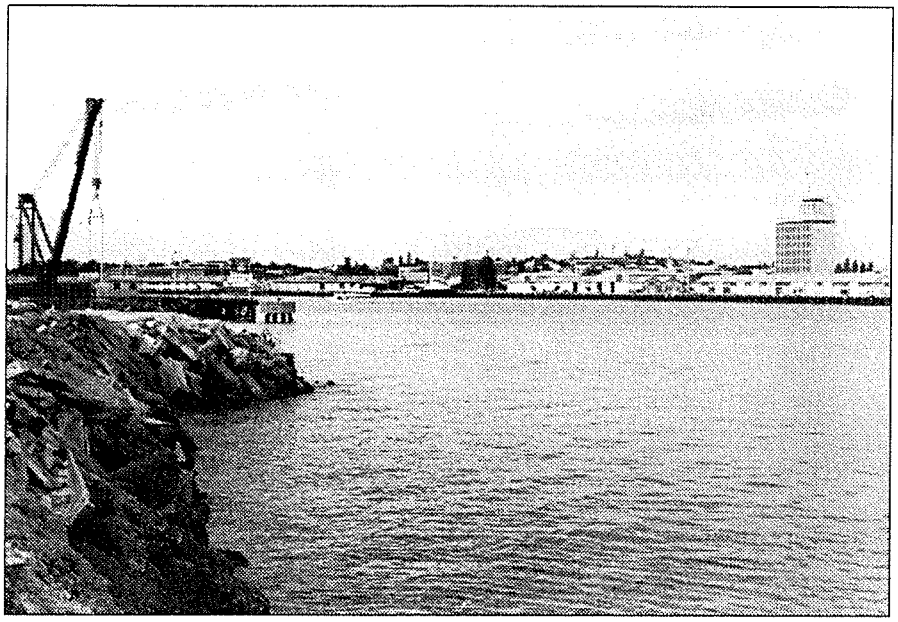
Fremantle, Western Australia. c1866.

Fredrick Grosse, 1828-1894. Wood engraving (in National Library of Australia).



Fremantle Harbour construction. c1897.

Photograph (from original in Swan River Trust).

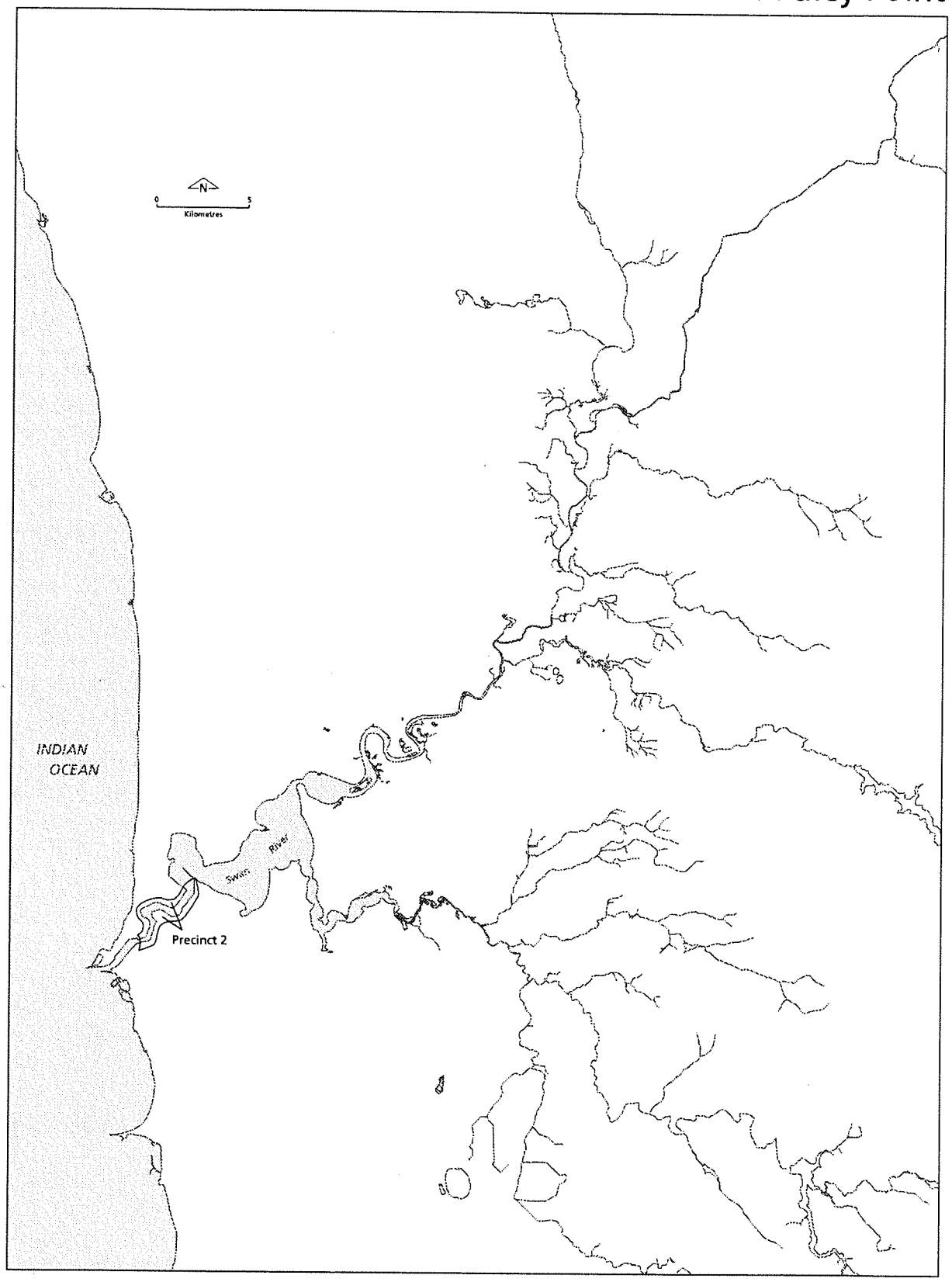


North Mole, Fremantle Harbour. 1995.

South Mole, Fremantle Harbour. 1995.

Precinct 2

Fremantle Railway Bridge to Point Walter Reserve and Chidley Point



Summary

Fremantle Railway Bridge to Point Walter Reserve and Chidley Point

The precinct area is the section of estuary between the Fremantle Railway Bridge to Point Walter Reserve and to Chidley Point. The present day landscape is the result of dramatic modification and yet there are still areas which have high scenic, recreation and conservation value. The most dominant natural features along the foreshore are the limestone cliff faces, which are exposed along much of the precinct.

These cliff faces result from extensive quarrying particularly on the northern side of the river. A number of caves and fossiliferous beds are found within the limestone beds.

Intensive land use has resulted in most of the natural vegetation complexes being substantially modified or removed from the area. The largest remnant vegetation communities are found between Minim Cove and Chidley Point and also along Blackwall Reach. However, there are a number of areas which have been identified as areas of ecological significance. The precinct is also significant for the Nyungar people who recognise several sites of importance. Locations of European historical value are also present.

Land reclamation has occurred along the North Fremantle foreshore. Mosman Park has a history of industrial development which is currently being relocated and the sites developed for residential use. Residential development extents to the river front at several locations within the precinct and is an important landscape feature along river. There are many locations which are highly popular for both passive and active recreation. Public access to the foreshore is made possible with dual use pathways, informal tracks and roads. The limestone cliffs often create a natural barrier to the foreshore.

The riverform is particularly attractive in this precinct, as the water winds through the relatively high limestone cliffs and the low lying sandy embankments. Parts of Rocky Bay cliffs are covered in endemic shrubs which form clusters of green on the weathered limestone. Other cliff faces have been seriously degraded and much of the limestone cliff has been quarried or collapsed. Exotic weeds do not take the endemic scattered clumped forms on the cliff, rather they entirely cover the limestone as can be seen on the cliff face opposite Blackwall Reach. Along Preston Point, the riparian land use is predominantly water orientated. The numerous water based sport clubs are visually consistent landscape elements. Their club houses range in style but all are functional and indicative of their riparian use. There are a number of residences which are visually inconsistent elements within the Blackwall Reach landscape. These houses have been constructed on and cut into the limestone cliff face. Their designs and building materials are in sharp contrast to the limestone form, colour and texture. Rocky Bay and Minim Cove are currently being redeveloped for residential and recreational purposes. The area was previously quarried and used as an industrial area which has degraded the visual landscape quality of the area. A new redevelopment is currently occurring at this site which will hopefully enhance the present degraded section of the river.

Biophysical Processes and Features

Geological Processes

The precinct occurs within the Tamala Limestone geological formation which extends from the coast to Mount Helena. Tamala Limestone was formed in the Quaternary period (12 000 - 15 000 years ago) by aeolian processes. The ancient dune system of quartz and marine calcareous shell fragments has been cemented by calcium carbonate and the resulting rock is referred to as aeolianite (City of Fremantle, 1992). The quartz fragments originated from the eroding crystalline rocks from the Darling Plateau that were transported to the sea by rivers and along the coast by longitudinal water movement (Ecoscope, 1993). Leaching of the overlying dunes has resulted in calcium carbonate cementing the shell material and the quartz grains into a solid limestone. The aeolianite is dominated by unconformity with a loose and friable structure. Surface evidence of the Tamala Limestone includes crossbedding structures as well as some solution pipes and dolines which indicate the erosive forces at work in the limestone. There is also evidence of past shorelines and rhizolith structures left by decaying roots (Seddon, 1972). In places along the Blackwall Reach, rain has physically and chemically attacked the limestone which has produced frequent sharp points and ledges in the limestone. Marine layers containing fossiliferous shell beds are found at Minim Cove and are considered a scientifically valuable site (Kendrick *et al,* 1991).

There are a number of caves within the precinct study area. At Rocky Bay there are two small caves within the limestone cliff faces. There are reputedly many underground caverns and tunnels in the Bicton area (City of Melville, 1986). The Bicton caves are low and narrow (around 1 metre in diameter) and up to 200 metres in length. An underground stream which flowed through the limestone has gradually eroded the rock forming caves. Stalactites have formed by rainwater seeping through the above soil.

The sand is derived from the Tamala Limestone and is characterised by being of low nutrient status and having a low water retention capacity. The overlying sands are yellow and brown sands referred to as the Cottesloe Soil Association. Alluvial soils are found along the foreshore areas and are a result of river sediment transportation. The soils are made up of fine to medium grained pale grey sands, with whole and broken mollusc shells (Ecoscape, 1993). The soil at Blackwall Reach Reserve is part of the Karrakatta Association. The Tamala limestone is also the parent source for these deep yellow and brown sands (Seddon, 1972).

Topography

In January 1697, three Dutch East India Company ships, commanded by Willem de Vlamingh, reached Rottnest Island and discovered the entrance to the Swan River, Western Australia. An engraving made during the expedition by an unknown artist in 1726 was sent back to Amsterdam and is one of the earliest representations of the area. This engraving has usually been regarded as fanciful, but it may well have been elaborated from a sketch made on the spot. Comparison with the original topography shows reasonable congruity. Arthur Head, the Ferry Point peninsula and Monument Hill are identifiable on the Fremantle side, with Buckland Hill looming up behind Rocky Bay, left margin, north of the river. The other hills on the north side reasonably represent *the Seven Sisters* (which have been levelled by quarrying last century); although their height may be a little exaggerated. Buckland Hill remains as one of the topographic highs and before levelling for the construction of a reservoir, it was 66 m above sea level which is comparable with Mt Eliza. Prior to levelling the other 'sisters' were around 50 m above sea level.

The Swan Coastal Plain is divided into three topographical units all of which are remnant dune systems. The Bassendean Dune System is composed of low hills and leached soils. This precinct lies on the Spearwood Dune System which is younger with higher hills and more fertile soils. The third system is composed of coastal beach sands and is known as the Quindalup Dune System and is not part of this precinct.

The major topographical features of the area are Cantonment Hill, Buckland Hill and the remains of the Seven Sisters. These rounded hills are visually evident and provide an interesting background to the riverscape. All these hills have been substantially reduced in height, up to 10 metres, due to quarrying

(Swan River Trust, 1994). There are a number of cliff faces adjacent to the river, including Rocky Bay and Blackwall Reach, and these range from 5 to 15 metres in height. Point Walter Reserve has a steep landscaped topography on its northern face.

The river channel is approximately 500 metres wide and mainly bounded by the aeolianite cliffs until Chidley Point, where it opens up into Mosman and Freshwater Bays. The beaches are narrow and in most places steeply sloping although there is a wider beach on the western side of the spit.

Hydrological Processes

Water features

The Swan River channel is approximately 500 meters wide in this precinct until Childey Point where it opens up into Mosman and Freshwater Bays. The flow of groundwater to the river is evident in several places such as the Jerrat Road foreshore (Ecoscape, 1992). Springs of freshwater flow from the base of the limestone embankments during the winter months.

Bathymetry

The water depth between the Railway Bridge and Preston Point is very shallow and only reaches to 5 metres in depth. The substrate sediment ranges from a fine, dark grey mud in the Blackwall Reach channel to coarse shell and pebble beds in Rocky Bay (Thurlow *et al,* 1986). As the river velocity slows towards the ocean, fluvial sediments are deposited in the form of lateral accretion at Preston Point. The sediment has been dredged adjacent to the yacht clubs at this point. The river channel deepens along Blackwall Reach and as it opens out into Mosman Bay. Point Walter spit extends into Freshwater Bay and under low tidal conditions is exposed. The spit acts as a natural barrier to river flow and restricts the flow into the narrower channel.

The section of river up to Blackwall Reach is subject to a small daily (astronomical) tidal range of 0.1 to 0.6 metres. The salinity reaches up to 35 parts per thousand in the summer periods as the water is almost completely of marine origin. The autumn and winter rains dilute the surface water so that it becomes almost fresh (Hodgkin, 1987).

Flooding

The precinct is mainly bound by high aeolinite cliffs where flooding by the river is has a very low risk. At Stirling Bridge and Minim Cover there are two small wetlands which are subject to seasonal inundation.

Erosion and accretion

The banks of the river channel for the most part are bound by the limestone cliffs which reduce potential for dramatic erosion and accretion processes. There has been the deposition of fluvial sediment form of lateral accretion at Preston Point resulting in a shallow bathymetry along the southern side of the point.

Vegetation Communities

Native

Cottesloe Complex

Much of the precinct's original vegetation has been cleared for development. The original vegetation would have ranged from a woodland of tuart *(Eucalyptus gomphocephala)*, jarrah *(Eucalyptus marginata)* and marri *(Eucalyptus calophylla)* to a closed heath on the limestone outcrops (DCE, 1980). The understorey includes chenille honeymyrtle *(Melaleuca huegelii),* tangling melaleuca *(Melaleuca cardiophylla),* hazel *(Trymalium ledifolium),* spider net grevillea *(Grevillea thelemanniana),* stinkwood *(Jacksonia sternbergiana)* and tree smoke bush *(Conospermum triplinervium).* The types of communities which make up this complex are described below.

Juncus and *Halosarcia* communities

Originally samphire *(Halosarcia* sp*)* and rush communities fringed the shores of the precinct area. The predominant species would have been the rushes *(Juncus kraussii and Isolepius nodosa).* Dune sheoaks *(Allocasuarina lehmanniana)* occasionally lined the edges of the rush communities. At present, at Blackwall Reach and further down stream, there are pockets of sword sedge *(Lepidosperma gladiatum)* communities. At Minim Cove, wetland species such as seablite *(Suaeda australis),* beaded glasswort *(Sarcocornia quinqueflora)* and samphire *(Halosarcia sp)* occur in an isolated saltwater wetland. These communities have been heavily invaded by grasses and other exotic species.

***Melaleuca* Complex**

Early descriptions of the Cantonment Hill area describe the heath communities on the shallow soils and limestone areas. The dominant species are coastal honeymyrtle *(Melaleuca acerosa)* and the coastal wattle *(Acacia cyclops)* and coojong *(Acacia saligna)* with many low form bushes. The Western Australian Naturalists' Club was able to report 44 species of native plants on Buckland Hill in 1985, including honeymyrtle *(Melaleuca huegelii)*, fountain or yellow leschenaultia *(Leschenaultia linarioides)* and cockies tongue *(Templetonia retusa)*, (Ecoscape, 1992). A variety of plant species is found along the high cliffs exposed to the salt spray. The vegetation is adapted to the harsh conditions and includes such species as coastal daisy bush *(Olearia axillaris)* and berry salt bush *(Rhadodia baccata)*.

Dryandra communities

At Blackwall Reach Reserve, there is a scrub community which supports small to medium sized trees, such as parrot bush *(Dryandra sessilis)*, peppermint tree *(Agonis flexuosa)*, slender banksia *(Banksia attenuata)* and firewood banksia *(Banksia menziesii)*, (City of Melville, 1986).

Woodland

A tall tuart forest *(Eucalyptus gomphocephala)* would have occurred extensively at lower parts of the foreshore areas on deep sandy soils. The canopy has foliage cover between 30 and 70% and the taller trees would have reached up to 30 metres (Swan River Trust, 1994). The understorey would have been made up of banksia *(Banksia* sp*)*, blackboys *(Xanthorrhoea preissii)*, perennial shrubs and sedge species and zamia palms *(Macrozamia riedlei)*.

In the shallower soils Rottnest Island pine *(Callitris preissii)* would have formed a closed forest. There would have been little understorey except in clearing between the trees.

This community was once common along the lower Swan River and now is virtually absent (Ecoscape, 1993).

Exotic

The extensive removal and disturbance of the native plant communities has encouraged the proliferation of exotic species. Disturbances such as fires, tracks, rubbish dumping and erosion have been the major contributing factor to the destruction of many trees and the lower storey vegetation in the precinct. Many of the exotic invaders are likely to have been introduced from visiting ships although the majority of species would have been intentionally introduced. Exotic grasses such as bearded oat *(*Avena barbata)*, and Guildford grass *(*Romulea rosea)* form a strata in areas including Cantonment Hill and Blackwall Reach. At Buckland Hill a number of naturalised exotic plants occur, including many from northern Mediterranean climates, such as wild fennel *(*Foenicultum vulgare)*, castor oil bush *(*Ricinus communis)* and pincushion *(*Scabiosa atropurpurea)*. Domestic gardens, parks and some reserves have been planted with lawns and exotic flora which now contribute to the character of the area and these include such plants as date palms *(*Phoenix canariensis)* and buffalo grass *(*Stenotaphrum secundatum)*.

Historical Land Use & Resulting Environmental Changes

In 1829 Captain James Stirling explored the Swan River and thought Buckland Hill, situated on the northern banks of the river, an excellent site for the proposed settlement. Charles Fraser, the New South Wales Government Botanist with Stirling, wrote in his journal:

These hills are admirably adapted for the site of a town, their elevated situation commanding a view of the whole of Canning Sound [now Cockburn Sound] with the adjacent coast, the interior for some distance, and the meanderings of the river. There [sic] lying open to all breezes, too, is an additional advantage.

(in Seddon, 1972).

However, Captain Fremantle's subsequent expedition in 1829 led instead to the choice of Arthur Head site in Fremantle as the place for the initial settlement of Western Australia. The majestic hills of Rocky Bay, including *the Seven Sisters* were later extensively quarried for limestone used in the construction of the harbour and other building materials, Buckland Hill being the remains of a once impressive river mouth.

The foreshore environs were quarried for well over 100 years (Swan River Trust, 1994). Rocky Bay was once considered the most beautiful bay in the Swan River but quarrying destroyed the high cliffs overhung with peppermint trees, cypress pine and many shrubs. The chine stone from this site was used to build the Perth Boys School, part of Government House and the courthouse at the rear of the museum. Capstone from the quarry was used as the first 'metalling' for St Georges Terrace and was also supplied to sailing ships as ballast.

Limestone was also quarried from the western face of Buckland Hill during the late 1800s. The quarry was located just north of Boundary Road, which was at that stage the dividing line between the districts of North Fremantle and Buckland Hill. Some of the quarried limestone went into the Fremantle harbour works and some into buildings (including Winthrop Hall at the University of Western Australia). Further quantities were burned in limekilns on the site, and some limestone was supplied to the goldmines at Kalgoorlie.

Billy Goat Farm was the first recorded farm in the district, established in the 1840s (Tuettemann, 1991). It fronted Minim Cove and existed for many years. Some of the first crops ever grown in the State were grown at this farm. Its semi-isolated location and large area allowed a large herd of goats to be farmed in the early years and in later years it became a dairy.

The Fremantle-Perth road followed the southern side of the river to Preston Point, where there was a ferry across to Minim Cove, this being a short passage and less exposed to strong winds and tidal currents than the alternatives closer to Fremantle. From this point, produce was ferried to various locations along the Swan River.

The northern shores of Rocky Bay to Point Roe have been used for industrial purposes for many years, resulting in dramatic modification of the original landscape. The most significant industries have been quarrying, CSBP and Farmers, the State Engineering Works, and the Colonial Sugar Refinery. These were for many years the only heavy industrial sites on the estuary apart from the Swan Brewery at Kings Park.

The chemical works, a branch of the Mt Lyell Mining and Railway Company of Victoria, was built on the Rocky Bay escarpment. The company manufactured acid and superphosphates using raw materials from Christmas Island and Kalgoorlie. The company after several mergers became known as CSBP (Cuming Smith-British Phosphate) in 1964 (Tuettemann, 1991).

From 1951 pyrites cinders were deposited, with permission, on two additional sites for which formal leases were obtained in 1953. These sites virtually doubled the land used by the company and were situated east and south of the present site of Rocky Bay Village, and in a narrow strip of land on the river south of the original lease. The pyrites cinders dumped by the plant were red, due to the high content of iron. Dust from the cinders dumped in the disused quarry east of Rocky Bay Village left its mark on nearby exposed faces of limestone, giving them a distinctive pink colour (Swan River Trust, 1994). Some colour remains in the rock to the west of Perrott Reserve. This discolouration is a minor legacy in comparison with the problem of chemical contamination left on the site, which ultimately covered the area bounded by: the existing State Engineering Works to the west; a playing oval on Tom Perrott Reserve to the east; McCabe Street, the Buckland Hill (Special) School and the WA Society for Crippled Children to the north; and the Swan River to the south.

CSBP and Farmers Ltd ceased operating on the site in 1969. The company was then required to reclaim the land by demolishing the buildings and removing contaminants. When, in 1973, the Government considered that this had been done to its satisfaction the lease was formally terminated. The acid and phosphate plant had been demolished after the company ceased operations in Mosman Park and transferred to a site on the coast near to Kwinana which provided direct access for shipping. In 1979, the University of Western Australia acquired the central portion of land on the former CSBP site, intending to develop it. However, when the University authorities learned of the extent of soil contamination, they commissioned studies of the ground water and of the surface soils (Swan River Trust, 1994).

Further investigations in 1984 and 1986 led to the production of a Public Environmental Report in 1987 (Maunsell & Partners, 1987). The main dump, to the east of Rocky Bay Village, was found by the Environmental Protection Authority to contain approximately 70,000 cubic metres of pyritic cinder residue, with a total residue thickness of between nine and ten metres. The report indicated that the entire site was in need of remedial treatment to remove the possible health risk posed by high levels of heavy metal contamination. Lead, copper, zinc, arsenic, mercury and cadmium were all recorded at high levels on the embankment along the Swan River, where there is also some evidence of heavy metal leachate, and beach contamination. The extent of ground water contamination is currently being investigated and it may be possible that leaching has occurred (Tuettemann, 1991).

After a good deal of public agitation, perhaps the biggest decontamination exercise the State has yet seen was undertaken. The site is now about to be developed as a housing site along with the adjoining State Engineering Works site on the Rocky Bay Estate. It is currently a flat terrace mid-way between the level of McCabe Street and the river, bearing no relation to either the original or the surrounding land form. The foreshore sand cliff is entirely artificial.

An old soap factory where soap and washing powder were produced for many years is still found at Rocky Bay. The effluent was tunnelled into the bay with the effect so great that the area was once known as "Soapy Bay". The site was also used as a margarine factory and warehouse (Catomore, 1986). It is now up-market apartments since its conversion in 1982.

The site of the Colonial Sugar Refinery (CSR) has a well conserved natural foreshore. It was originally quite an isolated site and workmen once used a sandy track to get to the factory. In the early 1900s CSR closed refinery operations, however, the factory is still used as a packaging plant. The land is now proposed for subdivision.

Although a little removed from the river foreshores, Buckland Hill is an important part of the river landscape, and a major viewpoint. Locally known as 'Monument Hill' or the 'Monnie', Buckland Hill affords a panoramic view of 360 degrees which rivals the views from Kings Park, Wireless Hill or Reabold Hill. The panorama encompasses not only the surrounding suburbs but also provides superb vantage over the Swan River's meanderings, and an unsurpassed seascape over the Indian Ocean, Rottnest and other islands (Seddon, 1970). The Buckland Hill area was the site of the University endowment block which consisted of 56 hectares. The land was recently sold for residential development.

A water reservoir was built on Buckland hill at the turn of the century. The Water Authority reconstructed the reservoir on top of Buckland Hill in the 1980s, a road leading to a parking area just below the summit was constructed to allow motor vehicle access to the area.

Cypress Hill at North Fremantle was used as an accommodation site for a large number of permanent soldiers at the turn of the century (Lee, 1979).

Cantonment Hill at Fremantle was named after the cantonment established on this site by the 3rd regiment, first colonial militia in 1829 (City of Fremantle, 1992). The hill was a popular picnic spot for the early residents of Fremantle because of its panoramic views. The area was quarried for construction material at the present site of the Army Store on Canning Highway. The present tower was the Fremantle Port Authority Signal Station until 1964.

The site of the present day Stirling Bridge was the location of the Drivers (Castlemaine) Brewery. It was also the location of the large homestead built by Thomas Carroll, a ship builder, which after many years of deterioration has been converted into 'The Left Bank', a pub and restaurant. Small yacht building companies were located along Preston Point (Lee, 1979).

Blackwall Reach was not well developed and was relatively inaccessible. A tram service was built in 1915 to bring visitors to the area, however this venture was not very successful except in the summer months when it was a relatively popular picnic spot. One of the attractions and source of adventure to the local children were the tunnels and caves of the limestone cliffs (City of Melville, 1986). Many of these tunnels have since collapsed or been blocked off.

Last century, various canals were cut into the Point Walter Spit to reduce travel time. Most of these canals

quickly silted up, however Alfred Waylen cut the most long lasting canal in the 1930s which silted up 20 years later. This topic is further discussed in Precinct 5.

Point Roe was named after John Septimus Roe who had a 5 hectare grant here in 1831 (Seddon, 1970). Further land use for this area is discussed in Precinct 3.

Present Land Use and Social Patterns

Residential development is a significant land use along the foreshore of the precinct. The suburbs of East Fremantle, Bicton, North Fremantle and Mosman Park have boundaries which extend to the foreshore reserve. Much of the development in East Fremantle and Bicton is medium to high density housing built from 1950s onwards (Ecoscape, 1993). The North Fremantle and Mosman Park suburbs have residences which have been built earlier this century. The residential development is an important factor in the estuary's landscape as it is a prominent land use which dominates the visual landscape. One of the recent estates to be constructed was on University endowment land which was sold to private developers for the Buckland Hill housing estate.

The main commercial activities found on the precinct's foreshore area include restaurants and cafes. There are commercial marine activities also located along the Point Preston and North Fremantle foreshores, including boat building facilities and marinas. The defence centre is located in the Leeuwin Barracks at Preston Point and covers a large area of the Point.

The Stirling and Fremantle Traffic Bridges are dominant elements and were built in 1974 and 1939 respectively. The North Fremantle bridge was built in 1867 by convict chain gangs who were used to cut the limestone foundations and construct the bridge.

Recreation nodes

The precinct area's foreshore provides a location for both active and passive recreation uses. There are a number of formal sporting reserves, such as the ovals at Preston Point, which are used by local sports clubs. The precinct has two golf courses at Melville and Chidley Point. which retain some native vegetation as part of 'the rough'. Yachting and rowing clubs in this precinct are the Swan Yacht Club, East Fremantle Yacht Club and Fremantle Rowing Club. Parks and recreation reserves include J. Dolin, Riverside Reserve, John Tonkin Park and Preston Point Reserve. These reserves and other open spaces are popular locations for various outdoor pursuits such as walking, jogging, nature studies, picnicking and sightseeing.

Popular swimming places are at Blackwall Reach, Mosman Bay, Preston Point and Bathers Beach. Snorkelling is good near the sand bank at Rocky Bay. A ski boat area has been designated adjacent to the reserve at Mosman Bay. Fishing, crabbing and prawning take place all along the river's edge, off the jetties and under the Fremantle Bridge.

There is provision made for a dual use path along Blackwall Reach, through Bicton to the East Fremantle foreshore. Another dual use path from Rocky Bay to Point Roe provides for pedestrians, cyclists and skate boarders. The old Rottnest Ferry Terminal is located on the eastern side of the Fremantle Bridge. This jetty although used by some ferries has largely been replaced by the new port at North Mole.

Public access

Public access to the foreshore varies throughout the precinct. There is a foot trail along the foreshore adjacent to Jerrat Drive in East Fremantle. Access is possible all along the North and East Fremantle foreshore except through the Army's Perth Water Transport Unit on Wauhop Road and the Water Police Headquarters at Pier 21. Pedestrian access is greatly restricted by the activities of the yacht clubs.

There is a dual use path along the southern water's edge which provides both cyclists and pedestrians with immediate access to the river edge. On the northern side of the river the dual use path extends from Rocky Bay to the CSR site.

The cliffs, steep embankments and often dense vegetation along Rocky Bay and Minim Cove present a natural barrier to the foreshore. However, Rocky Bay and Blackwall Reach have certain spots along the limestone cliff favoured by young people for diving and jumping off.

PRECINCT 1

Dominant Landscape Characters and Significant Viewscapes

N

100 0 200 400

Metres

LANDSCAPE CHARACTERS

Industrial

Suburban

Significant Viewscapes

INDIAN OCEAN

FREMANTLE HARBOUR

ROUS HEAD HARBOUR

Rous Head

Arthur Head

PRECINCT 2

PRECINCT 2

SWAN RIVER

Pt Brown

Stirling Bridge

Fremantle Bridge

CANNING HWY

EAST ST

VICTORIA ST

QUEEN ST

ORD ST

PARRY ST

ADELAIDE ST

HIGH ST

MARKET ST

SOUTH ST

NORFOLK ST

TCE

ALMA ST

CLIFF ST

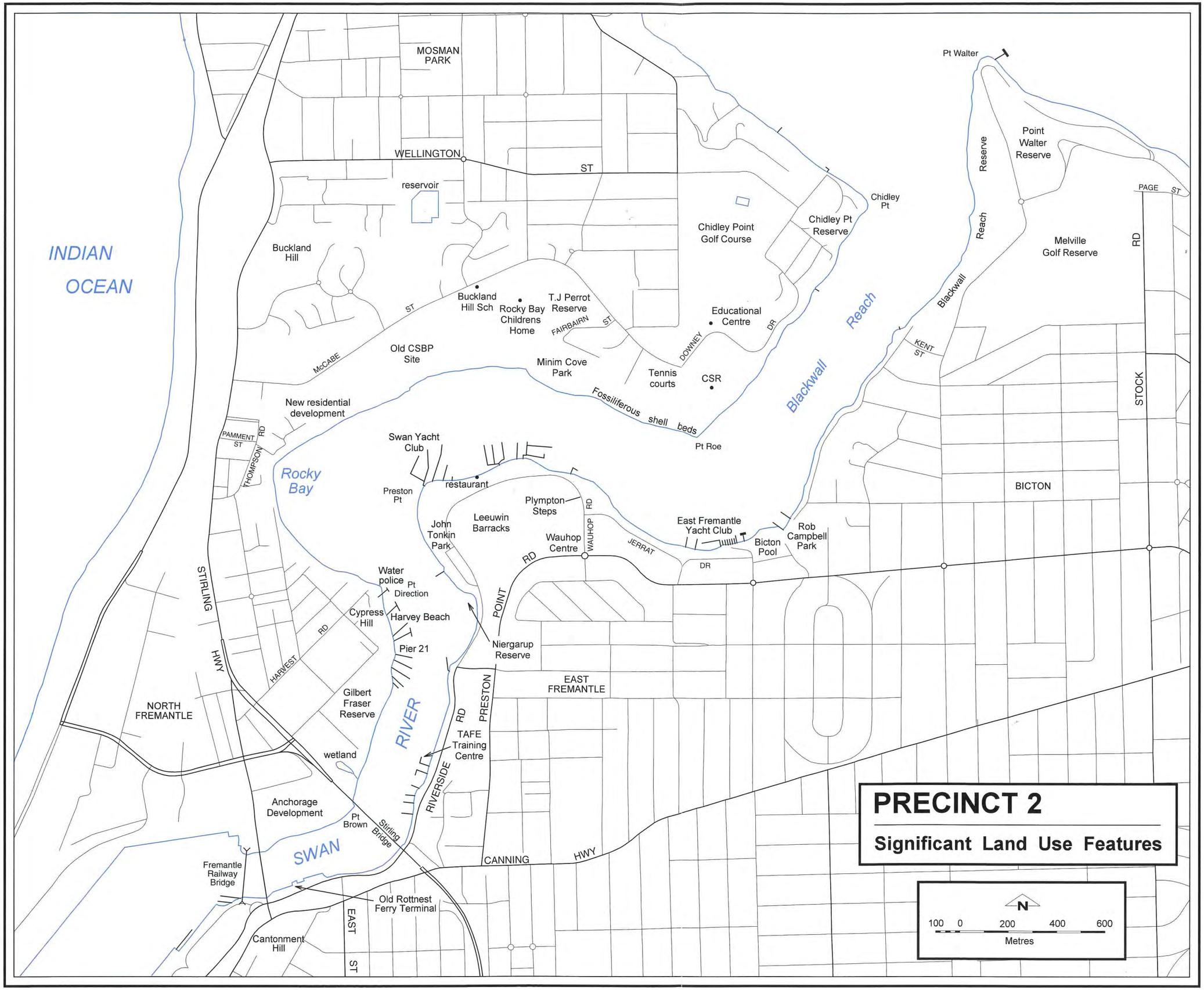
FLEET ST

PORT BEACH RD

ROUS HEAD RD

VICTORIA QUAY

RD


INDIAN
OCEAN
MOSMAN
PARK
WELLINGTON
ST
reservoir
Buckland
Hill
Buckland
Hill Sch
Rocky Bay
Childrens
Home
T.J Perrot
Reserve
FAIRBAIRN
ST
McCABE
ST
Old CSBP
Site
Minim Cove
Park
Tennis
courts
DOWNEY
DR
Educational
Centre
CSR
Chidley Point
Golf Course
Chidley Pt
Reserve
Chidley
Pt
Pt Walter
Point
Walter
Reserve
Reach
Blackwall
Melville
Golf Reserve
PAGE
ST
RD
STOCK
KENT
ST
Blackwall
Reach
Fossiliferous shell beds
Pt Roe
New residential
development
PAMMENT
ST
RD
THOMPSON
Rocky
Bay
Swan Yacht
Club
restaurant
Preston
Pt
Plympton
Steps
RD
WAUHOP
Leeuwin
Barracks
John
Tonkin
Park
Wauhop
Centre
RD
JERRAT
DR
East Fremantle
Yacht Club
Bicton
Pool
Rob
Campbell
Park
BICTON
STIRLING
HWY
Water
police
Pt
Direction
Cypress
Hill
Harvey Beach
Pier 21
RD
HARVEST
POINT
Niergarup
Reserve
EAST
FREMANTLE
NORTH
FREMANTLE
Gilbert
Fraser
Reserve
RIVER
RD
PRESTON
TAFE
Training
Centre
wetland
RIVERSIDE
Anchorage
Development
Pt
Brown
Stirling
Bridge
SWAN
CANNING
HWY
Fremantle
Railway
Bridge
Old Rottnest
Ferry Terminal
EAST
ST
Cantonment
Hill
PRECINCT 2
Significant Land Use Features
N
100 0 200 400 600
Metres

Vehicular access to the river is well provided by the residential nature of the area. There is a large carpark at the Rottnest Ferry Terminal and parking is available on Tuckfield Street. There is both private and recreational parking at the various sporting clubs and commercial outlets.

Boats and other small craft can access the river using the boat launching facilities and marinas along the river banks.

Sites of Nyungar & Wider Australian Community Significance

Nyungar Significance

This precinct is part of the Mooro district, which at the time of the establishment of the Swan River Colony was the *boodjar* or land of Yellagonga (Lyon, 1833). This area was bounded by the sea on the west, by Melville Water and the Swan on the south, by Ellen Brook on the east and by Moore River *(Gyngoorda)* to the north. Before colonisation, the area was abundant in food, shelter materials and water. There was an important route from the Perth area along the north bank to North Fremantle. It continues to be a location favoured by Nyungars (Gibbs, 1988). At North Fremantle, the water was shallow enough to swim across to the southern bank where the route continued south to Bibra Lake, Rockingham, Mandurah (place of trade and exchange) and the Murray River. Point Preston is known as *Niergarup* to local Nyungar. This means 'the place where the pelicans are located' (Collard *et al*, 1996).

At Minim Cove, a smooth granite stone was found some feet below the present land surface in an area covered by undisturbed bush. It appears to have been carried from the Darling Range and used for pounding. This suggests that this area is a Nyungar site of some age and importance (Gibbs, 1988). Tools made from small chips of quartz and chert found at Minim Cove have been dated to 9930 years old (Clarke & Dortch, 1977). Minim Cove would also have been a camping ground and a fishing site for Nyungars who stayed in the area while waiting for low tide to cross the river.

The Cantonment Hill area has been identified by Collard *et al* (1996) and Gibbs (1988) as *Dwerdaweelardinup,* meaning 'the hill where the spirit dogs guard the river entrance' or the 'place of dingo spirit'. The exact locality of the named area is in need of further research and analysis. The Fremantle City Council (1992) notes that Nyungars have recently identified the Old Traffic Bridge site as the place where the Dingo Spirit *Doodaroo* lives. Nyungars have a special *kowin middar* or corroboree for this spirit. Collard *et al* (1996) note that local elders have recently described the story of the seven dogs who guarded the mouth of the river. In this story a crocodile, travelling from the north attacked the dogs. One of the dogs bit off the tail of the crocodile. The crocodile sank to the mouth of the river forming the rocky bar at the river mouth.

It is recorded that a number of fresh water springs in this precinct were used by local Nyungar. One spring, which no longer exists, has been recorded as once being located at a site adjacent to the present day East Street (Gibbs, 1988). Two sites where water sources were used by Nyungars are recorded to have been in the vicinity of Blackwall Reach. The exact location of these sites is unknown (O'Connor *et al*, 1989). The area is known as Jenalup by Nyungars and refers to 'the place where the feet make a track' (Collard *et al*, 1996).

Two caves at Rocky Bay (*Garungup)* are believed to be the final resting place of the rainbow-serpent Warkle or Waugal, who created the Nyungar and their world , before it made the tunnel underneath out to the Gabee - Warden or the Indian Ocean. The rainbow-serpent slept at *Garungup* after it had created the local hills 'Seven Sisters' said to be the back of the Waugal (Ansara, 1989). Before this time, the Waugal made the Avon River, got sunburnt, constipated and had to shake off its skin. The stones at *Garungup* represent its hard-baked excreta. The name means the 'place of anger' or a place to be avoided (Collard *et al*, 1996).

Other significance

The Western Australian Museum has identified a circular limestone structure which formed the base of a capstan on the southern side of the river, east of the Fremantle Bridge. This was used to pull large boats out of the river for repairs and to tow barges (Tuettemann, 1991).

The precinct has had many popular picnic and

recreational spots. These locations have changed with changes in land use. Harvey Road beach and jetty was a local recreational node and a point for swimming lessons for the North Fremantle children. Areas, such as Minim Cove, are recorded as being popular with picnickers and are significant in the local history of the area. Some areas, such as Blackwall Reach, remain to this day as important regional recreation sites.

Minim Cove is an important location of scientific value. The fossiliferous shell beds represent one of four separate marine transgressions in the Swan estuary that occurred in the Middle to Late Quaternary times. The sites include highly diverse and rich fossil remains and are of important palaeontologic and stratigraphic significance. The sites are important research areas and valuable teaching areas (Clarke & Dortch, 1977).

Thomas Carroll House at Fremantle was constructed in 1900 and the two storey limestone and iron house is registered with the National Trust.

Hillcrest was built in 1890s for Francis Pearse. The facade is classified by the National Trust.

There are several wrecks in the river at Fremantle including the Carnac (built 1929), Eva (built 1879) and the Priestman Grab Crane (1945). The Mayfield (built 1899) is sunk at Rocky Bay. At the Black Wall Reach, the wrecks include the City of Perth (1872) and two steel barges (Thurlow *et al,* 1986).

Conservation areas

Wetlands

There are no conservation wetland areas in this precinct, although the Minim Cove and North Fremantle small wetlands are incorporated into local government management plans.

System six

M55 - Buckland Hill, Mosman Park.

This land was identified as being important for two main reasons. Firstly, it has historic value, as it was identified as one of the sites Captain Stirling chose for the Swan River Colony. Secondly, it was until recently the only large undeveloped area (apart from Kings Park) on the Stirling Highway north of the river. It was recommended that a management plan be developed for the area, in particular, encouraging the growth and regeneration of the area and retaining the open nature of the area (DCE, 1983). Two-thirds of the area has been developed for housing and the remaining portion is included in a management plan (EPA, 1993b).

M56 - Foreshore Reserves, Mosman Park.

Three reserves at Childley Point, including the golf course, were identified for their conservation and recreational value. Regional park recommendations were made for this area. This area is still being considered for a regional park plan by the MFP.

M57 - Minim Cove Foreshore, Mosman Park.

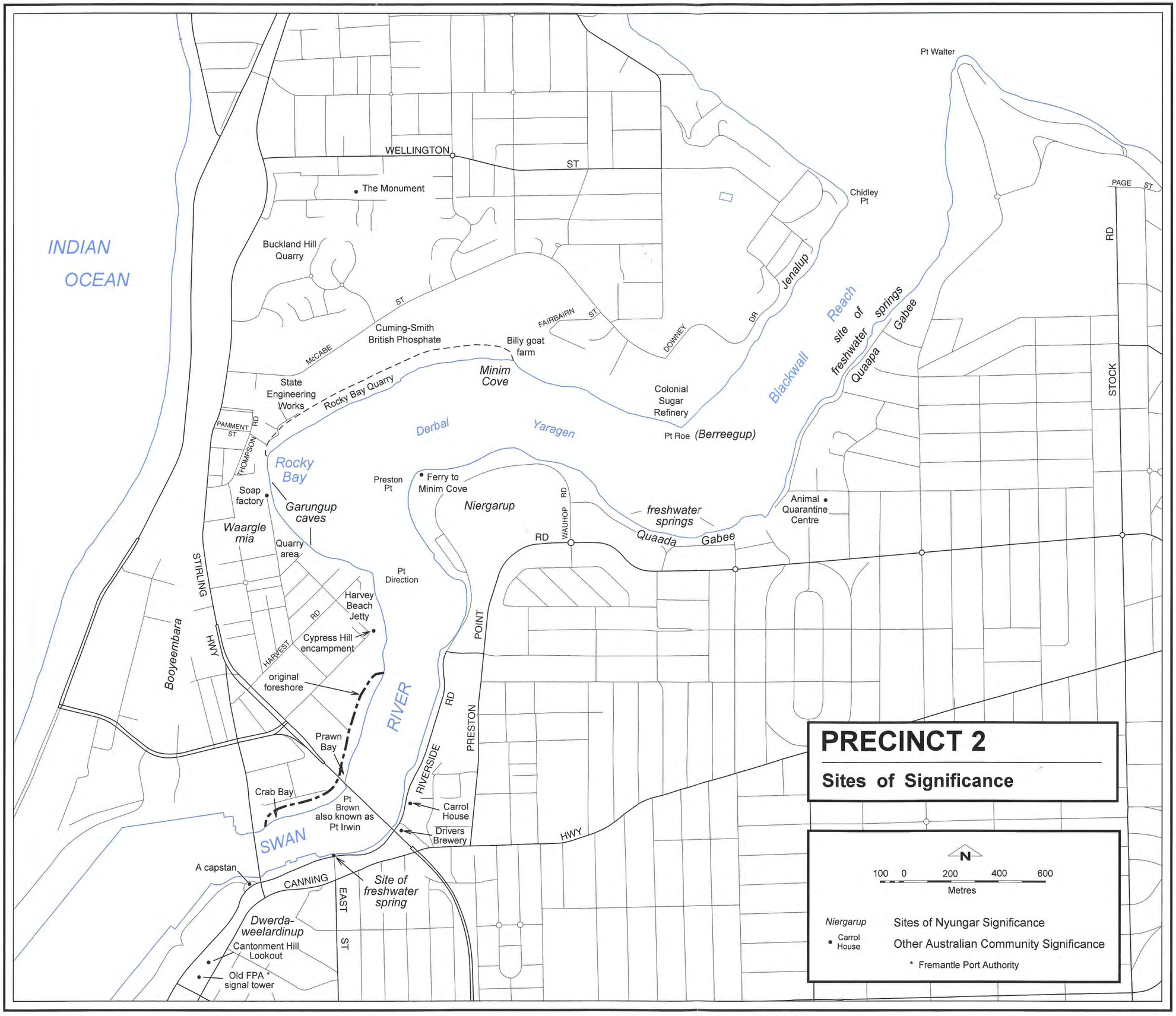
The area contributes to open area space of regional significance because of its high conservation, recreational and educational value. It has fossiliferous shell beds in the exposed cliffs which are an important geological site. The management of the site is still being considered and the Swan River Trust has recently produced a fact finding report to assist with further management decisions.

M71 - Cantonment Hill Fremantle.

The site has historical value as one of the first named sites in the region and the early Fremantle town used the location as a point of embarkation for local ferries. The area is a remnant of natural open shrubland. The local authority has a management plan for the area.

M58 - Blackwall Reach Foreshore, Bicton.

Blackwall Reach contains the only relatively untouched area of river limestone left in the region and provides high conservation and recreation value. Part of the area has been declared a Conservation of Flora and Fauna Reserve and the local authority has a management plan.



PRECINCT 2

Sites of Significance

N

100 0 200 400 600

Metres

Niergarup Sites of Nyungar Significance

• Carrol House Other Australian Community Significance

* Fremantle Port Authority

Precinct Description

Waterform

In this precinct the Swan River channel is on average approximately 500 metres wide. It takes the form of a visually straight channel up to Pt Direction before the water opens into Rocky Bay. There are two small bays which indent Preston Pt giving the promontory a scalloped neck. From the northern bank at the old CSBP site, the viewer is presented with a visually balanced water body as the river curves around Preston Pt. The river is equally wide on either side of the Preston Pt which makes the u-shaped meander a dominant feature of the precinct. The river curves around Pt Roe to a visually straight channel along Blackwall Reach to Chidley Pt. On the smaller scale there are slight undulations in the channel which create visual interest.

Natural riparian zone

There is a small wetland adjacent to Stirling Bridge. The area of inundation has a narrow channel leading to the river and occurs on a flat sand bank. North Fremantle has a flat tide-scalloped beach face which is very narrow (less than a metre). There is another similar sandy beach at the western side of Point Preston, however, this has a steeper gradient. Other small areas of gently sloped sandy beaches are dotted along the Bicton and Pt Walter Reserve foreshore. The Pt Walter spit extends from the point towards Keanes Point. This provides a long linear feature which attracts the viewer's attention and divides the water body visually as well as physically. At Minim Cove, there is small wetland area which is seasonally inundated. Here rocks emerge from a sandy beach and the shape of the beach appears to be quite natural compared with the adjacent areas. Much of the riparian zone near CSBP has limestone blocks which have broken off from the cliff or limestone which has been dumped into the water as rubble from the levelling of the hill. These rocks have not been subject to long term weathering so their shapes are unnaturally blocky and regular. Along Rocky Bay the river runs along the curved limestone cliffs. There are several rocks emerging from the water which gives the water junction a jagged uneven effect.

Landform

North Fremantle has a flat topography adjacent to the foreshore, which gently rises to the steep hilly form of Point Direction. Similarly on the southern bank the Preston Point area has a flat promontory which rises to the more gently curved hill crest. The steeply sloping undulating hill at East Fremantle has an exposed vertical (5 metres) face which extends to the adjacent Tonkin Park boat ramp. Here the slope becomes increasingly gentle and the land appears to spread into a flat headland from a visually steeper and undulating land mass.

Rocky Bay is characterised by a limestone cliff face which has been heavily eroded to form pinnacle shaped rocks as part of the face. At the base of the cliff, the water action has undercut the limestone giving a small shadowed ridge above the water line. The weathering has created a jagged texture and the limestone is mottled from dark grey to cream. The overall horizontal line of the cliff is sinusoidal as it dips in the centre due to probable quarrying in the region of the old Soap Factory. Blackwall Reach has a long stretch of cliff face which has a height of approximately 10 metres. Like Rocky Bay, the limestone has been weathered into pinnacles which in certain places are the highest point of the cliff face. These pinnacles are more distinct from the cliff face and give the limestone wall an undulating effect along this stretch of the river. Behind Blackwall Reach is a gently undulating hill which rises from Kent St and then tapers towards the Pt Walter spit. Adjacent to the reach is a large limestone hill which has an exposed limestone face.

On the northern side of the river, the landform has been dramatically altered from its original form of seven hills. At present, the old CSPB site and adjacent land is undeveloped. The land is currently cut into flat terraces which are devoid of any interesting undulating form and are unnatural. The hill has a steep face adjacent to the river, which is made up of small rocks used as a retaining wall. From Pt Roe, the hill face is steep and some of the original limestone cliff face is still present, although most of it is in the form of broken rock pieces. Chidley Point appears to stick out from the northern bank due to a slight indent in the hill to form a small bay adjacent

to the point. The background landform is the remains of Buckland and Monument Hills which rise above the Rocky Bay area. These have sharp quarry faces which contrast with the naturally gently sloping unquarried sides of the hill.

Vegetation

At North Fremantle there have been efforts to revegetate the wetland with native species.The bushes are rounded and have a soft dusty texture due to the small leaves. At present, the stand is immature and as a result the dominant ground cover is lawn.The wetland at Minim Cove has some native wetland species, however, the area has also grasses and other weeds which detract from the naturalism of the wetland community.

The areas west of the Stirling Bridge and the old Rocky Bay industrial area have been recently cleared of their last land use and as a result vegetation is sparse. Weeds, such as fennel and caster-oil bushes, are the dominant vegetation type and these form solitary clumps on the bare landscape.

The steeply sloping limestone faces, such as Rocky Bay, East Fremantle, Cantonment Hill and Blackwall Reach Parade, have small shrubs dotted on the cliff face. The oval forms of the bushes rarely overlap and due to the small sized leaves, have a soft blurry texture against the exposed rock. Along Riverside Road, the hill face is covered by a mix of native bushes and exotic plants. These provide a horizontal green band along the roadside. Minim Cove Park, Chidley Point and Blackwall Reach are visually dominated by native shrubs and trees. This vegetation extends to the cliff face and in more gently sloping areas reaches to the water in the form of small bushes. These three areas, although not in pristine condition, provide the area with a visual focal point and suggest pockets of natural landscape.

Lawn and parkland areas occur along Riverside Road, North Fremantle Preston Point, the ridge of Rocky Bay and Campbell Park. These provide visually smooth open areas of green lawn. They attract the viewer's attention due to the visual uniformity of the area. These parkland areas are well maintained and are indicative of their land use. Exotics, such as date palms and pine trees have been evenly planted along the river. They are regular in spacing and height and give the effect of an ordered urban environment. The residential areas are characterised by predominantly exotic species which are usually planted in the visual form of Anglo-Australian parkland design or other patterns which are indicative of a maintained and controlled environment. This vegetation planting is in keeping with the suburban land use and gives visual distinction from adjacent areas such as Blackwall Reach.

Riparian land use

The foreshore along East Fremantle and Bicton is mainly retained by limestone walls. These are built in block form and on average are one metre high. They restrict the river from cutting the foreshore and give a confined and structured urban nature to the riverine landscape. Due to the collapse of the limestone cliff adjacent to the new residential area at Rocky Bay, there have been attempts to build a sloping vegetated retaining wall. Although the small rocks are unnatural shapes, they are consistent in colour and material with the limestone cliffs. The most dominant features in the riparian section are the boat jetties at Swan Yacht Club and the Boardwalk complex. These stretch out into the river approximately half way and are balanced on either side of the Preston Pt headland. They provide a visual focus point as the crowded, angular, white forms of the boats form two large shiny white nuclei in the river. The angular shapes of the Boardwalk roofs are consistent with the angular forms of the boats. The Swan Yacht Club is less visually harmonious, however its style suggests functionality. East Fremantle Yacht Club is less visually intrusive as it does not extend into the river as much as the other marinas and is in a bay of the river. The jetties at Pier 21 and other complexes are relatively small and consistent with the river orientated land use.

Land use

The Railway, Fremantle and Stirling Bridges are visual and physical barriers. They are dominant features which cut the river and landscape into sections. The Fremantle Bridge has a solid structure and is of Federation style. It acts as a gateway to the historic buildings in the area and is important in setting the mood of the historic city. The Railway Bridge is simple and although not conforming with the style of the Fremantle Bridge, it is visually

consistent with the adjacent industrial harbour precinct which has functional, angular, steel forms.

The Stirling Bridge is a large modern structure and was built in 1973. It has wide caps and piles and the super-structure is a thick concrete body. The viewer adjacent to the bridge will see an isolated and dominant structure over the river, while to the driver over the bridge, the structure will be visually insignificant as the spacing of the railings is such that they blur at driving speed.

Leeuwin Barracks is a prominent land use at Preston Point. It consists of mixed colours and styles surrounded by manicured lawns. There is a visual line between the Barracks and the East Fremantle residential area. The two land uses are visually separated by the wide, flat and uniform area of Wauhop Park ovals and Preston Point Road. There are no large trees in this area which would help soften the line. The viewer's attention is drawn to the crest of the hill, as it has a strong linear form and rises above the surrounding residential area.

Along Blackwall Reach Parade, there are a number of residences which have been built on top of an exposed steep limestone hill face. These are visually inconsistent with the landform as their bold, modern and brutalist styles stand out from the curve of the hill. As the limestone vegetation is small and shrubby, there is not enough vegetation height to soften the line between the houses, retaining walls and the hill. The result is a visual incontinuity which is continued with the planting of palms and other exotics which draw attention to the houses rather than blend them into the landform. Beneath these houses there are more houses which are similarly at odds with the landform. Most have been built by quarrying large flat faces into the limestone. These scars can not be hidden by vegetation due to the lack of soil on which mature trees can develop. The buildings are mixed in style, the majority having building materials which are in contrast to the limestone colour and texture.

Residential areas such as those around Campbell Park and Kent Street, Bicton and Riverside Road are more in sympathy with the landform. The houses and units are built in the valleys of the hills or back from the cliff edge. This allows vegetation to be planted around the homes which mutes the linear forms of the houses. The houses are built in a layered effect as the natural gradient steepens, therefore providing visual interest. Although the styles and building materials are mixed this provides interest in the context of a suburban land use.

Buckland Hill estate was made available to developers in the late 1980s with the sale of the University endowment land. The resulting development was an expensive subdivision which has typically large modern designs. Due to the windy and salty nature of the location only salt tolerant vegetation grows in the area. There has been an unsuccessful trans-planting of date palms at the entrance of the estate.

Rocky Bay and the Minim Cove area are currently being redeveloped. At present, there is a cluster of red brick flats which perch on the cliff face. These are slowly being replaced with small architecturally interesting units, whose building materials and colours are more consistent with the limestone cliff faces. This new building project has had a positive effect on the residential nature of the Rocky Bay, and it is clear that the mistakes of building houses which do not enhance the landscape have been recognised by these planners.

Nine large blocks have been allocated between Thomson Road and the river. These have not yet been built on, however, curved roads and underground electricity cables are in place. The land is still flat from previous land use and it would have been beneficial to terraced it to provide interest in building height, however, the results of this land release have yet to been seen. Similarly, the old CSBP site has not yet been landscaped. Mosman Park City Council has developed a landscape management plan (1990) which addresses the need to provide a harmonious landscape. At present, a terraced retaining wall is the dominant feature of the cleared blocks. The CSR building is a old style factory which has historic significance. The red brick and iron sheet building is hardly evident due to surrounding mature trees which soften the verticalness of the building. The buildings themselves have long been a familiar landmark on the river, and are of a scale and form well suited to mark their prominent site at Point Roe. They are good expression of directly functional industrial architecture.

Landscape Interpretation

Dominant Landscape Character

This precinct has a very complex landscape character. Originally, the landform would have been a Cottesloe landscape character with low open woodland and shrublands on a hilly limestone landform. There is a section of this natural landscape character at Blackwall Reach where the remnant vegetation and visually minimal land use is evident. At present, the major landscape character is suburban. There is variety in the suburban landscape character due to the prominent limestone outcrops and cliffs which provides a interesting natural landform on which the suburban landscape has been created. A difficult area to classify was the old CSBP site which was originally an industrial landscape, however has recently been cleared. The site is currently being redeveloped into a suburban development, however due to its transitory landscape character it does not neatly fit into the classification and has been identified as been a modified landscape.

There is a narrow viewscape which can be classified as industrial landscape character at Rocky Bay. This is due to the few light industrial buildings and the now residential Soap Factory. There is a section of industrial character west of Fremantle Bridge. The old warehouses and sheds are soon to be redeveloped into a commercial and residential area. The CSR buildings give an industrial landscape to a small portion of Point Roe. Unlike the other industrial landscapes of the area, the buildings style and remnant vegetation communities make a less intrusive industrial character.

At Gilbert Fraser Reserve, Point Roe, Blackwall Reach and Preston Point, the dominant landscape character is recreational. The first three sites are open space or parkland in nature, however at Preston Point the recreational character is derived from the yacht clubs and sporting fields.

Significant Viewscapes

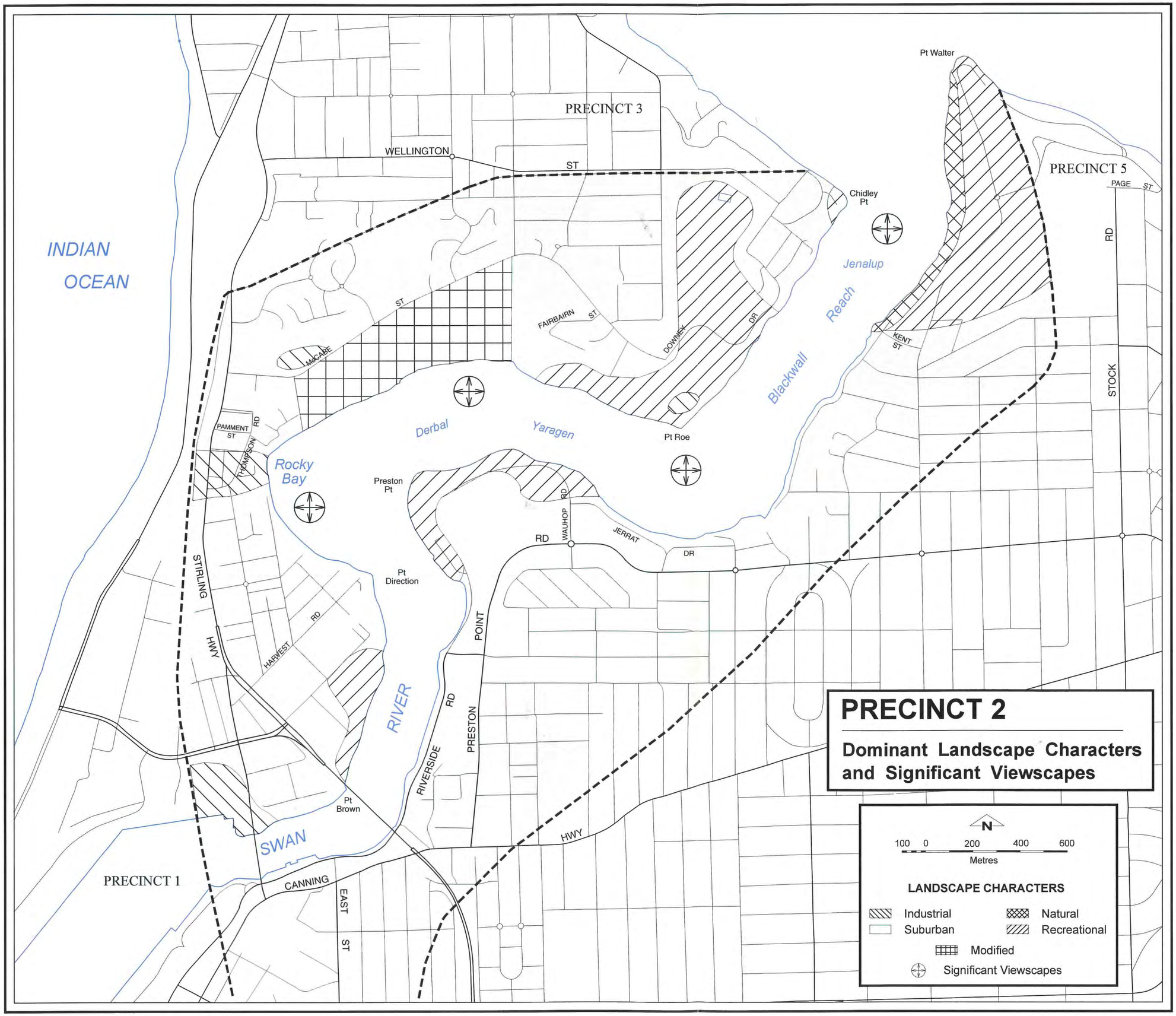
This section of the Swan River has several attractive viewscapes due to the raised nature of the limestone cliffs, remnant hill forms and the wide meandering nature of the river. From the river or foreshore, the viewer is presented with relatively short segments of river before it meanders around a promontory or point. In most sections of this precinct, the river curve is emphasised by the cliff line such as Rocky Bay. The view from Minim Cove to Point Preston is a well balanced viewscape with the river curving around the point with almost equal widths of water on either side of the Point. There is a gradual rise and fall of the Cottesloe dune form and this hill peaks in line with the centre of Preston Point. From Preston Point, the viewscape is not as spectacular due to the present preparation of the land for residential development. Several tracks and quarried rock faces detract from the viewscape. In addition, the prominent powerlines and several unattractive warehouse can be seen. From several locations along Blackwall Reach the view is framed by the limestone outcrops and the steep slopes of the opposite bank.

Conforming and Non Conforming Elements in the Landscape

Harvey Beach was a popular swimming spot for the local North Fremantle community and it has great potential to once again be an important recreational node to the local community. It is important that the beach remains easily accessible and the new urban development adjacent does not give the impression that the beach is private. At present, the beach has an enclave character which could be retained by ensuring that vegetation and adjacent land uses are retained in sympathy with this feature. The rocky foreshore and minimal intrusion of surrounding land uses are important features in the North Fremantle area.

Vegetation at Rocky Bay has been greatly improved as a result of local community groups replanting native species. Removal of some weeds which are detracting from the natural isolated clump forms of the native species would enhance the cliff landscape. It would also be advantageous to improve the grassed area in front of the Soap Factory by planting low form native shrubs. This would not inhibit the view of the houses behind the cliff and would eliminate the detracting lawn from the lie of the cliffs.

The old SEW site is currently being redeveloped. Developers and planners should recognise that the blocks could be staggered to create a more interesting landscape than the present flat surface. The redevelopment provides the opportunity to revegetate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McCABE ST
PAMMENT ST
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Significant Viewscapes

the slope with native species which would reflect the attractive and distinctive forms found at Rocky Bay.

The housing styles at Blackwall Reach Parade are an example of development which is not congruous with the surrounding landform. Similarly, the old Government Housing Flats at Rocky Bay are detracting elements in the environment. Adjacent new developments are more sympathetic to the landform.

Recommendations for Maintenance and Enhancement of the Present Landscape Character

- At present, the land beneath the northern bank of Stirling Bridge is unused and is dotted with derelict buildings and weeds. The new North Bank development will need to complement the surrounding historical and nautical character of East Fremantle to enhance the landscape character of this area.
- To enhance and create a natural landscape character, the Rocky Bay area and the new suburban area wall could be revegetated with native species. Their planting should be in a pattern/distribution that is similar to native species present on Rocky Bay cliffs.
- Further development at Blackwall Reach Parade should be discouraged as the landform is not suited for housing. Residences should be encouraged to grow native ground covers over retaining walls and it would be useful to consider a project to reduce the impact of cuts into the limestone face.
- Revegetation programs along Blackwall Reach should be continued and they should ensure that natural landscape character is maintained.
- Point Roe has a substantial amount of rubbish dumping of the vegetated cliff face. The vegetation would also be improved by re-establishment of native species and weeding.

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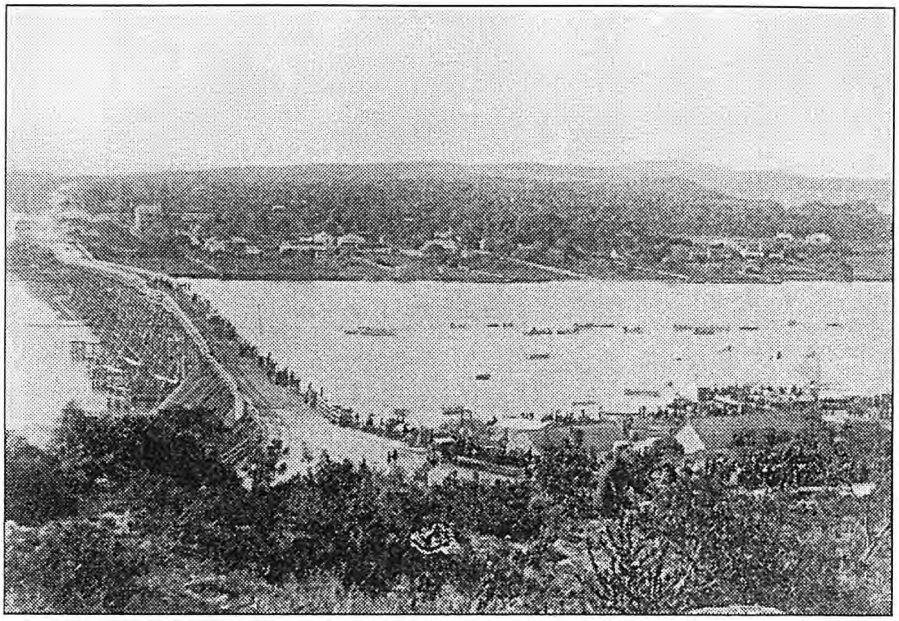

Fremantle Bridge. c1980.

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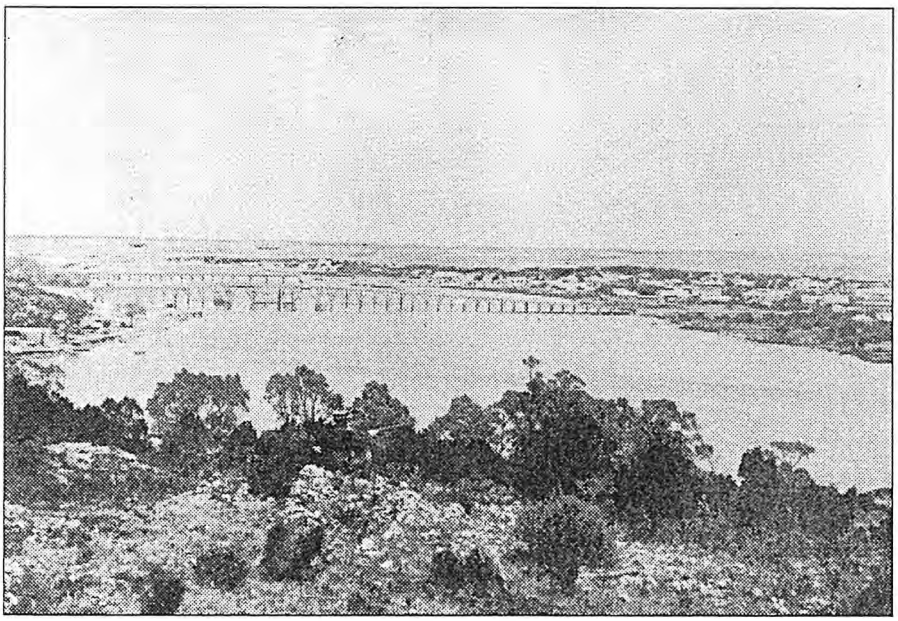

View from East Fremantle. c1890.

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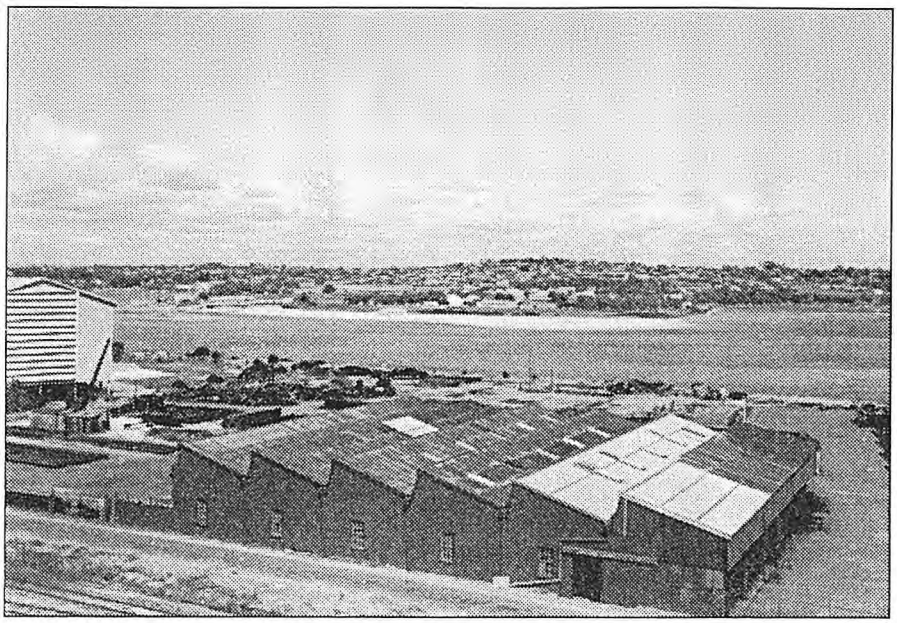
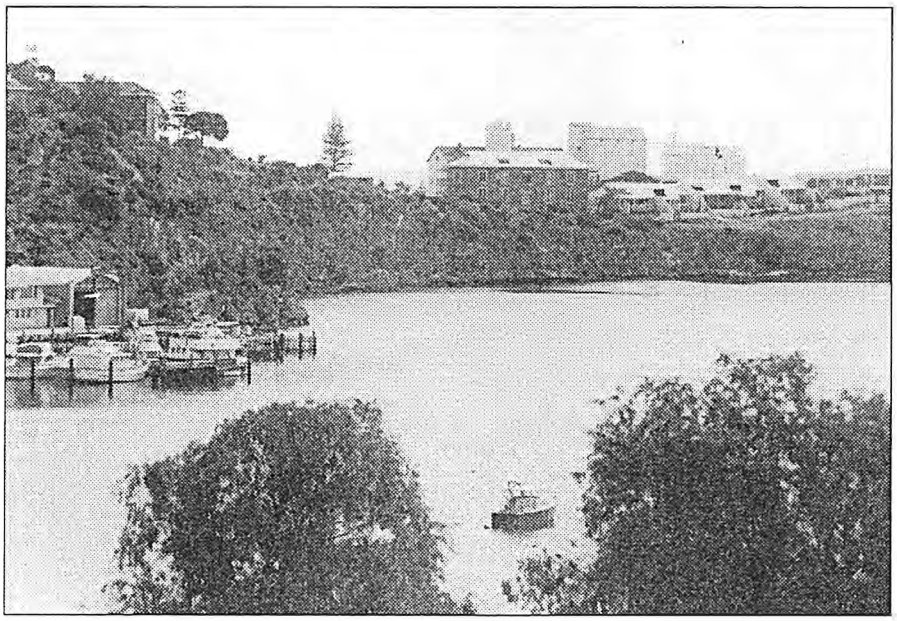


Preston Point from McCabe Street, Buckland Hill. Nov 1963.

Swan River Trust.

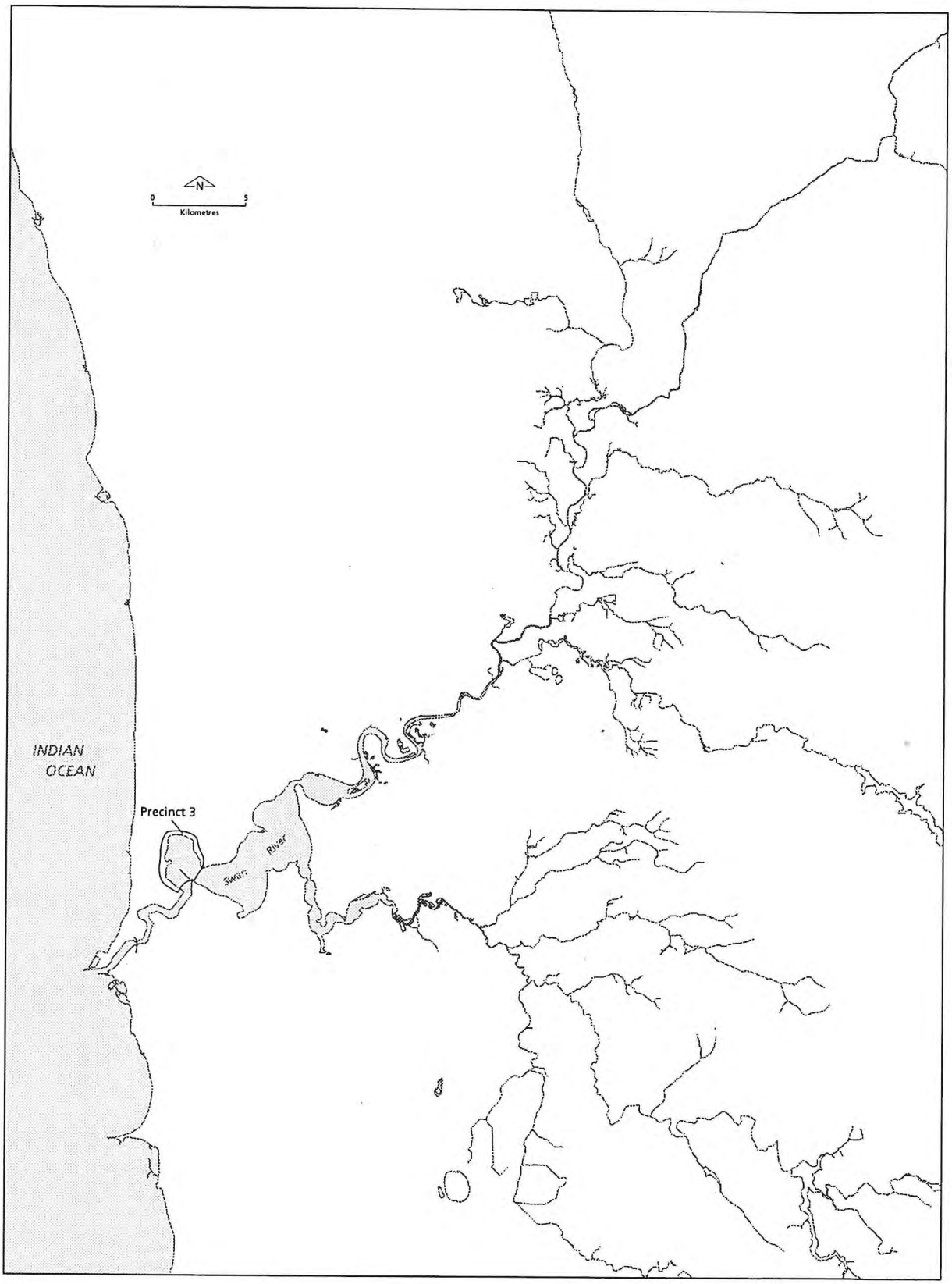


Blackwall Reach Parade, Bicton. c1996.

Swan River Trust.

Precinct 3

Point Roe to Point Resolution (Mosman & Freshwater Bays)



Summary

Point Roe to Point Resolution (Mosman & Freshwater Bays)

The precinct area is defined as between Point Roe and Point Resolution and including Mosman and Freshwater Bays. The area is characterised by the steeply sloping limestone landform upon which the residential areas of Mosman Park, Claremont and Dalkeith have been built. Much of the original limestone form has been cut by quarrying in the early history of the area and more recently with development of the residential areas.

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The section of river in this precinct is considered prime land as it has been historically been owned by the 'old' Perth families and notable business people. The greatly sought after properties have aesthetically pleasing views of the river's bays. In this precinct, much of the residential area encroaches right up to the high water mark or the cliff edge. This makes public foreshore access limited in places, however there are several wide foreshore reserves which encourage recreational activities. There are three yacht clubs and several rowing sheds along the foreshore. Water space is allocated for kayaking and water skiing. There are several reserves which are popular picnic spots and all of which provide panoramic views.

The regeneration of native species within the reserves has been encouraged by the local authorities, however most of the native vegetation has been replaced by residential gardens. The houses have a high degree of urban pride, however each house is an isolated entity in architectural and garden design. The visual unity is created by the spacing of the houses on the blocks which is relatively even.

Recently, a number of new houses have been built in areas such as Mosman Bay, which are at odds with the limestone topography. There are also a number of flats at Freshwater Bay which are multistorey and therefore are highly prominent on the landscape.

Biophysical Processes and Features

Geological Processes

Freshwater Bay is part of the Pleistocene Tamala Limestone geological unit, which is made up of cemented quartz dune sand and calcareous shell material (Seddon, 1972). One of the surface expressions of the Tamala formations occurs near Pindari Place, Peppermint Grove. Here the cliff face exposes the shell rock ,termed the Peppermint Grove Formation, which has been estimated as forming about 30 000 BC. The formation gives evidence that the river was a marine gulf rather than an estuary. Fauna that is representative of three different environments including open rocky shore or reef, sandy beach with moderate exposure and sheltered shallow marine gulf have been found (Seddon, 1970).

Overlying the geological unit are the Cottesloe and Karrakatta Soil Formations which are shallow and infertile. The Cottesloe Formation is made up of shallow yellow and brown sand, while the Karrakatta soil is a deeper formation. The boundary between these formations is approximately just north the Cliff Way and Richardson Avenue intersection (Swan River Trust, 1994).

Topography

The topography of the precinct ranges from relatively gently sloping terrain to cliffed foreshores. It is part of the geomorphological unit termed the Spearwood Dune System, which consists of a core of limestone overlain by yellow sand. There has been differential wind erosion to form two distinct landscapes associated with the Cottesloe and Karrakatta Soil Formations. The first has more exposed limestone and is less gently undulating than the Karrakatta areas.

Behind the foreshore is an undulating landscape of gentle low lying hills. At the western portion of the precinct between Green Place Reserve and Bay View Park, steep limestone cliffs rise up to 45 metres. There is a small valley at Chine Street. The centre of Peppermint Grove foreshore has contours of 5 -10 metres from the high water mark (AHD), which again rises to a cliffed section from Pindari Place, known locally as 'Devils Elbow'. The embankment has a small cave and adjacent to this the cliff has subsided due to an earth tremor in the 1970s. There are exposed solution pipes at Point Resolution which form pinnacle-like structures.

Hydrological Processes

Water features

Historically, freshwater springs existed at the base of the cliffs, hence the name 'Freshwater Bay'. One spring occurred at Keanes Point, Peppermint Grove' and another was adjacent to the present day Wilson St, Claremont. The springs are now less apparent or not present due to the extensive use of groundwater. Mosman Bay curves in a hook shape between Chidley Point and Keanes Point and the water body is separated from Freshwater Bay by the Point Walter spit which extends from the southern river bank towards Keanes Point. Freshwater Bay is approximately 1 km wide between Keanes Point and Point Resolution. At the centre of Freshwater Bay, there is a shallow sand bank known to the Nyungar people as *Karrakatta,* which has less than 2 metres of water over it.

Bathymetry

The bathymetry of Mosman Bay quickly falls to a depth greater than 5 metres just off the foreshore. Freshwater Bay reaches a depth of over 5 metres, however a bank in the centre of the bay is less than two metres in depth. There is a deep body of saline water which is flushed out only once every 20 years with heavy rain. With the winter rain the surface water becomes fresh while in spring the water is brackish. The area experiences an approximately 0.5 metre tidal range (Thurlow *et al,* 1986). The basin sediments are sand flats and sills (Thurlow *et al,* 1986). The grey silty sands are a mixture of fine and coarse particles which are derived from the offshore sea floor and relocated by tidal movements to areas such as Karrakatta Bank in Freshwater Bay (Riggert, 1978). Armstrong sandbank runs parallel to the Dalkeith-Nedlands foreshore and therefore the bathymetry is much shallower than that of the western precinct foreshore.

Flooding

Small retaining walls of limestone have been built along the beach, such as at Victoria Avenue, which has reduced the risk of flooding in these lower lying areas. Where the river is bound by the limestone

cliffs, there is no risk of flooding. It is believed that the low lying areas were originally subject to inundation during high water periods.

Erosion and accretion

The Peppermint Grove Shire Council has built a limestone retaining wall to combat wave erosion between Devils Elbow and Keanes Point (Seddon, 1970). There are several small beaches at the base of the cliffs and along Pt Resolution which are subject to minor seasonal erosion and accretion processes.

Vegetation Communities

Native

Cottesloe Complex

The natural vegetation complex of the western side of the precinct is identified as being the Cottesloe Complex (DCE, 1980). The complex would have ranged from a woodland of tuart *(Eucalyptus gomphocephala)*, jarrah *(Eucalyptus marginata)* and marri *(Eucalyptus calophylla)* to a closed heath on the limestone outcrops. The understorey includes chenille honeymyrtle *(Melaleuca huegelii)*, tangling melaleuca *(Melaleuca cardiophylla)*, hazel *(Trymalium ledifolium)*, spider net grevillea *(Grevillea thelemanniana)*, stinkwood *(Jacksonia sternbergiana)* and tree smoke bush *(Conospermum triplinervium)*.

Karrakatta Complex

At the eastern side of the precinct, the natural vegetation complex is classified at the Karrakatta Complex (DCE, 1980). This complex is predominantly tuart *(Eucalyptus gomphocephala)*, jarrah *(Eucalyptus marginata)* and marri *(Eucalyptus calophylla)*. The understorey consists of slender banksia *(Banksia attenuata)*, firewood banksia *(Banksia menziessii)* and bull banksia *(Banksia flexuosa)*. In addition, sheoak *(Allocasuarina fraseriana)* and peppermint *(Agonis flexuosa)* are found.

The types of communities that make up these complexes are described below.

***Juncus* communities**

A narrow fringe of shorerush *(Juncus kraussii)*, knotted club *(Isolepis nodosa)* rush are found along the foreshore at Mosman Bay, Point Roe and Point Resolution (SRT, 1994).

Among the shorerush communities there is a dense stand of swamp sheoak *(Casuarina obesa)* and Rottnest cypress *(Callitris preissii)* at Point Roe. A few peppermint trees *(Agonis flexuosa)* are dotted along the foreshore in amongst exotic trees.

***Dryandra* communities**

Dense heath remains on the limestone cliffs and supports cockies tongues *(Templetonia retusa)*, parrot bush *(Dryandra sessilis)* and the occasional coastal wattle *(Acacia cyclops)*. The understorey consists of mostly introduced species, but once would have been made up of small bushes and native grasses.

***Agonis* communities**

The open scrubland that is present at Bay View Road includes cockies tongues *(Templetonia retusa)*, parrot bush *(Dryandra sessilis)*, various *Acacia* species, peppermint trees *(Agonis flexuosa)* and honey-myrtle *(Melaleuca huegleii)*.

The dense scrub that once occurred in the precinct is reduced to isolated trees or small pockets of vegetation such as at Point Resolution. The understorey would have been represented by such species as zamia palms *(Macrozamia riedlei)*, Geraldton wax *(Chamelaucium uncinatum)* and kangaroo grass *(Themeda triandra)*.

***Eucalyptus* communities**

The woodlands were originally dominated by tuart *(Eucalyptus gomphocephala)*, marri *(Eucalyptus calophylla)*, flooded gum *(Eucalyptus rudis)* and Rottnest teatree *(Melaleuca lanceolata)* (SRT, 1994). Between Bay View Reserve and Butler Hump there are a number of remaining woodland trees including flooded gum, banksia and acacia.

Exotic

Much of the foreshore vegetation is grassed and planted with exotic species. However, the indigenous peppermint trees *(Agonis flexuosa)* have been planted along the foreshore north of Keane's Point. There are several dense stands of giant reed *(*Arundo donax)* along the foreshore. The precinct also has castor oil trees *(*Rinicus communis)*, domestic fig trees *(*Figus carica)*, olives *(*Olea europaea)* and Japanese pepper *(*Shinus terebinthifolius)*. There are several understorey species such as buffalo grass

*(*Stenotaphrum secundatum),* clover *(*Trifolium repens),* dandelion *(*Taraxacum officinale),* and kikuyu grass *(*Pennistetum clandestinum).*

Historical Land Use & Resulting Environmental Changes

At the suggestion of R.J. Yeldon, a member of the local Roads Board, Mosman Bay was probably named in recollection of Mosman in Sydney in 1907 (Seddon, 1970). The bay was originally considered part of Freshwater Bay and for a time was known as Samson Bay. It was also known as Quarryman's Bay, as between 1850s and 1900 convicts and other workers cut the sheer 30 metre cliffs for building material. The spoil was dumped into the river and large lumps are still evident today. Mosman Bay gave its name to the suburban town of Mosman Park, previously known as Cottesloe Beach and Buckland Hill. The early settlers in the area used old English descriptive terms for topographical and geological features in the Bay. The *Coombe* is an old English term for a valley and is now used as a street name.

Henry Prinsep bought a few acres for a holiday place and named it *The Chine* which refers to the collapsed solution structure and means 'ravine' in old English. He employed a quarry man to cut a cave for storage into the limestone. Adventurous holiday makers would camp in the cave or in tents. The quarryman is reputed to have etched into a nearby well and boulder in Greek (ΔΙΙΙΥΡΝΩΖΙΝ) meaning 'dip your nose in' which was not translated till years later. The cave is reputed to have been occupied in 1917 by Paul 'Bunny' Statham, a lands department draftsman, who travelled by canoe for part of his journey to work.

Green Place was originally an old colonial home which was used as a psychiatric hospital from 1916 for treatment of female alcoholics. The building was later closed and demolished.

Butler Hump was the original name for Keanes Point. John Butler (d. 1847) was granted 250 acres of land here in 1830, known as Prospect Place; he kept a halfway house or inn on the Perth-Fremantle Road near the present Albion Hotel. At View Street, where a freshwater spring occurred Butler built a wattle and daub farm. Here he built two lime kilns in 1835. By this time only six of the 250 hectares of foreshore flat were cleared for cultivation, and keeping pigs and goats. After the subdivision of the area the land at the point was bought by Mrs Lilla Keane in 1891. The promontory became widely known as Keane's Point, and the family homestead later became the clubhouse of the Royal Freshwater Bay Yacht Club. The southern boundary of Butler's grant met the river at a remarkable cave known as 'James Chair', evidently referring to Governor Stirling. The cave is no longer present although several similar caves are further upstream at Devils Elbow.

The Butler family sold their entire property (Swan location 84) for £1,200 to a syndicate of three men: George Leake, Alexander Forrest and Charles Crossland. The latter was a surveyor and he and a second surveyor, Hardy, subdivided the land for sale and the subdivisions became known as Peppermint Grove. It was not notably different in quality from a number of other sites around the river; for example Freshwater Bay was very similar, however, their subdivision plan was so enlightened that it has held its quality and, its economic value, ever since.

Freshwater Bay was first indicated on the HMS Beagle Map of 1841 showing the fresh water oozing through the base of the limestone cliffs (Seddon, 1970). Early settlement was concentrated at the north end of the bay where allotments were granted to the pensioner guards. The settlement was known as Freshwater Bay and is now known as Claremont. Freshwater Bay foreshore was a very popular recreational node in the latter part of the nineteenth century. There were a number of jetties and public baths along the foreshore and the grassed area was a popular spot for picnics. The present day Meads Restaurant was the site of the Smith's Boat Shed which for many years hired small boats and served food. This was demolished recently and the new restaurant was built in a similar style to the previous building. The Claremont Jetty (Chester Road) was a popular fishing spot, however it was closed and demolished. A new jetty was built in 1991 and the use of 'White Beach' once more as a recreation spot has been encouraged. Limestone was quarried adjacent to the Claremont Yacht Club last century and as a result the area has a level topography.

Point Resolution was named in honour of Captain James Cook's Pacific voyages in 1772-6 on the Resolution. The site had convict built buildings at its base which were later demolished (Williams, 1984). In 1860s convicts quarried back the foreshore cliff face for limestone. Olive and aloe plants on the level ground are surviving reminders of the convict encampment.

A large part of the precinct has been subject to clearing and residential development. The result has been the removal of the natural vegetation communities. These have been replaced by lawned parks and residential gardens. The foreshore vegetation has been dramatically reduced due to the restriction of local water inundation by a small limestone wall. This wall was constructed to reduce wave erosion along the Peppermint Grove foreshore to Warwick Street, Claremont.

Present Land Use and Social Patterns

The precinct is dominated by its residential use. The Mosman Bay cliff has recently been subdivided and old houses have been demolished to make way for new prestigious homes which extend from the cliff top to the foreshore. The flatter land extending out to Keanes Point has a mix of houses and units which vary in style and height. Peppermint Grove has mainly single homesteads on large blocks which are separated from the foreshore by The Esplanade. The suburb of Claremont is highly developed and in recent years there has been many subdivisions of the older larger blocks for new residences. There are a number of multistorey units, such as Continental Towers and Roseneath Units. Dalkeith's Victoria Avenue is considered to be on one of Perth's prime locations. The houses are typically surrounded by high walls and extend right down to the high water level (AHD).

Recreation nodes

Despite the foreshore being restricted in places there are several reserves which have facilities for picnics, lookouts and carparks, such as Bay View Reserve, Manners Hill, Bishop Road Reserve and Pt Resolution. Historically, the foreshore was frequently used as a swimming spot and this was encouraged by the presence of infrastructure such as jetties and baths. The Claremont Jetty was the site of the Claremont Baths (built 1903) and was a particularly popular swimming spot. At present, the river is a less popular swimming location, however, Freshwater Bay still provides for sheltered swimming. There are designated speed boat areas at Green Place Reserve, Claremont, and Pt Resolution. There are a number of parklands such as Manners Hill which provide important open space for the region.

Public access

Public access is limited along the Mosman Bay foreshore which has a steep embankment and very narrow public reserve. The adjacent residences make the foreshore difficult to access. However, Chidley Point and Green Place Reserve have a number of picnic areas and carparks which are quite often used. Royal Freshwater Bay Yacht Club restricts the pedestrian user along Butler Point. Public access is restricted along the foreshore in front of the Claremont Yacht Club which has several jetties and carparks. Unlike other yacht clubs, the land is owned by the club to the water's edge, although there are no physical barriers to people walking along the foreshore. A number of private landowners gain direct boating access from their Victoria Avenue properties. Two of the landowners have built boat houses on their land. The beaching of boats along Victoria Avenue impedes public access to the foreshore.

Much of the precinct is cliffed and therefore the pedestrian user can not easily access the water. However, Bay View cliffs have become a popular climbing spot and free jumping parasailing/ parachuting. For the less adventurous, there is a limestone retaining wall at Devils Elbow that has limestone blocks which act as stairs to access the foreshore.

Sites of Nyungar & wider Australian community significance

Nyungar significance

Willem de Vlamingh explored the beaches and cliffs of Mosman Park and Peppermint Grove on 5 January, 1697, and found a freshwater spring near the intersection of today's Lilla and Keane Streets, just within the boundary of Peppermint Grove (Tuettemann, 1991). This is probably near the spring

PRECINCT 3

Significant Land Use Features

N

100 0 200 400

Metres

CLAREMONT

HWY

Christ Church Grammer School

BAY VIEW TCE

FRESHWATER PDE

PRINCESS RD

RD

Methodist Ladies' College

Bethesda Hospital

RICHARDSON AVE

CLIFF WY

CHESTER RD

WARWICK ST

VICTORIA AVE

Claremont Yacht Club

Claremont Museum

BINDARING PDE

STIRLING

Mrs Herberts Park

WARATAH AVE

PINDAR PL

Scotch College Boatshed

Freshwater Bay

BISHOP RD

ESPLANADE

Peppermint Grove Foreshore

LEAKE ST

THE

KEANE ST

Keanes Point Reserve

Keanes Pt

LILLA ST

Manners Hill Park

Royal Freshwater Bay Yacht Club

David Cruickshank Reserve

JUTLAND PDE

Pt Resolution Reserve

Pt Resolution

Armstrong sandbank

BAY

Restaurant

Boatshed

Kayak Club

Mosman Bay

SWAN RIVER

VIEW

lawn bowls

Bay View Park

TCE

Pt Walter Spit

Pt Walter

The Coombe jetty and park

PEPPERMINT GROVE

THE COOMBE

OWSTON ST

Greenplace Reserve

WELLINGTON ST

Hinemoa Rock

Chidley Pt

Chidley Pt Reserve

MOSMAN PARK

PRECINCT 3

Sites of Significance

N

100 0 200 400

Metres

Minderup Sites of Nyungar Significance

• Prospect Place — Other Australian Community Significance

HWY

BAY VIEW

FRESHWATER PDE

TCE

RD

CHESTER

WARWICK ST

VICTORIA

AVE

White Beach

Freshwater Bay School

RICHARDSON AVE

CLIFF

WY

The Maisons

old slipway

Site of springs

Site of Osborne steps and jetty

Site of limestone quarry

Claremont Yacht Club

Site of Claremont Baths

BINDARING PDE

STIRLING

Freshwater Bay

Cave "Devils Elbow"

Karrakatta Bank

WARATAH AVE

BISHOP RD

ESPLANADE

LEAKE ST

THE

Nyeergardup (the bay area)

Freshwater spring

Keanes House (now yacht clubhouse)

KEANE ST

Keanes Pt (Butler Hump)

Minderup

LILLA ST

Prospect Place

James Chair Cave

JUTLAND PDE

Site of quarry and convict camp

"The Pinnacles"

Pt Resolution

Mandyuranup

BAY

Site of Smith's Boatshed

Minderup Bay

(also Samson Bay and Quarryman's Bay)

SWAN RIVER

(Derbal Yaragen)

VIEW

Dyoondalup Spit

Pt Walter

Wargul Mia

TCE

The Chine Caves

Curveergaroup (the cliffs area)

The Coombe

THE COOMBE

OWSTON ST

WELLINGTON ST

"Green Place" House

Chidley Pt

reclaimed

that later gave its name to Freshwater Bay. There were many such springs around this foreshore, but not many were flowing strongly in January when Vlamingh located this one. Whadjug Nyungars had a campsite in the area as it was a main source of water (Pascoe and Cumpston, 1983). The cliffed area is called *Curveergaroup* and the bay itself is termed *Minderup. Karrakatta* refers to the sand bar in Freshwater Bay and means 'the place of crabs'. The small bay at Keanes Point is called *Nyeergardup* meaning place of the pelican (Collard *et al,* 1996). Point Resolution *(Mandyuranup)* means place of banksia (Pascoe and Cupton, 1983). This area is very steep and therefore was not an easy or favourite location to gather food. However on the northern side of the point the beaches were flat and sandy being an ideal fishing and trading area (Claremont Museum, 1995). Butler Point is referred to as *Minderup* which is a place for alleviating sickness because of the freshwater springs (which were possibly heated). Point Roe is know as *Berreegup* to Nyungar which means the place of the banksias (Collard *et al,* 1996). Inland at Mount Claremont is referred to as the 'black hill', or *Karbomunup* (Collard *et al,* 1996).

Other significance

Claremont developed in the 1860s and was the first suburb of Perth. The suburb still retains a number of historic sites such as the Claremont Museum (Freshwater Bay School, 1862) which was built for the children of the pensioner guards at Freshwater Bay. Other sites of historic significance to the area include the Victorian Bayview Mansions (The Mansions 1898), House 4 at Richardson Avenue (1890s), Claremont Jetty (1898) and the Claremont Yacht Club (1905). The small cave at Keanes Point was called 'James Chair', referring to Governor Stirling.

The term *chine* means ravine in Hampshire, England. Adjacent to the depression is a valley and the old English descriptive term *the coombe* refers to the 'valley'. Within the base of the limestone cliffs is a small cave which is now adjacent to the Clough property.

Point Resolution is cliffed with a number of exposed solution pipes which have been termed 'the pinnacles' by local residents. The levelled out section at the site of the Claremont Yacht Club is likely to be the site of limestone quarrying last century.

Conservation areas

Wetlands

There are no conservation wetland areas in this precinct.

System 6

M54 - Foreshore Reserve, Peppermint Grove

The northern end of the reserve is uncleared and supports a thriving closed scrub community with some emergent tuarts. The area is significant as it is representative of most areas of the Coastal Plain which were formally closed scrub. This reserve has been unburnt for some time, and supports some rare species. It is also geologically important, as it contains one of Australia's few Pleistocene deposits. It was recommended that the area be subject to regional park planning, and a management plan be implemented for the geological site. These have yet to be implemented.

M56 - Foreshore Reserves, Mosman Park

The recommended area includes Chidley Point and the southern portion of Mosman Bay Reserves. Adjacent to Chine St there is a narrow rocky shore with a dense fringe of the rush, *Scirpus nodosus.* Behind is a steep slope which rises to approximately 50 metres, in which are a number of small caves. On the slope there are scattered scrub and tuarts which are recommended for regeneration. At Chidley Point the vegetation is in good condition and it was recommended that this be maintained. Also quandong and snakebush, which do not occur anywhere along the river, are present at this location.

M59 - Point Resolution Foreshore, Dalkeith

The shoreline around the point is sandy and rocky and is backed by a short steep slope with picturesque coastal limestone pinnacles and rocks. The area supports various indigenous plant species and it is recommended that growth and regeneration of these species be encouraged.

Landscape Description

Precinct Description

Waterform

The attractive waterform of the hook shaped curve from Chidley Point out to Keanes is echoed in Freshwater Bay. Point Walter spit provides a visual boundary between Mosman and the northern section of Freshwater Bay. It helps to create Mosman Bay water body as a visually separate entity. As Keanes Point and Point Resolution are parallel to each other they seem to suggest the end points of the u-shaped bay. This gives the water the characteristics of an enclosed and sheltered water body, isolated from the rest of the river.

Natural riparian zone

Mosman Bay has a very narrow and rocky shoreline. There are a number of small sandy beaches dotted in between the limestone pinnacles which emerge from the water adjacent to the steep embankment. The Chine and Peppermint Grove have small white seasonal beaches which form against the natural and man made limestone walls. Along Devils Elbow there is no beach only a rocky edge of the cliff. Claremont's White Beach and the Dalkeith foreshore are characterised by a wider beach. This provides a visually distinct white line between the water's edge and the adjacent landform and use.

Landform

The precinct is part of the gently undulating coastal plain. The river edge is quite linear until Bay View Park from where the slope decreases to a flat promontory and the water's edge curves around to Keanes Point. At Chidley Point the topography quickly rises from the water's edge to a steep embankment. Keanes Point is a knoll like headland which is higher than the surrounding land. From the gently sloping Peppermint Grove foreshore, the land form rises to a cliffed escarpment. In front of this steep slope at Dalkeith, there is a small sandy beach, however the land behind is raised and relatively flat due to levelling for residential purposes. Both at Bay View Park and Pt Resolution, limestone pinnacles emerge from the cliff face. These cone shaped forms stand out from the surrounding cliff due to the forms emerging from surrounding sand or vegetation.

Vegetation

The natural vegetation in this precinct has for the most part been removed or degraded by urban activities. At Roe Point there is a narrow point of natural scrubland. A number of mature sheoaks and associated understorey are an important visual focus for the water user. This promontory together with the natural vegetation at Point Walter give the impression of two relatively undisturbed points as the river closes into the Blackwall Reach channel.

The cliff at Bay View is predominantly covered in native flora species. Due to the shallow soil the trees, such as eucalypts and peppermints, have a stunted form. There are a number of interesting-shaped dead tree trunks which emerge from the scrub. Parrot bush is the dominant scrub species and its soft green and small spiky leaves give a dense dusty form. From the water the cliff face has a dotted effect towards the top as the dense vegetation of the lower embankment is thinned out due to the lack of soil. Around the pinnacles near the top of the face is grey grass which has the same grey tone of the adjacent weathered limestone. There is a small stand of riparian reeds at the base of the escarpment that have a spiky dusty form which is overshadowed by a number of sheoaks which curve over the water edge. The parkland overlooking the water has been planted with lemon scented gum whose mature graceful forms dominate the landscape. These are not endemic to the region; however due to the well maintained lawn beneath them, the general impression is of an urban park-scape which merges into the residential gardens on Bay View Road.

There is similar presence of natural vegetation at Pt Resolution which is graded from riparian reeds to mature peppermints on the peak of the gently sloping embankments. The parkland at Pt Resolution consists of banksias and eucalypts each standing isolated, to be viewed as a single specimen of that species rather than a banksia woodland. This effect has been accentuated by planting of trees which are not endemic to the Point, such as a couple of palms, and the well maintained lawn beneath the trees. There are a number of introduced trees within the more dense vegetation of the embankment, however their non endemic forms are overshadowed by the more dominant native species.

Native species are able to grow along the steep embankments and natural riparian zones, however on most of the gently sloping bays and land behind the

embankments the vegetation consists of exotic species. At Keanes Point the viewer is presented with the large deep green angular pine trees which rise above the yacht club and houses. The Peppermint Grove foreshore has grassed embankments and peppermint trees planted at regular intervals around the bay. There are a couple of large Moreton Bay figs which stretch out over the road and beach and as individual specimens are quite impressive. Behind the houses are highly maintained gardens, some of which have been transformed into formal English enclaves, while others have neat eclectic gardens. These isolated gardens do not at any point along the river grade into the riparian zone as there are distinct zones created by fences and lawn edges. This point is exemplified at Dalkeith where riparian reeds grow on the sandy beach, and behind a straight line of fences gardens and lawn are maintained at the edge of the properties.

Riparian land use

There are a number of jetties in the precinct which jut into the river, including Green Place Jetty and Claremont Jetty. At Mosman Bay, there is an old boat shed which is made from overlapping horizontal wooden boards and has a steeply gabled tin roof. This simple functional construction has been reflected in the new Meads Restaurant which has a similarly wooden shell and board walk, and a double peaked gable galvanised roof. These simple buildings have minimal intrusion and reflect the riparian nature of their location.

The Royal Perth Yacht Club has the historic Keanes homestead as its club house. This building is a two storey Federation building with more recent additions added to the back. The building can best be viewed from the water, and with its rose gardens presents a pretty residential feature. The moorings form a square nuclei of large white boats and yachts which stretch out into the Bay. From Peppermint Grove, the club house is obscured by old boat houses made of wood and corrugated metal roofs. These are at present slightly weathered and give a well used effect.

The beach at Freshwater Bay has formed in front of a limestone retaining wall. The wall gives a curved and contained nature to the beach. At Devils Elbow, the limestone has been cleverly used to build steps to the water's edge so that they have a minimal impact on the natural beach.

Claremont Yacht Club is a small building and its moorings form a double 'T' in the water. From the Claremont Jetty to Dalkeith the foreshore remains relatively free from urban structures.

Land use

The precinct is dominated by residential land use. The houses include various styles according to the fashion at the time of building such as Federation bungalows, interwar Mediterranean, Old English houses and late twentieth century styles. From the river, the residences at Mosman Bay stand out from the topography. The houses are large, extravagant constructions. Most are characterised by large reflective windows which draw the viewer's attention to the angular bold designs. At present, a substantial development is occurring and a great deal of the cliff has been quarried out. The newer homes and some of the formal grassed gardens do not have large trees to soften the edges of the houses and as a result they are extremely prominent.

Between Manners Hill and the foot of Bay View Park, the curve of the hills and the lower topography give a nested urban precinct.The houses and units are restricted in height and therefore no forms stand out from the general urban scape. The designs are highly varied from nostalgic to modern styles and well maintained. The mature trees of the suburbs obscure the roof tops and houses behind the foreshore residences.

At Devils Elbow and Claremont a number of large modern white units rise above the surrounding landforms. The water user is in particular attracted to these buildings' forms. The foreshore buildings are quite prominent at Claremont. Both Methodist Ladies College and Bethesda Hospital are built right to the edge of the cliff in modern block like forms. The houses and units along the foreshore are prominent, however, the residences behind these are hidden due to flatter topography and mature trees hiding the roof forms. At Dalkeith the houses are well spaced and isolated from their neighbours. As there is no concave meeting of two hills, such as at Mosman Bay, the buildings do not have the same overlapping effect. There are a number of high walls which cut off the houses and gardens from the river and the effect to the foreshore user is rather unfriendly and isolating.

Dominant Landscape Character

The original landscape would have been the dense heath on the shallow limestone soils ranging to open eucalyptus woodlands on the sandy Karrakatta Soils. Today the overall topography of relatively high limestone dunes on the western foreshore which grade to a flatter sandy landform is still evident despite quarrying and reshaping. The present dominant landscape character type is a suburban landscape. The suburban landscape is made interesting by the varied landform on which it has been built. Also the wealthy nature of the area has brought about a high degree of urban pride.

The other dominant landscape character is the parkland/recreational character which is identified as being a thin section of Point Resolution, Freshwater and Mosman Bay, and Chidley Point. The Point Resolution section has remnant vegetation and grassed areas with scattered trees. The Freshwater Bay section has a thin line of grassed foreshore with a number of peppermint trees. The Mosman Bay area is a section of remnant vegetation around the steep limestone outcrops while the flatter areas have mostly been grassed with a few remnant or planted trees.

Significant Viewscapes

The views from the river to the foreshore are very pleasing in this precinct. From most positions from the water there is a panoramic view of the surrounding foreshore and land use. The precinct has a limited horizon due to the enclosed landforms and bays. This sheltered and limited viewscape is considered by most people to be attractive. From the raised position of Johnston Parade and View Street, there are spectacular views of the two bays and the city skyline over the Nedlands Peninsula. Similarly, from most points around the foreshore there are pleasant panoramic views of the water and opposite land uses.

Conforming and Non Conforming Elements in the Landscape

Sheltered beaches and sandy bays provide opportunities for recreation. There are a number of established facilities for boating and other water based uses. It is fortunate that the riparian buildings at Peppermint Grove and Mosman Bay are simple and functional and have a design which is in keeping with their water based use. The boat ramps in the precinct are quite small and the associated carparks are similarly made for only a small number of users. However, other boating facilities such as yacht clubs and rowing clubs are generously catered for in the area and are positive visual elements in the riparian environment.

The style of the old wooden boatsheds has been reflected in the new Meads Restaurant. Steeply sloping gabled corrugated metal roofs and wooden board walks give the viewer the impression of minimal impact and simple functional constructions. One of the benefits to the land based user in this precinct is that their view of the river bay is rarely impeded by prominent riparian structures.

Along the Dalkeith foreshore the walls edging the properties have created a linear boundary. This detracts from in the environment and there are opportunities to alter these features.

Recommendations for Maintenance and Enhancement of the Present Landscape Character

- There is the opportunity to promote education of the historical significance of features such as Keanes Point and the boat sheds and highlight the geological significance of the area. Major European historic sites are identified in the Claremont Museum. It may be of benefit to highlight these points by signs and information. Sites of Nyungar significance could also be further researched.
- There is a problem of access to the foreshore in certain areas of this precinct such as Mosman Bay. Steep topography, private property to high water mark and private yacht clubs limit access. The problem is also exacerbated since the public foreshore zones appear to be private due to development by adjacent land holders. The reserves are often narrow and the cliff embankment is vertical to the water's edge making physical access difficult except to the very athletic. The carparks are small, therefore restricting the number of river users in the precinct. The foreshore between Chidley and Keanes Point highlights the problems, as there are a number of private roads and properties

PRECINCT 3

Dominant Landscape Characters and Significant Viewscapes

N

100 0 200 400

Metres

LANDSCAPE CHARACTERS

Recreational

Suburban

Significant Viewscapes

BAY VIEW TCE

FRESHWATER PDE

HWY

RICHARDSON AVE

CLIFF M

CHESTER RD

WARWICK ST

VICTORIA AVE

BINDARING PDE

STIRLING

Freshwater Bay

WARATAH AVE

BISHOP RD

ESPLANADE

LEAKE ST

THE

KEANE ST

LILLA ST

Keanes Pt

JUTLAND PDE

Pt Resolution

BAY

VIEW

TCE

THE COOMBE

OWSTON ST

WELLINGTON ST

Chidley Pt

SWAN RIVER

Pt Walter

PRECINCT 5

extending right to the foreshore. Due to the rocky nature and narrowness of the foreshore reserve, it is difficult to walk along the river. Access by boat is possible as there is a small jetty and beach at Green Place Reserve. If it is considered that pedestrian access should be possible then a raised walkway may be the most visually acceptable solution.

- It is important that any further foreshore development be complementary to the present developments and take into consideration the riparian nature of the environment.
- Along the Dalkeith foreshore, in particular, planting native shrubs would minimise the impact of the walled homes and linearity of the property edges. Indigenous species would create continuity with the remnant vegetation at Point Resolution and the western side of the bay. In addition, the remnant species would give local identity and be visually pleasing with the adjoining waterform. They would also be of great ecological value.

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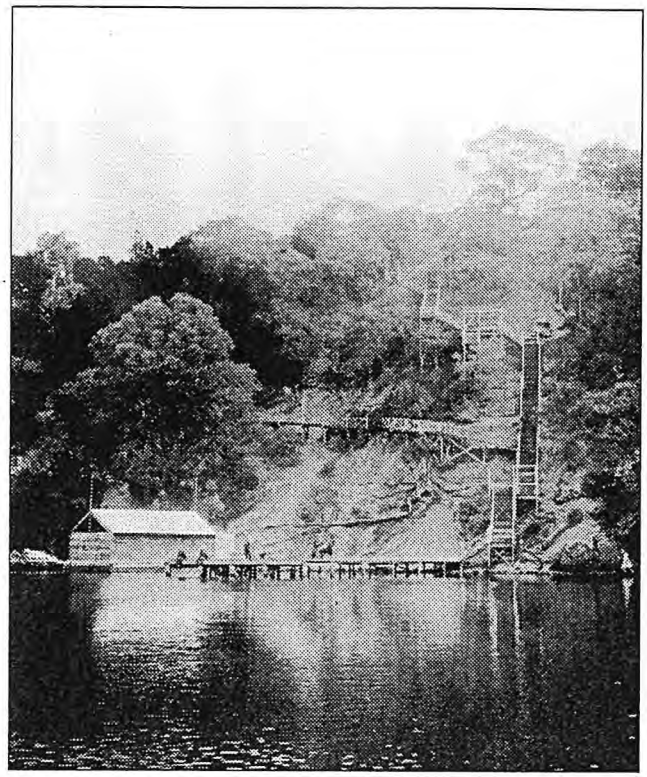
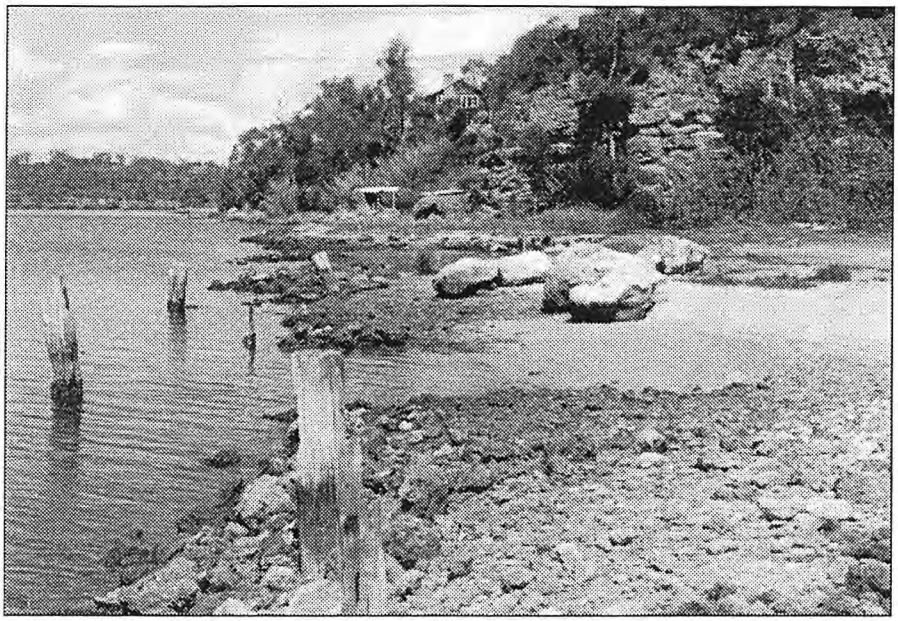


Osbourne Steps, Freshwater Bay. c1890.

Battye Library 5960B.

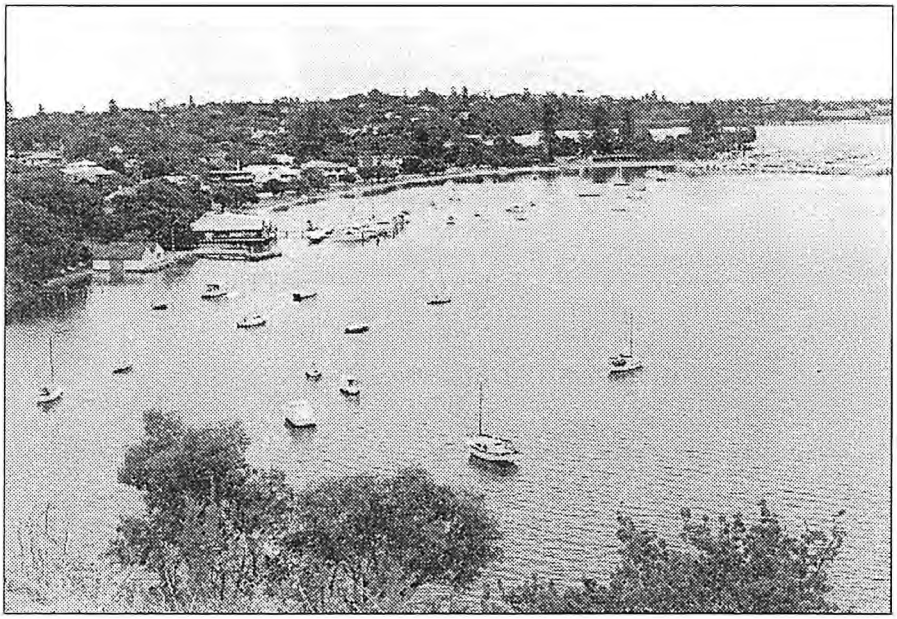
Peppermint Grove, picnic near Kearne St. c1900.

Battye Library 9717P.



Coombe Reserve, Saunders Street, Mosman Park. 1962.

Swan River Trust.

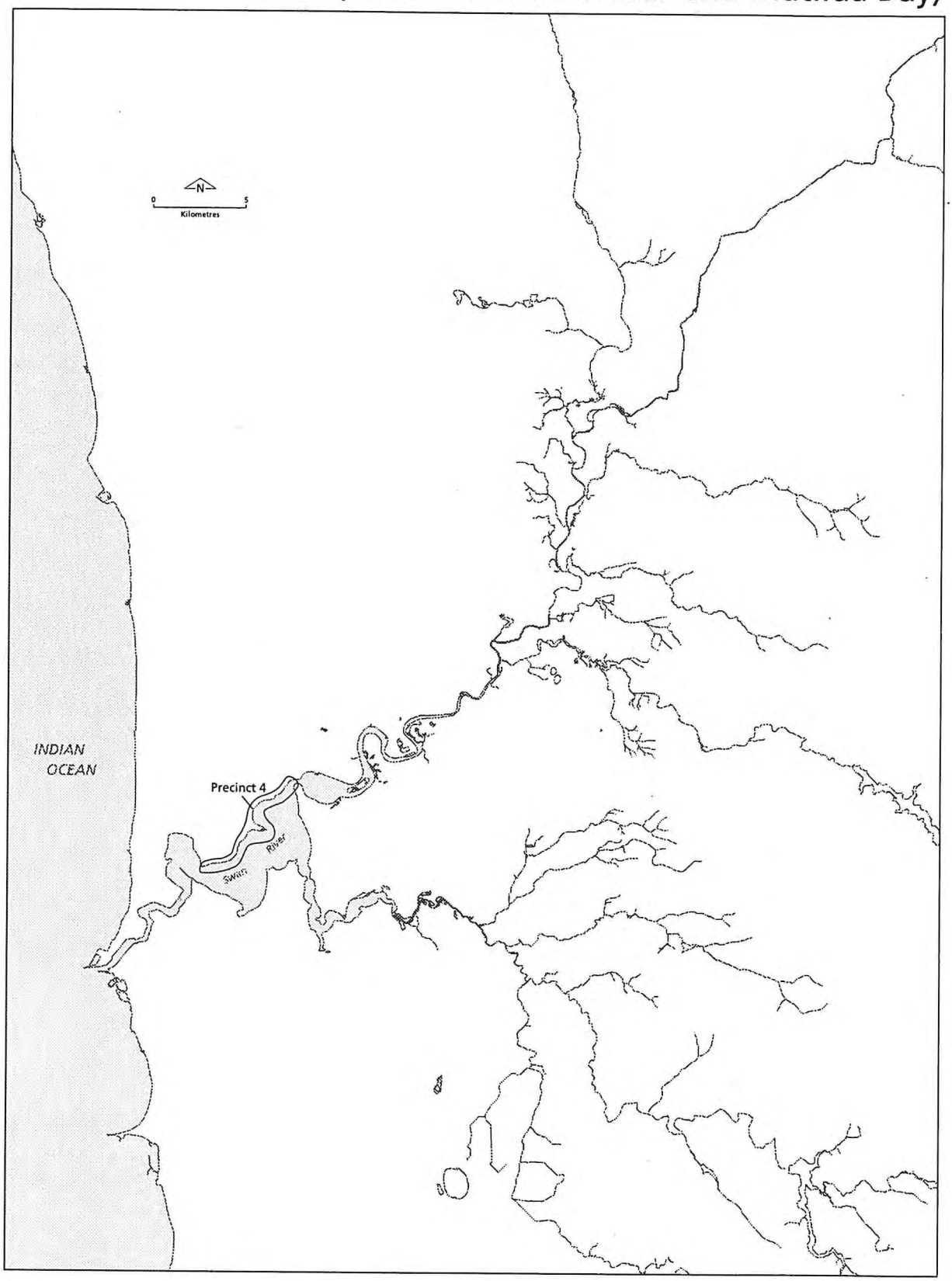


Mosman Bay from Bay View Park. 1996.

Swan River Trust.

Precinct 4

Point Resolution to the Narrows Bridge (North Melville Water and Matilda Bay)



Summary

Point Resolution to the Narrows Bridge (North Melville Water and Matilda Bay)

The precinct ranges from Point Resolution to the Narrows Bridge and includes the northern half of Melville Water and Matilda Bay. The area includes such natural features as steep outcrops of coastal limestone along Dalkeith and Kings Park, and low lying estuarine deposits which form the flat land of Nedlands and Crawley Bay. Pelican Point juts out into the river forming the curve of Matilda Bay and providing shelter from the prevailing weather conditions.

In contrast, Nedlands foreshore is flat reclaimed land and the river bank has been made from limestone blocks and as a result is relatively linear, flat and unnatural.

The area was left predominantly undeveloped until the first world war and now the suburbs of Nedlands and Dalkeith are characterised by large ample blocks and a mix of architectural designs, the majority of homes being single storey bungalows. Along the southern Dalkeith foreshore the landform is a steep cliff face which continues to Sunset Hospital. The narrow foreshore and properties built to the edge of the escarpment make the foreshore inaccessible. In contrast, the reclaimed land at Nedlands and wide flat reserve at Matilda Bay are ideal for public access. As a result the foreshore is popular for passive recreation and more active sports such as swimming, cycling, windsurfing and boating. Kings Park provides a regional recreation node and also is important for including a large area of native bushland. The park has spectacular views of the river and adjacent land, however along the foreshore the river access is severely inhibited by Mounts Bay Road which is a major arterial road.

Biophysical Processes

Geological Processes

The precinct is part of the Tamala Limestone which is aeolian calcarenite which is lithified, calcretised and leached to quartz sand (Riggert, 1978). The limestone was formed in the Pleistocene and the cemented dunes made up of aeolianite, beach and shallow marine deposits, whose structures are overprinted by solution pipes, calcrete and root cast (Collins, 1987).

The soils of the precinct are predominantly of the Karrakatta Association which are deep yellow and brown sands overlying aeolianite (McArthur and Bettenay, 1974). In the Matilda Bay area, the soil is made up of variable and undifferentiated deposits associated with estuarine processes (Seddon, 1972). The offshore features consist of thin films of dark clay and sandy banks of the Vasse Association.

Topography

Point Resolution is a topographically high point of the undulating Spearwood Dune System. It has a steep escarpment from the Point to Sunset Hospital. From here the land slopes more gently towards the fluvially formed Matilda Bay. Pelican Point is a topographic low, and originally would have been subject to severe inundation. Kings Park is another outcrop of the Spearwood Dune System which forms a headland forming jutted much further than present into Perth Water. There is a steep scarp along the southern edge of Kings Park, which would have originally had a very narrow foreshore. Behind the 30 meter scarp of Kings Park is the gently undulating ancient dune system.

Hydrological Processes

Water features

Melville Water is a wide basin which opens from Point Walter and Pt Resolution and expands into a large stretch of water that curves around the northern shore up to the Narrows. The northern foreshore is a relatively linear bank which has a gentle curve around south Nedlands and continues to the sharp peninsula of Pelican Point. The water body curves into a protected and shallow bay at Matilda Bay and edges the escarpment of Mount Eliza.

There have been several stages of infilling along the foreshore near Mt Eliza. Between 1921-1935 a thin line of foreshore on the southern side of Mt Eliza was infilled allowing Mounts Bay Road to be widened. The infilling of Mounts Bay will be discussed in the Perth Water Section. At Nedlands foreshore, the land was infilled and held in place with a linear limestone retaining wall during the 1930s as part of the process to 'improve the river flow' (Riggert, 1978).

Bathymetry

In cross-section the river channel has a relatively wide shallow bathymetry at the banks of the channel. Armstrong spit is a shallow bank of under 2 metres water depth which is exposed at high tide and is approximately 200 metres off the Dalkeith foreshore. From Pelican Point, a shallow bank of under 2 metres in depth extends in a southerly direction for a kilometre. The channel cross-section widens to over a kilometre of water more than 5 metres deep at Melville Waters. This basin is the widest body of water in the river and is seldom flushed out. Overlying the stale seawater is a layer of lower salinity water. The change in salinity or halocline between these two bodies is often abrupt. The lower water often becomes deoxygenated as a result of biological activity. The mean tidal range within this precinct is 0.8 metres.

The channel is made up of light coloured sands consisting of shell material and quartz grains around the foreshores. In the deeper waters, muds consisting of silt particles and organic matter are found. There are also extensive fossil shell deposits in Melville Water.

Flooding

The degree of inundation along the foreshore between Sunset Hospital and J.H. Abrahams Reserve and from the Perth Dinghy Sailing Club to the Narrows Bridge has been modified from its natural regime. Limestone retaining walls were built from grouted rock in the 1930s along Mounts Bay Road. This has prevented major flooding of the Mounts Bay Road foreshore, such as, that which occurred in June and July of 1932. The Nedlands foreshore was reclaimed by dredging and the spoil was used to extend the foreshore. The new land was protected from wave action by a limestone wall. At Pelican Point, the land was also dredged and reclaimed,

however no retaining walls were constructed. As a result the point is subject to seasonal inundation allowing a small remnant wetland to exist. There is a small lake which is present throughout the year, as well as small tidal flats.

Erosion and accretion

The beaches in the precinct are subject to localised erosion from tidal or wind action. In areas such as Matilda Bay, there is quite severe erosion due to mainly non natural causes such as boat wash and the removal of foreshore flora. This problem is being addressed by increasing the beach area so that the slope is more gradual, planting native species and constructing walls of logs or ungrouted rock. Along the Nedlands walled foreshore small sandy beaches often form in summer, however in winter the wall restricts erosive processes and often creates a narrow gully where the wave action has removed sediment from the channel banks.

The wave action against these walls is reflected off the flat faces and as a result unnatural erosive processes take place. To reduce the reflective energy transfer some sections of the Mounts Bay Road walls have been replaced with more gently sloping gabion walling.

Vegetation Communities

Native

Vasse Complex

At Nedlands, the Vasse Complex occurs along the foreshore and is surrounded by the Karrakatta Complex. It is a mixture of closed melaleuca scrub to a fringing woodland of flooded gum *(Eucalyptus rudis)* and melaleuca species. It would have also included an open forest of tuart *(Eucalyptus gomphocephala)*, jarrah *(Eucalyptus marginata)* and marri *(Eucalyptus calophylla)* on the higher land. Pelican Point wetlands originally supported swamp paperbark *(Melaleuca rhaphiophylla)*, moonah *(Melaleuca pressiana)* and saltwater paperbark *(Melaleuca cuticularis)*, swamp sheoak *(Casuarina obesa)*, Christmas tree *(Nuytsia floribunda)*, robin redbreast bush *(Melaleuca lateritia)* and coojong *(Acacia salinga)*. Remnants of this community are still present despite serious degradation. Also present is a sedgeland community consisting of Isolepis nodusa and a few emergent shrubs of wattle in places.

The foreshore near the Tawarri Restaurant in the late 1920s supported swamp sheoak *(Casuarina obesa)* and swamp teatree *(Agonis linearifolia)*. There were also rushes and Spinifex hirsutus (Powell and Emberson, 1978). By the 1930s the sheoak and paperbarks had been removed and coojong had replaced these communities. Parrot bush *(Dryandra sessilis)*, and basket bush *(Spyridium globulosum)* were also present on the cliffs.

Karrakatta Complex

Along the Karrakatta Complex is the main plant community in the area (DCE, 1980). This complex is predominantly tuart *(Eucalyptus gomphocephala)*, jarrah *(Eucalyptus marginata)* and marri *(Eucalyptus calophylla)*. The understorey consisted of slender banksia *(Banksia attenuata)*, firewood banksia *(Banksia menziesii)* and bull banksia *(Banksia grandis)*. In addition, sheoak *(Allocasuarina fraseriana)* and peppermint *(Agonis flexuosa)* are also found. The communities which make up the Karrakatta Complex are outlined below.

***Dryandra* communities**

There is a closed scrub dominated by parrot bush *(Dryandra sessilis)*. Stinkwood tree *(Jacksonia* sp*)* and smoke bush *(Conospermum triplinervium)* are also present. In the rockier areas, cockies tongues *(Templetonia retusa)*, chenille honeymytle *(Melaleuca huegleii)* and fan flower *(Scaevola nitida)* predominate. The closed scrub also supports Hackett's hop bush *(Alyxia buxifolia)* which is restricted to the Metropolitan area.

***Eucalyptus* communities**

Kings Park has approximately 260 ha of native bushland which supports 465 recorded indigenous and exotic plant species and associated fauna communities (Bennett, 1989). There is open woodland forest dominated by sheoak *(Allocasuarina fraseriana)*, slender banksia *(Banksia attenuata)*, Menzies or firewood banksia *(Banksia menziesii)*. Tuart *(Eucalyptus gomphocephala)*, jarrah *(Eucalyptus marginata)*, marri *(Eucalyptus calophylla)* are present in the park, however they have been particularly stressed due to fire and borer attack. Christmas tree *(Nuytsia floribunda)* and various *Acacia* are dominant in the open woodland.

Exotic

Pelican Point reserve was recently surveyed for CALM (1992) and it was found that approximately 95% of the flora not natural to the site. The non endemic species include Victorian tea-tree *(*Leptospermum laevigatum)* and sheoak *(*Casuarina glauca)* which are exotic to the Swan River, and are acting as weeds and replacing those species which are endemic to the point. Moreton Bay fig *(*Ficus macrophylla)*, Norfolk Island pine *(*Arauccaria heterophylla)* and London plane tree *(*Plantanus* X *acerifolia)* which provide shade during summer. These trees were planted as 'specimens' which was a common historical practice; the grounds of the University of Western Australia are a good example of transformist gardens.

Fire has been detrimental to the Kings Park tuart and jarrah communities and has encouraged the proliferation of veldt grass *(*Ehrharta* sp*)*. Exotic species have been introduced both by accident and by intentional planting and include prominent flora, such as sugar gum *(*Eucalyptus cladocalyx)*, gladiolus *(*Gladiolus caryophyllaceus)* and Guildford grass *(*Romulae rosea)*.

Historical Land use & Resulting Environmental Changes

Captain Stirling named the whole lower estuary Melville Water and restricted the river upstream from Perth to the name Swan River. Melville Water has, however, come to refer to the wide body of water between Pt Resolution and the Narrows. The section of this river was named Melville Water by Stirling after Robert Dundas, 2nd Viscount Melville, First Lord of the Admiralty, 1812-30 (Seddon, 1970).

In 1831, Adam Armstrong was the first settler to take up an estate in the precinct, which he named Dalkeith after his home town in Scotland. The property extended between the present day roads of Birdwood and Waratah Avenues. The property was sold to John Lewis in 1839 and then to James Gallop in two parts in 1847 and 1865. James Gallop built a house in 1872 on a limestone hill and it is still present today as the oldest remaining house in Nedlands. The property was renowned for the fruit and vegetables it produced for Perth and Fremantle markets. The western side of Armstrong's original property (Lot 86) eventually became the land of the Bruce family whose son Edward inherited the land. The land was deemed rather worthless and was jokingly referred to as 'Ned's Land', hence the name Nedlands. The land remained mostly unused until World War I when the land was subdivided and the Nedlands Park Hotel (now Steve's Hotel) was built on Broadway (Williams, 1984).

Most of the western side of the estate was subdivided after the turn of the century, and became the suburban locality of Dalkeith. Many streets in the area were named by the surveyor, P. G. S. Hope, after yachts on the river in the racing season 1912-13. The subdivisions were offered under generous terms, however the land had 'difficult' scrub to remove before building. David Cruickshank Reserve (or College Park) was built in 1954 to 'tidy up' the foreshore.

One of the features of the area was 'The Dome' or 'Hot Pool' at the present day site of the 'Tawarri' function centre. This was an artesian bore which was heated and was a popular bathing spot for many years from the 1920s. The bore had been originally sunk to service the Old Men's Home (Sunset Hospital) and the popularity of the free pool along with the reputed activities it encouraged, earned the area the name of 'Naughty Nedlands'. There were several baths in the precinct. Nedlands Baths was built in 1907 and was a popular swimming point for both locals and people from other areas. The building still remains today as a restaurant and is the only remaining baths building along the Swan River (Clarke, 1993).

At Crawley Bay adjacent to Broadway there is a concrete ramp which was used by the Qantas Flying Boats in World War II. The planes flew weekly to Sri Lanka and were important in maintaining communications with Britain (Catomore, 1986).

Stirling's exploratory party of 1827 found the quantity of swans, pelicans and ducks on the river at Pelican Point (Point Currie) 'truly astonishing'. In 1827 voyage Charles Fraser, the colonial botanist of New South Wales, recorded the view from Pelican Point as

'exceedingly grand. The contrast between the dark blue of

the distant mountains and the vivid green of the surrounding forests is such as must in a peculiar manner strike the attention of a person long accustomed to the monotonous brown of the vegetation of Port Jackson'.

The point is also known as Point Currie and was named after Captain (later Admiral) M.J. Currie (d 1874), first harbour master of Fremantle. Currie first took up land at Crawley and soon afterwards the Redcliffe estate on the river above Perth. The reserve has been the location for an number of recreational groups for many years, including the 1st WA Sea Scouts Troop since 1919 and the Royal Perth Yacht Club since 1910 (Uren, 1966). In the 1930-40s Pelican Point was dredged on the north side and the resulting soil was deposited on the south side of the point. The result was the loss of most of the shallow water and wetlands at Pelican Point.

Matilda Bay was named by Stirling in 1829 after Mrs J. S. Roe (nee Matilda Bennet). The bay also known as Sutherland's Bay, Eliza Bay, Currie Bay and Crawley Bay (the last name which has also confusingly been given to the Nedlands foreshore). The estate bordering the bay was first owned by Captain J. M. Currie who was Fremantle's first harbour master. It was sold in 1832 to Henry Sutherland, who came to the colony in 1829 as assistant surveyor and was later Colonial Treasurer; his mother's maiden name was Ann Crawley. The estate passed to Sir George Shenton, a Mayor of Perth, who lived on the estate until his death in 1909. The land was acquired by the State in 1910 for public recreation and the foreshore was used as a camping ground. This was served by a tram line to Nedlands Baths. The university acquired the bulk of the land in 1914. In World War II Crawley Bay was requisitioned by the Commonwealth for defence purposes and as a result an American Navy Base was established.

Along Mounts Bay Road near Quarry Point was the site of the Crawley Baths. The baths covered 3.5 ha in area and had 300 dressing boxes. The limestone walls between Matilda Bay and Point Lewis were built in the 1920-1930s economic depression by men who would work for 7 shillings and 6 pence week.

The Old Swan Brewery is located at the foot of Kennedy Springs. In 1861 Governor Arthur Kennedy erected the fountain at the site of the freshwater springs which were an important water source to the early Swan River Settlement and is also an important location for Aboriginal people as outlined below. The flat area adjacent to the spring was used as a shipyard in the 1830s and then was the site of an Aboriginal welfare institution. In 1838, a steam driven mill was built and in turn later became a tannery and ice works. There was also a convict depot which in the 1850s was converted to an old men's home. The Swan Brewery was built in the 1880s and used the spring water for its beer making. The Brewery which had been purchased by the Government in 1985 was later resold to the property developer Yosi Goldberg. It was once again purchased by the Government who leased the site to John Roberts who is developing the site for offices and a restaurant complex. At present, the development has stalled partly due to court proceedings initiated by the Nyungar people.

Mount Eliza was named by Stirling after Mrs Ralph (later Lady) Darling (nee Eliza Dumaresq), wife of the Governor of New South Wales. In 1826, Stirling had prevailed on Darling to allow him to explore Swan River. Apprehensive of French intentions in the area, Darling had just despatched the party which established the settlement of Albany. When the Swan River Colony was founded in 1872 the Surveyor General John Septimus Roe intended that Mount Eliza be preserved as a public park. In 1872, the first 175 ha were gazetted and later in 1890 the area was extended to the present 400 ha. It was initially known as Perth Park, however to mark the accession of King Edward VII it was changed by his son the Duke of Cornwall and York (later King George V) during his visit in 1901. The park was an important source of building timber to the early settlers. In 1835 five tonnes of jarrah were cut from the area and exported from Western Australia (Catomore,1986). The limestone scarp was quarried at Quarry Point for building material. Quarry Point is also known as Knot Spit as offshore there are two piles which are exactly one nautical mile apart.

Point Lewis originally was at the base of Mt Eliza, however, it was reclaimed with the construction of the Narrows. It was named, probably in 1831, after John Lewis the Commissioner-General and Colonial

PRECINCT 4

Significant Land Use Features

N

100 0 200 400 600

Metres

KINGS PARK

CRAWLEY

Botanic Gardens

D.N.A Observation Tower

Mt Eliza

Hacketts Path

RD

Kennedy Fountain

The Narrows

The Old Swan Brewery

Mill Pt

Pt Belches

BAY

MOUNTS

Quarry Pt

RIVER

CRAWLEY AVE

St Georges College

DR

Cygnet Hall

PDSC/UWA Boat Club

University of Western Australia

Matilda Bay

SOUTH PERTH

HWY

STIRLING

HACKETT

KWINANA FREEWAY

BROADWAY

Kiosk

Royal Perth Yacht Club

NEDLANDS

(Shenton) Crawley House

SWAN

CALM

Scouts

Matilda Bay Reserve

Pelican Point (Pt Currie)

PRINCESS RD

J.H. Abrahams Reserve

Crawley Bay

BROADWAY

Restaurant

Nedlands Golf Course

THE AVENUE

ESPLANADE

Nedlands Foreshore Reserve

WARATAH AVE

Gallop House

Nedlands Yacht Club

PDE

DALKEITH

Melville Water

BIRDWOOD

David Cruickshank Reserve

PDE

Sunset Hospital

Tawarri Function Centre

Beaton Park

Perth Flying Squadron Yacht Club

JUTLAND

Armstrong Spit

Pt Heathcote

Bay

Waylen

Coffee Pt

Pt Resolution Reserve

Pt Resolution

Pt Dundas

Treasurer. Stirling originally named the promontory Garden Point, as the 1827 expedition planted a small experimental garden at this location.

Present Land Use and Social Patterns

Approximately half the precinct's foreshore area is used for residential purposes. Along the southern Dalkeith escarpment is what is considered one of the most prestigious roads in Perth. Jutland Parade has large post war and modern 'mansions' which are typically the extreme architectural styles of their period. They front onto the escarpment and as a result there is limited public access along the foreshore. However, from Birdwood Parade the residences are separated from the foreshore by the escarpment, below which there is a flat promontory that allows foreshore access. The escarpment has remnant bushland present and this obscures the view of the river from the road. Along the Nedlands foreshore, the residences are well set back from the river and are on the northern side of The Esplanade. The southern side has been reclaimed for foreshore and playing fields. The houses of the Nedlands suburb are mixed in design and period, however away from the foreshore houses built in the 1930-40s are dominant. There are also some multistorey units which front the Nedlands foreshore reserve. Prestigious highrise units are present between Crawley Avenue and Kings Park as well as a few bungalows.

Sunset Hospital is a home for senior men. It was originally located at the Swan Brewery site, however it was moved to Nedlands in 1904 where it was built as a poorhouse for 'aged and infirm' men. Behind Hackett Drive is the University of Western Australia, which has attractive buildings and environs. Several of the earlier buildings are particularly attractive and are of local significance.

Mounts Bay Road is a major traffic route between the city and Stirling Highway and therefore cuts off the foreshore to recreation users. However, there are two carparks which cater for passive recreation and other activities, such as fishing. Hackett Drive and other roads in the area are heavily used by University students and people using Matilda Bay. The result is a busy road and parking problems.

Recreation nodes

Pelican Point Nature Reserve is part of the Swan Estuary Marine Park. It is not accessible to the public due to wire fencing. This is because of the sensitive nature of the reserve and the importance of it as a habitat for transmigratory birds.

Abrahams Park is adjacent to Pelican Point. The park is used by windsurfers and picnickers. Nedlands foreshore reserve is used by cyclists, picnickers and private sporting clubs who use the well maintained ovals. The ovals have also become with kite fliers who take advantage of the prevailing winds. Beaton Park has a nicely landscaped parkland with barbecue and play gym facilities. A dual use path caters for cyclists and pedestrians all along the Nedlands foreshore.

Matilda Bay reserve attracts 400 000 visitors for active and passive recreation, including the visitors to the sporting clubs and restaurants. It provides opportunities for sightseeing, picnicking, windsurfing, swimming, prawning and boating. Features such as the parkland setting and the safe swimming areas and city views attract people to Matilda Bay. The Department of Conservation and Land Management has recently built a limestone wall adjacent to the kiosk to prevent further erosion of the grassed banks.

There are several yacht clubs including the Perth Flying Squadron which was incorporated in 1908. It was originally located on Perth Water, however it moved to its present location in the 1960s. The Nedlands Yacht Club has been at its present location since the mid 1950s and is primarily dedicated to dingy sailing. Mounts Bay Sailing Club is also primarily a dingy sailing club and launches from the beach. Royal Perth Yacht club has been at its present location since 1910 and has an annex at Fremantle's Challenger Harbour. The University Boat Club was opened in 1929. The Perth Dinghy Sailing Club was established in 1903 and moved to Matilda Bay in the 1960s. The club caters principally for younger sailers. Cygnet Hall was built in 1956 by the Governors of Hale School as the base for the school's rowing club.

Kings Park is a unique and valuable tract of bushland and cultivated gardens which are adjacent to the city. The park is the most visited tourist destination in

Western Australia and provides an important recreation node for all the people of Perth. Apart from the spectacular view of the city, Perth and Melville Waters, there are several war and pioneer memorials, play grounds, picnic and barbecue facilities, guided walks and food outlets. The park is also an important botanic feature having at least two-thirds of the area as natural bushland. The other areas are parkland and botanic gardens showing the different plant communities found within the State and other Mediterranean parts of the world.

Public access

There is limited public access along the southern Dalkeith foreshore due to the steep escarpment and properties reaching to the edge of the cliff or the high water mark. Along Birdwood Parade the residences are set back from the escarpment and there is a wider foreshore which the public is able to access. The embankment has a woodland community that blocks the view from the road to the river, and also acts as a buffer between the residential and foreshore activities. Foreshore access is also limited along Mounts Bay Road due to the four lane arterial road which curves along at the base of Mount Eliza. The foreshore here is walled and has no beaches, however there are two parking bays which are frequently used for passive recreation and as a fishing vantage point. There is also a dual use path which can be accessed from Kings Park via a footbridge on the eastern side of the park. At Kennedy Spring there is a small parking bay which serves users of the picnic area adjacent to the fountain.

The Nedlands foreshore is well provided for public use. There are several public carparks, dual use paths, ovals, and jetties which cater for both passive and active foreshore users. There is a particularly good carpark at the base of Gallop House which has been built so that only its entrance is visible from The Esplanade. The parking bays are hidden using native trees which are in keeping with the vegetation of the escarpment behind.

At Matilda Bay there is a dual use pathway and a picnic area. On most days parking is at a premium due to demands from University users and those clubs and associations at Pelican Point. Other users are often unable to easily find a parking bay.

The boating clubs at Nedlands use the foreshore to rig and wash their equipment. This often gives the impression to non club members that the foreshore is private property, however access is not restricted and the public can walk adjacent to the clubs and also behind the property. At Matilda Bay the foreshore access is still more visually restricted than the Nedlands clubs due to fencing and the crowded nature of the marinas. As Pelican Point Reserve is also fenced to ensure the wellbeing of transmigratory birds, the point is not as accessible to the public as it could be. However, the public is well catered for on either side of the point with parking and recreational facilities available.

Sites of Nyungar & Wider Australian Community Significance

Nyungar significance

This area was used as hunting grounds by Mooro Nyungars who at the time of the Swan River Colony were headed by Yellagonga until his death in 1835 (Williams, 1984). Originally, there were several springs including ones which occurred near the area of the present day Archdeacon and Edward Streets (Vinnicombe, 1989). At the site of the present day University of Western Australia campus, a hot water spring once ran and the same site was used as a battle ground by Nyungar people. The area was plentiful with fish, shell fish, frogs and turtles. Matilda Bay (several references give different names which possibly referred to different features in the area, and include *Godroo, Goodamiorup* or *Gurndandulup)* and Pelican Point (*Bootanup* or *Booriarup* meaning place of the *Xanthorrhoea*, balga or blackboy tree leaves) (Vinnicombe, 1989; Collard *et al,* 1996), were favoured for crabbing and prawning by the Mooro people. The southern side of Pelican Point is known as *Goordandalup* meaning the meeting place of the married or betrothed persons (Collard *et al,* 1996). Pelican Point is also known as *Katamburdup* meaning 'high rise near where paperbark and zamia palms grow' (Vinnicombe, 1989). It is also recorded that there was a swamp area near Gallop House called *Gooliliup* and *Beenyup* and that Armstrong spit along the southern side of Dalkeith is known as *Nanulgurup* (Green 1979, Williams, 1984).

PRECINCT 4

Sites of Significance

N

100 0 200 400 600

Metres

Bootanup — Sites of Nyungar Significance

• Gallop House — Other Australian Community Significance

Kooymulyup

Waugal site

Goonialup

Pt Lewis (One Tree Point)

Goonininup

Swan Brewery

Mill Pt

Pt Belches

RD

BAY

MOUNTS

Quarry Pt (Knot Spit)

Site of Crawley Baths

CRAWLEY AVE

DR

University of Western Australia

HACKETT

HWY

STIRLING

BROADWAY

Matilda Bay

(Godroo, Goodamiurup or Gurndandulup)

hot water springs

Nyungar Karra mia or camping place

Site of spring

Quaada Gabee

Nyungar Battle Ground

KWINANA FREEWAY

PRINCESS RD

Pt Currie (Pelican Point) *(Bootanup)*

Site of QANTAS Flying Boat Base and later American Naval Base

Katamburdup - favourite food collection and gathering site

SWAN RIVER (Derbal Yaragan)

BROADWAY

Goordandalup

Site of Nedlands Baths

THE AVENUE

ESPLANADE

WARATAH AVE

Site of swamp Goolilup or Bennyup

Gallop House

PDE

BIRDWOOD

Melville Water

(Duntanboro)

College Park

JUTLAND PDE

Site of "Nedlands Hot Pools"

Nanulgurup (Armstrong Sandbank)

Pt Resolution

Pt Heathcote

Bay

Waylen

Coffee Pt

Pt Dundas

Oral history records that Nyungar wells tapped a freshwater supply in the vicinity of the present Nedlands/Dalkeith foreshore. The exact location of this site is now undetermined (O'Connor *et al,* 1989). *Goonininup* camping ground was adjacent to the Old Swan Brewery. This means the 'place where he defecated' and is derived from the word *kwun* or anus (Vinnicombe, 1989). The exact location is difficult to define due to extensive land reclamation and dredging in the vicinity. However, Kennedy Spring is believed to be the eastern point of the camping ground. The Waugal (derived from *waug* which means soul, spirit or breath) is believed to have surfaced near to the fresh water spring in the area. The Waugal's resting place is known as *Gargatup* (Collard *et al,* 1996). Many Nyungar believe that the Waugal is associated and equivalent to 'living water' or a vital force of water and is represented in the form of a 'water snake' (Vinnicombe, 1989). The abrupt rise of Mount Eliza is said to have been caused by the struggles of the Waugal as it came to the surface and wriggled its way back to the sea (Vinnicombe, 1989). The area is a place that demands great respect by Nyungars and there are strict codes of ethics which still exist today. The Waugal would 'suck you in' at the place where it returns back into the ground on its way out to the sea. The term *Waygalan* means 'ill, sick or under the influence of Waugal'. A person would be *Waygalan* if they have disregard for the site. The Waugal is believed by many Nyungar to have laid an egg represented by a large round stone near Matilda Bay which was removed by white settlers of the Swan River Colony. The track of the Waugal from the old Swan Brewery Stables up the hill face is referred to as *Gooniallup* (Collard *et al,* 1996). *Goonininup* and an adjacent camp called *Goodinup,* is a recognised meeting place for Nyungars. It is a place where inland Nyungar met with the coastal Nyungar (Ansara, 1989). It was a place associated with male initiation, economic exchange and a recognised trade route for red ochre. It was one of a number of sites of importance to the Nyungars. Near the camp was an area referred to as *Kooyamulyup,* meaning the place of the frog camp which refers to the many frogs in the area which were part of the diet of the people. It is also believed to have been a place for initiation for young men (Collard *et al,* 1996).

Other significance

The precinct was first described by Stirling and members of his 1829 exploratory trip. The river in this area was favourably described and trial crops were planted at Point Lewis. The area, however, was slow to develop and the residential areas which are present today did not develop until early this century.

Gallop House was built by James Gallop in 1847 and later extended. It was built using the limestone from the Nedlands pinnacles. It is the oldest remaining house in Nedlands and has been recently been restored by new tenants. The house is open on certain days of the year.

Sir George Shenton's Crawley House is now within the university grounds. It is a Georgian styled two storey building. Crawley House was built by H. C. Sutherland in the 1840s on the original grant of 12.5 ha allotted to Captain Currie.

Conservation Areas

Wetlands

Pelican Point has a wetland which is of world wide importance for migratory birds and is discussed below.

System 6

M49 Kings Park

The recommended area is 400.8 ha and about two thirds of this is undeveloped low open forest and woodland. There is a limestone scarp which supports a closed-scrub community. The area is an open space of regional significance because of its high conservation, recreational and education value as well as being close to the city. It includes botanic gardens, arboreta, roads, water supply reservoirs and mains, sewerage works and underground cables. The Kings Park Board is responsible for the park's planning and management.

M52 Pelican Point, Crawley

The area is a point which includes tidal flats, lake and marsh. A large section of the point is covered in sedgeland and rush with a few emergent bushes. The area is one of only three significant wading bird habitats remaining in the Swan River. Thousands of birds including 22 species, migrate from their

breeding grounds in the northern. The migratory waders feed entirely on the invertebrates which occur in the intertidal flats and marshes. The area is at present being included in the Swan Estuary Marine Park and Adjacent CALM Reserves Draft Management Plan (1995). It was identified as having educational, conservational, recreational, historical and research value.

Precinct Description

Waterform

One of the most prominent features to the water and land user in the precinct is the wide basin of Melville Water. This is the widest point in the river and from the banks it appears to be enclosed entirely by the foreshores that bound it. The river opens between Point Walter and Point Resolution and broadens quickly as it curves along south Nedlands foreshore to Pelican Point. The curved promontories of Pelican Point and Pt Heathcote (Melville Water) are mirror forms to the viewer. Matilda Bay is a sheltered embayment which has a curved form. The river narrows to a 'v' between Kings Park and the South Perth foreshore, and consequently the descriptive name of 'The Narrows' is apt.

Natural Riparian zone

The riparian zone in this precinct has been greatly altered due to reclamation and the construction of walls. However, at Pelican Point despite land reclamation earlier this century the foreshore appears 'naturalistic' on the southern bank. There is a white sandy gently sloping beach which stretches into a shallow sandy bank in a southerly direction. Behind the beach, a small channel enters a permanent wetland in the form of a lake and marsh. Along the southern Dalkeith foreshore the limestone escarpment borders the water's edge with a number of small sandy beaches in between the limestone rocks which scatter the foreshore.

Landform

The limestone escarpment at Dalkeith gently undulates from Pt Roe to the Sunset Hospital. The escarpment in places is vertical at Dalkeith but becomes more gently sloping after Sunset Hospital. The escarpment has limestone pinnacles which emerge from the surrounding vegetation and soil, these are particularly prominent adjacent to Gallop House. From approximately Winthrop Avenue, the topography once again rises to Mount Eliza. The escarpment is steeply curved, however, at Quarry Point, the limestone has been cut back to a vertical face. Kings Park would have originally had a headland form, however with the freeway construction and adjacent high rise city buildings, the headland's height and curved form have become a less dominant feature and its prominence has been diminished.

At the base of Sunset Hospital, the original foreshore was extended into a flat field, however, Beaton Park has now been landscaped into a gently undulating parkland. In contrast, the Nedlands foreshore reclamation has remained a flat platform to accommodate the playing field facilities. Most of this area is uninteresting with no curved foreshore or layered vegetation to attract the viewer. Matilda Bay is also walled, however due to the sheltered nature of the bay a white sandy beach has built up in front of the retaining wall. This allows a more 'naturalistic' foreshore than Nedlands, although it can hardly compare with the wetland which would have existed previously. The foreshore has almost formal form with the wall acting as a line between the white beach and the green maintained lawn. The exotic trees and regular spacing of the peppermints are quite formal and are in keeping with the university grounds behind the beach area.

Vegetation

Much of the native vegetation has been replaced by exotic species or is very degraded. There is some remnant woodland adjacent to Sunset Hospital. There is a young stand of marri which is hardly in its original condition, however it is an important barrier between the residential area on the hill and the foreshore beneath the escarpment.

The vegetation at Matilda Bay has some native species, however, there are several thriving exotic species. To the viewer the vegetation appears 'naturalistic'. There are several stands of rushes which are adjacent to the foreshore and have a softening effect along the beach and around the lakes. Irregular clumps of sheoak and ti tree emerge from the surrounding reeds and low form bushes. The effect is unordered and natural. In comparison, J. H. Abrahams park has bushes which are planted in between maintained lawn. Native species (although not endemic) have been planted in curved nested forms indicative of a well landscaped garden and its ordered form is quite attractive and pleasing to many viewers. At Matilda Bay, exotic species and peppermint trees have been planted in linear regular

forms. The trees have been trimmed into more ordered shapes and are in keeping with the well ordered lawn. There are no understorey species, and as a result the effect is of a parkland. This is in keeping with the area, as the University of Western Australia has well ordered transformist gardens.

Riparian land use

The precinct has several foreshore land uses which are water orientated. The Tawarri Function Centre is nested in the base of the escarpment adjacent to the Sunset Hospital. The 1950s flat international style incorporates the original 'The Dome' of the 'Hot Pool'. The style is generally considered unattractive although it is typical of the 1950's style which is becoming increasingly appreciated by the public as an important architectural character. It is isolated being at the end of a no through road and at the base of the escarpment and is not a dominant feature of the riparian zone, however it is significant for its historic value.

Jo Jo's Restaurant is a prominent land use at Nedlands, as it is the original wooden baths which jut out into the water. The adjacent oval, linear nature of the banks and the bright blue roof make the building isolated and a dominant feature. In contrast, the club house, CALM buildings, and Matilda Bay restaurant are less intrusive on the landscape. The curved bay and adjacent trees minimise the buildings' form and they nest into the relatively flat landform. The northern club houses in Matilda Bay are functional in style and though quite prominent on the landscape are not uncharacteristic with the riparian nature of their location. The new wall at Matilda Bay acts as a physical barrier separating the beach from the grassed banks. It would have been preferable to have these elements merging rather than a linear barrier.

The limestone wall adjacent to Kennedy Spring has steps which enter the water. Unfortunately, due to the cutting away of the foreshore sediment and the adjacent busy road, the water access they were designed to allow, is rarely used. Their attractive formal form would have once been linked to the Arcadian landscape of Kennedy Springs, however they have become isolated to the viewer and user. The Swan Brewery site, has the potential to reduce the isolation of the river from the adjacent landscape. At present, the nature of the redevelopment is rather controversial, many favouring the site to become parkland. The redevelopment which has taken place is in keeping with the original Federation warehouse style.

Land use

The Dalkeith houses which are lined along the steep escarpment are varied in style and prominence. In general, they are extravagant in style and are built in the extreme fashions popular at the time of construction. Unlike the Claremont houses, due to the topography, only one row of houses can be viewed from the river, giving a linear effect on top of the edge of the cliff face. There is little cliff vegetation and retaining walls have been built on the cliff, resulting in visually unlinked landscape elements.

The Sunset Hospital is made up of several buildings in the typical institutional and functional style of the turn of the century. The property has several mature trees and as a result the hospital is not a prominent feature on the landscape. However, all water users in the area will be familiar with the white letters of 'Sunset' which are set in a cleared garden on the escarpment.

The Nedlands residential area is well set back from the foreshore. It is on flat land and the buildings are mixed bungalows, townhouses and low multistorey units. Adjacent to the Nedlands' ovals the properties have long frontages which act as a residential/ recreational transition zone. However, east of Broadway, all the properties which front onto the parkland are walled and create a linear barrier between the park and the residences. Parking along Hackett Drive obscures the view of the river and the road spoils the continuity between the university grounds and the Matilda Bay foreshore.

Kings Park provides a pleasant backdrop to the city as well as a spectacular view of the city and river environs. From the river, the viewer is presented with 'naturalistic' vegetation of the Kings Park escarpment and this is an important respite from the heavily urbanised river. From Forrest Drive the viewer is presented with a foreground of woodland and the wide expanse of Melville Water. The road beneath is not visible and the scene is very attractive. From Fraser Avenue, there is a view of the city, South Perth

and both Melville and Perth Waters. The view is framed by the tall linear sugar gum trees and the attractive scene is one of the most viewed landscapes in the State. The water body is the dominant element and that which makes the view attractive. The Narrows Bridge and associated ring roads detract from the scene but are dominant elements of the landscape. The plane trees are attractive specimens which give a promenade effect along Mounts Bay Road. They are also in keeping with the almost Arcadian landscape of Kennedy Springs and the Federation style Swan Brewery.

Landscape Interpretation

Dominant Landscape Character

The original natural landscape character type of undulating paleo dune forms with limestone outcrops is still evident in parts of this landscape. Originally the vegetation would have ranged from open eucalyptus woodland to shrubland throughout much of the precinct. Today, despite the presence of Mounts Bay Road, significant vegetation disturbance and quarrying, from a distance the southern side of the park appears as a relatively natural vegetation community. The bushland section of the park including the escarpment long the road has therefore been characterised as a natural landscape.

The southern side of Pelican Point has been classified as a natural landscape character as the original Vasse vegetation and landform appear relatively unaltered and natural.

The present landscape character type along most of the foreshore area is a parkland/ recreation character. This ranges from remnant woodland communities at Point Resolution and at Birdwood Avenue, to open playing fields with remnant and planted trees. Kings Park is an important landscape element for being a large and prominent section of the precinct. The foreshore and Point Lewis end of the park has grassed areas and recreational facilities. This section has been classified as a parkland/recreational landscape character type.

The Dalkeith, Nedlands and Crawley section of the foreshore has been classified as a suburban landscape. The Dalkeith suburban landscape has prominent and grand styled houses which edge the limestone escarpment. The Nedlands houses are less prominent from the river landscape while there are several tall units at Crawley.

Significant Viewscapes

From the Nedlands and Dalkeith foreshores there are attractive views of the broad Melville Water. Similarly from the river the viewer can see the limestone escarpment of Dalkeith grading to the flat Nedlands foreshore and the curved Pelican Point. Pelican Point provides a dramatic panoramic view of Melville Water and Matilda Bay. The horizon from Pelican Point is limited by the limestone escarpment of Kings Park and the dune forms of the opposite Melville foreshore. From Matilda Bay, there is a significant viewcape which is framed by the curve of the Bay and faces South Perth foreshore. From the water of Matilda Bay the viewer has a panoramic view of the curve of Matilda Bay and Melville Water. From the southern section of Kings Park, there are several locations which provide a panoramic view of the river and the opposite foreshores.

Conforming and Non Conforming Elements in the Landscape

Kings Park is a very important feature of the Perth region. It is unfortunate that the once majestic headland which jutted into the river at Lewis Point is no longer present; the Narrows Bridge and Mounts Bay Road landfill now detract from the landform and are dominant elements of this region.

Kennedy Spring is a popular picnic spot as its parkland landscape is attractive to viewers with European landscape values. Unfortunately, this enclave is separated from the river by Mounts Bay Road. The adjacent new car park at the Swan Brewery is so far incomplete and to the road user is unattractive and presents opportunities to increase the landscape amenity. The concrete safety barriers are visually unattractive and there is opportunity to minimise visual impact.

The parking along Hackett Drive obscures the river views and the continuity between the park and the university grounds. The Matilda Bay kiosk has a style which is not in keeping with the adjacent university and the recreated Matilda Bay jetties. The new limestone riparian wall at Matilda Bay creates an artificial line between the beach and grassy banks. The Matilda Bay view of the river is pleasing due to Kings Park in the background and the riparian elements such as the boat moorings in the foreground.

The walled foreshore at Nedlands is not particularly attractive and there are opportunities to improve the foreshore amenity.

PRECINCT 4

Dominant Landscape Characters and Significant Viewscapes

N

100 0 200 400 600

Metres

LANDSCAPE CHARACTERS

Recreational

Suburban

Natural

Significant Viewscapes

HWY

STIRLING

PRINCESS RD

BROADWAY

HACKETT DR

CRAWLEY AVE

MOUNTS BAY RD

Mill Pt

Pt Belches

Quarry Pt

RIVER

PRECINCT 7

KWINANA FREEWAY

SWAN

Pt Currie
(Pelican Point)

BROADWAY

THE AVENUE

ESPLANADE

WARATAH AVE

PDE

BIRDWOOD

JUTLAND PDE

Pt Resolution

Melville Water

Pt Heathcote

Bay

Waylen

PRECINCT 5

Coffee Pt

Pt Dundas

Recommendations for Maintenance and Enhancement of the Present Landscape Character

- Mounts Bay Road is a narrow suburban landscape which could be enhanced to compliment the adjoining natural landscape of Kings Park. Mounts Bay Road's prominence could be decreased and enhancement of the foreshore landscape could be improved. Landscaping could be used to link the Brewery with the native species present on the adjacent escarpment.
- A concept plan has been produced by CALM (1992) for Matilda Bay reserve highlighting the need for improved parking. In particular the parking along Hackett Drive obscures the river views and the continuity between the park and the university grounds. The kiosk style is not in keeping with the reserve and it would be beneficial have it modified to a style which is in keeping with the adjacent university and with the recreated Matilda Bay jetties. It is unfortunate that the limestone riparian wall was built along the foreshore as it creates an artificial line between the beach and grassy banks. The Matilda Bay view of the river is pleasing due to Kings Park in the background and the riparian elements such as the boat moorings in the foreground.
- Along Nedlands foreshore it would be visually beneficial to recreate some of the sandy beaches which once were present before the land reclamation and retaining walls were constructed. By creating an undulating foreshore and areas of small sandy beach, the visual quality of the area would be improved. There may be problems with developing the sandy beaches due to the prevailing weather conditions, however this may be overcome by planting riparian species which would not only stabilise the beach but would also create a 'naturalistic effect'. It would be beneficial to have vegetation adjacent to the present Nedlands foreshore oval. This would help alleviate the sparseness of the foreshore, and clever landscaping could make the land attractive. The landscaping does not have to be naturalistic, however it may be useful to model the landscaping on Beaton Park where native species have been successfully planted on an undulating landform. This will ensure that the vegetation is in keeping with the remaining bushland, but has a park land spacing indicative of its use.

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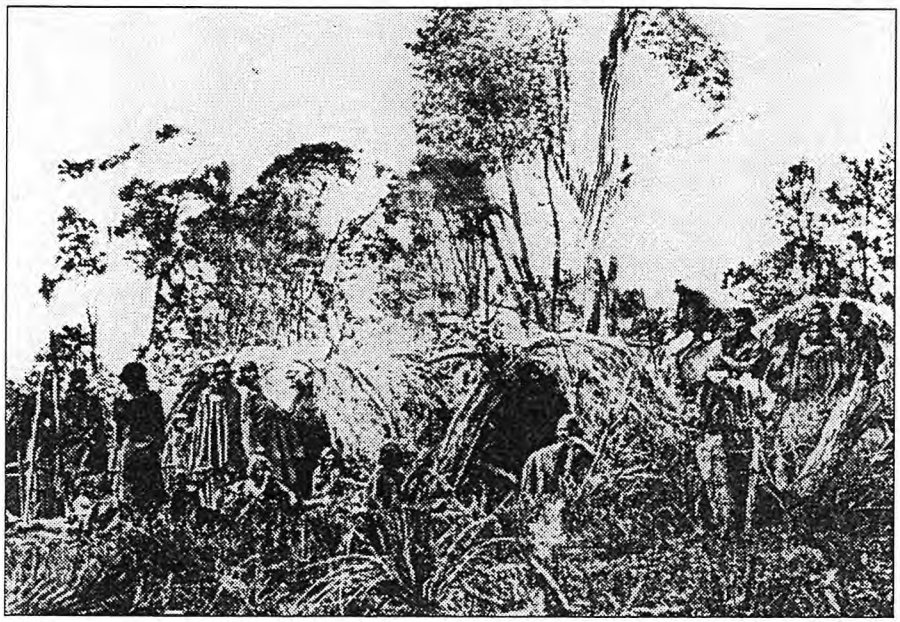
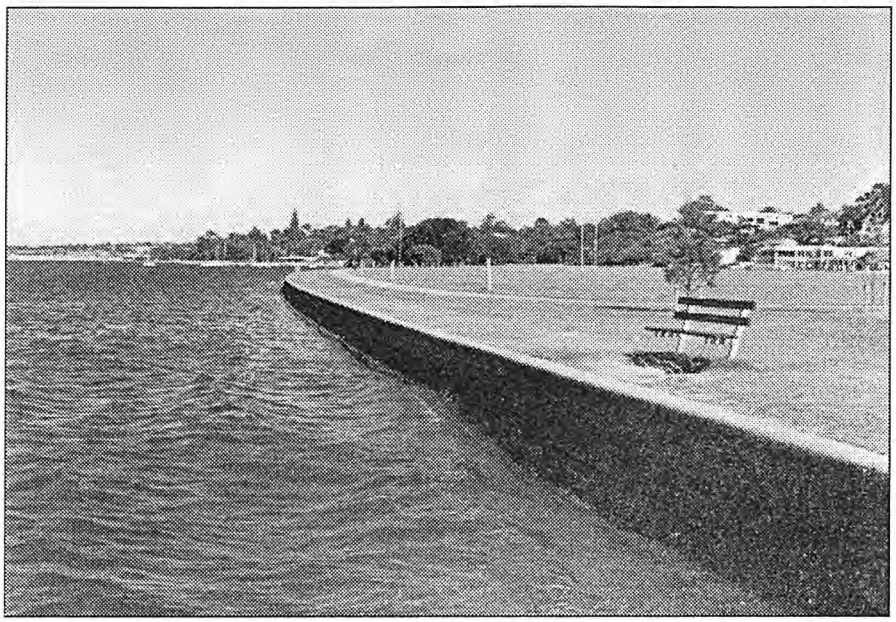


Nyungar camp at Pelican Point (Crawley Point). c1865.
Battye Library 5033P.

View from Swan Brewary. c1900.



Nedlands foreshore. View from Jo-Jo's jetty. 1997.

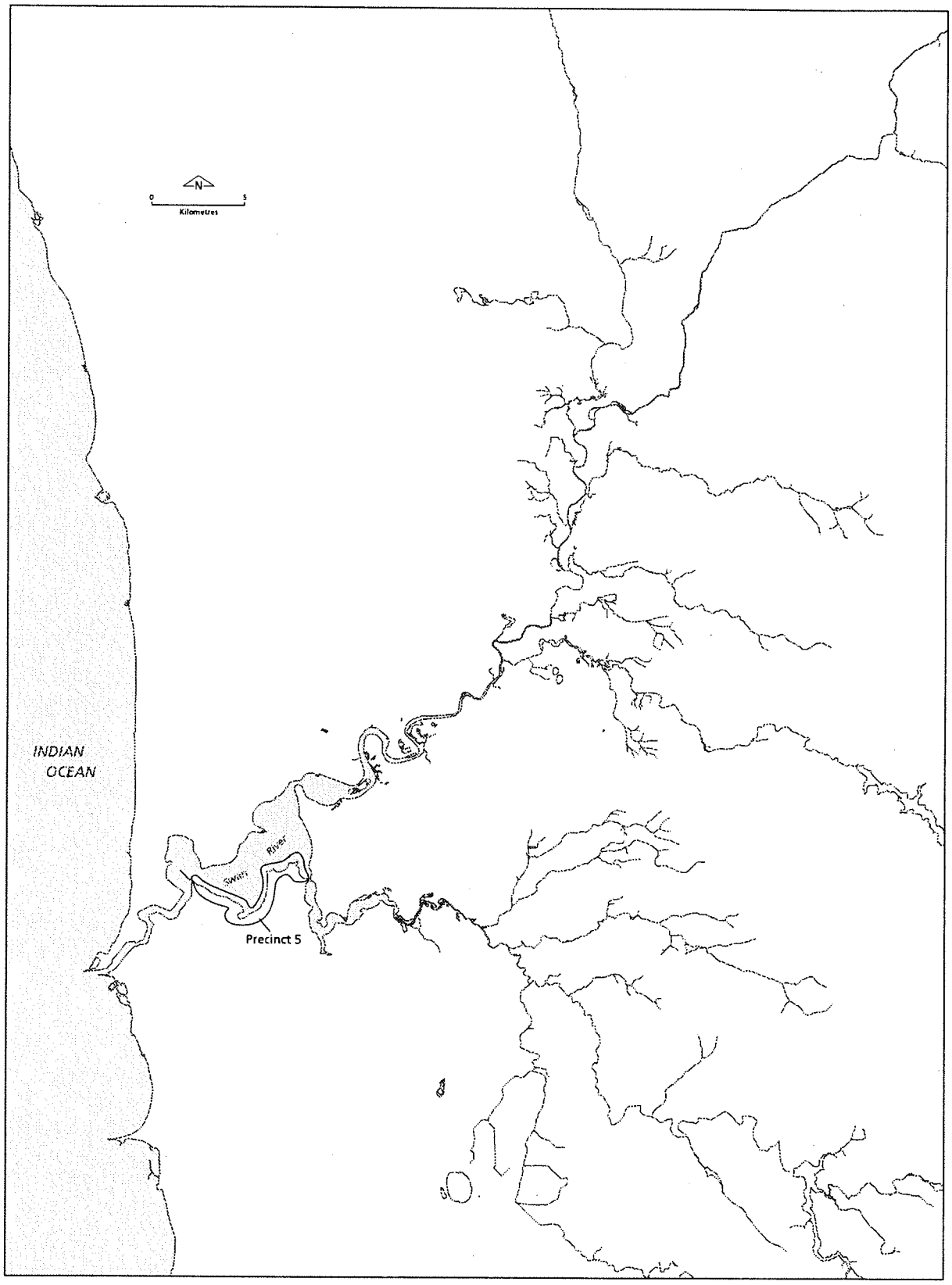
Swan River Trust.

Cliff face of Kings Park from Old Swan Brewery. 1997.

Swan River Trust.

Precinct 5

South Melville Water Point Walter to Canning Bridge



Summary

South Melville Water Point Walter to Canning Bridge

The precinct is defined as between Point Walter and Canning Bridge. From the narrow mouth between Point Walter and Point Resolution, the river widens to Melville Water.

Lucky Bay is a large triangular shaped indent in Melville Water which stretches between Attadale and Point Dundas. The western foreshore of Lucky Bay has been infilled by dredging and rubbish fill and as a result is relatively flat and has little native riparian vegetation. The Melville Beach is a linear and narrow beach which has urban development built only metres from the high water line. Alfred Cove, which indents into a small bay within the centre of Lucky Bay, supports samphire flats, reeds and fringing woodland and is an important reserve for wading birds. The wetland itself is very attractive, however adjacent recreation and housing developments encroach on the reserve and give a limited view of the area. The Applecross headlands of Point Dundas and Point Heathcote jut into Melville Water and have several concave bays as part of an undulating foreshore. Point Dundas is at present, undergoing redevelopment as an exclusive residential area, while Point Heathcote is currently being considered for redevelopment of the old hospital site.

The residential areas adjacent to the foreshore have recently undergone an increase in demand due to their proximity to the river and city. There are several new prestigious homes of extreme designs. Generally, they appear removed from the foreshore area as most residential areas are separated by a road and wide foreshore reserve. The infilled foreshore is in most parts relatively topographically uninteresting. However, parts of the foreshore have fringing woodland which acts as a visual distraction from the flat playing fields of the adjacent foreshore reserves. Point Walter has recently been redeveloped to provide more attractive amenities and food outlets. The designs are an example of attractive and unobtrusive buildings and paved areas which take into consideration the local landform and vegetation communities.

Biophysical Processes

Geological Processes

The precinct is part of the Tamala Limestone Formation which formed about 10 000 years ago when the sea was at its lowest level. The coastal limestone has structures such as aeolian and marine bedding. The most recent transgression (Flandrian) occurred around 6 000 years ago and evidence of this process occurs as an undisturbed shallow fossil deposit at Alfred Cove. This consists of 2 metres of unlithified sands, clayey sands and shelly muds which were formed when the water level in the estuary was believed to be 0.5 metres higher than present (Yassini and Kendrick, 1986). As the water receded, more recent alluvial deposits formed over the shell beds.

The soil around Alfred Cove consists of fine silt particles and sticky clays. The precinct consists of predominantly Karrakatta Sands, which in places extend to 20 metres before reaching the underlying parent limestone. The overlying soil is infertile yellow and brown sands. These sands originally supported a woodland community with a thin loamy layer due to the decomposition of the leaf litter. Charles Fraser who was present on Stirling's 1827 exploratory voyage of the Swan River was mislead by the abundant vegetation and described the on turning the soil up found it ëto contain a considerable quantity of loam even on the tops of the hills, the valleys and headlands are formed of the richest loams, and covered with the most luxuriant herbage'.

Topography

Overlying the limestone is the aeolian Spearwood Dune System which contributes to the precincts undulating topography (Seddon, 1972). The precinct comprises of two broad flat ridges which are separated by the shallow north-south orientated valley. The ridges are gently undulating and rise to a maximum height of 50 metres AHD; they are the geologically remnant dunes. The low lying area at Alfred Cove forms a flat plane which joins the gently sloping precinct foreshores. The Applecross area is situated on a headland which is topographically higher than the surrounding land. At both Point Dundas and Point Heathcote there are very narrow foreshores and steeply sloping hill faces. To the east of both of these hills are small curved bays which have comparatively gentle slopes.

Hydrological Processes

Water features

Along the western side of Lucky Bay and Alfred Cove shallow muddy waters have formed, while at Melville Beach and Point Walter narrow sandy beaches are present. At Point Walter a spit has formed as sediment has been deposited against the band of aeolianite which traverses the estuary. Large shell deposits occur in Lucky and Waylen Bays and a sand bank was originally present at Point Waylen. Within the eastern facing bays sands have accumulated due to the relatively sheltered weather conditions.

The topographically low areas of Alfred Cove are subject to stormwater runoff and there are several suburban drains which enter the area. In addition, it would be expected that groundwater through flow into the bay would be high due to the low topography. Excessive use of bore water would cause the fresh groundwater to become increasingly salty as the deeper salt water is drawn closer to the surface to replace the removed fresh water.

Bathymetry

Melville Water is the widest channel cross section of the Swan River. The river channel depth reaches to approximately 10 metres at Applecross and supports a permanent body of saline water at approximately than 5 metres. There is often a sharp halocline between the saline body and the overlying fresh water. A shallow sand bank along the Attadale foreshore to Pt Waylen is present, however much of this was dredged in the 1960s as part of a reclamation program. The bays around Pt Dundas to Canning Bridge are shallow and well protected, with wide shallow banks which are supported by seagrass beds.

Flooding

Historically, the tidal flats at Alfred Cove would have been subject to irregular submergence at times of high water levels associated with storms or high flood water discharge. Due to dredging and damming in the catchment the degree of inundation has been reduced due to the change in river velocity and reduction in the flood volume (Riggert, 1978).

Erosion and accretion

The Alfred Cove foreshore is considered very stable due to the maintenance of riparian vegetation. Melville foreshore is subject to seasonal erosion as the residential development is built very close to the beach. The foreshore is regularly eroded in high water conditions and local authorities and the Swan River Trust regularly renourish the foreshore with sand.

Vegetation Communities

Native

Karrakatta Complex

The Karrakatta Complex is the main vegetation community in the area. This complex is predominantly tuart *(Eucalyptus gomphocephala)*, jarrah *(Eucalyptus marginata)* and marri *(Eucalyptus calophylla)*. The understorey consisted of slender banksia *(Banksia attenuata)*, firewood banksia *(Banksia menziesii)* and bull banksia *(Banksia grandis)*. In addition, sheoak *(Allocasuarina fraseriana)* and peppermint *(Agonis flexuosa)* are also found. The communities which make up the complex are outlined below.

Halosarcia communities

The sheltered salt marshes at Alfred Cove are one of the few remaining samphire and low shrub communities along the Swan River (Murdoch University, 1989). Samphire *(Halosarcia* sp*)*, beaded glasswort *(Sarcocornia blackiana)*, creeping brookweed *(Samolus repens)*, streaked arrow grass *(Triglochin striata)* and seablite *(Suaedae australis)* are very common in the intertidal area. On the higher foreshore sedges and rushes, such as shore rush *(Juncus kraussii)*, marsh clubrush *(Bulboschoenus caldwelli)* and knotted club rush *(Isolepis nodosa)* are found.

Melaleuca communities

The swamp paperbarks *(Melaleuca rhaphiophylla)* occur along the foreshore in small islands of remnant vegetation. These are also often associated with the flooded gum *(Eucalyptus rudis)*. The understorey often has rushes, such as shorerush *(Juncus kraussii)*, bare twigrush *(Baumea juncea)* and bog rush *(Schoenus curvifolis)* depending on the degree of salinity. The swamp sheoak *(Casuarina obesa)* is present at Point Walter.

Dryandra communities

At Alfred Cove, parrot bush *(Dryandra sessilis)*, red-eyed wattle *(Acacia cyclops)*, swamp sheoak *(Casuarina obesa)* and sedges *(Lepidosperma)* occur. The rocky headland of Heathcote supports a number of native shrubs including red-eyed wattle *(Acacia cyclops)*, fanflower *(Scaevola nitida)* and cockies tongues *(Templetonia retusa)* (National Trust of Australia, 1991).

Banksia communities

A low open woodland of banksia *(Banksia* sp*)*, sheoak *(Allocasuarina species)*, parrot bush *(Dryandra sessilis)*, tree smoke bush *(Conospermum triplinervium)* and woolly bush *(Adenanthus cygnorum)* occurs along Waylen Bay (Murdoch University, 1989). Originally, the residential area of the precinct would have included woodland of marri *(Eucalyptus calophylla)* and jarrah *(Eucalyptus marginata)*, with a second storey of banksia and sheoak and a understorey of waljumei *(Jacksonia sericea)* and bacon and eggs *(Oxylobium capitatum)*. Other species such as kangaroo paw *(Anigozanthos manglesii)* and cats paw *(Anigozanthos humilis)* would have also been prominent.

Exotic

Exotic species are prevalent along the foreshore and many of these have been intentionally planted. At Alfred Cove and Waylen Bay, pigface *(*Carpobrotus edulis)* is a prominent species, and at Waylen Bay is the dominant riparian species retaining the beach foredune (Murdoch University, 1989). There is a considerable amount of the bright green kikuyu *(*Pennisetum clandestinum)* which has encroached to the rush beds at Alfred Cove and flourishes due to the regular maintenance of the adjacent ovals. At Point Walter, one of the most significant features are the tall Norfolk pines *(*Arauccaria heterophylla)* and Moreton Bay fig *(*Ficus macrophylla)* which have been planted at the base of the escarpment. Poplar *(*Populis* sp*)* acts as a weed with several saplings present along the Point Walter and Applecross foreshores. Along Melville foreshore there are several flooded gums (*Eucalyptus rudis)* which remain although the understorey is a maintained lawn of buffalo *(*Stenotaphrum secundatum)* and couch *(*Cynodon dactylon)*. At Point Heathcote there are a number of Japanese peppers *(*Shinus terebinthifolius)* and a large stand of giant reed *(*Arundo donax)*.

Historical Land use & Resulting Environmental Changes

The area was first explored in 1801 by the French party lead by Ensign Francois Heirisson on the Naturaliste. Waylen Bay was originally known as Frenchman's Bay as the party camped here. The 1827 exploratory party led by Stirling named Point Heathcote after G. G. Heathcote, midshipman on H.M.S. Success. It is believed that Point Dundas was named in honour of Lieutenant Richard Dundas who was stationed in New South Wales.

The first land grants in the precinct were made in 1830 to those migrants who followed the first settlers in the Swan River Colony. The earlier settlers had claimed the more fertile soils of the Upper Swan leaving the relatively infertile soils of Melville. Land was allocated to John Adams, Alfred Waylen, Lionel Lukin, Joseph Cooper, Archibald Butler and John Hole Duffield. Their grants were placed to enable easy access to the river which would be the major transport link for many years. At the time of the grant allocations, the site of the capital had not been determined and Point Heathcote was considered a favourable option.

Those settlers who had located on the Canning side of Melville were enthusiastic and were eager to develop their properties. However, the only properties to have any form of development along Melville Water were those owned by Butler and Waylen who both constructed homes. At Butler's Pembroke Farm, there was little progress, as he realised that he would be better investing in the Avon with his brother. Waylen at his Point Walter property had applied for an ale and spirit licence and also was intent on establishing a ferry service to his proposed ale house. A number of misfortunes occurred at his property including one of his labourers being speared to death after another labourer had killed an Aboriginal for stealing potatoes. In 1831, after being granted land at Preston River he left the colony for two years returning to build a more successful property. Lukin and Hole Duffield did not develop their properties and were uninterested in the land.

In 1837, Waylen was able to cut a channel in the Point Walter spit and although constantly silting up, it was heavily used. The point became a popular stopping point between Perth and Fremantle. Waylen leased his recently built inn and the channel was tolled, however, he was more interested in establishing Bull's Creek as a river port. In the 1850s several of the properties changed hand, but the majority of the land was used for rough grazing country for cattle and horses. Waylen ran cattle in the Alfred Cove area for many years. The native understorey was greatly reduced by to heavy grazing. Jarrah and tuart were cut for firewood, sheoak for shingles and banksia for firewood. The banksia was quick to recover from this intensive harvesting, however the eucalypts were replaced by only a few small saplings. From the 1840s to the turn of the century the area was mainly used for grazing.

By the 1850s the steamers were the dominant form of river transport and these were too big to pass through Point Walter spit. The channel was poorly maintained and by the 1860s was unused. In 1862 the half way house became a picnic ground. The first trip that year was by the Working Men's Association Picnic when 450 people arrived by ferry and spent the day with several types of entertainment.

In January 1850, the Canning Bridge located at Hell's Gate was open to the public. It was built by Solomon Cook and a gang of prisoners from Fremantle. The bridge was tolled, however the Canning Road leading to the bridge was a sandy track for many years and the road was difficult to traverse.

In 1896, Alexander Matheson built jetties at Attadale, Applecross and Coffee Point for his proposed ferry service. A boat building yard was established at Coffee Point and several boats were built and maintained at this location. The ferry service was quickly overtaken by the buses.

By 1900 the Canning Bridge Hotel was located on the western bank of the Canning River confluence and was a popular recreational location. This was later to replaced by the Raffles Motel/Hotel.

In 1914, a tram service was built between Stock Road and Point Walter. It was aimed at encouraging visitors to the Point, however most people arrived by road or by boat. Despite this, the point became a popular location due to the several attractions, such as, dancing and side shows. The cost of running such

entertainments was high and as the popularity of the area declined there were increasing pressures on local council's finances.

By 1930 much of the Melville land was under modest agricultural development. The increase in Perth's population had given rise to the demand for perishables such as milk, fruit, vegetables and eggs. W.D. Atwell and subsequently Arthur Groves ran the Atwell House and dairy at Alfred Cove for many years, and had approximately 100 dairy cows which grazed in the fringing woodlands.

At the turn of the century, increasing numbers of Fremantle workers bought land in the Melville area for their homes, from where they would commute to Fremantle. Areas such as Palmyra, Richmond and Plympton developed into suburbs. Subdividers of Attadale, Applecross and Mount Pleasant directed their attention to attracting Perth's business men and public servants, who could afford to commute to the city. The land was slow to be taken up, however a few families did move to the area when the Wireless Hill radio transmitter was built in 1911.

From 1948 to 1972 the former military camp overlooking Melville Water was a shelter for immigrants while they found accommodation. The site was crowded and uncomfortable and most often a rather uninspiring and difficult introduction to the country.

By the 1950s the shorelines of Melville were seriously degraded. Erosion had exposed many limestone boulders in the shallows at Point Walter. Applecross was fouled with an algal bloom. In 1961, 30 000 tonnes of clean sand were pumped onto Point Walter Beach to replenish the sand. There was a plan by the Public Works Department to fill in Waylen Bay, but it, this was later abandoned due to general public outcry. However, the Applecross foreshore was filled in to cover the algal blooms which had developed in the small bay and the land became a flat playing field.

The large flat areas of Troy and Tompkins Parks are the result of the use of the area between 1952 and 1964 for disposal of domestic and building wastes which were covered with sanitary landfill. The Attadale foreshore was cleared of natural vegetation and the river bed was dredged and the soil used to fill the foreshore. The area was also used as a rubbish dump for domestic waste and liquid effluent. At Point Waylen, the Civil Aviation Transmitter was constructed in 1958 and still plays an important role in communication for Perth Airport, however, it has been proposed that it should be removed (Murdoch University, 1989).

The Majestic Hotel at Point Dundas was originally built for Governor Sir Gerard Smith who at no time ever resided at the house. It was bought by G. Forster who lived there for five years and eventually the house became the Hotel. By the 1970s, the Majestic Hotel's income had decreased and several redevelopment proposals had been tendered. They included a international holiday centre in 1969, a casino, hotel, marina and yacht club complex in 1974, and 1982 a 32 storey hotel by Bond Corporation. The latter was rejected, so a second proposal of a high density residential and commercial development was proposed and again rejected. After several other owners and controversies the land was eventually cleared for a low density prestigious residential development. The land market, however, crashed at the time of release and the prices of the blocks were too expensive. By 1995 only a couple of blocks had been developed and the point remains a sandy block.

The South of Perth Yacht Club was relocated in 1962 to Point Heathcote. In 1972, it was hoped that a bridge would be built between Point Walter and Point Resolution, however among many considerations the cost was deemed too high.

Present Land Use and Social Patterns

The precinct is mainly made up of the suburbs of Applecross, Attadale, Bicton and Alfred Cove. Apart from a small section north of Dee Road, Applecross residential development does not go to the high water mark. Along Melville Beach Road, there is a very small foreshore road built on its back dunes. Adjacent is a line of predominantly post 1960s homes with a high degree of urban pride. Several of these blocks have been recently subdivided and new expensive homes have been constructed. The residential area in Attadale is behind Burke Drive, and has generally large homes which have been built over many decades. At Point Dundas an exclusive

PRECINCT 5

Significant Land Use Features

Pt Resolution

SWAN RIVER

Melville Water

Pt Walter

Cafe and amenities

CARROLL DR

Pt Walter Reserve

Sport and Recreation Centre

RD

Santa Maria College

BURKE DR

Attadale Reserve

Lucky Bay

Melville Golf Course

ST

RESERVE

STOCK

BICTON

WICHMANN RD

Civil Aviation and Safety Authority radio towers

Troy Park

Pt Waylen

Alfred Cove

Attadale Hospital

lawn bowls

YMCA

Tompkins Park

DUNKLEY AVE

Wireless Hill Telecommunications Museum and Lookout

ATTADALE

Pt Heathcote

South of Perth Yacht Club

Heathcote Hospital

Coffee Pt

Bay

Waylen

RD

Pt Dundas

Boardwalk

Jeff Joseph Reserve

THE STRAND

DUNCRAIG

Raffles Motor Hotel

KINTAIL RD

APPLECROSS

DEE RD

OGILVIE RD

Lucky Bay

Beach

Melville

HWY

CANNING

Canning River

N

100 0 200 400 600

Metres

low density residential development is currently being built. The site had a limestone wall and metal railings built along the foreshore to retain the blocks. Unfortunately, due to the slow development of this site the fencing has been vandalised and this has not been fixed for over a year by the developer.

Heathcote Hospital has recently closed down and decisions are yet to be made regarding land use for the site. It is currently managed by the Health Department of Western Australia and the hospital will be relocated. The relocation could facilitate improved public access to the foreshore and ideal opportunities to sensitively redevelop or convert the old hospital into a new land use.

The Raffles Hotel/Motel is located at Canning Bridge, Applecross, and due to the need for bridge support has high retaining walls. The motel is painted rather gaudily and has a large advertising sign on its roof. The retaining banks are concreted and bituminised for a carpark.

Recreation nodes

The facilities at Point Walter were recently upgraded and the area re landscaped. Road modifications and carparks were relocated away from the foreshore. A new kiosk and cafe replaced the old food outlet and amenity block. New barbecue facilities and a small amphitheatre were constructed. The result has been a successful relocation of traffic away from the foreshore and greater provision of foreshore available for recreational pursuits. The area is heavily used for swimming, fishing, prawning, sail boarding. boating and water skiing. The boat ramp provides a focus for boating activities.

Attadale Reserve is flat open grassland with some paperbarks which has a golf practice area. The area was infilled during the 1960s and as a result there is a flat open space. A dual use path runs adjacent to the foreshore and allows the user to view the remaining paperbarks and flooded gum, although unfortunately the understorey is poorly represented due to the flourishing kikuyu grass.

Alfred Cove provides a valuable opportunity to observe and study the visiting wading birds and the rare wetland community. The site did have a hide, however this was removed due to the high cost of maintenance. Again the kikuyu grass is a severe problem and indicates that nutrients from the adjacent residential gardens and ovals are entering the wetland.

Tompkins Park Reserve is composed of a number of ovals which are used by several sporting and recreational clubs. The clubs have several carparks which are partly hidden by planted native flora and the club houses are painted in green tones which reduce their prominence on the landscape. Atwell House at Alfred Cove is used as an arts centre and displays works produced by local people and members of the groups which meet at the centre.

Melville Water is heavily used by windsurfers as it is often subject to prevailing wind conditions. The relatively sheltered Melville Beach is considered to be an ideal location for the less experienced windsurfer and as a result classes often take place at the Cunningham Street carpark.

The South of Perth Yacht Club is located at the confluence of the Swan and the Canning River and has a large area set aside for club activities. A tennis club is located at Waylen Bay foreshore and the area has several recreational facilities. Two water ski areas are located at Waylen Bay and Point Walter.

Public access

Melville City Council and the Swan River Trust have provided a raised walkway around the foreshore at Point Dundas and have replanted a reed species to reduce natural erosive processes around the point. The shallow water around the point is inaccessible to swimmers and near water users. The precinct has a well maintained dual use pathway all along the foreshore. There is a lookout at Point Heathcote which is linked to the Point Heathcote pathway and overlooks Melville Water. There is restricted access from the Point Dundas walkway to Dee Road as residences are built to the high water line and the adjacent beach is narrow due to erosive processes. Alfred Cove can be reached by a dual use pathway or via Troy and Tompkin Park reserves.

Sites of Nyungar & Wider Australian Community Significance

Nyungar significance

In summer, the Beeliar Nyungars used Alfred Cove

(Marradungup) as a campsite for this was an area of the wetlands which was an abundant source of yams, crustaceans, turtles, and waterfowl. This name means place of death water (Collard *et al,* 1996). Beeliar Nyungars would regularly burn sections of this area which kept the understorey low and was considered a useful technique for flushing out game. The Melville area was originally open woodland as the result of centuries of burning by Nyungars (Cooper *et al,* 1989). The area was particularly admired for its open woodland by the early white explorers who found this landscape aesthetically pleasing (Seddon, 1972). Early colonists could not be persuaded to live in the area particularly at the time of Yagan. Yagan was a local Nyungar who continued to defend his custodial right to this area for some time after the Swan River Colony had been established (Uren, 1975). The Nyungar names for the area are *Dootanboro* (Melville Water) meaning 'the big pelican river', Point Walter or Dyoondalup meaning the 'place of white sand', Lucky Bay *Margamangup* meaning 'the place of the bird's nest in the tree', *Moondaap* (Point Dundas) meaning 'the blackness of the river bank', *Kooyagoordup* (Waylen Bay) referring to the place of the *kooyar* species of frog (Collard *et al,* 1996). *Goolugatup* (Point Heathcote) means the 'place of the children' and the Canning confluence is known as *Gabbi Kowangalup* the 'place where the water comes out of the hole'.

Other significance

Point Heathcote was where the 1827 exploratory trip camped and planted a garden to test the qualities of the soil. No report on the garden's success or failure was given (Seddon, 1972).

Point Heathcote was one of the sites considered for the capital of the Swan River colony as it was the site of the confluence of the Canning and Swan Rivers. However, the present Perth City location was chosen in preference due to the abundance of fresh water. The old Heathcote Hospital is one of the prominent features at Melville Water and has an attractive building opened in the 1929. Heathcote was built as the Heathcote Reception Home which was the result of a 1927 agreement which distinguished between the certified insane and the mentally ill (National Trust of Australia, 1991). Heathcote was for recoverable patients who could be separated from the senile, epileptic or mentally deficient based on legislative definitions of the time. There are 1940s and post war buildings.

Historically, the precinct was very isolated and as a consequence was slow to develop. Early colonisers, such as Alfred Waylen, were important in encouraging development in the area. Some of the water and land features adjoining his properties have been given his name. The Atwell family was associated with dairy farming in the area and their homestead is one of the earliest houses remaining in the district and is now used as an arts centre.

Conservation areas

Wetlands

Alfred Cove is part of the area under consideration for the Swan Estuary Marine Park and this wetland will be managed by CALM.

System 6

M61 Aquatic Reserve, Attadale

The recommended area comprises the tidal flats and salt marsh areas of Point Waylen and Alfred Cove. The vegetation community includes sedgeland, bulrush, closed heath and a narrow belt of low closed forest of swamp paperbark. In Alfred Cove, there is a fossil deposit of sea shells. The area is one of only three significant wading bird sites on the Swan River. Trans equatorial migratory species are found in great numbers on these tidal flats. The area is a regionally significant open space and has high zoological significance. The area is recommended to become a regional park. The park is currently being incorporated into the Swan Estuary Marine Park and Adjacent CALM Reserves Draft Management Plan (1995). It was identified as having educational, conservational and recreational value.

M65 Point Heathcote Foreshore, Applecross

The recommended area is situated on the shore and steep slope behind Point Heathcote. The area consists of rocky headland of coastal limestone carrying a number of native shrubs and a low open woodland along Waylen Bay.

Pt Resolution

Melville Water
(Dootanboro)

Gabbi Kowangalup

Pt Heathcote
(Beenabup or Goolugatup)

Heathcote Hospital

Coffee Pt

Old boat building location

Site of Majestic Hotel

infilling in 1960's

(Kooygoordup) Bay

Waylen (Frenchmans Bay)

Pt Dundas
(Moondaap)

original foreshore

RD

STRAND

THE

DUNCRAIG

Lukins Property

KINTAIL RD

"Hells Gate"

OGILVIE RD

DEE RD

Lucky Bay
(Margamangup)

HWY

CANNING

Canning River

(Dyoondalup)

Pt Walter

Point Walter Ferry Jetty

CARROLL DR

migrant huts

RD

SWAN RIVER
(Derbal Yaragan)

Lucky Bay
Dyoondalup

BURKE DR

ST

RESERVE

STOCK RD

Beede

WICHMANN RD

Butler's Property

Pt Waylen

Alfred Cove

Marradungup

DUNKLEY AVE

HISLOP RD

Waylens Property

PRECINCT 5

Sites of Significance

N

100 0 200 400 600

Metres

Dyoondalup Sites of Nyungar Significance

• Waylen's Property Other Australian Community Significance

Precinct Description

Waterform

Within this precinct there are several small bays and undulations within the wider river channel. At Point Walter, the water forms a gently undulating beach and the shape is of a sheltered bay due to the spit and the riparian structures along the foreshore. From western bank of Lucky Bay (Attadale Reserve) the river widens and becomes more linear until it curves around Pt Waylen into Alfred Cove. Alfred Cove is a particularly attractive enclave, the water broadens into a circular form as it enters the cove mouth between Troy and Tompkins Parks. The river then becomes a wide channel along Melville Beach which runs in a northerly direction. At Point Dundas, the river form curves around the small headland and the wide expanse of Melville Water is on either side. Waylen Bay is a small embayment which is bounded by Points Dundas and Heathcote and although the curve of the waterform is less than at Alfred Cove, the effect is still an enclosed and sheltered water body. Point Heathcote has a synodal water edge which juts into the long north-south orientated stretch of water which runs along the Como foreshore.

Natural riparian zone

One of the widest beaches in the precinct is located at Point Walter. The beach is gently sloping white sand and due to the relatively sheltered conditions and previous beach replenishment is a couple of metres wide. In contrast, the narrow beach at Melville Beach is open to prevailing weather conditions, the lack of vegetation has resulted in seasonal erosion and steep narrow concave slopes. The Melville City Council regularly reclaims the foreshore between Pt Dundas and Dee Road, Applecross. The new beach is uncompacted sand which eventually takes a more natural gradient and if planted with riparian vegetation would be held in place.

Along the Melville reserve from Carroll Drive there are several stands of reeds which spread into the high tide zone to the edge of the riparian zone. The reeds, attractive long thin spiky form has a soft brushy effect and their clumpy form make the foreshore line irregular and undulating. There are several paperbarks and sheoaks which have branches which curve over the water's edge. There is a break in the riparian vegetation at Burke Drive golf practice area, which has a narrow sandy beach. The riparian vegetation is abundant in Alfred Cove and is several metres wide in places. The result is a pleasing effect with the brushy reeds and low red samphires forming curved nodes in the waterform.

Heathcote has a relatively wide sandy beach facing the prevailing weather conditions. This is possibly due to the natural vegetation which supports the sandy beach to the high tide line. A steep embankment is present on the northern part of the headland and a narrow sandy beach has formed in the concave bend within the headland. From Coffee Point the small sheltered bay to Canning Bridge has a narrow white beach dotted with riparian vegetation.

Landform

Point Walter has a quite steeply sloping face to the relatively high undulating land. The steep face has been cut back to a more gradual slope around the kiosk area to enable easier access to the foreshore and the undulating hill behind the foreshore. Attadale becomes more gently sloping and the foreshore area broadens into a flat plane. The topographically low flat land becomes intertidal at Alfred Cove. At Tompkins Park, the land is a wide reclaimed playing field which narrows to Melville Beach. There is little foreshore along Melville Beach and Dunkley Avenue and it is only metres from the water and adjacent residential area, which is very gently sloping. From Dee Road, the Pt Dundas headland rises quickly and steeply, however the slope is not gradual due to residential blocks cut in the limestone in step form. The steep land declines sharply towards the Waylen Bay foreshore which due to reclamation in the 1960s is very flat compared with the sloping hills behind the bay. Pt Heathcote is a steeply sloping limestone outcrop. This is suffering from small landslides in the steeper unvegetated areas. The hill gradient rapidly decreases towards Coffee Point which is a flat embayment.

Vegetation

The vegetation at Point Walter is dominated by Norfolk pines, Morton bay figs and poplars along the foreshore. There is maintained lawn as well as a few

sparse dune species. At the steeply inclined cliff adjacent to the boat launching carpark, there is a low formed scrub community. There are also several prominent bamboo stands which dominate the cliff vegetation with their long stems and contrast sharply with the dull dusty green clumpy forms of the native bushland.

Along Attadale foreshore, there are several isolated trees adjacent to the maintained kikuyu grass of the golf practice area. There is a stand of attractive and mature paperbarks and rivergums. These have particularly pleasing bark and leaf forms and it is unfortunate that the kikuyu grass is the dominant understorey. The adjacent foreshore has several large clumps of reeds which have a needle like dark green form and due to their clumpy nature give the foreshore an irregular form.

Like Attadale, Troy Park has several mature river gums and paperbarks with little original understorey. However, close to Alfred Cove the wetland vegetation community is quite spectacular, particularly with the red samphire and adjacent dark green reeds. There is also bulrush present which forms soft brown downy flowering bodies. The colour tones of the wetland are rather overwhelmed by the bright green of the kikuyu grass edging the wetland.

Melville foreshore has several introduced flame trees and also a few sparse stands of native species. There is little riparian vegetation except the reeds recently replanted at Point Dundas by the Swan River Trust. There is a wide band of reeds at Jeff Joseph Park and a few isolated stands of rivergum. The Melville City Council is currently planting a few new seedlings within the present stands.

Point Heathcote has a good stand of open shrub communities which are in relatively good condition, however, in places where vegetation has been removed, the slope is so great that erosion is a serious problem. The bushes are particularly attractive and the viewer does not see the Heathcote Hospital from the pathway through the vegetation community. There is a large stand of bamboo adjacent to the South of Perth Yacht Club and there are several flame trees along Coffee Point which due to their vivid flowers and spreading form are quite dominant form. There is lawn along Coffee Point and several patches of reeds which encroach into the river.

Riparian land use

At Point Walter there is an old jetty which was originally frequented by day trippers, and on special occasions is still used by tourist ferries. The jetty is a reminder of the historic value of the area as a recreational node. The new kiosks are in keeping with the historic nature of the area, however, the designs are modern and the building materials are visually of minimal intrusion due to the soft limestone colours and light gum green roofs. The Waylen Bay jetty at Applecross does not attract as many recreational users and is a rather isolated structure.

At Point Dundas a limestone retaining wall has recently been constructed around the headland. This has resulted in a very narrow riparian zone. Water reaches the wall and reeds have been planted adjacent to the wall to restrict sediment movement against the vertical wall. At the Raffles Hotel, there is a vertical limestone wall which supports the land around the hotel and the Canning Bridge, the limestone wall is well weathered being built at the turn of the century, however the bank is an unattractive concrete surface.

Access to the South of Perth Yacht Club is slightly restricted by club activities, however a dual use pathway encourages public access to the foreshore. The marina is in the bay at Coffee Point and is not an intrusive structure into the river.

Land use

The suburbs of Applecross, Attadale, Bicton and Alfred Cove front onto the river landscape. The Melville and Canning Beach Roads have urban developments on a flat topography so the front row of houses adjacent to the beach are the dominant land use element presented to the river user. These houses have a high degree of urban pride and of architectural styles typical of the era in which they were built. There are some more extreme architectural styles along Burke Drive, although, being set back from the river , these houses are less visually intrusive to the river viewer. The building of Sainta Maria College is a prominent feature to the river user, as it is set on the higher topography of the Attadale hills and is visually in keeping with the urban use of the area. At Point Dundas, an exclusive low density residential development is currently being built. The few houses

which have been constructed are very extravagant and bold in style. There has been no attempt to maximise visual quality of the site by linking the blocks with a 'transition' zone between the water and the urban development as the two elements are separated by a limestone wall.

The Sports Recreation Camp at Point Walter has low visual impact on the landscape. The site has been successfully redeveloped without substantial effect on the surrounding open woodland. Its buildings are simple and functional. The kiosk is an excellent example of how a recreational node can be compact and unintrusive and at the same time functional and attractive.

Heathcote is an attractive and prominent building on the landscape. It has a brown brick tower which rises above the tree canopy. The building itself is institutional in style, however the brown brick buildings are quite pleasing to the viewer for their age and non residential style.

The Raffles Motel is a prominent feature at Canning Bridge. It has a bright blue and white motel and the hotel is painted cream. Its *Moderne* style is in keeping with the adjacent local town hall, however, due to an advertising bill board, the architectural line of the building has been compromised.

Landscape Interpretation

Dominant Landscape Character

Originally the precinct would have had a natural landscape type characterised by the undulating forms of the Spearwood Dunes with more recent fluvial deposits in places such as Alfred Cove. The vegetation would have been mainly low open forest with fringing estuarine vegetation communities. Now the dominant landscape character type is suburban. The houses around the foreshore have a high sense of urban pride and due to the mainly flat nature only the first row of houses is prominent. The other dominant landscape character type is recreational.

At Point Water, Burke Drive and Alfred Cove the fringing vegetation and any remnant vegetation acts as a parkland effect to the dominant grassed areas used for recreational purposes. The South of Perth Yacht club is a recreational landscape as is Waylen Bay. The samphire flats at Alfred Cove have been classified as a natural landscape character as they appear relatively undisturbed. Unfortunately, the suburban area encroaches on the viewscape so it was difficult to determine whether the wetland area should be classified as parkland or natural. The latter was chosen as the vegetation was in relatively good condition and due to fencing around the wetland the area can only be viewed rather than physically accessed. Within the fencing the wetland appears to have had little human influence.

Significant Viewscapes

All along this precinct's foreshore, the views of Melville Water and the opposite banks are particularly significant. At Point Heathcote and Point Dundas, the city skyline is an important focal point of the panoramic viewscapes. From the river the views are limited by the first hill rise which is the limit of the viewscape's horizon. From the Canning Bridge area the viewscape is guided by the almost linear South Perth foreshore and the v-shaped opening of Melville Water.

Conforming and Non Conforming Elements in the Landscape

Point Dundas is one of the visually significant points on the river to both the water and land based user. It is unfortunate that the recent redevelopment did not undertake to develop the headland as an area of high visual quality. It would have been very beneficial to have a transitory zone between the foreshore and the first row of residential properties. This zone could have graded the foreshore vegetation to low shrubland which would merge into residential gardens. As it is the properties have high walls in addition to the limestone retaining wall which creates a strong visual barrier. Foreshore access should have included an area of at least 50 metres not simply be restricted to a walkway. This would not only have given adequate access but also played an important visual role in the headland's landscape. It is also important to note that the strong geometric modern designs of the houses accentuate the isolating effect, however the design of the house should not be the issue in landscape opportunities, rather it how to best develop a high quality landscape within the allocated land use.

Heathcote Hospital site is an excellent opportunity to sensitively redevelop or change the land use of the present buildings. The buildings are attractive and it would be good to incorporate at least some of these structures into the new land use. It would also be a good opportunity to stabilise the banks and return the site to a more natural gradient. This would overcome the problem with bank erosion and would facilitate the re-establishment of vegetation in sites of high erosion.

The Raffles Hotel is more strictly an issue for local councils, however as it is a prominent river precinct feature it may be relevant to discuss it here. It would be beneficial if the bill board could be removed allowing the original design of the hotel to be appreciated and it would be an ideal opportunity to link the hotel and the moderne or art deco design of the adjacent town hall in a 'historical zone'.

Melville Beach is regularly reclaimed and it would be visually more acceptable if the reclamation could be associated with vegetation planting which would help create a visually more natural foreshore.

The foreshore adjacent to the Attadale golf practice area and Troy Park has some very attractive paperbark and flooded gums. There is the opportunity to restore the understorey which is heavily infested with weeds including the vivid green kikuyu which

PRECINCT 3

PRECINCT 4

Pt Resolution

SWAN RIVER

Melville Water

Pt Heathcote

PRECINCT 7

Coffee Pt

Bay

Waylen

RD

Pt Dundas

THE STRAND

DUNCRAIG

KINTAIL RD

DEE RD

OGILVIE RD

Canning River

Lucky Bay

HWY

Pt Walter

CARROLL DR

RD

BURKE DR

PRECINCT 2

ST

RESERVE

STOCK

WICHMANN RD

Pt Waylen

Alfred Cove

DUNKLEY AVE

CANNING

HISLOP RD

PRECINCT 5

Dominant Landscape Characters and Significant Viewscapes

N

100 0 200 400 600

Metres

LANDSCAPE CHARACTERS

Recreational

Suburban

Natural

Significant Viewscapes

detracts from the soft colours of the native vegetation.

Jeff Joseph Park at present has a flat and uninteresting landscape due to infilling and previous use as a rubbish dump. The area presents an exciting opportunity re-landscaping to incorporate a more interesting landform.

Recommendations for Maintenance and Enhancement of the Present Landscape Character

- Consider the opportunities which the Heathcote Hospital and Raffles Hotel sites have for enhancing the landscape character taking to consideration the values of the present buildings and the opportunities to improve the vegetation condition, particularly at Heathcote.
- The area adjacent to the Attadale golf practice area and Troy Park has the potential to be restored. Sensitive vegetation replanting could help recreate a natural understorey and the whole area could be included in the Alfred Cove management zone. Replanting the understorey would provide the viewer with a more pleasing landscape due to the multi layering and diversity of a paperbark and river gum community.
- At Jeff Joseph Park a slightly undulating landscape could help focus and link the present jetty to the recreation area. Planting of curved gardens of low lying native shrubs and understorey species could create interesting nodes and reduce the sparseness of the area. The landscaped gardens could incorporate native species in informal (non geometric) shapes. The area does not have to be 'natural' in that grassed areas and 'parkland' design would be quite visually acceptable as the bay is surrounded by suburban development.

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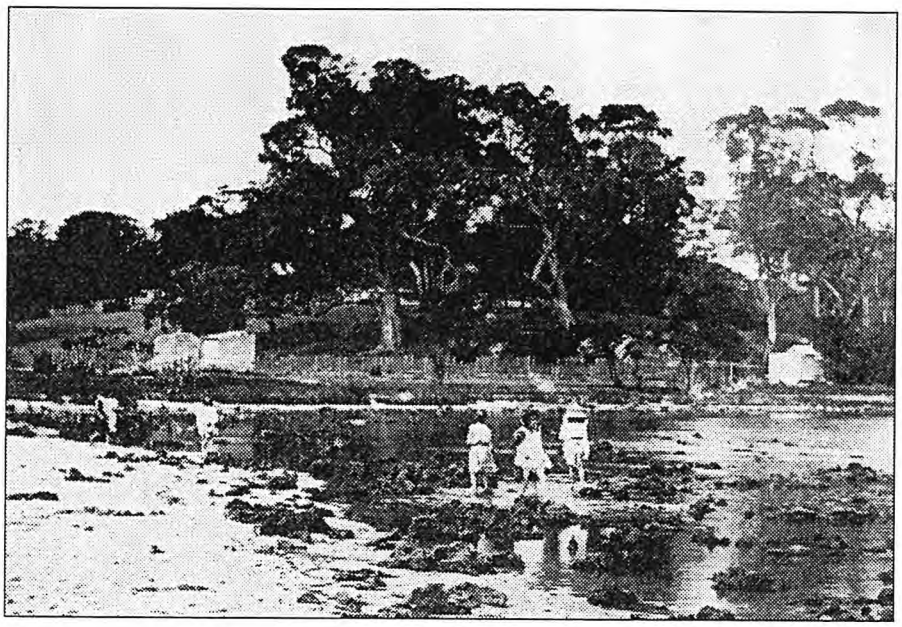
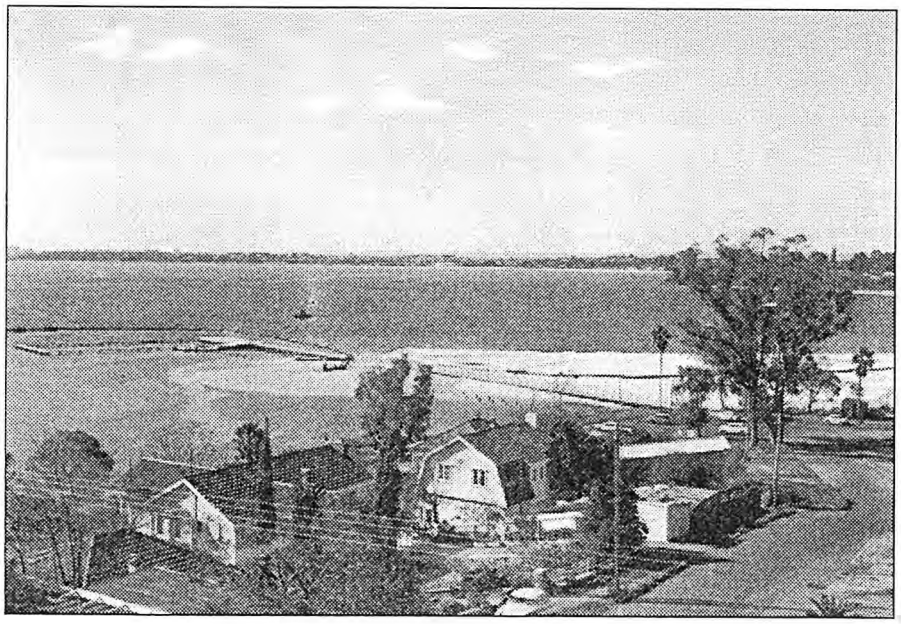
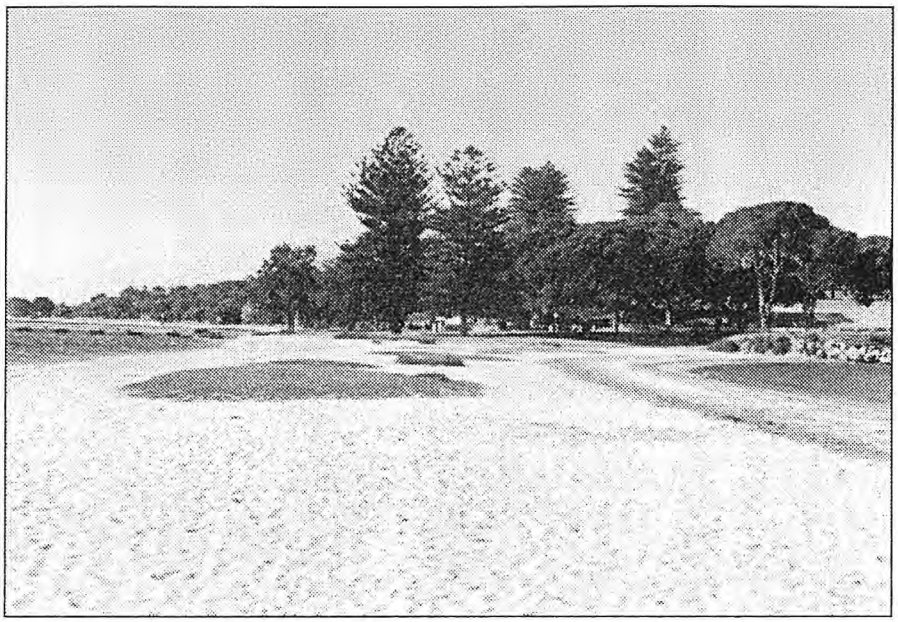


Point Walter Spit. c1900.
WA Newspapers HIST3526.



View from Majestic Hotel, Applecross foreshore. 1961.
Swan River Trust.



Point Walter Spit. 1997.

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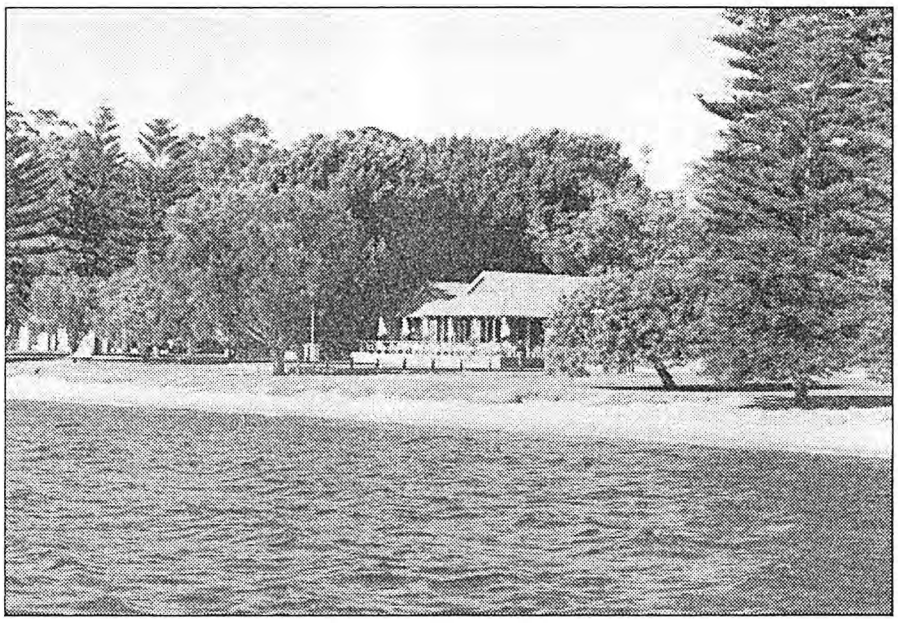

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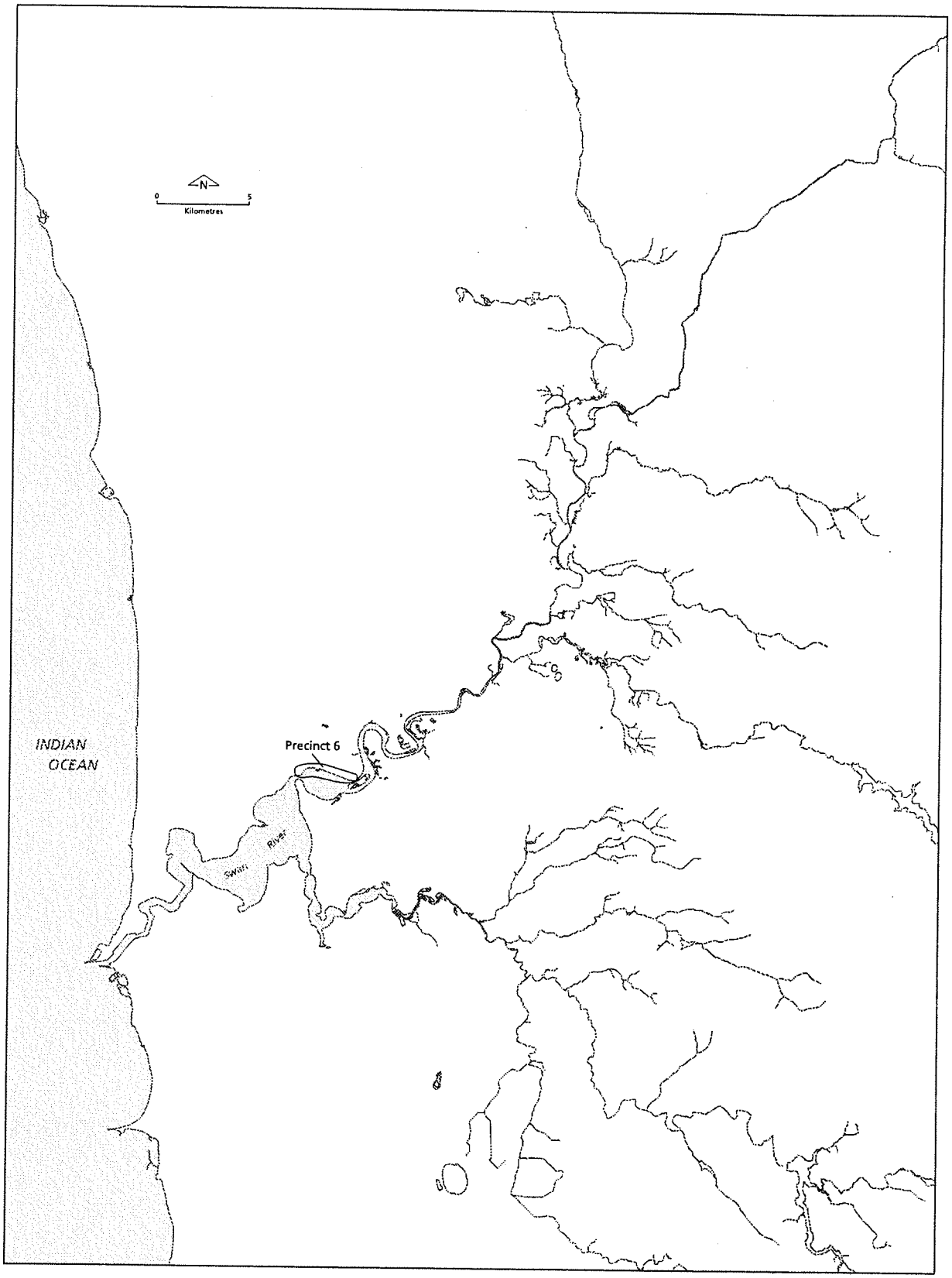
Precinct 6

Perth Water - Perth City Foreshore



Summary

Perth Water - Perth City Foreshore

The precinct is defined as the northern half of Perth Water between Point Lewis and the Causeway. The basin has an attractive wide form which tapers towards the Narrows and Heirisson Island.

Historically, the foreshore has been dredged and infilled several times which has resulted in a topographically flat and linear foreshore. There is a limestone retaining wall along most of the foreshore which acts as a visual barrier and limits access to the water. However, one of the most dominant and restrictive land uses of the river foreshore is the Narrows interchange and Riverside Drive. These roads are extremely busy and act to serve both the city and the metropolitan area. The foreshore user is physically restricted to the narrow belt of grassed foreshore by the roads and visually these road systems are strongly linear and geometric in form. The Esplanade and Langley Park are open grassed areas which run parallel to the river. The geometric form of the green lawns is emphasised by the linear planting of exotic trees around the park boundaries.

The dominant landscape features in this precinct are the high rise buildings which are orientated parallel to the river in an east-west direction. The buildings provide a strong vertical element to a basically flat topography of the city area. Kings Park originally would have been the most vertically dominant element, however, the escarpment is visually diminished due to the city skyscape and the loss of prominence due to the infilling of Mounts Bay and construction of the freeway interchange.

Biophysical Processes

Geological Processes

The original foreshore of Perth Water is the marine deposit termed the Vasse. These are poorly drained plains with variable undifferentiated estuarine and marine deposits (DCE, 1980). Behind these deposits are the Karrakatta aeolian deposits which are deep yellow sands over limestone. The underlying Tamala Limestone formation is composed of coarse to medium grained calcarenite consisting mainly of fossil skeletal fragments and quartz sand which were laid down in the Quaternary.

Topography

The precinct is part of the undulating topography of the Spearwood Dune System which is higher and less leached than the adjacent Bassendean Dunes. The city town site was originally quite undulating, however much of the higher land was levelled last century to allow for building construction. Most of the foreshore is flat reclaimed land which was built using dredging spoil and infilling the wetlands.

Hydrological Processes

Water features

Previous to reclamation the river foreshore edged Mount Eliza forming the scalloped shaped Mounts Bay. The Perth basin edge was a relatively linear foreshore until Point Fraser, an isthmus of mud flats which curved into the water in a south-westerly direction. At present, Perth Water is a large basin which tapers at Heirisson Island and the Narrows. The Perth foreshore is linear and has no remnants of the original curve of Mounts Bay and Point Fraser. It is also interesting to note that Perth had abundant freshwater lakes and springs, however these have been reclaimed and the sites dewatered for building land uses.

Bathymetry

The basin covers approximately 327 hectares but is very shallow with an average depth of 1 metre. The hydrological condition of the Perth Water changes seasonally, depending on the volume of river flow. The winter conditions of the water body is relatively fresher due to high river runoff in winter. The salinity increases over summer due to the fall in river runoff and the increase in surface evaporation. In winter, the surface salinity in the basin is around 25 ppt which rises to over 30 ppt in the summer months. Tidal movements also influence the hydrology of the water conditions.

There are two wide banks of clay deposits which stretch in a north-south direction across Perth Water. There are also shell deposits in the Heirisson Island area. Several navigation channels have been dredged in the Perth basin.

Flooding

Perth foreshore is seldom subject to severe flooding due to the limestone retaining walls which support the reclaimed banks. However, historically the low lying land was frequently inundated. Some of the major floods were: July 1847 Perth jetty and low land was submerged; June 1907 and May 1908 the low lying land of Perth was created; and 1932 the banks overflowed at Mounts Bay Road.

Erosion and accretion

There is no bank erosion along the Perth foreshore at present due to the presence of the limestone retaining wall. Without the wall, the river bank would be dynamic and subject to the fluvial processes of the river. The fast flowing winter floods would cut the banks quite dramatically and the dominance of estuarine factors in summer would allow these banks to build up once more.

Vegetation Communities

Native

Vasse Complex

The flora of the Vasse Complex would have been the original vegetation at this site (DCE, 1980). It consisted of a mixture of closed melaleuca scrub and a fringing woodland of flooded gum *(Eucalyptus rudis)* and melaleuca species. It would have also included an open forest of tuart *(Eucalyptus gomphocephala)*, jarrah *(Eucalyptus marginata)* and marri *(Eucalyptus calophylla)* on higher land. The wetlands would have originally supported swamp paperbark *(Melaleuca rhaphiophylla)*, moonah *(Melaleuca pressiana)* and saltwater paperbark *(Melaleuca cuticularis)*, swamp sheoak *(Casuarina*

obesa), Christmas tree *(Nuytsia floribunda),* robin redbreast bush *(Melaleuca lateritia)* and coojong *(Acacia saligna).* The Perth precinct has few remaining indigenous species and those which occur have been planted.

The fringing vegetation around the freshwater lakes of Kwinana Freeway exit points has been planted. There are reeds of marsh club rush (*Bolboschoenus caldwellii)* and planted native species including sheoak *(Allocasuarina fraseriana),* slender banksia *(Banksia attenuata)* and peppermint tree *(Agonis flexuosa)* which stand as isolated specimens. From Plain Street to the Causeway there are saltwater sheoak *(Casuarina obesa),* flooded gum *(Eucalyptus rudis),* and marri *(Eucalyptus calophylla).* The understorey is couch grass *(Cynodon dactylon).* The Causeway has gardens with planted native flora including everlastings *(Helipterum roseum)* and kangaroo paws *(Anigozanthos* sp*),* which are planted for show rather than reflecting the type of flora indigenous to the precinct area (Mains Road Department, 1973).

Exotic

The Perth City Council has a policy of encouraging native species in the foreshore vegetation at the Causeway and Narrows city gateways. Towards the centre, historical gardens have been planted predominantly with exotic species. Along Mounts Bay Road, English plane trees *(*Plantanus* X *acerifolia)* and Moreton Bay Figs *(*Ficus macrophylla)* have been planted. The understorey is grassed with couch *(*Cynodon dactylon)* and kikuyu *(*Pennisetum clandestinum)* grasses all along the precinct foreshore. Several palm species have been planted including cotton palm *(*Washingtonia* sp*)* and date palms *(*Phoenix dactylifera)* along Riverside Drive. There are several gardens within the Perth foreshore area such as Government House Gardens and Barrack Square which have been planted using classical formal designs using predominantly exotic species, especially perennials for colour.

Historical Land use & Resulting Environmental Changes

In 1697, the Dutch East India Company trade ship led by Willem de Vlamingh sent three row boats up the Swan estuary to the mudflats east of the present Perth City. Vlamingh's men found nothing which would be of profit to their trade company and gave an unflattering report of the 'Swarte Swaene-Revier'. He considered the land to be arid, barren and wild and the vegetation decidedly inferior to that found in the East Indies. The unrewarding experience was repeated by various French and Dutch explorers in the seventeenth and eighteenth centuries. In 1801, a French exploratory trip on the vessels *Naturaliste* and the *Geographe* sent a small scientific and exploratory party under the command of Heirisson. This party again explored the 'Riviere des Cygnes' up to the present day Causeway and the mouth of the Canning River. Heirisson Islands were named 'Iles Heirisson' after the leader of the French exploratory party in 1801.

In 1827 the cutter and gig from His Britannic Majesty's ship *Success* explored much of the Swan River under the command of Captain James Stirling. Within a fortnight Stirling's party had mapped the river course to the Ellen Brook confluence and gave detailed descriptions of the area. Stirling was convinced that the whole Swan Coastal Plain was an ideal location for colonisation (an option he held before even exploring the area). He named it *Hesperia* which is Greek for 'western land'. Within two years of Stirling's brief exploration the British Government had officially annexed it to the Empire and had given permission for it to be colonised.

Stirling was sent out on the *Parmelia* to take charge of the settlement and was given the position of Lieutenant-Governor. After much it was decided to locate the new town 12 miles up stream on the northern bank of the river. The choice was justified by the fact that there were alluvial flats near Point Fraser which would be useful for growing food and fresh water was near by (Battye, 1912). The site was within reach of the port but inaccessible to hostile naval forces. The location however, was inaccessible to sea going ships and being sheltered by Mount Eliza was denied the early sea breeze in the summer afternoons.

Captain Stirling had decided to lay the first stone of the town of Perth on King George IV 's birthday on 12 August 1829. Captain Fremantle records that there was *'no stone contiguous for our purpose, to celebrate the commencement of the new town, Mrs Dance cut down a tree: fired volleys, made speeches and*

gave several cheers, named the town Perth, according to the wishes of Sir George Murray.'

An area of three square miles was reserved as the site of the new town. This area was divided into allotments of nine to ten acres each and these were leased for twenty one years. By September 1829, Captain Roe had made sufficient progress with the surveys and the first allotments were sold by auction to F.C. Irwin, Rev J Wittenoom, M. Hodges, P. Smith and George Leake. The civil population which was at this time located at Fremantle was moved to Perth and camped in tents until small cottages and barracks were built.

The first plan for the city of Perth was made in 1833 from 'documents furnished' to the Colonial Office by the first Surveyor General, John Septimus Roe, which were prepared by George Smythe, the Assistant Surveyor General (Stephenson, 1975). The plan was similar to the street layout of today except for a central square at Irwin Street which was lost due to subdivision. The waterfront had been allocated as a separate domain, however by 1834 all but the Government House grounds were subdivided. The Colonial Draftsman, A. Hillman, in 1838 prepared a plan for the city from an actual survey and his map shows the dimensions of the narrow north-south orientated blocks which are still evident today.

The Barrack Street Jetty (Coles Jetty) was the first jetty in operation at the Perth Port. In 1841 the decision was made to build a new jetty at William Street (Steamer Jetty) which would be the berthing point for steamers. The construction of Mill Street Jetty (Stone Jetty) allowed punts to unload stone conveyed from the quarries at Point Resolution. The jetties were not constructed in the same straight line as the streets but rather were deflected to the south-west in order that they might be in a direct line with the prevailing wind, which facilitated the mooring of the boats.

In the early days of the settlement one of the difficulties facing the settlers was getting to the south side of the river. Before the erection of the Causeway bridge, boats were taken across the Perth Flats (Fraser Point and Heirisson Islands) by dragging boats through the mud. Fraser Point was named after Charles Fraser who was the botanist in Stirling's 1827 exploratory party. The point was originally a curved promontory and its form can be seen on maps prior to the reclamation of Riverside Drive. In 1830-31 a canal was dug through the Burswood isthmus creating a passage adjacent to the newly created island. The Causeway bridge was built in 1842 using the plan produced by Mr Trigg and the bridge was subsequently leased as a tolling point. In 1865, chaingangs were used to widen and deepen the Perth causeway channel (Battye, 1912).

The first ferry service between Fremantle, Perth and Guildford was begun in 1831 using whaling boats. By 1842 a daily service between Perth and Fremantle was in operation. The first steam ship Lady Stirling reduced the transport time between Perth and Fremantle to two hours in 1856. Passengers and cargoes of wool were the dominant traffic and there was fierce competition between steamers for their patronage. There were boat yards at the foot of Mount Eliza and on Perth Foreshore.

Access to the river through Pier Street was inhibited by the construction of Government House which was built right across the designated road way. Between Mill and William Streets, the water front was the focus of the port activities and the quays were linked by Bazaar Street which ran along the foreshore. The Public Works Department in the early 1880s, created the area of foreshore known as the Esplanade by using the soil from the levelling of St Georges Terrace. The Esplanade was a popular centre for outdoor activities for many years. The original Supreme Court was build quite close to St Georges Terrace and on the river bank. The river foreshore in front of it was reclaimed in the late 1880s by 'shell infilling' (Stephenson, 1975).

During the early 1900s the Public Works Department had plans to extend the quays to Point Fraser, however improved road transport eventually made the inland port of Perth redundant. After World War I, major reclamation was undertaken to widen Mounts Bay Road between Mill Street and Crawley between the road and river.

During the depression of the 1920s and 1930s the Metropolitan Town Planning Commission implemented large scale dredging, filling and rubbish disposal along Langley Park, as well as, constructing a limestone wall between the Causeway and Barrack Square. Riverside Drive was constructed to act as a

city bypass and was completed in 1937. Its construction involved filling in the section of river between William and Mill Streets where boat sheds and wharfs were located.

In 1955, the Stephenson-Hepburn Report was produced as an authoritative guide to planning for Perth's future. This report highlighted the benefits of constructing the Kwinana Freeway as a north-south transport access though Perth city and suburbs. The freeway was to bridge the river at Pt Belches and the reclaimed Mounts Bay. Previously, Mounts Bay had very soft organic, silty clay, varying in depth between 10 and 30 metres overlying limestone at approximately 30 metres. The Main Roads Department stabilised the mud layer in four years by using three million cubic metres of sand to squeeze the mud dry and to build embankments. The original interchange plan had 12 traffic lanes merging into six lanes over the bridge, however some of the roads through the Mounts Bay areas were altered so that there were fewer lanes. The project people realised that the intersection would have a dramatic impact on the foreshore landscape and a landscape advisory committee lead by Mr. J. Oldham, a landscape planner, designed the series of freshwater lakes and islands in between the roads. The plan allowed for four pedestrian tunnels, a 'visually pleasing' pedestrian bridge, an extensive dual use pathway and public toilets. For many years the landscaping remained very sparse and the waterforms simply bland, however, now 20 years later the interchange vegetation has matured so as to be more attractive.

The area which is at present occupied by Trinity College was reclaimed using landfill up until 1972. The area reclaimed was 1.5 hectares and extended to a depth of 1.5 metres (Riggert, 1978).

Present Land Use and Social Patterns

Perth Water is the one of the dominant landscape features of Perth City. It provides a focus for a variety of recreational, commercial and transport activities (SRT, 1988).

The Barrack Street Jetty handles more than 1 million passengers per year (SRT, 1988). The area has recently been redeveloped to improve facilities by providing public toilets, and improving pedestrian access and parking. The Barrack Square project involved the reconstruction of the buildings on jetties 1,2,3,4, and 5 as well as refurbishment of the existing Department of Transport office adjacent to jetty 5. The development is in Federation architecture and is in keeping with the original Old Perth Port with timber cladding and buildings of 1 to 2 storeys with a gabled roof. Some of the older jetty ticket boxes have yet to be refurbished.

The Western Australian Rowing Club located adjacent to the Perth Port jetties was recently repaired and restored to good condition.

Riverside Drive is an important arterial road which acts as a bypass and access route to the city. It is built very close to the river foreshore and is planted with palms and flame trees. It links the Causeway to the several ramps of the Kwinana Freeway interchange.

There is a large amount of land designated to parking including the large open areas of Carpark 1, adjacent to Langley Park and carpark 2, adjacent to the city busport. The Perth busport is a modern, relatively horizontal building which is used as the terminus for many of the metropolitan bus services. It is located in a prominent position close to the interchange.

Government House Gardens originally would have been adjacent to the river foreshore. At present they are closed to the public except on special open days.

Parallel to the river are the highrise buildings of the city centre. These are predominantly for office use, although other functions such as commercial and hotels are also served. There are a number of prestigious houses and units on the Mount Helena escarpment and these range from turn of the century single residences to late twentieth century style units. At the eastern end of the city centre there are a few less prestigious flats which were built in the 1940-60s and are now being replaced with more modern units.

Recreation nodes

The Narrows interchange is a one of the busiest transport convergence nodes in Perth. The area has been planted with native species and has waterforms. A dual use pathway runs adjacent to the river and freeway changes, allowing both pedestrian commuters and cyclists to access the city. The area is rarely a spot for stoping rather is used by people on

PRECINCT 6

Significant Land Use Features

N

100 0 200 400

Metres

Parliament House
Barracks Arch
MILLIGAN ST
ST GEORGES TCE
Central Park Tower
Perth Railway Station
MURRAY ST
WELLINGTON ST
Royal Perth Hospital
Wellington Square
Police Traffic Headquarters
East Perth Cemetery
Claise Brook
Claisebrook Cove
Gloucester Park Raceway
MOUNT RD
MILL ST
WILLIAM ST
BARRACK ST
HAY ST
Trinity United Church
Town Hall
Saint Georges Cath.
PIER ST
Central Fire Station
St Marys Roman Catholic Cathedral
Mercedes College
Main Roads Dept.
Kings Park
Southern Cross Fountain
Jacob's Ladder
BAY MOUNTS AVE
FRASER AVE
Parking
Perth City Busport
Parking
Allan Green Plant Conservatory
Alf Curlewis Gardens
Child Care
Stirling Gardens
Govt. House and Ballroom
The Esplanade
Supreme Court of W.A
Concert Hall
Supreme Court Gardens
GOVERNORS AVE
Family Courts
Parking
VICTORIA AVE
ADELAIDE TCE
HILL ST
BENNETT ST
HAY TCE
PLAIN ST
Queens Gardens
WACA Oval
Trinity College
RIVER
Mount Hospital
War Memorial
Mt Eliza
Anzac Bluff
FWY
Lt.Gen. Sir Talbot Hobbs Monument
The Narrows Interchange
BARRACK SQ
Old Perth Port
WA Rowing Club
RIVERSIDE DR
TERRACE
ABC
Freemasons Lodge
Langley Park
RD
Hyatt
Mineral House
Police Headquarters
Bowling Club
Heliport
CAUSEWAY
Island
Heirisson
Yagan's memorial
The Narrows
Narrows Bridge
Perth Water
SWAN
Mill Pt
KWINANA
Pt Belches

their way to other city and foreshore activities, however a number of recreational fishermen are frequently seen under the Narrows Bridge.

The Esplanade is an important gathering place for public meetings. The open space is rarely used for recreational activities but it provides an important green place. It is lined with Moreton Bay figs and has the Alf Curlewis Gardens along the northern boundary. There is also the Allan Green Conservatory which houses a small jungle of exotic tropical plants.

Supreme Court Gardens were planted in the 1880s and have a number of very attractive exotic trees. They have been planted in the eclectic style of the nineteenth century and form a lawn with a boundary of trees. The park was the site for outdoor concerts at the 'Shell' stage, however this was recently removed, leaving only a shed in the centre of the lawn.

Perth Concert Hall is the location for many concerts and is an important function centre for Perth. It has a cafe and bar where people tend to congregate for the short time before and after the concerts. The building is a modern 'brutalist' style and is quite a dominant feature on the landscape due to its many red brick stairs leading to the entrance way.

Langley Park is a playing field which stretches along Riverside Drive between Victoria Avenue and Plain Street. The playing field is used by a number of sports clubs and is a valuable area of open space in the city.

Fraser Point is currently a small recreation node which has a bicycle hire outlet and a dual use pathway. It is also the site of a helipad which takes up a small amount of room.

Heirisson Island has a number of small man-made wetlands which are accessible by dual use pathways. It also has a commemorative statue of Yagan, who was the son of the tribal elder Midgegooroo of the Beelair people. The historic significance of Yagan is outlined below.

Public access

Public access along the foreshore is greatly restricted by Riverside Drive and the Narrows interchange. However, once on the foreshore there is a dual use pathway which runs the entire length of the river and has several underpasses and a footbridge at the Narrows interchange. Parking is at a premium at the foreshore as most of the bays are taken by city users.

From the pedestrian level, river views are rarely evident except for a glimpse on William and Barrack Streets.

Sites of Nyungar & Wider Australian Community Significance

Nyungar significance

The Perth city area is a place of great significance for many Nyungars. It is an important meeting place for many Nyungars who used this area as a camping site. In addition it was frequently visited by members who lived inland, such as Gingin and Moore River people (Vitticombe, 1989). It was known to Nyungars as 'White City'. The *Pinup* springs which flowed at Spring Street marked the site of the Goodinup Camp which looked over *Karrgatup* (Mounts Bay) and *Goodroo* (Eliza Bay) (Vinnicombe, 1989). Before colonisation the *Byerup* area near the rise of *Yogarin* or Kings Park, meaning the 'place of zambia plants and its nuts', was seasonally the location of a kangaroo hunt which culminated in the driving the animals to the cliff edge (Bates, 1992). Within the area of Kings Park, there is a Nyungar meeting place called *Wandaraguttagurr*up where 'there were holes towards the ocean' (Collard *et al*, 1996). Near where the statute of Queen Victoria is today at Kings Park, there was once an old hollow tree which collected rain water. This area is known as *Gabbikalga* (Collard *et al*, 1996).

Nyungar tradition and knowledge records that a spring and traditional camping place were located in the grounds of Government House, near the present day junction between Terrace Road and Governor Avenue (Vinnicombe, 1989). This camping ground would have been on the foreshore of the Swan River. It is recorded that there were Nyungar camps along the Esplanade between Barrack and William Streets at the time of colonisation (O'Connor *et al*, 1989). It is believed that the *Dyeedyallup* campsite was located near Burt Way.

Perth Water is known as *Buneenboro* and the flat muds of Heirisson Island(s) as *Matagarup*. This refers to the place where the river is only leg deep (Collard *et al*, 1996). One of the original islands of Heirisson Islands is known as *Kakaroomup* which is the island between the bridges where Balbuk's mother was born (Collard *et al*, 1996).

Most of the original lakes and wetlands of the Perth city area have been filled in. To Nyungars living in the region prior to colonisation, these wetlands were important for food collection and also spiritually significance. Lake Henderson is referred to as *Danjanberu.* This means the 'place of the shallow lake' or three island lake where the zamias or byers grow (Collard *et al,* 1996). Lake Henderson is referred to as *Goongarnula yarreenup* meaning 'the place of the stinking spring with moss'. Hyde Park area is referred to as *Boodjamooling* meaning the 'earth-ground where it looks like a nose pegging takes place' referring to the initiation of young men (Collard *et al,* 1996).The north bank of Perth Water is known as *Booneenboro* meaning 'very big river'. *Beeabboolup,* which is somewhere near the original Pt Fraser, means 'the place of many fish' (Collard *et al,* 1996).

When Vlamingh explored the Swan River he claimed to have not seen any Nyungars. He did record that on the river banks there were *'several footsteps, also some pits with fresh or somewhat brackish water and three ruined huts'.* One can surmise that Nyungars continued to be elusive and were only glimpsed by explorers when Stirling's exploratory party arrived in 1827. One of the earliest records of contact between Nyungars and the British explorers can be found in Fraser's journals. He said that the few Nyungars *'were not disposed to behave ill; on the contrary, they seemed much alarmed at first, but soon gained confidence. We gave them some black swans, which they eagerly accepted, and we dressed several of them in the old jackets of our marines. They had, indeed, a most ludicrous appearance, and seemed like men in shackles.'*

Today at *Boodjar -Gorden* or Heirisson Island there is a commemorative statue of Yagan, who at the time of colonisation was a Nyungar *boodir* or important person. Strictly speaking the statue might not seem to be within Beelair Nyungar *boodjar* or land, rather it is in the territory of the Beeloo Nyungar. However Yagan's family affiliation would have given access to this area. Yagan is now recognised for his resistance to the colonists who divided Nyungar hunting grounds into fenced farms and allotments, therefore reducing Nyungar means of existence and access to country. He led a number of raids on properties which resulted in four colonists being fatally speared. As a result of these incidents and the political conflicts between the colonisers and Nyungars, Yagan was wanted by the Swan River authorites for murder. He was caught but quickly escaped and eluded his convectors for 'a considerable time'. He was eventually shot dead by two teenagers, James and William Keates (Carden, 1968). During the skirmish, William was fatally speared. However, his brother escaped to get help. Yagan's body was quickly taken by armed settlers and was horribly mutilated by flaying his tribal tattoo from his shoulders and removing his head to be sent to England as an example of a 'Swan River Chieftain'.

Other significance

The land in Precinct 6 is significant to Western Australians as the site of their capital city centre and one of the earliest white settlements in Western Australia. The foreshore has been significantly reclaimed, infilling much of the original foreshore including the original Perth Port site. The port was an important link to the new settlement and provided both communication and supplies. Its role has now been usurped by the dominance of the road and rail system. There are several significant buildings within the Perth City, these include those of historical significance and architectural interest. Several buildings were erected with convict labour and remain today in various altered forms, including the Court House and Goal (1854), old Government House (1859), the Pensioner Barracks (1863), the old Trinity Church (1864), the St Mary's Roman Catholic Cathedral (1865) and the Perth Town Hall (1870). The railway was built in 1881 and has influenced the city shape and growth dramatically. At the turn of the century the Town Hall, bath house and St Mary's Cathedral were the dominant features on the Perth skyline.

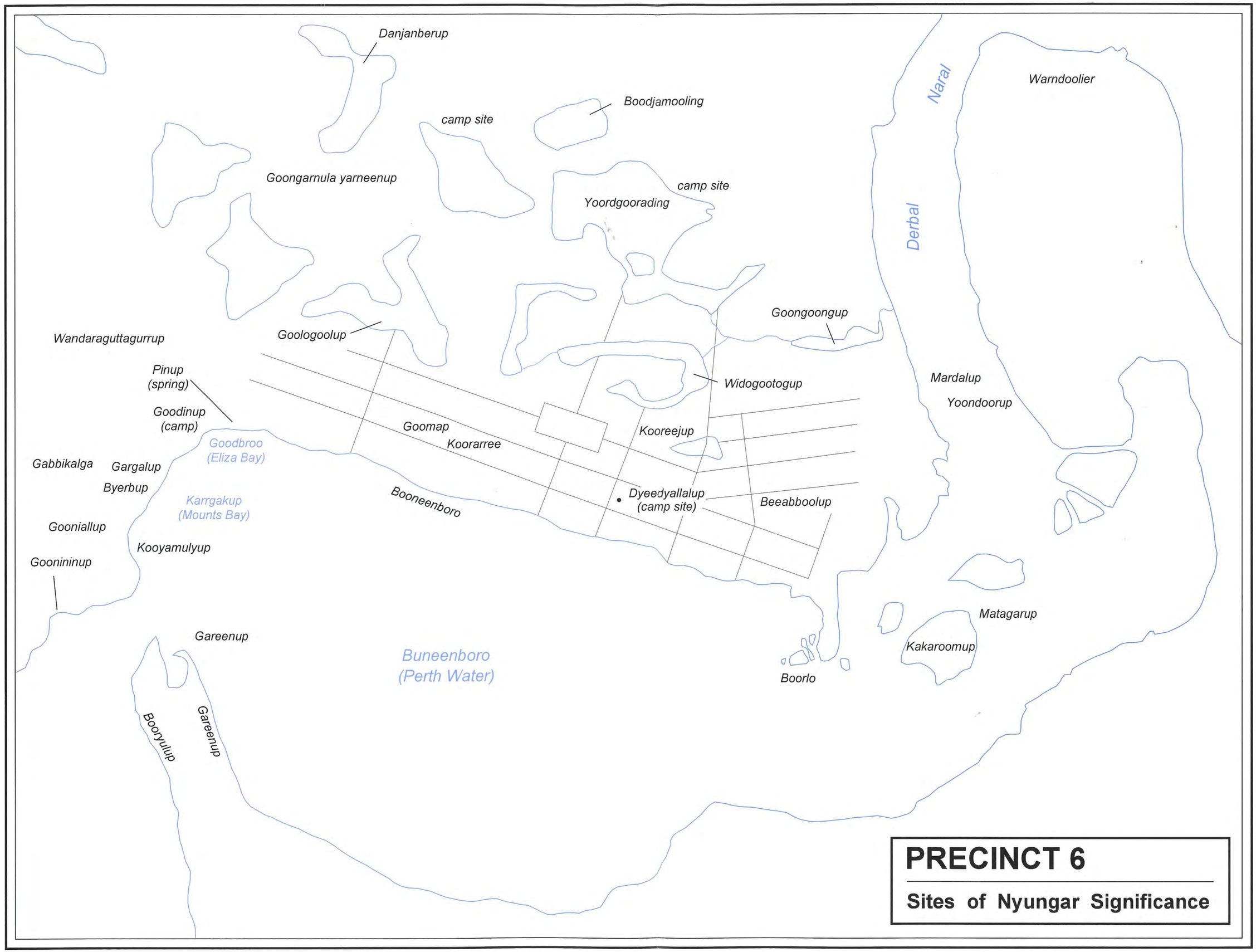
Conservation areas

Wetlands

There are no wetlands identified as significant in Precinct 6.

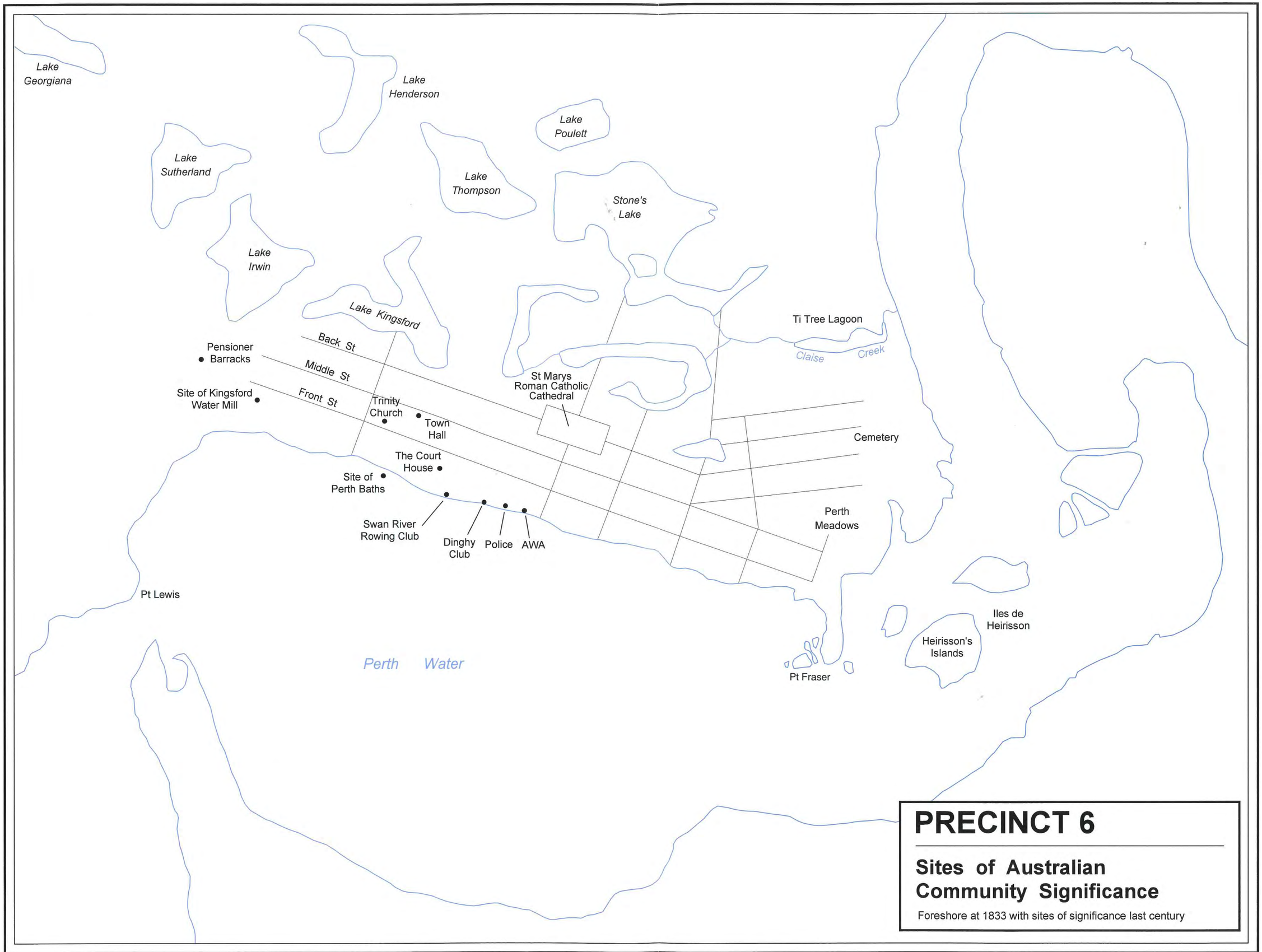
System 6

There are no areas identified in the System 6 recommendations in Precinct 6.



PRECINCT 6

Sites of Nyungar Significance



PRECINCT 6

Sites of Australian Community Significance

Foreshore at 1833 with sites of significance last century

PRECINCT 6

Sites of Significance

N

100 0 200 400

Metres

Other Australian Community Significance • Perth Baths

Pensioner Barracks
Site of Kingsford Water Mill
Trinity United Church
Town Hall
St Marys Roman Catholic Cathedral
The Court House
Site of Perth Baths
Swan River Rowing Club
Dinghy Club
Police
ANA
Kingsford Lake
Claise Brook
RIVER
Island
Heirisson
CAUSEWAY
The Narrows
Perth Water
SWAN
Mill Pt
Pt Belches
KWINANA FWY
MOUNTS BAY AVE
FRASER AVE
MOUNT RD
Back St
Middles St
Front St
Bazaar St
Railway St
ST GEORGES TCE
WILLIAM ST
MILLIGAN ST
MILL ST
BARRACK ST
BARRACK SQ
PIER ST
MURRAY ST
HAY ST
WELLINGTON ST
GOVERNORS AVE
VICTORIA AVE
ADELAIDE TERRACE
HILL ST
BENNETT ST
RIVERSIDE DR
HAY PLAIN TCE

Precinct Description

Waterform

The Perth basin is a wide sheltered body of water. On the southern side, the water forms a curved 'c' shape while on the northern side reclamation has changed the foreshore to a straight east-west line. Mounts Bay has been filled in to form a shallow concave curve in sharp contrast to the original foreshore which was a deep concave line which hugged the base of Mount Eliza. The river originally tapered towards the Point Fraser isthmus, however, reclamation has created a smooth curve around the causeway. The river divides into two around Heirison Island which is a smooth elongated oval shape due to the dredging and reclamation of the original mud flats.

Natural riparian zone

There are no natural riparian foreshores along this stretch of river due to extensive reclamation and the construction of limestone retaining walls. However, there is a small sandy beach west of Barrack Square. This is a white crescent which meets the grassed banks, and is an attractive enclave compared with the adjacent walled foreshores. The original foreshore ran along roughly where the Esplanade Parade is today. There was a narrow beach at the base of Mounts Bay probably similar to the narrow beach at Mosman Park. The Perth City foreshore would have been a flat sandy to silty beach which was subject to regular inundation. Charles Fraser described Heirisson Island as having 'a rich sandy deposit carried down by the floods. Their margins are covered with *Metrosideros* and *Casuarina*. At Point Fraser there are a number of artificially created small sandy beaches which have been replanted with riparian vegetation.

Landform

Perth City is adjacent the steeply sloping ANZAC Bluff of Mount Eliza. The escarpment shelters the city from the sea breeze and acts as a limit to the city centre. From Point Lewis the escarpment originally curved around to the river foreshore, with the steep slope decreasing quite rapidly to the flatter wetlands. The foreshore at the escarpment would have been quite narrow, somewhat similar to the remnant foreshore at Mosman Park and Blackwall Reach. The wetland area (now the city centre) was locally undulating and subject to inundation. The foreshore slope would have varied from relatively flat to quite steep under high water conditions. The eastern end of the precinct would have been low lying flats subject to inundation and relatively devoid of any undulations in topography. The Heirisson Island area would have originally been a number of mud flats which were seasonally isolated from the main banks.

Vegetation

There is very little endemic vegetation within this precinct. Mount Eliza escarpment has a low lying closed scrubland which is an attractive backdrop to the city. The clumped forms, scrubby-dusty texture and the grey-green colour of the shrubs enhance the cliff face and provide an important visual focus from the river and city. The line of sugar gums are an important linear feature along the escarpment and serve to give vertical definition to Mount Eliza which has had its vertical dominance diminished by the tall city skyline.

The Narrows interchange has been planted with native tree species and lawn. The trees are now quite mature, although appear to be isolated individuals in many cases as there is no understorey. The interchange islands have quite dense vegetation which is attractive and may serve as a model to enhance the other interchange gardens. East of the interchange the roadside has been historically planted with exotic palms, flame trees and lawn which give Riverside Drive a 'boulevard' effect. The vegetation planting is completely urban and unlike the interchange vegetation has no pretence to be 'natural'. The Supreme Court Gardens are particularly attractive as an example of transformist attitudes of the early twentieth century. The gardens are formally designed and are attractive for their eclectic qualities and maturity of the trees. The Alf Curlewis gardens are less attractive being a mix of isolated native flora and rose bushes. The garden would be more attractive if a single design was adhered to. The large elongate grassed areas of the Esplanade and Langley Park are important open spaces in the city. They are essentially rather bland as they are topographically flat and the vegetation that is planted along the boundaries consists of a single row of single spaced, homogenous trees.

Heirisson Islands have had riparian species planted in more sheltered areas such as the man made bays.

There are also some indigenous tree species along with other native species not endemic to the area. Lawn is the predominant understorey on the island.

Riparian land use

Most of this section of the river has limestone retaining walls which were built in the 1920s along the entire northern stretch of the Perth basin. Due to the high erosive processes, much of this wall has had a concrete slope constructed in front of it. The concrete is an unattractive addition to the limestone and does little to abate the wind or boat induced wave energy. A slightly more attractive wall is the limestone gabion wall adjacent to the Narrows interchange. The need to protect the urban land use has demanded that the limestone walls are not replaced with small sandy beaches, however the walls are particularly bland and their linearity is uninteresting.

Barrack Square has recently undergone some redevelopment and is at present a mixture of architectural designs. The recently constructed tourist shop, kiosks and restaurants have been modelled on Federation boat houses similar to the adjacent Western Australian Rowing Club. The new buildings have been constructed with horizontal wood battening and gabled corrugated metal roofs. Each building has a unique style, however, similar paint and roof colours give these buildings coordination. Jetties 1, 2, 4 and 5 have not yet been upgraded and have low concrete modern ticket boxes, which appear rather shabby and out of context with the new and tidy buildings. The WA Rowing Club for many years was derelict , however a recent initiative has restored the two storey club house to an attractive feature. One of the most appealing features is that the sheltered location allows the water to be reflected on the high gloss painted wooden walls. Barrack Square originally was in the form of a 'Union Jack', however the diagonals are no longer present and the square has a cross with a focal point of a circular flower bed with a line of flag poles at the southern axis. This gives a corridor of focus between the exotic vegetation to the jetty or back along Barrack Street.

All along the foreshore is a dual use pathway which has recently been widened. The pathway is now two strips of bitumen, one of red stone and one of black asphalt which gives an inconsistent and careless impression. There are several benches along the foreshore which are of differing designs and colours. Consistency in street furniture would be more harmonious.

The original mud flats of Heirisson Island have now been reformed into a elongated oval shape which is retained by limestone rocks on a more steeply sloped angle than the natural gradient. On the eastern end of the island, the reclamation material of bricks and other building material has been exposed. The area has extensive dual use pathways and a number of picnic tables. There are a couple of small lakes in the centre of the island and there is a small man-made bay with a narrow mouth which acts as a retreat from the faster flowing river.

Land use

The dominant land use of this precinct is the city of Perth. The buildings range in height some being over a 100 metres others only one storey high. The buildings have a strong vertical presence as the proportionally narrow blocks restrict horizontal development at the prime sites. There are a range of building materials and designs, however the river user is drawn to the tall narrow late twentieth century designs. These are often built with highly reflective glass or have large flat surfaces which attract the viewer's attention. Towards the eastern end of the city the buildings are predominantly only a few storeys high due to height restrictions. This gives a flatter less vertically dramatic skyscape. The city plan has restricted the depth of the city centre and as a consequence the buildings are lined adjacent to the river in an east west direction. They are predominantly used as offices, although some floor area is allocated to retail and accommodation land use. In the past land use has been relatively isolated into precincts, such as commercial and financial areas, partly due to the economic need to be close together and partly due to the planning restrictions. More recently with improved communications and the less restrictive planning there is increasing diversity in land use.

The green lawns of the Esplanade and Langley Park emphasise the east-west orientation of the foreshore and city zone and the gardens and planting of trees somewhat minimise the harshness of the city landscape. However, the planting of trees in linear forms only serves to emphasise the geometric forms of the city.

PRECINCT 6

Dominant Landscape Features and Significant Viewscapes

N

100 0 200 400

Metres

LANDSCAPE CHARACTERS

Recreational

Urban

Significant Viewscapes

ST GEORGES TCE

MURRAY ST

WELLINGTON ST

HAY ST

BARRACK ST

WILLIAM ST

MILLIGAN ST

MILL ST

MOUNT RD

BAY

MOUNTS BAY AVE

FRASER AVE

PIER

BARRACK SQ

GOVERNORS AVE

VICTORIA AVE

ADELAIDE TERRACE

HILL

BENNETT ST

HAY PLAIN TCE

RIVERSIDE DR

RD

KWINANA FWY

PRECINCT 4

PRECINCT 8

PRECINCT 7

Claise Brook

RIVER

The Narrows

Perth Water

SWAN

Mill Pt

Pt Belches

Heirisson Island

CAUSEWAY

Dominant Landscape Character

The dominant landscape character for this precinct is urban. The landscape is dominated by the high rise buildings of the city centre and the Narrows interchange. Originally, the landscape would have been dramatically different with numerous wetlands on a gently undulating alluvial terrace. The residential area at Bellevue Terrace and Mount Street has been included in the urban landscape character type, as the Narrows interchange is a strong landscape element in the area. The open melaleuca woodlands and fringing estuarine vegetation would have covered the plain and foreshores. The Kings Park limestone embankment has been classified as parkland, as the lookout, formal tree plantings and the memorial are quite visible from the city area.

Significant Viewscapes

One of the Perth area's most significant viewscapes is the view of the city, Perth Water and the Darling Scarp from Fraser Avenue at Kings Park. This is the most frequently visited site by tourists and is a popular viewing position for locals. All along Riverside Drive the view of the Perth Water is an important viewscape although the road itself is a strong detracting element in the landscape. Unfortunately, from the Esplanade and Langley Park the view of the river is limited by the flat landform and Riverside Drive. From the high rise buildings the views of Perth Water are very attractive and highly sought after. From the river the viewscape is of the city skyline which is one of the main viewscapes used to identify Perth. The plantings along the foreshore are important in presenting a green parkland landscape in the urban environment.

Conforming and Non Conforming Elements in the Landscape

The urban landform is by its very nature uncompromising on the natural landscape. There is little to indicate the original landscape, and original landscape elements may now appear as non conforming elements in the urban landscape. The desirable landscape for the Perth City, and in particular its foreshore, has been a long contentious and difficult issue. Several plans and concepts have been suggested, and a few of these ideas have been implemented. Agreement on how the Perth landscape should reflect an 'identity'. Would allow the identification of conforming and non conforming landscape characters.

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The city foreshore land use is a highly contentious issue and has been the subject of many competitions and political rhetoric. The relatively flat and straight foreshore is almost a 'blank page' for which a wide range of ideas and proposals can be made, if given unlimited funding. Below the author suggests a number of ideas which are not representative of the Swan River Trust's view but have been outlined so readers may begin to consider what type of landscape they would desire for this important section of the Swan River.

One of the first features which strikes the viewer of the Perth foreshore from Kings Park or the water is the formal straight line of the foreshore. This geometric arrangement is continued with the east-west orientation of the city and the tall vertical forms of the city. The city is fortunate that it has the attractive waterform at its base, however the visual landscape, for example, could be enhanced by creating a more undulating foreshore. The present line is artificial and visually it would be more interesting and attractive to return to a more natural form by creating cove or beach like shapes.

Unfortunately, the reclaimed foreshore would be subject to high erosive processes and due to the roads and pathways on the foreshore a natural sandy bank would not be practical. The creation of enclaves could be facilitated by having curved limestone embankments with have steps (similar to those at Kennedy Springs) in the form of an amphitheatre into the water. The number of steps exposed would depend on the water conditions. These could have seats in keeping with the Federation theme of the Perth port area, such as park benches or a semi circle wooden bench similar to those in Forrest Place. It may be possible to plant *Juncus* and other riparian vegetation if ample room was allowed for a sheltered gradual beach face, otherwise the water would be too deep and the velocity too fast.

The section between Barrack Street and Victoria Terrace has the potential to be an attractive and active foreshore. It is reasonable to suggest that this section of the foreshore is at present at the heart of the urban centre of Perth. It is subject to so much urban land use that to try and give a naturalistic impression would be extremely difficult, and many people argue that the foreshore should be 'urban'. At present, the foreshore is isolated from the city by pass roads and other physical barriers. The foreshore could be altered to create a more dynamic landscape. It would not be out of context to extend the foreshore into Perth Water between Governors and Victoria Avenues, therefore creating a focal point. A fountain enclosed with an amphitheatre like sitting area which is sheltered by trees and has an attractive promenade effect could be one of many alternative plans for visual and recreational nodes.

It may be suggested that a foreshore node should be the type of place where people can sit and have their lunch or a small picnic and appreciate the beauty of the riverform and their city. The node should not be highly developed within walking distance to cafes and other pedestrian drawing features. By removing carpark No. 1 adjacent to Governors Avenue, there could be a square of land which could be dramatically changed to draw people to the foreshore. This could extend the Victoria Avenue 'vista' with an attractive focus. Extending the Perth Concert Hall precinct would allow this to be achieved. The carpark could be turned into a cultural square which gives the opportunity to emphasise the historic and Aboriginal importance of the area. People will not come to an area without life and activity to keep them entertained, and small cafes and restaurants could be the solution. It is important that these areas are visually pleasant, and provide shelter, comfort and security for the user and a 'square' of buildings could facilitate this. Many people object to the idea of development near the foreshore, however many cities in the world bring life to their waterways by having urban use in the vicinity of the water. Since this is such a small section which has already been dramatically changed, the river would not be losing its natural foreshores or vegetation if urban development is built adjacent to (not on) the foreshore.

If ever implemented a foreshore recreation node or focus point should be easily accessible. It is important that it should be within walking distance of the city centre which would help draw people to the area. It is important that events, spontaneous and organised entertainment are allowed to occur in the area. It was shown that by having outdoor markets and Sunday trading in the City, the present Perth Cultural Precinct was used and visited by people.

Unfortunately, the city foreshore has recently not been part of our 'urban city culture' and Perth's population goes elsewhere for riverside interaction. It is possible that by a strong effort people could be encouraged into the area, both during weekdays and as well as the weekend.

If the decision is made not to remove Riverside Drive it may be an option to make a board walk in the area which would increase the amount of foreshore available to pedestrian access. This could only be justified if suitable attractions were located in the area.

At present, the majority of visitors to the foreshore are using the Perth Port jetties. The present port facility has a new restaurant and cafe which have been recently constructed in a Federation style with wood battening and gabled roofs. It is very important that the buildings at Barrack Square have a style and scale which are in keeping with the waterfront location and that the amenities such as signs and street lighting is sympathetic. It is the attention to detail which makes an area attractive, and one fault with the new buildings is that the rubbish bin enclosure on the jetty does not have a gate and the viewer is presented with the bins adjacent to the main façade. At present, there are several jetties which have the flat low lying 1960s style entrances which are the antithesis of the new Federation buildings. It would be more aesthetically pleasing if these jetty ticket boxes were in keeping with the new buildings. The Western Australian Rowing Club has been restored to a fine condition and is particularly attractive at all times of the day as the sheltered location allows the river to reflect the water patterns on the high gloss wooden panels. The adjacent riverside pathway, however, is made from several different materials and almost every bench has a different design and colour along the foreshore. It would be more pleasing if there was a theme for the foreshore. It is important that the visual corridor down Barrack Street be maintained and that new structures do not interfere with the river views.

Riverside Drive is a source of contention as it acts as a physical and visual barrier to the river. At present, it is a main arterial road which services the city and through traffic between the Causeway and Narrows Bridge and Mounts Bay Road. There been several proposals on how to reduce the traffic through the area and make the foreshore more accessible. One proposal suggests realigning Riverside Drive to Terrace Road, however it is believed that this would restrict access to the popular Langley Park and also the few townhouses would be exposed to noise. It is desirable that Riverside Drive is not widened to accommodate increased traffic as this would take up either the foreshore strip or decrease the recreation areas of Langley Park.

Another proposal is to sink Riverside Drive. This would remove the visual and physical barrier of the traffic. It would involve substantial earth works and be quite expensive. However, it would limit the commuters' view of the river as a scenic drive which it is argued makes a pleasant distraction from peak hour frustration. The tunnel option would be very expensive. The present Government is currently constructing a tunnel through the Northbridge area to reduce the use of Riverside Drive as a by pass. This, however, is not likely to solve pedestrian access across the road, which is likely to continue being a heavy traffic area. This maybe overcome by a pedestrian overpass or underpass, the former being preferable to the pedestrian who will be raised to see the foreshore, the latter being possibly unattractive for safety reasons. A recommended design would be a structure which would have minimal impact on the river foreshore character. It is possible that a combination between tunnel and road be used, a small tunnel between Victoria Avenue and William Street would allow the river foreshore, Perth Port and the city parks to be linked without inhibition. This would emphasise Barrack Street as a promenade and the Barrack Square could become an important end point as historical city planners designed. Similarly this section of Riverside Drive could be lowered creating a depression which could be bridged with pedestrian pathways. It is important that the pathways be suitable for bicycles, prams and wheelchair access.

Much of the foreshore has been allocated as parking, however it may be argued that the land is too valuable for this land use. It is ironic that one of the best views of the river can be attained by standing in carpark 1,

where it is one of the only reclaimed areas is high enough to command a wide strip of river. If are to remain carparks number 1 and 2 should be visually minimised by having single storey areas adjacent to the foreshore. It is also important to the pedestrian that these flat expanses be softened by suitable tree planting. A suggested alternative is to remove these topographically flat and unattractive areas which take up so much of the foreshore and build a replacement multistorey carpark in a less sensitive area. Much of this car parking serves the adjacent business and commercial sector and if the carparks were relocated closer to these precincts then the patrons would also benefit.

Langley Park is an important playing field and although it is a rather bland feature it should be maintained for this purpose. Some people argue that the foreshore should not be the site of 'organised' sport rather than more passive recreation, releasing the land for more people and giving opportunity to provide a more dynamic landscape. However, by encouraging a variety of different uses of the oval, and ensuring the oval is used at all times, the foreshore parkland will have a population which can be enticed to appreciate the river. Fields and clubhouses should, however, be maintained in excellent order and be kept to the present functional and low lying form.

The helipad at Fraser's Point is a contentious use of the foreshore. Visually it is not very intrusive, however it is rather out of keeping with the aim of maintaining this part of the foreshore for recreation. The Fraser Point foreshore is at present adjacent to one of the busiest traffic sections in Perth. For this reason, it is probably best that the foreshore recreation node remains low key with the establishment of restaurants and other facilities that have been suggested in recent years only adding to the congestion of the area. It is also an area which is difficult for pedestrians to access due to Riverside Drive. It is important to improve foreshore pedestrian access at Fraser Point.

There is very little visual access to the Government House Gardens due to a high white wooden fence. From the gardens there is very little view of the river. By replacing the fence with a more open design this would create the visual access to these historic gardens. If it were to remain the fence should be less intrusive by painting it a less reflective and intrusive colour such as a soft green or brown. It would be a good opportunity to make the gardens more accessible to the public, for example for a short time a couple of days a week. Supreme Court Gardens have a wonderful selection of exotic trees planted in a 19th century Acadian design. There are some impressive specimens which form a boundary around the open grassed area. The area is cut off from the river and also the noise of the adjacent traffic. In contrast, the Esplanade is lined with Moreton Bay figs on the east and western boundaries. The southern side is grassed to the Lieutenant General Talbot Hobbs Memorial, and associated trees which once were part of the grassed area and is now part of the Riverside Drive traffic island. The isolation of this part of the park is unfortunate and makes the park very noisy. The Alf Curlew Gardens, although quite attractive, are a very narrow belt of vegetation and do not have the same consistency in garden design as the adjacent Supreme Court Gardens. The Allan Green Conservatory opened in 1980 is a fine pyramid shape and provides an interesting contrast against the rectangular forms of the city skyscape.

Most of the trees along the foreshore are not native species. Many people have suggested that by planting indigenous species the road would become a tourist attraction and the city river foreshore a unique feature. Riverside Drive has date palms planted parallel to the foreshore wall. These are in clusters of eight which are more attractive than a single line of trees. The centre island has been planted with cotton palms which at present are much smaller than the date palms on either side of the road. The cotton palms will eventually be much taller than the adjacent date palms and will provide a different perspective to the river user. It may also be noted here that the dead leaves on the cotton palms should be retained, rather than having an unattractive clump of green on a 'stick' effect in contrast to the graded shades of the old fronds. Adjacent to Langley Park the flame trees provide a splash of red colour in winter which is a cheerful addition to the drive. It is necessary for safety reasons that some trees be pruned, however, there needs to a decision on whether all trees along the foreshore should appear at least 'naturalistic'

rather than heavily pruned. It is also important that the plane trees which line Victoria Avenue, Barrack Street and other roads perpendicular to the river be maintained as they provide a visual corridor to the river.

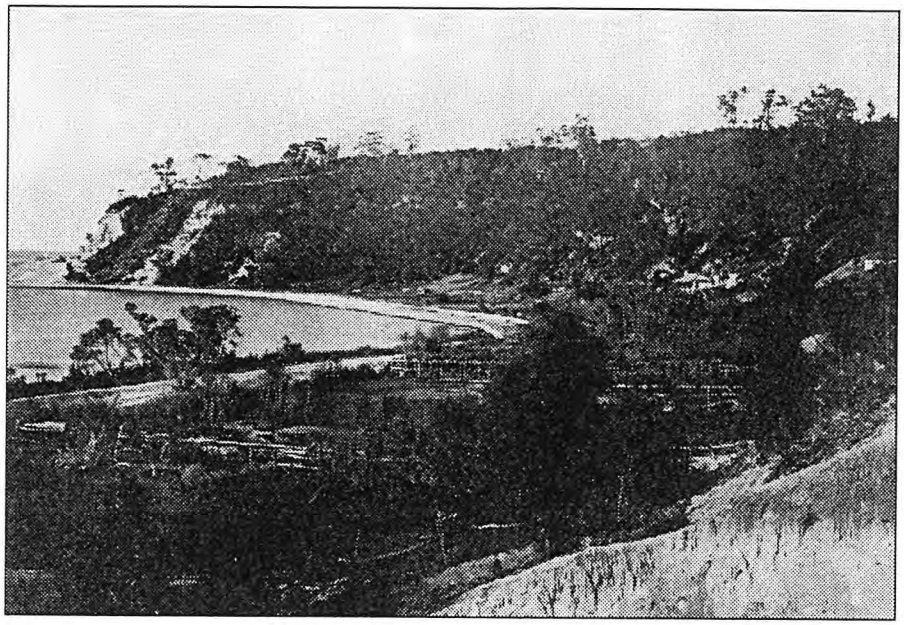
The 1988 Central Perth Foreshore Study suggests that the foreshore at present has a 'orderly and interesting mixture of exotic and native planting within the central gardens graduating to informal native planting at the western and eastern extremities'. It was suggested that it was appropriate to maintain the heritage and botanical aspects of the exotic gardens and continue this graduation in future planting.

The precinct has residential development on the Kings Park escarpment and adjacent to the eastern foreshore. Many of the units along Langley Park are getting to be rather blighted and aesthetically would be more appealing if they were restored or renewed. Further high quality design apartments should be made available which would cater for a cross section of the community and attract more people back to the city. The presence of activity is an important attraction for the visual element of a city foreshore.

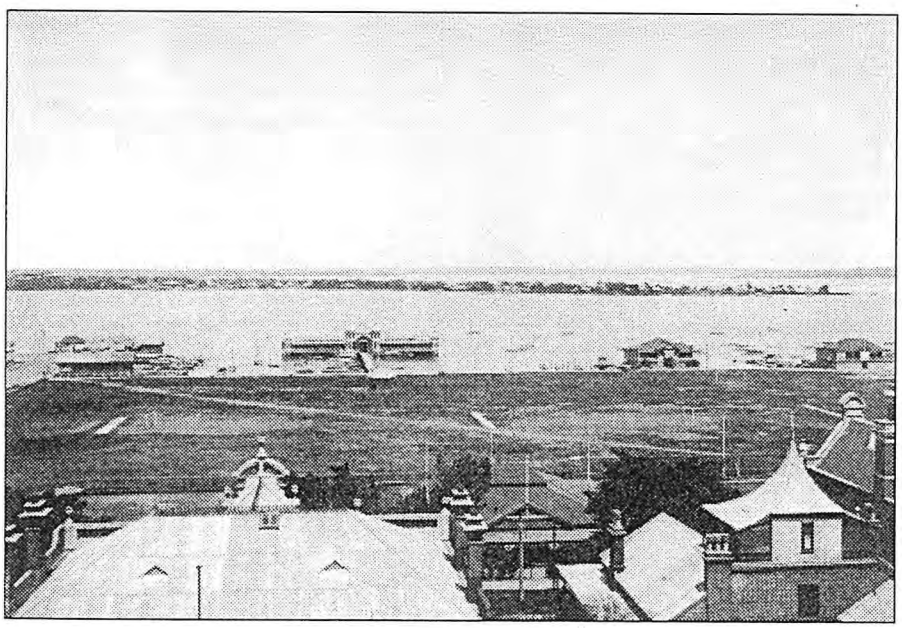
Unfortunately, the best that can be made of the Narrows interchange is to encourage the planting of native species which may naturalise and reduce the impact of the strong geometric road form. This area is a typical modified landscape. The vegetation is well maintained lawn and tree landscaping. The question arises, as to whether this vegetation in keeping with the city, or whether it would be beneficial to recreate 'naturalistic' native woodland and wetland communities adjacent to the city. If the Kings Park escarpment vegetation was reflected on the freeway reserves, then it would be a uniquely Western Australian green zone within the city. Planners need to decide which elements are important and need to be further encouraged, and which elements of the city are beneficial characteristics.

The city itself is one of the major features of the river landscape. The city skyscape is constantly changing as new buildings stretch further upwards. From the Esplanade the viewer is presented with many colours, shapes, designs and heights, including small neoclassical and art deco styles and late twentieth century modern forms. It may be said that Perth's skyscrapers are quite modest buildings, the most extreme in design being relatively tame by other world cities' standards. The more radical designs have been limited by planning policies and clients' budgets. From the 1950s new highrise buildings were constructed as monuments to their time. Their architecture is sometimes regarded as ugly by some people, however if one takes time to appreciate their designs it can be seen that these buildings reflect the attitudes and expectations of the builders and therefore are as valuable to Perth's history as the older smaller buildings. One of the flaws of the late twentieth century buildings is that the roof tops have not been addressed. Most of the buildings have large shed like air conditioning and other units on top, completely at odds with the rest of the building's design. Fortunately, many of the buildings constructed after the mid 1980s have learnt from this mistake and these features are incorporated into the total design; a good example of how these features can be made attractive is the Bank West Tower. It is imperative that any building constructed is of the highest design standard. It is also important that old buildings are retained. It is often valuable to restore old buildings to their original condition but change their function, allowing the buildings to continue being a dynamic part of the city. Planning should address the needs of the pedestrian as well as the long distant viewer of the city. Planners should remember that some of the worlds' most attractive and visited buildings were often considered radical for their time, and sometimes a less conservative building is a great addition to a city landscape.

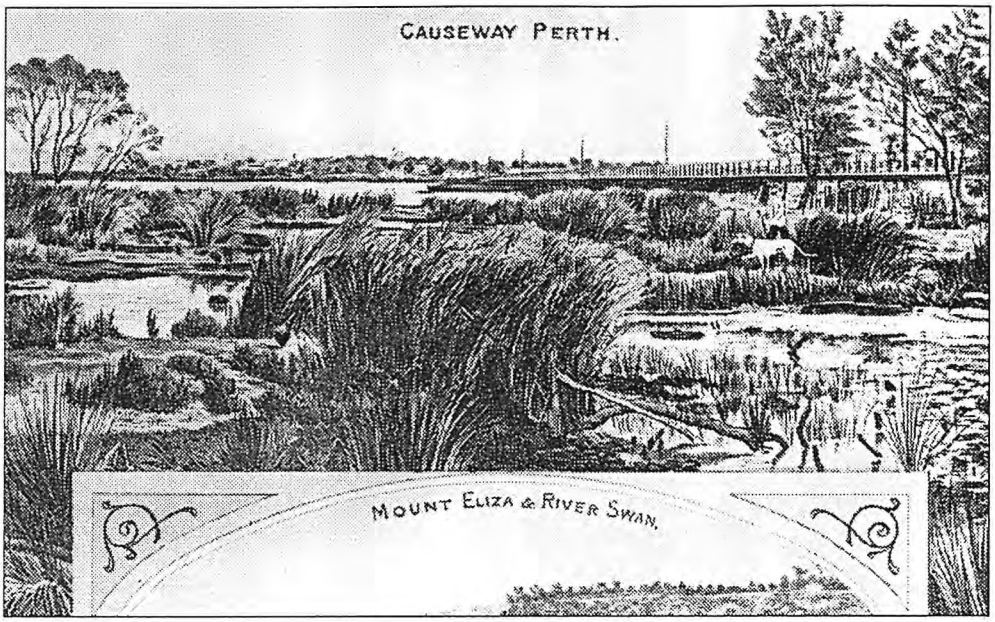
Perth City is fortunate that it has such an attractive location despite dramatic alteration of the river and the adjacent Mounts Bay. The foreshore at present is a place which most people just drive or ride by and there is little to encourage them to stop and appreciate the river and city views. By providing a focus point or reducing the amount of traffic along Riverside Drive the city foreshore may become more accessible.



Mount Eliza from top of clay quarry. 1862.
A.H. Stone. Courtesy of W.S. Croft. Swan River Trust.

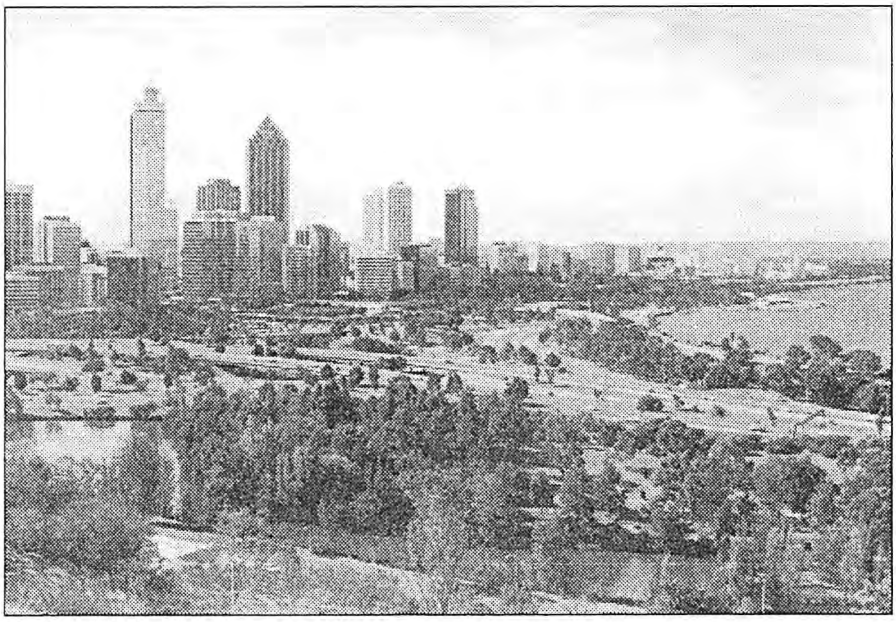


Perth Water. c1880.
Battye Library 4888B.



Causeway, Perth. c1900.

Battye Library 5032P.

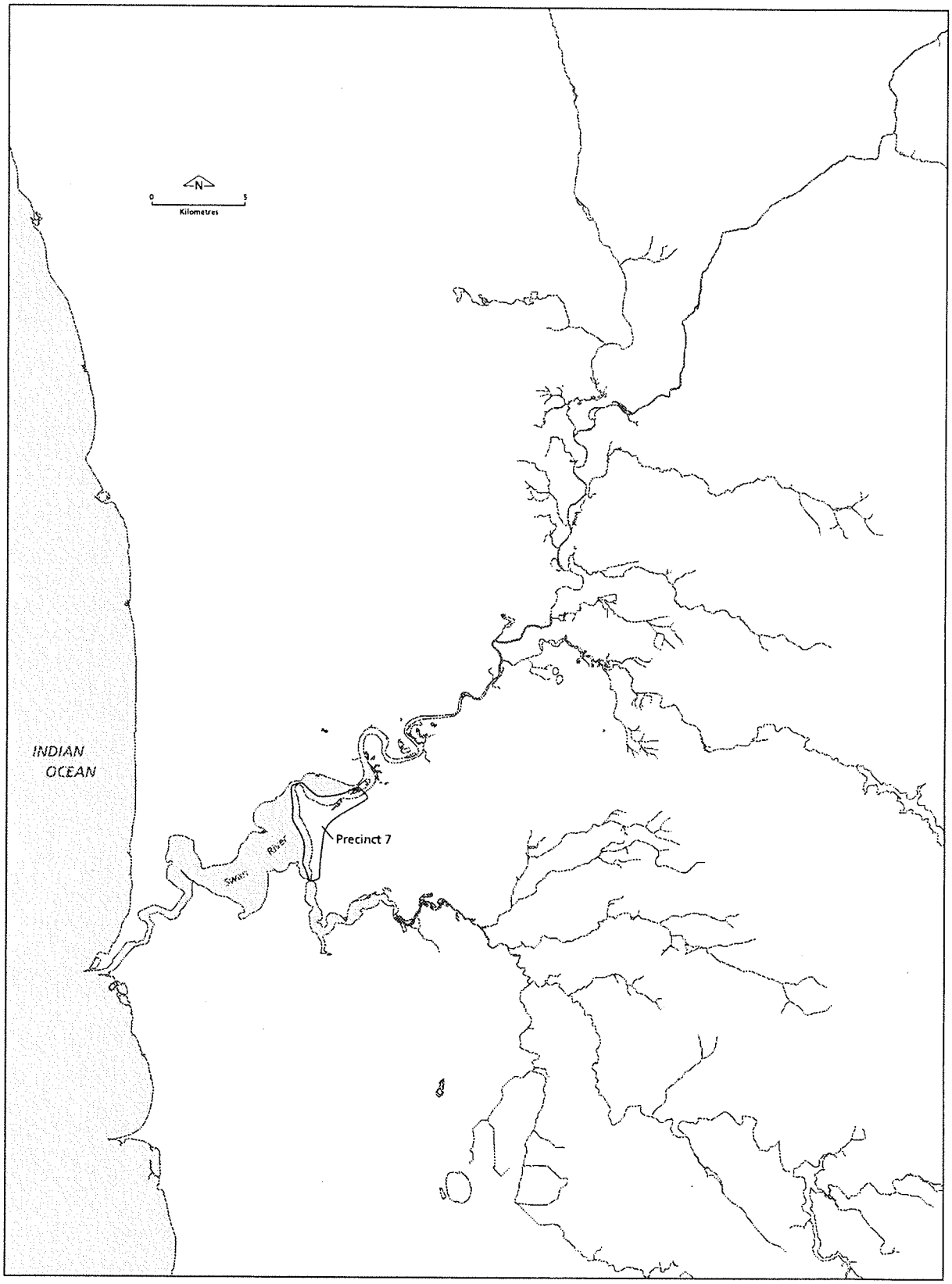


City from Kings Park. 1997.

Swan River Trust.

Precinct 7

South Perth - Canning Bridge to the Causeway



Summary

South Perth - Canning Bridge to the Causeway

The precinct is the southern foreshore of Perth Water and the eastern side of Melville Water, between the Causeway and Canning Bridge. The Como section of Melville Water is a long linear north-south orientated sandy beach. The construction of the Kwinana Freeway has reduced the once wide sandy beaches to narrow beaches with several limestone groins to reduce sand movement.

The Milyu Reserve is a narrow belt of natural vegetation which is an important nature reserve for the flora and fauna of the area. The rest of the Como foreshore is grassed and has other exotic species present. There is also a heavily used dual use path along the foreshore.

The Swan River forms a visually enclosed basin at Perth Water. The southern foreshore has been reclaimed using sediment from the channel and landfill. This is protected from erosion by the limestone retaining wall which has been constructed along the South Perth foreshore except for the small sandy and shelly beach west of the Coode Street Jetty. The South Perth foreshore has reticulated lawn and gardens. There are few trees adjacent to the South Perth Esplanade and there are a number of rose beds. Sir Mitchell Park has been extensively re-landscaped to incorporate the original paperbark swamps and the open playing ground areas. There are several man-made lakes and various facilities to encourage several recreational pursuits. The area adjacent to the foreshore reserve is high density housing with several multistorey townhouses and units dominating the landscape. The overall appearance of the river landscape in this precinct is of an ordered and controlled environment. This is due to the maintained lawn and gardens, the retaining wall separating the water and land and the neat residential areas.

Biophysical Processes

Geological Processes

The geological formations of the South Perth Precinct are made up of Quaternary deposits of partly lithified or unconsolidated sediments which are related to erosion and deposition processes during the Pleistocene and Holocene (SRT, 1994).

The major part of the South Perth precinct is made up of the sandy plains which have peaty pozols in the swampy areas known as the Bassendean Soil Unit (McArthur and Bettenay, 1974). The South Perth peninsula is made up of the aeolian deposits of the Karrakatta Soil unit (deep yellow sands over limestone). The marine deposits of the Vasse unit consisting of mixed layers of recent estuarine deposits are present along the southern Perth Water foreshore. The early settlers found the soil excessively drained deep yellow sands, except for the northern shore where the land was sandy loam.

Topography

South Perth is part of the Bassendean Dune System which consists of a series of low hills (Balla, 1994). Apart from the central hill, the land in South Perth is below 15 metres ADH and was originally subject to frequent flooding. The present day foreshore topography is between 2 and 4 metres AHD, however this would have been much lower before reclamation took place. The foreshore now is a relatively flat platform which is only broken by the rise of 'Yellow Hill' adjacent to Parker Street.

Hydrological Processes

Water features

The water foreshore was reclaimed in 1939 at Millars Pool and again in 1966 which extended the foreshore 50 metres into the river. Further foreshore changes were made with the construction of the Narrows Bridge and Kwinana Freeway, which involved realigning the Melville Water foreshore and removing 60 metres off Point Belches. There are three artificial lakes located on the eastern side of Sir James Mitchell Park. These receive drain water which is drained into the river and also used for reticulating the park. Originally, there were several freshwater springs in the area, however these have since dried up.

Bathymetry

The river bed is rocky and stable and varies in depth between 0.6 and 1.5 metres. There are two banks of shallow clayey mud flats which stretch in two north-south orientated bars in the Perth Water. The South Perth section of the channel originally had a large shelly fossil bed, which was excavated by the Public Works Department for reclamation at Coode Street. The section of Melville Water adjacent to Royal Perth Golf Course has a large sandy bank which is often exposed in low tide conditions. There are several navigation channels which range between 1 and 1.5 metres below low water mark. The river foreshore contains several underground aquifers up to 1000 metres deep which are refilled by rainwater, although extensive bore construction has reduced the amount of low salinity water in these formations.

Below the Causeway the river is estuarine in character. The physio-chemical composition of the river is dependent on the high winter rainfall received in the catchment. The water in the deeper basins, such as Melville Water, is more saline than the overlying water. In the shallower Perth Water, the stratification is less pronounced due to the wind driven water agitation. Hydrological change also varies due to tidal influence which varies between 0.15 and 1 metre AHD (SRT, 1994).

Flooding

In 1862, there was severe flooding of the South Perth river flats and these floods caused Millars Pool to become filled with sediment. In 1929, Perth had received an unusual sequence of high westerly winds and very heavy rains in the hinterlands. The flood waters inundated all of Mill Point and the South Perth Esplanade and all the Chinese market gardens adjacent to Mill Point Road. Flooding has been reduced by reclaiming the low lying land and retaining the land with limestone walls.

Erosion and accretion

The degree of erosion along the South Perth foreshore has been markedly reduced by the limestone retaining wall which has been constructed along most of the foreshore. There is little erosion along the shelly banks of the unwalled foreshore near Coode Street. At Milyu there is offshore deposition and etosion of fluvial sediments on the mud banks. Como beach is

more dramatically effected by erosive processes since the construction of the freeway which has built upon the sediment which would have been removed and redeposited by wave action.

Vegetation Communities

Native

Vasse Complex

The flora of the Vasse Complex would have been the original vegetation at Point Belches and along a narrow line east of the Coode Street Jetty (DCE, 1980). It consisted of a mixture of closed melaleuca scrub to a fringing woodland of flooded gum *(Eucalyptus rudis)* and melaleuca species. It would have also included an open forest of tuart *(Eucalyptus gomphocephala)*, jarrah *(Eucalyptus marginata)* and marri *(Eucalyptus calophylla)* on the higher land. The wetlands would have originally supported swamp paperbark *(Melaleuca rhaphiophylla)*, moonah *(Melaleuca preissiana)* and saltwater paperbark *(Melaleuca cuticularis)*, swamp sheoak *(Casuarina obesa)*, Christmas tree *(Nuytsia floribunda)*, robin redbreast bush *(Melaleuca lateritia)* and coojong *(Acacia saligna)*.

Karrakatta Complex

A small section of Point Belches originally supported the flora identified as being the Karrakatta Complex. This complex is predominantly tuart *(Eucalyptus gomphocephala)*, jarrah *(Eucalyptus marginata)* and marri *(Eucalyptus calophylla)*. The understorey consisted of slender banksia *(Banksia attenuata)*, firewood banksia *(Banksia menziessii)* and bull banksia *(Banksia grandis)*. In addition, sheoak *(Allocasuarina fraseriana)* and peppermint *(Agonis flexuosa)* are found.

Bassendean Complex

The indigenous flora of this precinct is classified as being part of the Bassendean Complex.

The vegetation ranges from woodland of jarrah *(Eucalyptus marginata)*, sheoak *(Allocasuarina fraseriana)*, and various banksia species *(Banksia* species*)* to sedge lands on the moister and lower sites.

Sir Charles Fraser, botanist on the 1927 Stirling exploratory party, described Point Belches as having banksias, eucalypts and the shrubs consisted of a 'beautiful Isopogon, a species of Acacia and a Jacksonia with crimson flowers'. Early residents of South Perth recall that there were abundant swanberries *(Rhadodia baccata)*, a native berry which was very sweet and popular with both with locals and goannas. They also recall that between Mends Street and the Causeway there was a belt of rivergum *(Eucalyptus rudis)*, salt sheoak *(Casuarina obesa)*, paperbark *(Melaleuca* sp*)*, reeds and rushes *(Gothard, 1988)*. The hinterland was described as undulating with jarrah *(Eucalyptus marginata)* and banksia *(Banksia* sp*)* (Crowley, 1962).

The man-made lakes have some fringing rushes *(Typha and Baumea)*. North of Canning Bridge there are several reeds *(Juncus* species*)* and salt sheoak *(Casuarina obesa)* which are not in good condition. There are also summer scented wattle *(Acacia rostellifera)* and several eucalyptus trees adjacent to Kwinana Freeway. At Milyu, there are rushes *(Juncus kraussii)* and paperbarks *(Melaleuca* species*)* but unfortunately several weed species.

Exotic

The foreshore along Sir James Mitchell Park, Point Belches and Mc Callum park are maintained lawn of couch *(*Cynodon dactylon)* and kikuyu *(*Pennisetum clandestinum)*. The man made lakes have large willows *(*Salix babylonica)* and cotton palms *(*Washingtonia* sp*)* on the islands which are the result of incorporating historically planted species into new landscape plans. Giant reed *(*Arundo donax)*, and pine seedlings *(*Aracuccaria* sp*)* are prominent exotics along the Kwinana Freeway. Como Beach has flame trees *(*Brachychiton acerifolius)*, dandelion *(*Taraxacum offininale)*, poplars *(*Condonocarpus continifolis)*, buffalo *(*Stenotaphrum secundatum)* and couch *(*Cynodon dactylon)*. At Milyu Reserve there is pigface *(*Carpobrotus aquilaterus)*, wild oats *(*Avena fatua)* and beaded oats *(Avena barbarta)*, cats tail *(*Lagurus ovatus)* and couch *(*Cynodon dactylon)*. North of Canning Bridge, Geraldton wax *(*Chamelacium uncinatum)* and pencil pines *(*Cupressus* sp*)* have been planted.

Historical Land use & Resulting Environmental Changes

The area was first sighted by the Dutch explorer Willem de Vlamingh in 1697. In 1801, the French exploratory party lead by Francois Heirisson was stranded at the muddy flats now known as the Causeway and the islands were named 'Iles Heirisson'. Stirling's exploratory party mapped the Swan and named Point Belches after Peter Belches, 3rd Lieut. of H.M.S. Success.

The early colony was planned from 1829 and the South Perth peninsula was identified for suburban extension of Perth. In the early years there was little need for a suburb of Perth and as a consequence the area was quite slow to grow due to its inaccessibility and land which was unsuitable for productive agriculture. However the rich and risk taking investor William Peel laid claim to the whole area using his and a number of other people's entire fortunes. Peel planned to initiate a massive land settlement the peninsula and it was agreed that the scheme must be successful before 1 November 1829 after which the land would be allocated to other settlers. His scheme fell through and Peel was allocated land near the present day Peel Inlet at Mandurah.

As a result the land was open to any person who could prove that they had sufficient capital and money equal to the land's value. The land excepting 'Suburban Perth' was eventually sold to a number of investors. Edward Flaherty, George Earl and Henry Trigg owned land between Douglas Avenue and Berwick Street. Como and Collier areas were allocated to Hugh Mac Donald, C. Farmer and T. Middleton.

In 1833 the first land grant in the 'Suburb of Perth' was allocated to William Shenton and the following year he opened his mill. Later in 1834, the mill was attacked by Aborigines of the Murray River people who stole the flour and equipment. In a second incident, the mill was burnt down and needed to be rebuilt. It ceased operation in 1854.

Millars Pool at the tip of Point Belches was a popular boating spot, however with the approval of the South Perth Roads Board, the government filled in the pool. This was done to stop foreshore erosion and reduce river flooding, improve transport and fill in the algae collecting bays between Richardson Street and Mends Street. There was great opposition to the project, however it was justified by the Road Board due to the plan to bridge Perth Water by islands or a punt ferry. In 1840, the problem of accessing South Perth was overcome by the construction of the first Causeway over Heirisson Island. Early plans for a railway from Fremantle to Guildford through South Perth were never implemented.

South Perth suburban lots were offered for sale in 1834 and these were bought by a number of families so by 1859 there was a total of 65 people living in the area. The suburb of South Perth was divided into the wealthy area along the peninsula and the working families towards the Causeway. Several old pastoral families built their town houses in South Perth. In March 1851, the pensioner guards had established a depot in South Perth. Many of the guards were given allotments along the Kwinana Freeway side of the South Perth foreshore (Florey, 1995).

All along the South Perth foreshore between the Causeway and Point Belches there were several Chinese market gardens which have been recorded as along the foreshore from 1888 (Crowley, 1962). The land on the foreshore was owned by a number of white families who allowed the market gardeners to cultivate the rich loam and the area became known as 'Yellow Hill'. The area had springs and the gardeners built several drains to water the gardens, which were filled with minnows and goldfish. As the government refused to grant miners leases to any Chinese and they were not allowed to become naturalised, many of the Chinese migrants settled here. In 1903 conditions became so crowded that bubonic plague broke out. However the gardens were a popular feature of South Perth and the local people boasted that the produce was the best in the State. They remained until the 1950s when the South Perth Council took over the foreshore.

The Mends Street and Coode Street Jetties were built in 1894 and 1896 respectively. Previously, the first vessels used on the South Perth run were the two small sided paddle steamers Princess and Empress run by the South Perth Ferry Company. These transported passengers between Barrack Street, Perth,

and Queen Street, South Perth. There were several discussions whether to municipalise or subsidise the ferries, as demand on the ferries increased from tourists to the Perth Zoo and commuters to the city. Harry Sutton and Jack Olsen started the Swan River Ferries in 1910. They ran the Coode Street service and the Canning Bridge Applecross/Como service as well as round-the-bay trips on weekends and trips up to Guildford. The State Government ran the service between Mends Street and the City. Sutton and Olsen were part of the significant Swedish and Norwegian community which had settled in the area and as a consequence most of the ferries were given Swedish names.

In 1905, the first subdivision of the 'Como Estate' was sold. During 1907, the Como Jetty was built by the estate and the Council provided facilities for bathers, campers and picnickers. The beach was declared a public beach in 1911. From this point on the Como and South Perth area rapidly developed. Crowley (1962) expressed an opinion that the suburbs were developed with the profit motive and not the vision of a planner. He also believed that the home builders for a variety of reasons were 'condemned to a physical encompassing that left them with little room for individuality' when they conformed to the generation's architectural style.

There were several dairies in the area in the 1930s. Robert's Dairy was located adjacent to the old Weaver and Locks soft drink factory in Gladstone Avenue. The Manning's Dairy was near the Causeway and the cows were often seen standing on the sand bank adjacent to Heirisson Islands (Gothard, 1988).

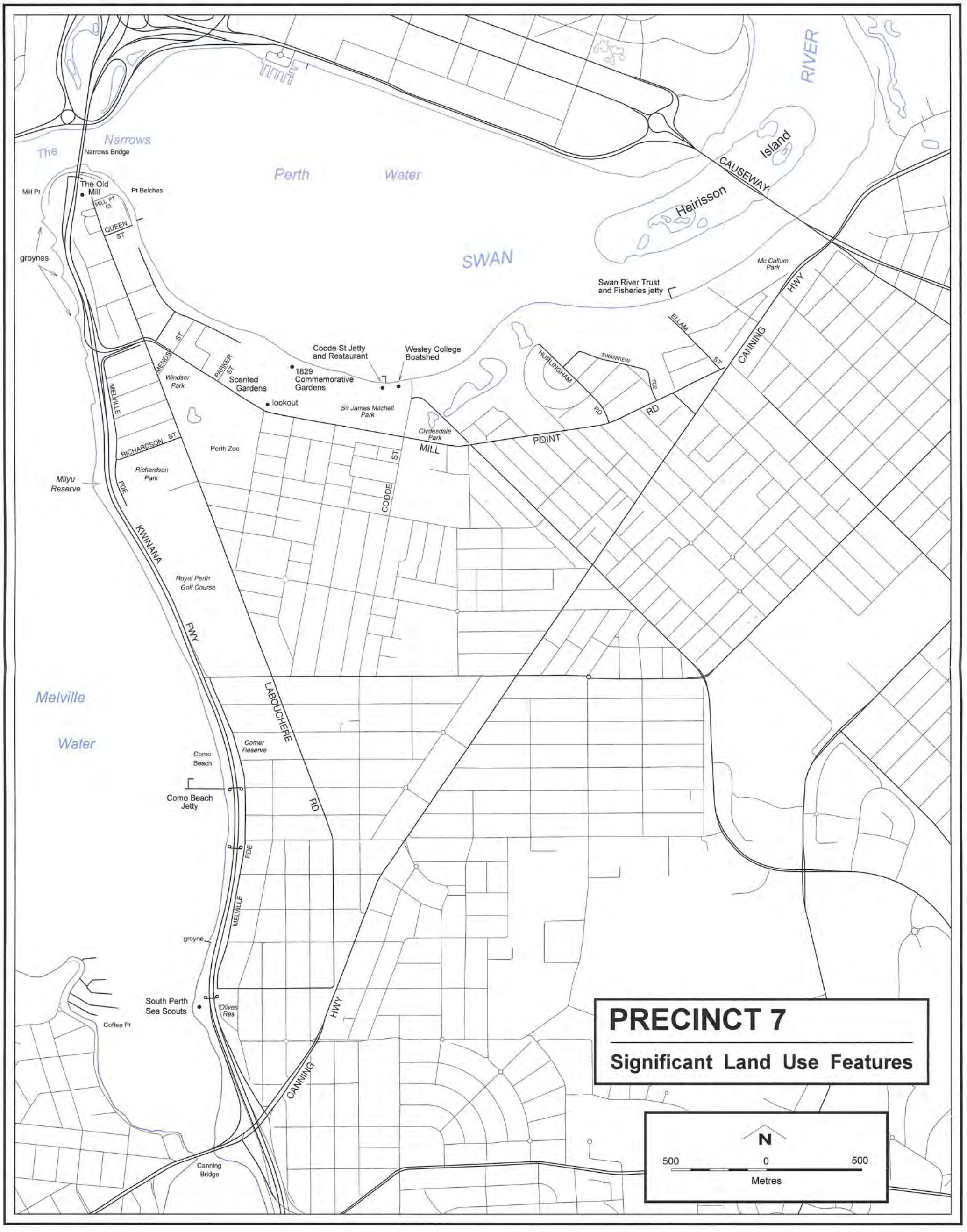
The cleared foreshore near Wesley College was used as an unregistered race course run by Alec Clydesdale and the park now bears his name. The racetrack was established in 1890s and was still used forty years later.

The Perth Zoo has been a popular recreational spot for people from all over Perth since it opened in 1898. Visitors to the zoo created a heavy demand for the ferries across Perth Water. In the early days the Zoological Gardens not only provided opportunity to see many exotic animals and flora but also had facilities for tennis, cricket and a hot bath. The hot bath was built using the hot underground springs which were once prevalent in the area. The baths were frequented by the residents of South Perth every day as they were cheaper and easier than heating hot water for a bath at home. The Richardson family lived adjacent to the parkland now named after their father. Constable Richardson was the local policeman and later the gate keeper for the Perth Zoo. Several of the palms which are present from Coode Street to Como were planted using seed from the Zoological Gardens in the 1930s (City of South Perth, 1996).

In 1922 the tram service reached the district and ran until 1952. The trams served to link the ferry ports to the growing suburbs and the demand for crossing the river dramatically increased. From 1901 plans were drawn up for a bridge across the Narrows, however these plans were abandoned. In 1954 the Hawke Government made a decision to construct a traffic bridge across the Narrows water. The plan involved taking 60 metres off the Point Belches foreshore and reclaiming a significant part of Perth Water. Maunsell and Partners were the engineers who were given the requirement that the bridge should be 'of good appearance worthy of its beautiful setting'. The pre-cast, pre-stressed, concrete bridge was opened in 1959 as 'The Narrows Bridge'. The Kwinana Freeway was built on the Melville Water foreshore which substantially reduced the wide sandy beach at Como and the remaining swampy beaches at Milyu.

The South Perth and Como areas were dramatically changed by the freeway. It was decided that it was better to build the freeway along the foreshore rather than running the freeway through the suburbs which would cut the suburbs in half and be a more costly project. The 1960s proved to be a time of dramatic population boom in the municipality and the first high rise development, 'Darley Heights', was constructed in 1967. This was the first of many multi storey apartments and subdivided blocks which have become characteristic of the inner-city suburb of South Perth.

Infilling of the South Perth foreshore has occurred since the 1930s. Most infilling occurred around Pt Belches, Melville Parade and Coode St Jetty. During the 1950s a section of Perth Water was excavated by the Public Works Department for reclamation at


The Narrows
Narrows Bridge
Perth Water
RIVER
Island
CAUSEWAY
Heirisson
SWAN
Mc Callum Park
HWY
Swan River Trust and Fisheries jetty
ELLAM ST
CANNING
Mill Pt
The Old Mill
Pt Belches
MILL PT CL
QUEEN ST
groynes
MENDS ST
PARKER ST
Windsor Park
Scented Gardens
1829 Commemorative Gardens
Coode St Jetty and Restaurant
Wesley College Boatshed
lookout
Sir James Mitchell Park
HURLINGHAM
SWANVIEW TCE
RD
Clydesdale Park
MILL POINT RD
MELVILLE
RICHARDSON ST
Perth Zoo
CODDE ST
Milyu Reserve
Richardson Park
PDE
KWINANA FWY
Royal Perth Golf Course
LABOUCHERE RD
Melville Water
Comer Reserve
Como Beach
Como Beach Jetty
groyne
MELVILLE PDE
South Perth Sea Scouts
Olives Res
Coffee Pt
Canning Bridge
HWY
CANNING
PRECINCT 7
Significant Land Use Features
N
500 0 500
Metres

Coode Street. Between 1959 and 1969 the foreshore area adjacent to Swanview Terrace was used as a domestic rubbish tip. The area reclaimed was 32 hectares and reached to a depth of approximately 2 and a half metres (Riggert, 1978). This was levelled and use as a golf practice driving range up until the late 1980s when the land was re-landscaped into artificial lakes and a general recreational area.

Present Land Use and Social Patterns

The majority of homes in South Perth are constructed in California bungalow style while in Como there are more recent international styled bungalows. There are of course a few older homes in the district but the majority of these have been demolished for townhouses and units. There was a building boom in the late 1980s which allowed large townhouse complexes to be constructed in *Post Modern* styles several storeys high adjacent to Sir James Mitchell Park. At Mends Street and 'Yellow Hill' there are several multistorey flats which are built in narrow 'sky scraper' forms of the 1970s styles. There are several places where the residential area abuts directly onto the foreshore including the flats on 'Yellow Hill' and between Coode and Ellam Streets.

At Mends Street there is a retail complex which extends between the Perth Zoo and the Mends Street ferry. The streetscape has recently been upgraded with new trees, a new pavilion at the ferry terminal and a new shopping centre. The retail complex has recently encouraged office land use and some of the shops have aimed for a regional market which has put increasing pressure on parking in the area.

At Sir James Mitchell Park the South Perth City Council has been implementing a foreshore management plan (1994). The plan has allowed a small kiosk to be constructed on the foreshore adjacent to Coode Street Jetty. The kiosk is in a boat shed design of treated pine and gabled green colour bond roof. This style was used for the picnic area shelters and is in keeping with the adjacent Wesley College Rowing Club.

The Como foreshore has been isolated from residential and commercial use by the freeway. There are several prominent buildings including a few motels, a number of townhouses and the recently demolished 'Pagoda' dance hall. This suburban land use is distinct from the narrow recreational use of the foreshore.

The southern foreshore of Perth Water is walled by limestone retaining walls, except for the area between Parker Street and Wesley College boat shed. The rest of the precinct's foreshore has been allowed to retain small sandy and shelly beaches.

Recreation nodes

The open areas of McCallum Park, Sir James Mitchell Park and Point Belches are popular areas for passive and active recreational activities including picnicking, walking, and bird watching. Water based activities include water skiing, surfcatting, rowing, jet skiing, fishing and prawning. Water skiing is restricted to an area off Mill Point which is also used by a commercial para sailing company. Mobile surfcat operations are located adjacent to the Coode Street Jetty and use the Perth Water area between the ferry channel and up to Hurlingham Road. The Wesley College rowing shed is located on the Coode St foreshore adjacent to a boat ramp. A new restaurant has been built at the Coode Street Jetty.

At Como Jetty, the beach is suitable for swimming and there is a small picnic area adjacent to the jetty. The area is also a popular fishing spot with local people and a good prawning spot in summer. Due to the relative inaccessibility and high noise level the number of beach users is very small considering with how popular the beach was historically.

Every Australia Day weekend the South Perth Foreshore is an important viewing point for thousands of people to view the fireworks show. For many of the locals this is a controversial activity, as the foreshore is inundated by many people and the result is an expensive clean up operation every year.

Royal Perth Golf Course was granted its lease along Labouchere Road in 1907. It is a private course, with the highly manicured lawns and trees restricted to members only. The adjacent Richardson Park is used by local sporting clubs through out the year.

Other foreshore recreational spots include Milyu Nature Reserve, Mc Callum Park and Clydesdale Park.

Public access

There is a dual use path all along the foreshore between the Causeway and the Canning Bridge. There are four pedestrian overpasses across the Kwinana Freeway to enable access to Milyu and Como Beaches. The bike paths are heavily used by cyclists who commute to the city for work. Access is severely limited by the Kwinana Freeway which discourages visitors to the area due to the heavy traffic and associated high noise levels generated so close to the foreshore.

Sites of Nyungar & Wider Australian Community Significance

Nyungar significance

It is believed by Lyon (in Collard *et al,* 1996) that the South Perth area was the country of Beeloo Nyungars or river people. The key Nyungar figure at the time of colonisation was described by Lyon as Munday. Nyungars who used this area were known as *Gareen* and their place was *Gareenup* (Vinnicombe, 1989). An important camping and fishing area was situated between the present day Richardson Park and Mill Point *(Gareenup)* and this area was referred to as *Booryulup* or the place of the *booryul* or magic people (Collard *et al,* 1996). This area has since been covered by the Kwinana Freeway. The area stretched for approximately one and a half kilometres of foreshore and 150 metres into the bushland to the east of Melville Water. Today the foreshore reserve is called *Milyu* which is an Aboriginal but not Nyungar word for samphire. Further south along the foreshore is the place of the frog holes or *Gooyagarup*. The Como foreshore was a place for digging holes or *Beenabup* (Collard *et al,* 1996). Nyungars referred to the area of rushes near Millars Pool as *Goorgygoogup* (Collard *et al,* 1996). The South Perth foreshore side of Perth Waters is known by Nyungars as *Gaboodjoolup* or 'the place of the shore'. Further east is *Joorolup* or 'place of the jarrahs' (Collard *et al,* 1996).

It is recorded (Bates, 1992) that Nyungars would camp in the South Perth area when the *beere* or banksias were flowering and extract honey from the blossom. A spring which was on the Melville Water side of South Perth was widened by the Nyungar at this time of year and blossoms were left to ferment in the water. The fermented drink was then consumed as part of this special occasion.

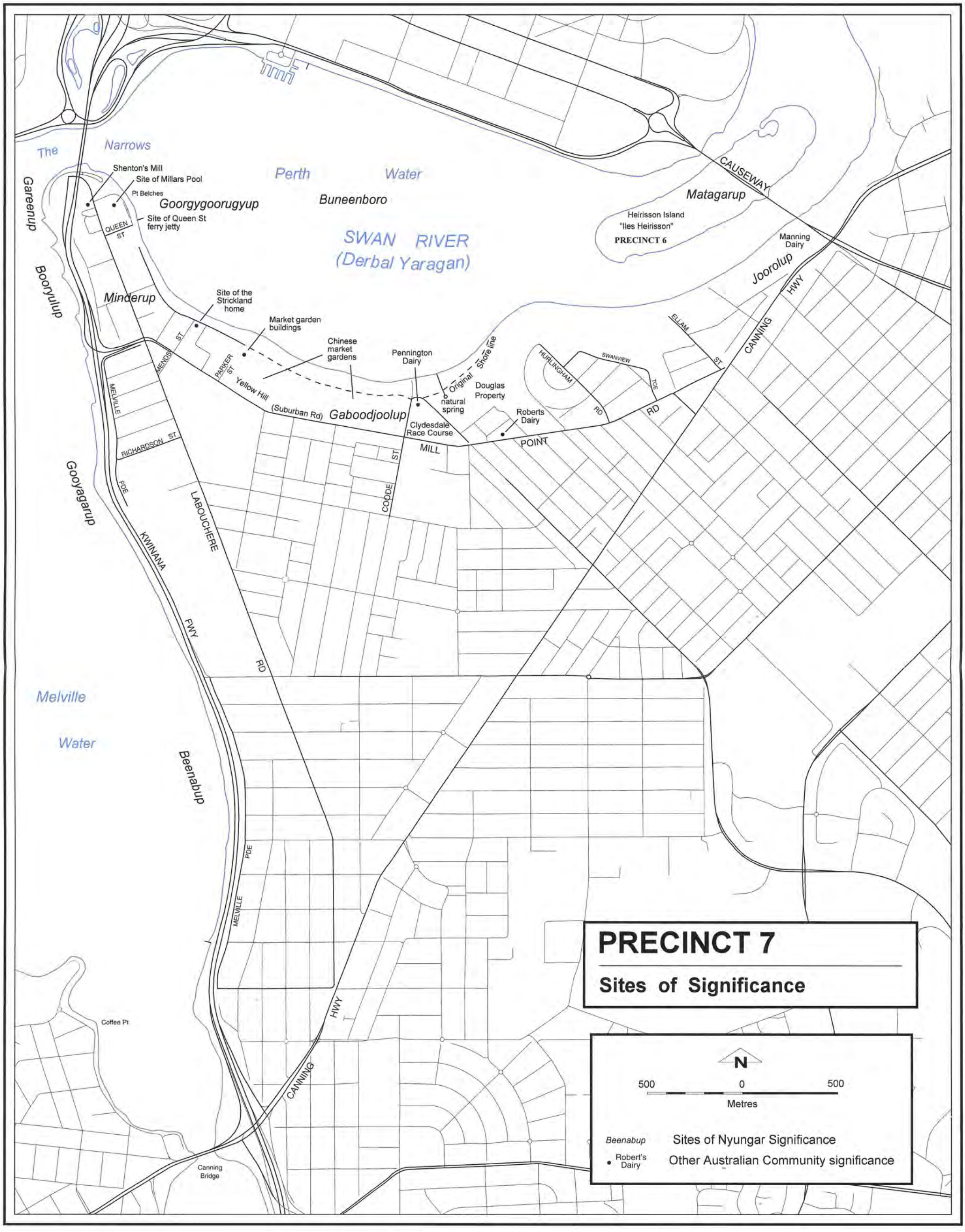
After colonisation, one of the earliest recordings of Nyungar presence in the area occurred when a party of thirty men from the *Bidjareb* (Pinjarra) Nyungar attacked Shenton's Mill. The leader of the party, Gcalyut, was later jailed (Joynt, 1972).

During the 1850s, there were violent confrontations between Nyungars and the very small white population in the area. In 1847 E.W. Landor commented on these confrontations as : '*a little well-timed severity, and a steadily pursued system of government, soon reduced them into well-conducted subjects of the British Crown*' (Crowley, 1962). After this time, a camp near the present day Causeway was established and occasionally Nyungars would use the South Perth area (Florey, 1995). During the 1930s and 40s the Parfitt and Pickett families, among others, lived here. At this time other families visited the area to catch prawns, bees, fish and crabs (O'Connor *et al,* 1989).

Other significance

The Old Mill built by William Shenton first in 1833, has become the landmark most associate with South Perth. The Mill has been threatened several times in its history. In 1835 it burnt down and was rebuilt later that year with Governor Stirling laying the new foundation stone. The mill ground wheat up until the late 1850s and approximately 30 years after its closure T. Brown attempted to turn it into a picnic resort. This venture was not particularly successful. However the mill has now been restored to its original condition and can be viewed by freeway drivers and visitors to Point Belches.

At Sir James Mitchell Park there is a commemorative garden and flag pole which was built for the 150th Birthday Celebration of the State in 1979. The park was only named after Sir James Mitchell in 1950 when it was decided by the South Perth Road Board to use the area for sporting groups.


The Narrows
Perth Water
Shenton's Mill
Site of Millars Pool
Pt Belches
Goorgygoorugyup
Site of Queen St ferry jetty
QUEEN ST
Buneenboro
SWAN RIVER
(Derbal Yaragan)
Garreenup
Booryulup
Minderup
Site of the Strickland home
Market garden buildings
Chinese market gardens
Yellow Hill
(Suburban Rd)
Gaboodjoolup
Pennington Dairy
Original Shoreline
natural spring
Douglas Property
Clydesdale Race Course
Roberts Dairy
MILL POINT
CAUSEWAY
Matagarup
Heirisson Island
"Iles Heirisson"
PRECINCT 6
Manning Dairy
Joorolup
HWY
ELLAM ST
CANNING
HURLINGHAM RD
SWANVIEW TCE
AMENDS ST
PARKER ST
MELVILLE
RICHARDSON ST
PDE
CODDE ST
LABOUCHERE RD
KWINANA FWY
Gooyagarup
Melville Water
Beenabup
MELVILLE PDE
CANNING HWY
Coffee Pt
Canning Bridge
PRECINCT 7
Sites of Significance
N
500 0 500
Metres
Beenabup
Sites of Nyungar Significance
Robert's Dairy
Other Australian Community significance

Conservation areas

The Perth Zoo is vested in the National Parks and Nature Conservation Authority and listed on the Register of Heritage Places.

Wetlands

The Swan Estuary Marine Park Management Plan has been prepared by CALM and Department of Environmental Protection for the Milyu Reserve.

System 6

M60 Aquatic Reserve, South Perth

It was recommended that the tidal flats immediately to the west of the Kwinana Freeway, South Perth be incorporated into a management plan. The vegetation consists of sedgeland and reeds. The area is one of the only three significant wading bird habitats remaining on the Swan River. These are an important feeding and resting ground for trans equatorial migratory birds. The reserve is now being incorporated to the Swan Estuary Marine Park and adjacent CALM Reserves Draft Management Plan (1995).

Precinct Description

Waterform

The southern section of Perth Water is a wide basin which bends around Point Belches to a gently concave shaped bay. The water surface is always a pleasing landscape feature in this section of the river as the enclosed form is subject to prevailing weather conditions which are reflected in water surface condition. The water body narrows with a gently convex point adjacent to the Hurlingham Street, and the river is divided into two by Heirisson Island. In contrast to the gently curved foreshore at South Perth, Melville Water has a eastern foreshore which is a straight north-south orientated beach. The water body is subject to strong prevailing winds and the viewer is presented with the wide basin that stretches between Crawley, Kings Park and Applecross.

Natural riparian zone

The Como foreshore is a narrow white sandy beach which has been dramatically reduced in width since the construction of the freeway. Much of the beach backs onto grassed banks or a small limestone retaining wall. There is a sandy bank adjacent to the Royal Perth Golf Course which is often exposed at low tide. This feature connects to the fringing vegetation at Milyu Reserve. Along Como the beach is quite steep and narrow compared with the wide gently sloped beaches shown in photos previous to the Freeway construction. The only unwalled foreshore at South Perth is west of the Coode Street Jetty. This is a narrow sandy beach with large oyster shells a significant part of the sediment material. The high tide water action has created a small cut into the shelly bank which is held in place with kikuyu grass.

Landform

The South Perth precinct forms a gently undulating plain. The edge of the central hill fronts onto the South Perth Foreshore, an area referred to as 'Yellow Hill'. This has a comparatively steep embankment in contrast with the flat platform like foreshore. This flat plain is partly the result of many infilling projects along the river. The foreshore area is saved from a monotonous morphology by the artificial lakes and tree planting in the area.

Vegetation

The foreshore vegetation is predominantly exotic species, but a few enclaves of native flora exist. The Milyu Reserve has narrow band of native species including several young Sheoaks which have dark green wispy forms which rise above the low uniform height of the bushes. The reeds are also long needle like forms which extend into the shallow water. Adjacent to this enclave are four very tall cotton palms which are somewhat out of place and have no association with any understorey or river feature. As individuals they are quite impressive, however the adjacent freeway light poles and overpass detract from their attractive linear form.

The Como Jetty area has several flame trees which provide the seasonally bright colours of deciduous plant and several bushes are planted around the foreshore toilet block. The lawn is well maintained and reaches down to the high water mark, however the narrowness of the reserve has limited the planting of more trees and shrubs.

At the South Perth peninsula there are several formal rose beds and well maintained lawn to the limestone retaining wall. The Mends Street jetty has several mature plane trees and small cotton palms which have been planted in a formal pattern and the lawn is well maintained. The South Perth foreshore near 'Yellow Hill' has a few stands of mature paperbarks. These have substantial amounts of kikuyu grass beneath them which is unfortunate as the trees themselves are very attractive. The South Perth City Council has embarked on landscaping the area with native species and has successfully used the vegetation to minimise the impact of the carparks and buildings. The dual use path user also experiences the contrast between walking through planted native gardens and open grass areas. The man made lakes have native riparian vegetation, as well as several cotton palms and flame trees. The plants are spaced in a 'parkland' manner. Several date palms are present along the Hurlingham Road foreshore area. These are fine individuals and it would be of benefit to plant more palms or other tall trees to make a feature of trees along this point. Mc Callum Park has several mature exotic trees and the area has been completely transformed into a parkland.

Riparian land use

The Como Sea Scouts are the only remaining club on the Como foreshore. They have a small clubhouse which is surrounded by bushes and is fairly inconspicuous. The area once supported the South of Perth Yacht Club and Como Baths. The Como Jetty has recently been upgraded and the Council has provided public toilets, picnic tables and play equipment. However the recreation node is fairly narrow and only metres away from the freeway, the two areas separated by a cyclone wire fence. There are several limestone groynes which have been built to reduce sediment transport around the South Perth peninsula. The result is the classic beach build up on one side of the groyne and little sediment at the other end. These white sandy crescents are a prominent feature from Kings Park, while to the South Perth foreshore user the shape of the beach is a less dominant feature.

At South Perth the Queen Street Jetty is occasionally used for fishing. The Mends Street Jetty still provides a link from the city to South Perth. The service is mostly used by recreational users although a small number of people use the service to commute to the city. The City of South Perth has recently allowed a kiosk development to be built adjacent to the Wesley Boat Shed. The new building is of a wooden boat shed style and has corrugated metal gabled roof. The building is in keeping with the water based use of the area, and other adjacent features, such as the picnic table shelters, have been kept in the same design. The amenities at Hurlingham Street have also been kept in a similar conforming and descreet design.

The Swan River Trust and the Fisheries Department have their field station located at Ellam Street. The several sheds and equipment are fenced off and surrounded by native bushes which reduce the impact of the site. The area is fenced right down to the foreshore wall, however the jetty is still accessible and is a popular fishing spot.

Land use

The dominant land use at Como is the Kwinana Freeway which is heavily used at all times of the day. The freeway has seven lanes and a car over pass at Judd Street. The river is accessible to dual use path users by four pedestrian overpasses. Behind the freeway there are several townhouses and units which apart from a few single bungalows, are the dominant form of residential development. A prominent feature along Melville Parade is the Pagoda which has a 1940s style and a large advertising sign on the roof. (This has since been redeveloped). There are several motels, restaurants and retail complexes along Melville Parade which can only be seen from the freeway and the pedestrian overpasses.

The South Perth peninsula is dominated by prime real estate apartment blocks. These are approximately ten storeys high with modern light coloured designs. The apartments on 'Yellow Hill' have a skyscraper effect with a much taller construction and an older style. Along the rest of Mill Point Road several new townhouse dominates the residential area. These have modern styles from the 1980s onwards and mix in with the adjacent older post war bungalows. The area has several leafy trees which give the impression of a well settled suburban area. Along Swanview and Farland Streets, there are several new houses which front onto the river foreshore. These are built in a quite imposing style and many have high walls which front onto the parkland area.

Dominant Landscape Character

The dominant landscape character for the South Perth foreshore is a man-made urban character. The original natural landscape character types has been altered by clearing of the bushland for suburban development and infilling the foreshore. The foreshore area between the Causeway and Canning Bridge can be considered as a parkland character type which suggest that it is used for recreation purposes and has been greatly modified from the original landscape. On the northern section of the precinct there are relatively large areas of open space with the occasional cluster of trees and man made lakes. Recreational amenities have been provided. The backdrop is the Suburban Character Type of the main South Perth area. The narrow section of cycle path and beach at Como can also be considered as a parkland character type, due to the formal lines created by the beach walling and recreational jetties. At Milyu Reserve, there is a narrow band of regenerated fringing vegetation which could be considered as an natural. The land from the Kwinana Freeway and westwards is of an urban/suburban landscape character type.

Significant Viewscapes

There are several significant viewscapes from the South Perth foreshore to the Perth city centre and Kings Park. These viewscapes are mainly framed by individual or clusters of trees which help to frame and soften the view of the city. They also create an expectation of what is behind them which adds interest to the viewscape. From the river the view of the South Perth peninsula is attractive and the high rise buildings link the city land use to the South Perth foreshore. From Coode Street the urban land use is flatter and lower with the trees from the suburban gardens covering most of the forms. The landform gradually rises from the foreshore which gives this viewscape a sense of depth.

From the Kwinana Freeway and cycle path there are spectacular views of Kings Park and Melville Water. This wide viewscape is limited by the freeway and the tall buildings on Point Belches, however by standing on the foreshore or pedestrian overpasses a commanding stretch of the river can be viewed. From the river, the viewscape is a relatively flat suburban landscape. The few trees along the foreshore are important features from the river as they screen the freeway and a rather ordinary suburban landscape. The Como Jetty is an important element in the viewscape as it links the urban landscape to the river form.

Conforming and Non Conforming Elements in the Landscape

The Kwinana Freeway greatly detracts from the Como foreshore landscape. It is indeed unfortunate that such a significant stretch of the river has been given over to such a noisy and polluting land use. However the freeway plays a very important transport role and is now a permanent feature of the area. The challenge is to reduce the impact of the freeway on the foreshore.

The median strip along the freeway could consist of well maintained natural flora. Local species are not only attractive, but are particularly suitable for the harsh conditions of the adjacent freeway and require little watering. The freeway reserves require regular rubbish removal and users should be encouraged not to litter the reserves. The South Perth City has recently planted grasses, roses, rosemary and *Agapanthus orientalis* at the Judd Street turn off. This is not in keeping with the rest of the native flora planted along the freeway reserve, however it may be argued by the council, that the freeway turn off is the gate way to the South Perth City and the gardens are indicative of the old suburban nature of the area. These gardens will require high maintenance and weeds tend to grow through the woodchip ground cover.

The Milyu Nature Reserve while environmentally significant it is also a very limited and narrow section of 'natural' landscape adjacent to the Kwinana Freeway. Its presence is a positive element in the landscape. The revegetated reserve appears as a natural landscape and is important in reducing the visual impact of the freeway on the riverine environment. The reserve has sheoaks and sedges which have an attractive form and provide a habitat for water birds who use the adjacent shallow. There is opportunity to retain, conserve and even extend this positive element in the precinct.

PRECINCT 7

Dominant Landscape Characters and Significant Viewscapes

PRECINCT 8

PRECINCT 6

RIVER

Island

CAUSEWAY

The Narrows

Perth Water

Mill Pt

Pt Belches

MILL PT CL

QUEEN ST

groynes

SWAN

Heirisson

PRECINCT 6

PRECINCT 8

HWY

CANNING

ELLAM ST

SWANVIEW TCE

HURLINGHAM RD

RD

POINT MILL

ST

COODE

AMENDS ST

PARKER ST

MELVILLE

RICHARDSON ST

PDE

KWINANA FWY

LABOUCHERE RD

Melville Water

groyne

Coffee Pt

PRECINCT 5

Canning Bridge

N

500 0 500

Metres

LANDSCAPE CHARACTERS

Recreational

Suburban

Natural

Significant Viewscapes

The man-made lakes at Sir James Mitchell Park are feature of the foreshore and attractive to local residents. From certain angles the viewer is presented with two water bodies, the flat wide enclosed forms of the lakes and the broader form of Perth Water. These views are particularly pleasing and should be conserved. The many melaleucas and flooded gums which are on the foreshore are attractive elements for several reasons. Not only are they reminiscent of the original vegetation and have attractive forms and habitat value. In addition, they also frame views of the Perth Water. The trees create an expectation of what is behind them which adds interest to the viewscape.

The car parking in the precinct has been well addressed. The council has planted trees in a way which reduces the impact of the area and also provides shelter. This policy should be encouraged. At the Hurlingham Street carpark and adjacent to the Mends Street carpark are two remnant stands of flooded gum which should be retained for their visual amenity as well as their ecological significance.

The development at the Coode Street area is visually congruous with the adjoining buildings and the riparian nature of the development. It is important that the low impact development of the foreshore be maintained and any further development in the area be considered carefully.

Walling of the South Perth foreshore has created a comparatively uninteresting and formal border between the river and the parkland. Future planning decisions may consider how to improve this landscape element.

The South Perth foreshore skyline has several tall buildings which are consistent with the urban environment in the area, however if in the future further tall buildings are proposed, their location and suitability to the landscape character need to be carefully examined. The Old Mill at Point Belches is a significant landscape feature.

Recommendations for Maintenance and Enhancement of the Present Landscape Character

Several opportunities may be considered including

- The question arises whether the planting of dense native scrub along the freeway reserve should be encouraged. This would reduce the noise and improve the appearance of the freeway to the foreshore users, however it would restrict the river view of many commuters who find the view of the river a pleasant distraction on the drive to work.
- The natural landscape character and the environmental sensitivity of the Milyu Nature Reserve need to be preserved. It is recommended that the regeneration of native flora here be encouraged. It would be ideal if the area could be extended between Mill Point and Como beach which would not only act as a larger nature reserve but also a buffer to the freeway. The natural flora would enhance the view of the river to the river user and those using the freeway.
- To enhance the present parkland landscape character the provision of shallow banks on the lakes and planting of native riparian species could be encouraged to provide a natural edge and also a habitat for birds. The Swan River Trust (1994) supported the idea of encouraging black swans back to the area by ensuring that the water quality of the lakes is high and relatively fresh for most of the year. Provision of natural habitats and islands in the lakes would provide suitable nesting sites for the swans. The Melaleuca stands in the area would benefit from the removal of the kikuyu grass and re establishment of natural understorey.
- Access to and amenity of the river would be improved by having more naturally sloped gabion walling which would encourage beach build up. The groins at Mill Point could slowly be replaced by planting natural riparian vegetation, or at least encouraging the vegetation to grow against the groynes which soften their appearance.
- Consideration should be given to the impact of to tall buildings on the river landscape. If the result is a single building emerging from a relatively flat landscape should be discouraged.
- Acknowledgment of natural landscape, local significance and history could be incorporated into the area by having a heritage trail.

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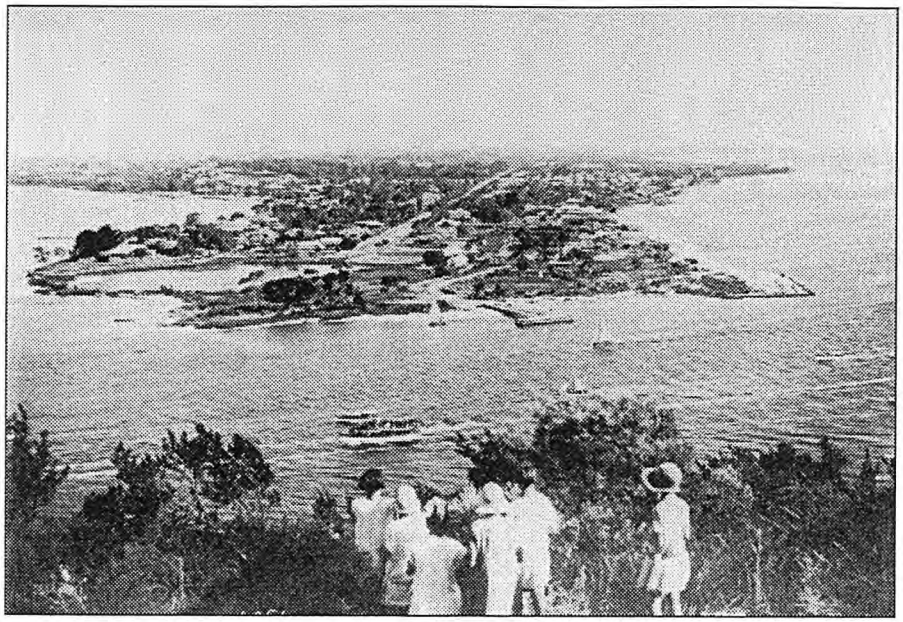
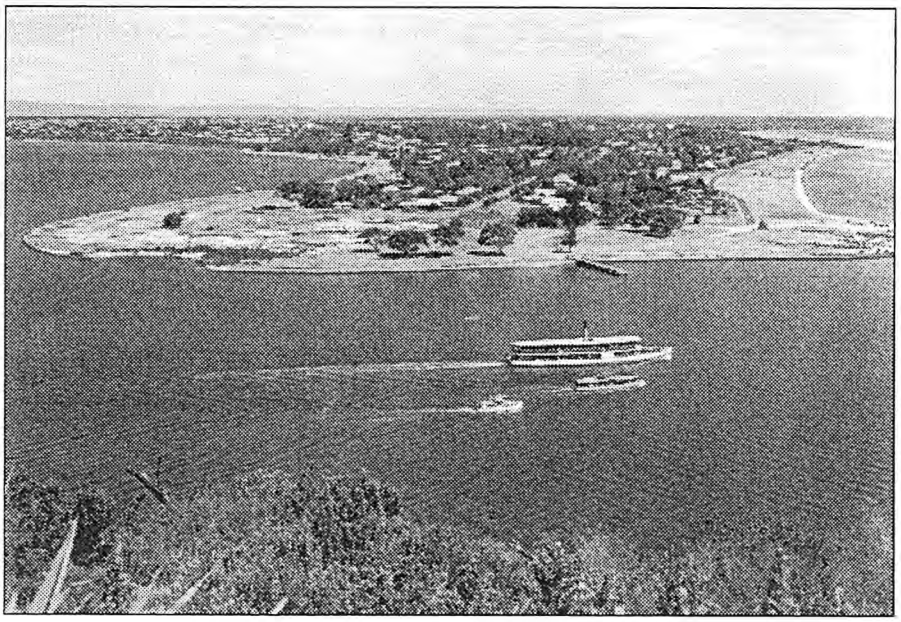


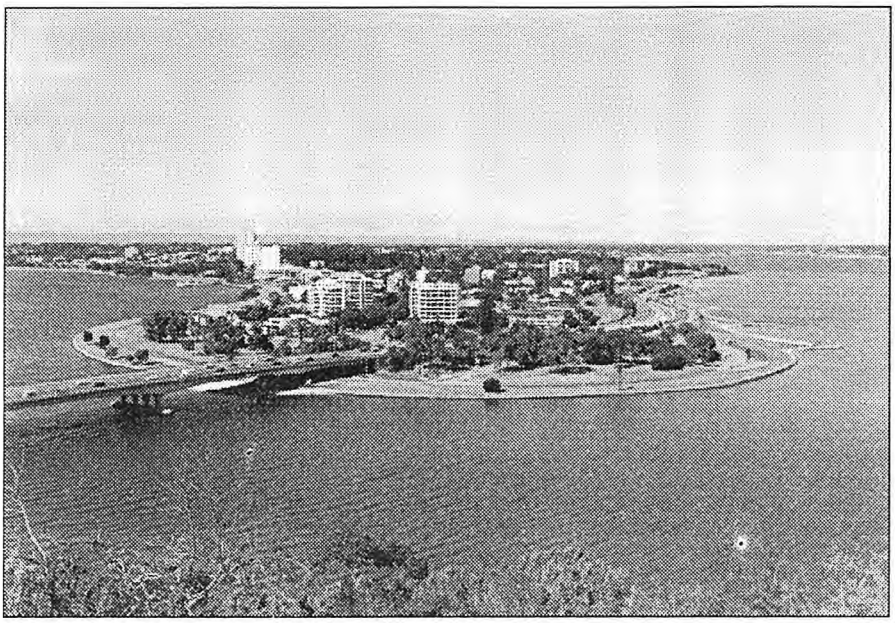
Mill Point from Kings Park. c1932.

Battye Library A4051.



Mill Point from Kings Park. c1950.

Battye Library 816B/C4999.



Mill Point from Kings Park. 1997.

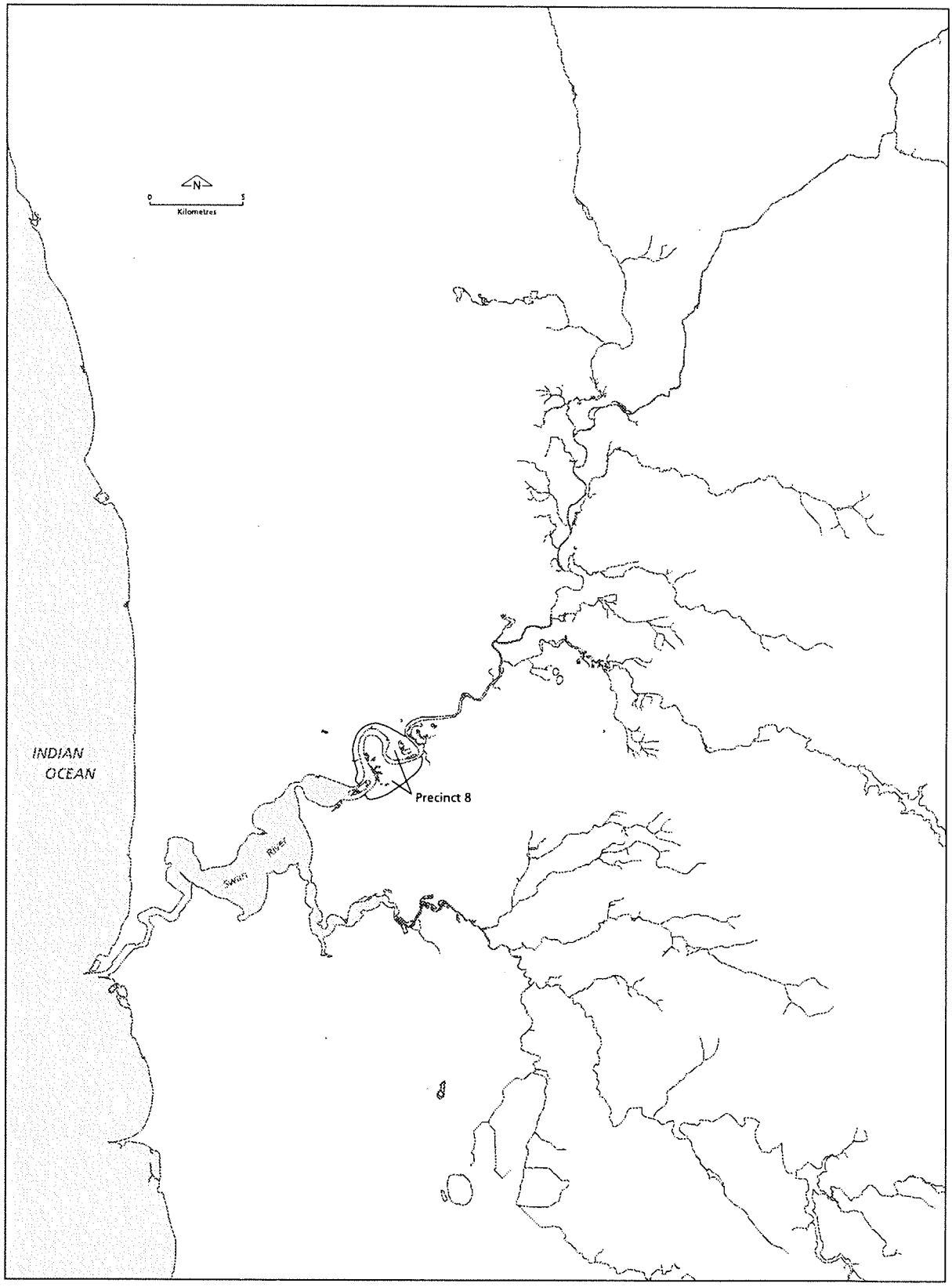
Swan River Trust.

South Perth Foreshore. 1997.

Swan River Trust.

Precinct 8

Burswood Island to Maylands Peninsula (Causeway to Bath Street Reserve)



Summary

Burswood Island to Maylands Peninsula (Causeway to Bath Street Reserve)

The Swan River takes the form of broad, graceful regular meanders upstream of Heirisson Island to Maylands Peninsula. The wide channel seasonally inundates the remaining flat alluvial sediments, such as Maylands Peninsula. The landform is particularly attractive as it highlights the river meander bends with the flat peninsulas nesting into steeply sloping escarpments of the opposite banks.

The escarpment line curves in a parabolic form with the low points being the peninsulas at either end and the central curve tapering to a uniform, higher ridge.

There is little natural riparian vegetation along the foreshore in this section due to extensive landfill and intensive land use in the area. One of the most attractive vegetation complexes is the samphire flats and fringing reed communities at the Maylands Peninsula. Remnant flooded gum and paperbark communities are present along the southern foreshore between Belmont Park Racecourse and Abernethy Road, however these complexes have been overrun by weeds. The northern section of the foreshore has little indigenous vegetation between Trinity foreshore and Maylands, rather exotic trees have been planted or weeds have invaded remaining areas of inundation.

A prominent riparian feature was the old Bunbury rail bridge which has been recently been replaced with the new Goongoongup rail bridge and the high tension power lines. Several small jetties are found along the river section which add interest to the water body. In the past, this section of the river has been subject to various industrial and degrading land uses. The East Perth Redevelopment Project has recently widened the Claise Brook drain into an inlet and has landscaped the new banks attractively using a mixture of exotic and Australian flora and limestone retaining walls. The new development will be a mixture of residential and other urban land uses. North of the inlet is the derelict East Perth Power Station which is of historic significance and a prominent river feature. The Maylands Peninsula has a mixture of single and high density residential properties on the topographically higher land. Most of the peninsula used for recreation and conservation. The old Maylands Brickworks have been recently restored and along with Tranby House provide interesting landscape features as well as being of historical significance to the area.

Burswood Island Resort is a large modern development which stands out rather than complements the river environment, however the landscaped gardens and highly maintained appearance is more attractive than the adjacent railway reserve land. At present, the northern point of the peninsula is currently being developed as a major transport node to bypass the main city area and consequently is an unattractive construction site. There is a mixture of high density flats and single residential blocks along the Rivervale foreshore and the land west of Abernethy Road is currently being redeveloped for residential land use.

Geology

East Perth's geology is characterised by leached quartz sand with over sections of Tamala Limestone (DCE, 1980). However adjacent to Heirisson Island at the floodplain meander bend the more recent clay and silt fluvial and estuarine deposits have built up on the limestone and sand. East of Bardon Park, the Tamala Limestone derived sand gives way to the Bassendean Sand which is leached dunes of white and grey quartz sand. However more recent fluvial and estuarine deposits of clay, sand and loam have formed over the extensive flood plain areas. The eastern section of the Maylands Peninsula is part of the Guildford geological formation. It is described as being sandy clays to clayey sands and as including colluvium and alluvium.

There are several soil associations within this small precinct, however much of the original associations has been extensively disturbed due to past land uses and ongoing earthworks. The East Perth area consists of the Vasse Soil deposits which are poorly drained plains with estuarine deposits. Around Burswood Island and the western part of the Maylands Peninsula, the soil is part of the Swan Association which consists of red podsolic and undifferentiated alluvial soils (McArthur& Bettenay, 1974). The eastern section of the Maylands Peninsula consists principally of alluvial clays. The soil is part of the Guildford Association and has alternative layers of sand and clay.

Topography

The area is part of the Swan Coastal Plain which is low lying and gently undulating. The western section of the precinct borders of the edge of the Spearwood Dune System while the eastern portion is part of the older Bassendean Dune System. The Spearwood Dune Systems consist of higher dunes compared to the low sandy hills and sandy swamps of the Bassendean Dune System. The alluvial deposits typify the precinct's landform. Both the Maylands Peninsula and Burswood Island are flat alluvial plains while the opposite banks of these peninsulas are quite steep embankments. The East Perth landform is gently undulating, however the slope is quite steep around the East Perth Cemetery and Banks Reserve. Much of the original low lying land around Claisebrook has been infilled and reshaped for various developments.

Hydrology

Water Features

The Swan River continues upstream of Heirisson Islands with a highly sinuous meandering channel. The original varying channel width has been altered so that today the channel width is relatively even. The depth has also been increased to allow improved transport movement. Originally, the channel depth was less than a metre in places. The river sediments in the channel at East Perth vary from fine sediments to silt, sand, rubble and mussel shells (Camp Scott Furphy, 1992a). A distinct sand lens occurred at the northern mouth of the Claisebrook drain, prior to its redevelopment as the Claisebrook Inlet. The inlet is now a broad mouth which narrows before forming a rectangular pool in the centre of a new residential area.

The water is fresh for almost four months of the year in winter. In the summer months, stratification occurs with a saltwater intrusion upstream and the maximum salinity level occurs in early autumn. There is a natural spring adjacent to Goodwood Parade which creates a permanent swamp surrounded by a dense band of vegetation.

Bathymetry

The channel has been dredged in the past and the depth varies between 2 - 4 metres below mean water level. The river upstream is shallow and is approximately 1 - 2 metres below mean water level.

Erosion and accretion

Originally, the soft sediments would have been subject to the natural processes of erosion and accretion in places where there was little retaining vegetation. The use of speed boats has increased the erosion of the banks, however restriction of these vehicles to the Belmont Water Skiing Area has reduced vegetation degradation. Pine retaining walls have been placed to decrease the loss of landfill at Goodwood Road. Management plans have been implemented by the Stirling City Council which aim reduce the loss of samphire flats from the Maylands Peninsula. Reduced vehicle access to the foreshore has minimised the loss of the vegetation community and consequently the foreshore is more stabilised in this area. The landfill at Trinity College foreshore is eroding exposing the rubble and rubbish used to create the foreshore.

Flooding

There are several floodplain sites in this precinct which have been infilled. These include the Burswood Island Casino Complex and the western side of the Belmont Park Race Course. The samphire flats are subject to seasonal inundation and areas such as the land in front of Saint Annes Hospital is also damp throughout the year.

Vegetation Communities

Native

Vasse Complex

The Vasse Complex originally occurred along the foreshore from the Causeway to Bardon Park and on Heirisson Island and a small section of the Burswood peninsula (DCE, 1980). It would have been a mixture of closed melaleuca scrub to a fringing woodland of flooded gum *(Eucalyptus rudis)* and melaleuca species. It would have also included an open forest of tuart *(Eucalyptus gomphocephala)*, jarrah *(Eucalyptus marginata)* and *(Eucalyptus calophylla)* on the higher land. At Heirrison Islands and the West Perth wetlands swamp paperbark *(Melaleuca rhaphiophylla)*, moonah *(Melaleuca pressiana)* and saltwater paperbark *(Melaleuca cuticularis)*, swamp sheoak *(Casuarina obesa)*, Christmas tree *(Nuytsia floribunda)*, robin redbreast bush *(Melaleuca lateritia)* and coojong *(Acacia saligna)* would have occurred. Little of the complex remains, however some remnant species do occur along the foreshore and are discussed below.

Swan Complex

At the Burswood peninsula and the western half of the Maylands Peninsula, the original flora would have been identified as being the Swan Complex (City of Stirling, 1987). A remnant paperbark wetland typical of the Swan Complex occurs at Berringa Park. The vegetation ranges from fringing woodland of flooded gum *(Eucalyptus rudis)* and swamp paperbark *(Melaleuca rhaphiophylla)* with localised occurrence of low open forest of sheoak *(Casuarina obesa)* and saltwater paperbark *(Melaleuca cuticularis)*. The understorey species include bearded twine rush *(Leptocarpus* sp*)*, shore rush *(Juncus kraussii)* and bogrush *(Schoenus* sp*)*.

Guildford Complex

The northern section of the Maylands Peninsula would have originally supported the flora identified as being part of the Guildford Complex. The complex ranges from a mixture of open to tall open forest of marri *(Eucalyptus calophylla)*, wandoo *(Eucalyptus wandoo)* and jarrah *(Eucalyptus marginata)*. The understorey species include bull banksia *(Banksia grandis)*, black gin *(Kingia australis)*, blackboy *(Xanthorrhoea preissii)*, and buttercup *(Hibbertia* sp*)*.

Karrakatta Complex

The Karrakatta Complex occurs at West Perth and Mount Lawley areas away from the river. The complex is predominantly tuart *(Eucalyptus gomphocephala)*, jarrah *(Eucalyptus marginata)* and marri *(Eucalyptus calophylla)*. The understorey consisted of slender banksia *(Banksia attenuata)*, firewood banksia *(Banksia menziesii)* and bull banksia *(Banksia grandis)*. Sheoak *(Allocasuarina fraseriana)* and peppermint *(Agonis flexuosa)* are also present. Shrubs include coastal wattle *(Acacia cyclopis)*, coojong *(Acacia saligna)*, dwarf sheoak *(Allocasuarina humilis)* and buttercup *(Hibbertia hypericoides)*.

Bassendean Complex

The flora of the Bassendean Complex occurs on the higher areas at the northern and southern sections of the precinct. The vegetation ranges from woodland of jarrah *(Eucalyptus marginata)*, sheoak *(Casuarina obesa)*, and various banksia species including firewood banksia *(Banksia menziesii)*, slender banksia *(Banksia attenuata)*, holly leaved banksia *(Banksia ilicifoila)* to sedge lands on the moister and lower sites.

The Swan and the Vasse Complexes which line the foreshore will have sedge and samphire communities which are briefly described below.

Juncus and *Sarcocornia* communities

Shorerush *(Juncus kraussii)* communities line several sections of this precinct's foreshore and characterised by its emergent form. The samphire beaded glasswort *(Sarcocornia quinquiflora)* occurs in areas adjacent to the shorerush complex in the north-western part of the Maylands Peninsula, and is the dominant vegetation complex in the southern foreshore area. This is often associated with the other succulent samphire *(Halosarcia* sp*)*. Knob sedge

(Carex inversa) and marsh club rush *(Bolboschoenus caldwellii)* are also present in the lower lying drainage of the Maylands Peninsula. At Burswood Island, there are clumps of shore rush *(Juncus kraussii)* and pale rush *(Juncus pauciflorus)* and a salt pan community including seablite *(Sueda australis)* and creeping brookweed *(Samolus repens).*

Exotic

The Trinity foreshore understorey is predominantly couch grass *(*Cynodon dactylon).* The landscaped gardens adjacent to the Causeway are made up of various Western Australian Melaleucas and other species which have forms and characteristics which make them suitable for landscaping.

The Claisebrook Inlet banks were until recently flourishing with weeds and exotic trees. Most of these have been removed during land excavation, however several trees which have aesthetic appeal are incorporated into landscaped gardens. The new gardens consist of non indigenous natives as well as exotic species. At present, there is no vegetation along the foreshore due to land works. Banks Reserve is a grassed open parkland with isolated mature trees, such as fig trees *(*Ficus* sp), and several exotic palms . There are no understorey shrubs.

Sections of the foreshore between Saint Annes Hospital and Bath Street Reserve have many exotic species which flourish in the damp conditions. They include bulrush *(*Typha orientallis),* fig *(*Ficus* sp), couch grass *(*Paspalum dilatatum),* pampas grass *(*Cortaderia selloana),* morning glory *(*Ipomoea indica),* blackberry *(*Rubis fruticosa),* arum lilies *(*Zantedeschia aethiopica),* elephant ear *(*Philodendron hastatum),* and jacaranda *(*Jacaranda minosifolia).*

Burswood Island has an abundance of weeds and exotic species. These include caster oil *(*Ricinus communis),* geranium *(*Pelargonium* sp), pampas grass *(*Cortaderia selloana),* bulrush *(*Typha orientalis),* giant reed *(*Arundo donax),* pigface *(*Carpobrotus* sp), fennel *(*Foeniculum vulgare),* broomrape *(*Orobanche minor),* lupins *(*Lupinus* sp), and poplars *(*Codonocarpus continifolius).* Grasses are abundant and the more prominent species are Guildford grass *(*Romulea rosea),* couch *(*Cynodon dactylon),* African lovegrass *(*Eragrosits curvula)* one sided oats *(*Avena barbata)* and veldt grass *(*Ehrharta calycina).*

Historical Land use & Resulting Environmental Changes

Claise Brook was named after F. R. Clause, a surgeon of the H.M.S. Success (East Perth Redevelopment Authority, 1992). The name Clause Brook was eventually misinterpreted as Claise Brook. The watercourse was used to drain the lakes on the northern section of the city and became Perth's main sewer towards the end of the 1800s. A scheme in 1870s to set up a silk industry on the river banks involved planting mulberry trees which remained up to one hundred years later despite the industry never reaching fruition.

A prominent landowner was Peter Brown who owned many properties along the Swan River, including the East Perth Power House site. The East Perth Gasworks was established in 1915 to increase gas supplies to the existing facilities for Perth (Camp Scott Furphy, 1992b). Gas was produced by carbonisation of coal supplied from New South Wales in retorts. The process involved removing ammonia and hydrogen sulfide (East Perth Redevelopment Authority, 1993). From 1926 coal tars were separated from the aqueous coal to form light tars, creosote and pitches. Other methods of gas extraction included a water gas plant established in 1929 which produced gas from oils and a catalytic reforming plant which operated until 1971. Wastes which were produced included tars, tar residues, complex cyanides and sulphates. Catalytic oils including heavy metals such as vanadium and nickel were also produced (East Perth Redevelopment Authority, 1993). The north of the site was originally very low and was infilled with rubble to reduce the risk of inundation. There was extensive land infilling during the time which the gas works were operating.

The Claise Brook drain was redirected to a more southerly entrance to the Swan River in 1915 and has been until recently a node of industrial land use. Some workshops and the East Perth Power Station still exist in the area, although many of the State run operations are being relocated.

The area know as Burswood Island was first settled in 1829 by Henry Camfield and his family and servants (Public Works Department, 1979). The 1000 acres of land took the form of a low lying peninsula leading to a ridge and steep sandy hill with scrubland (today's Burswood Island to Lathlain). He called it Burrswood after his home *Burrswood Estate* in Kent, England. They planted Indian corn and potatoes which all failed in the first years. Eventually, the land was leased to Solomon Cook who established a large market garden at Burswood.

Travelling upstream of the Causeway was difficult in the early years of the colony due to the shallow waters. In 1830s, a canal was constructed through the Burswood isthmus creating a island (Battye, 1912). The canal, however quickly filled in by the late 1830s and it was replaced with a new canal built through the peninsula at today's Trinity College.

Western Australia's first golf course was build on Burswood Island in 1895 (State Government of WA, 1984). The clubhouse was a mudhut. The Burswood racecourse was established in 1899 adjacent to the golf course. The racecourse was changed to Belmont Park in 1902 and a second race course Goodwood was established between the old canal and Belmont park ten years later. Both courses operated for years until Goodwood was sold in the mid 1940s.

The land was used as sewage settlement ponds between 1906 and 1934 as part of the Burswood and Claisebrook treatment works (State Government of WA, 1984). Bacterial septic tanks were located at Claisebrook and at Burswood filter beds were located and were infamous for their smell. Other light industries were established in the area and by 1919 Swan Portland Cement was operating from the peninsula. After World War II, the land became a domestic rubbish dump site until 1972. Swan Portland Cement dredged over 1.5 million cubic metres of shell upstream and downstream of the Causeway for cement between 1973 and 1976. During the same period the Blizzard Sand Company dredged almost 10 000 cubic metres of sediment from the same area of the river channel.

The Riversdale Estate was the first attempt at a residential development in the area and land was offered in the 1890s. This was not particularly successful, however several residents lived in the area known as Burswood. Due to the undesirable land use in the area, the name was changed to Rivervale in 1921. The Burswood Island Resort and Casino was opened in 1985. The resort and golf course is located on landfill from past river dredging.

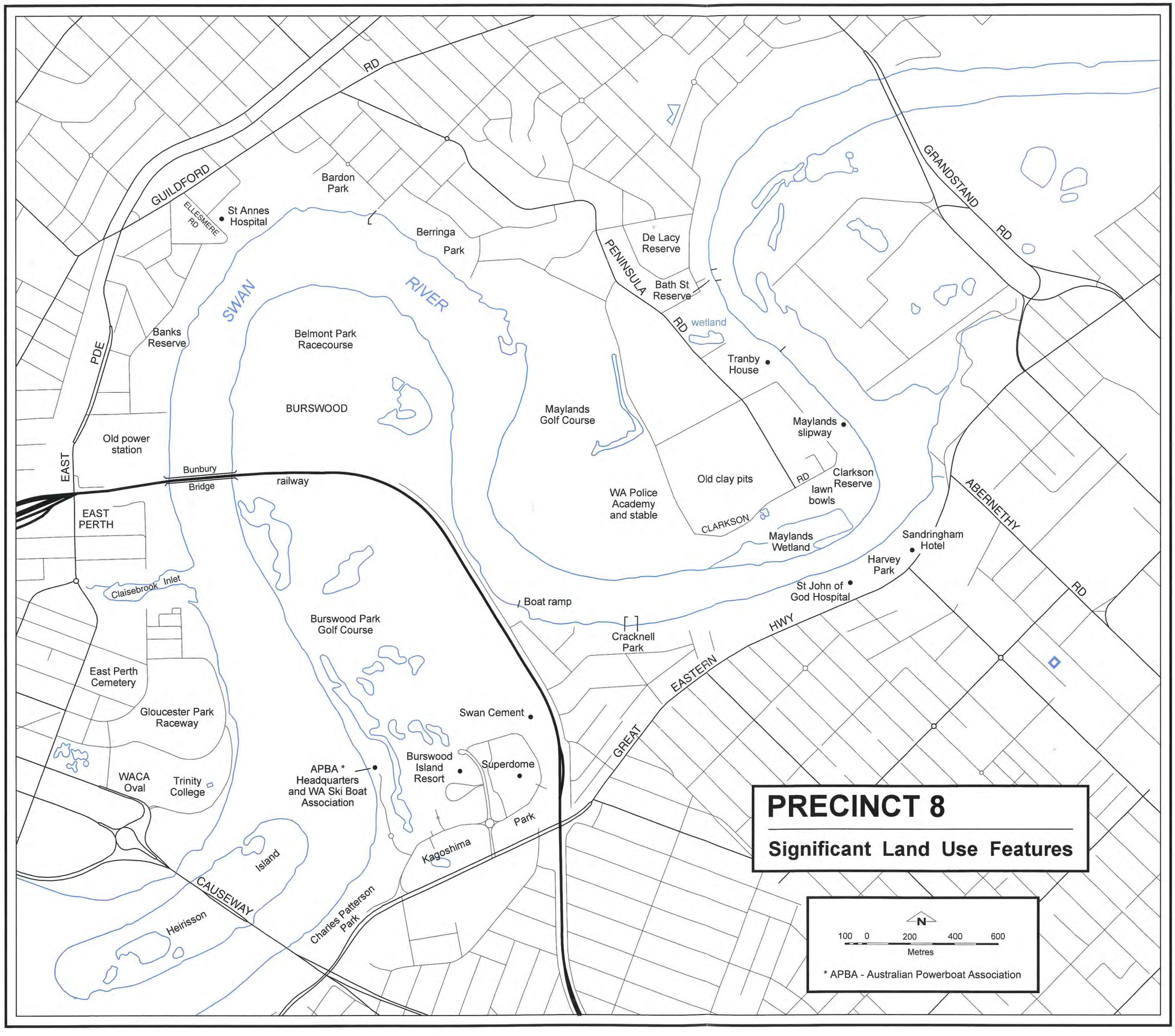
In 1911, the Sisters of St John of God bought a large house called *Keer Weer* where they established a hospital. They later purchased more land and St John of God Belmont Hospital was established.

In early 1830, the first settlers to the Maylands area arrived on the ship Tranby (Carter, 1986). The Maylands peninsula was divided into eight grants (City of Stirling, 1988). One of the early settlers to the area was Joseph Hardy who settled on the eastern bank of the Maylands Peninsula. He suffered several misfortunes, his first two mud houses being washed away. However his third dwelling built in 1836 proved to be very enduring and *Tranby House* still stands today.

The opening of the Fremantle to Guildford railway line was important for the growth of the area and a station was opened at Maylands in 1900. This allowed low cost residential land to be made available to the settlers (City of Stirling, 1987). The Maylands Peninsula was cleared in the 1900s by two Chinese families for market gardens. Recent enhancement works revealed the rectangular systems of the drainage channels which have been colonised by reed communities. The market gardens tended to be on the higher land away from the salt marsh communities due to soil salinity and drainage constraints (City of Stirling, 1988). The area was locally known as 'Chinamen's Bay'.

Several landuses contributed to the degradation of the vegetation communities in Maylands. From 1920s, the area became degraded as belts of weeds extended over the abandoned market gardens. It is believed that blackberries, bamboos and other weeds were well established by this time. The area has been generally poorly maintained. Several disturbances included installing the sewer line (1920s) and a natural gas pipeline (1986).

In 1923, 52 hectares (130 acres) in the Maylands Peninsula were resumed by the Commonwealth Government as the site for an aerodrome (City of Stirling, 1988). This was used until 1964 when the land was temporarily used as a recreation site.


GUILDFORD RD
ELLESMERE RD
St Annes Hospital
Bardon Park
Berringa Park
De Lacy Reserve
PENINSULA RD
Bath St Reserve
GRANDSTAND RD
SWAN RIVER
wetland
Banks Reserve
PDE
Belmont Park Racecourse
BURSWOOD
Tranby House
Maylands Golf Course
Maylands slipway
Old power station
EAST
Bunbury Bridge
railway
Old clay pits
RD
Clarkson Reserve
lawn bowls
WA Police Academy and stable
CLARKSON
ABERNETHY
EAST PERTH
Maylands Wetland
Sandringham Hotel
Harvey Park
St John of God Hospital
RD
Claisebrook Inlet
Boat ramp
Burswood Park Golf Course
Cracknell Park
HWY
EASTERN
East Perth Cemetery
Gloucester Park Raceway
Swan Cement
GREAT
APBA * Headquarters and WA Ski Boat Association
Burswood Island Resort
Superdome
WACA Oval
Trinity College
Park
Kagoshima
Island
CAUSEWAY
Heirisson
Charles Patterson Park
PRECINCT 8
Significant Land Use Features
N
100 0 200 400 600
Metres
* APBA - Australian Powerboat Association

In the early 1920s the extensive clay deposits in the Maylands Peninsula became attractive to the brick-making industry (City of Stirling, 1987). The Metropolitan Brick Company, under the direction of Mr Robert O. Law, purchased several small dairy farms and various other properties including the Mill Pottery works, which was the first pottery works in the colony. In 1927, Mr Law built a complete brickworks at Maylands which included a Holffman kiln. A second plant came into operation in 1936.

The Meckering earthquake of 1968 seriously damaged the brickworks. The eastern Kiln and chimney stack were subsequently demolished and the rubble used to fill portion of the claypits. On 30 September 1973 H.L.Brisbane and Wunderlich made a successful bid for the Metropolitan Brick Company. After the further acquisition of Monier Limited the holding company changed its trading name to Metro Brick. In 1980 the City of Stirling purchased the brick kiln and claypits from Metro Brick (City of Stirling, 1988). In 1984 all brick making works ceased. The City of Stirling moved to protect the brickworks as a historical/tourist attraction. The National Trust included the kiln curing sheds and the extruder shed and tower on its classified list in 1985.

As early as 1955, the Stephenson/Hepburn Report suggested that the Peninsula would be an ideal location for a major arterial road crossing the Swan River. The Metropolitan Region Scheme in 1963 reserved a section of the peninsula for a highway under the Public Purpose Classification. The rest of the land was zoned Urban landuse. Portions of the aerodrome buildings and land were revested and reserved for 'Police Purposes' (City of Stirling, 1987). Strong objections to use of the site as an equestrian park and Police Depot were received. By 1969 the City of Stirling had allocated a large amount of money for the development of the Swan River foreshore. A concept plan for the aerodrome site was proposed with the possible inclusion of a golf course. By 1988, the State Government had decided not to proceed with the 'Swan River Drive' crossing. As a consequence work commenced on the redevelopment of the area including the Maylands Peninsula Golf Course.

One of the most prominent urban development projects in the area was the 1972 Bond Corporations' medium density development called Tranby on Swan.

There have been several dredging and infilling operations in this precinct. Between 1946 and 1964 there was continual dredging between the Causeway and the Bunbury Bridge as part as the flood control program by the Public Works Department (1979). The spoil was dumped on Heirisson Island. The river foreshore and wetlands were infilled using dredge spoil by the City of Perth at Rivervale between 1950 -1972. Between 1965 to 1966 dredging continued in the area, however the spoil was placed on the Rivervale foreshore. Flood control continued in 1968 between the Bunbury Bridge and East Street Maylands. The spoil was placed on Burswood Island. Maylands foreshore was dredged for navigation and used to form a beach in the area in 1969. The ongoing process of dredging upstream of the Causeway continued between 1969 and 1973.

Present Land use and Social Patterns

There is a wide variety of land uses in this precinct. There are several residential areas adjacent to the river which are mainly separated from the river by the foreshore reserve. On the northern banks, a number of turn of the century homes have been renovated and many are quite prominent to the river user. Interspaced with these large blocks are high density townhouses and flats. The most prominent are the Maylands multistorey flats which are not of a high standard of architecture. The 1990s have seen a dramatic change in the residential land use in the area with subdivision of large blocks to build a large number of townhouses and units.

Trinity College is located on the north bank of the meander bend before it opens into Perth Water. The college consists of mainly modern buildings which are up to three storeys high in a simple yard with lawn and trees. The foreshore reserve around this area is public open space and adjacent to the Causeway are landscaped gardens.

The former East Perth Gasworks site has been contaminated with the by products of the manufacture of gas. The contaminants were principally coal tar and its derivatives which had spread to adjacent parts of the Swan River and Claise Brook drain. As part of the present redevelopment of

the East Perth site, the soils were removed from the affected areas and the buildings demolished and removed. The site is present being developed for a mixture of residential, commercial, educational and public open space purposes by the East Perth Redevelopment Authority (1993).

On the northern bank of Claise Brook the old East Perth Power Station is a prominent feature. The main building is still standing and is of historic significance and at present a working party is deciding how to best utilise the property. At present, the main building is derelict, the windows broken and the roof missing. The East Perth Power Station - Technical Services and Scientific Section is still operating from the site. These have a new building and two upgraded older buildings. There are several high tension power lines which quite prominent on the skyline and emphasise the industrial land use of the area. Other land uses include light industry, warehousing and government utilities. The new Goongoonup railway bridge has been recently opened and has replaced the old Bunbury rail bridge.

Saint Annes Hospital is located adjacent to Ellesmere Road and overlooks the foreshore at Mount Lawley. It is made up of several functionally styled buildings and a major multistorey complex which is a prominent landscape feature. Adjacent is an old factory which is set back on the ridge of the foreshore. In front of the factory is a block which has been invaded by weeds and there is considerable soil disturbance.

Much of the Maylands Peninsula is used for recreational purposes and is discussed below. The Stirling City Council is currently designing concept plans for the old brickwork claypits which will assess the community preferred concepts for these historic and prominent landscape features. Although the privately owned land on the peninsula has been zoned for residential purposes, most residential development has occurred on the eastern banks in the form of high density townhouse. The original *Tranby on Swan* development has since been surrounded by numerous low rise units. Most overlook the river and their front gardens are not visually separated from the adjoining foreshore reserve. One of the most attractive land uses of the peninsula is the Maylands slipway where private boats are built and maintained.

Other land uses include the large area set aside for the Western Australian Police Academy and stables, the original Perth aerodrome.

Burswood Island is at present the site of the Belmont Racecourse, the Bunbury railway, the Swan Portland Cement Factory and the Burswood Island Resort. The resort has a casino, hotel, convention centre, tennis club and golf course. On the eastern bank of the railway is an area of light industry including car panel beaters and furniture workshops.

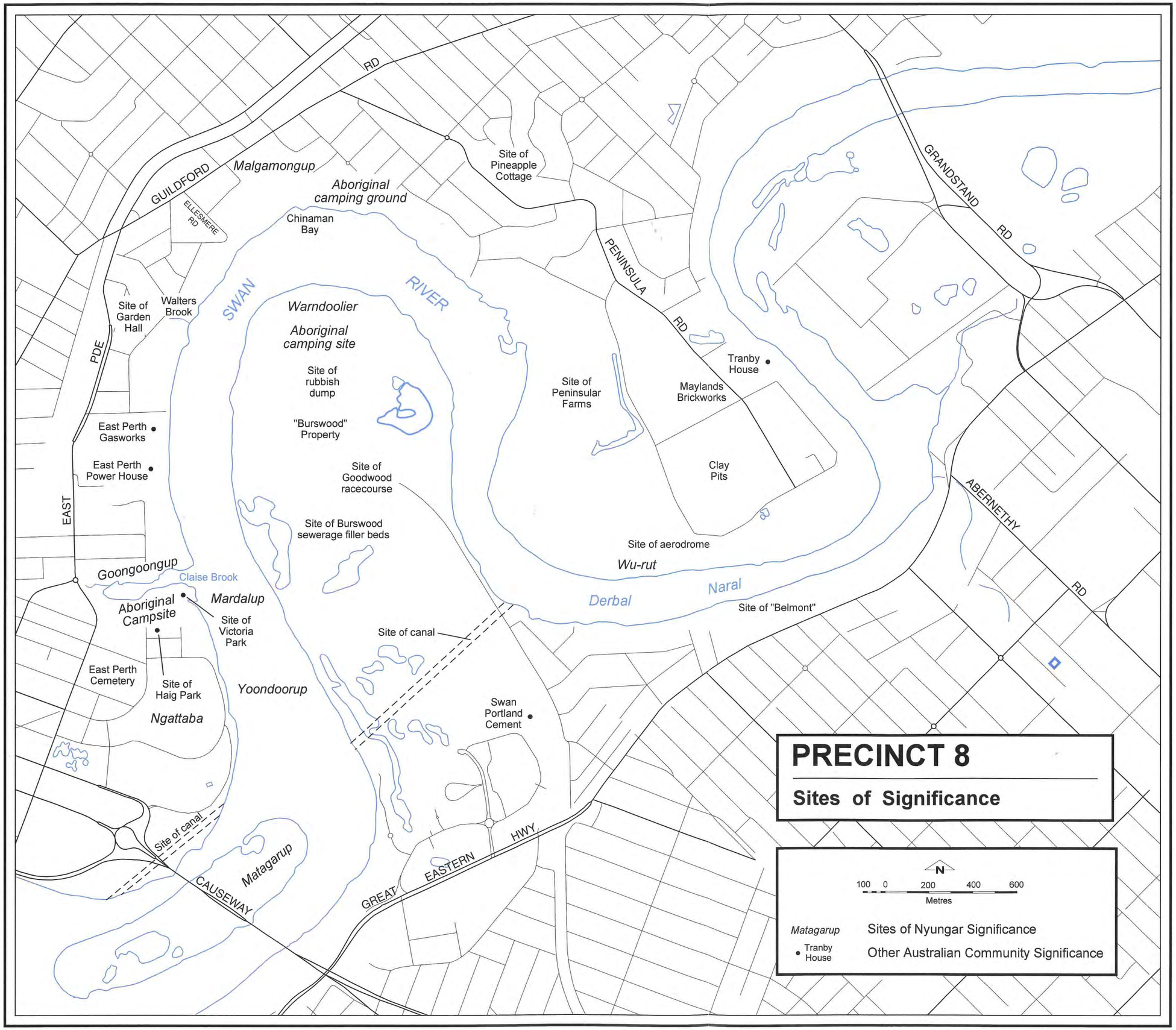
The current State Government has approved the construction of a Burswood bridge and road to improve public transport access to the city. The road will run down Orong Road and cross the river from the Belmont Park Racecourse to East Parade and parallel to the existing Bunbury Bridge. The bridge is part of the City Northern Bypass Project. At present, the reserved land at Burswood Island is very weedy and the earthworks are currently taking place.

Recreation nodes

There are several parklands within this precinct including Banks Reserve, Bardon Park, Berringa Park and Hardey Park. All provide valuable areas of open space and are all well maintained with toilet blocks and picnic facilities.

Adjacent to Burswood Island the water is designated for speed boat and water ski clubs use. There are several recreational activities in the area. Passive and active recreation includes cycling and walking, fishing, worm bait collection, golfing, bird watching, watersking, yachting, prawning and picnicking.

Over the years, the City of Stirling has commissioned a number of studies on the public open space along the river foreshore. It has responsibility for managing reserves and has developed recreation reserves and protected conservation areas including the tennis and bowling complexes and a boat ramp. Recently, the City of Stirling opened the Peninsula Golf Course on the land which was set aside for government use. The golf course incorporates the recently renovated Maylands Brickworks which have been retained as a feature of local significance. The Maylands rehabilitation area encompasses the samphire communities along the foreshore The Mount Lawley Sea Scouts have their club house at Banks Reserve.


GUILDFORD RD
Malgamongup
Aboriginal camping ground
Site of Pineapple Cottage
ELLESMERE RD
Chinaman Bay
PENINSULA RD
GRANDSTAND RD
PDE
Site of Garden Hall
Walters Brook
SWAN RIVER
Warndoolier
Aboriginal camping site
Site of rubbish dump
"Burswood" Property
Site of Peninsular Farms
Tranby House
Maylands Brickworks
East Perth Gasworks
East Perth Power House
Clay Pits
ABERNETHY RD
EAST
Site of Goodwood racecourse
Site of Burswood sewerage filler beds
Site of aerodrome
Wu-rut
Derbal
Naral
Site of "Belmont"
Goongoongup
Claise Brook
Aboriginal Campsite
Mardalup
Site of Victoria Park
Site of canal
East Perth Cemetery
Site of Haig Park
Yoondoorup
Ngattaba
Swan Portland Cement
Site of canal
Matagarup
CAUSEWAY
GREAT EASTERN HWY
PRECINCT 8
Sites of Significance
N
100 0 200 400 600
Metres
Matagarup Sites of Nyungar Significance
Tranby House Other Australian Community Significance

Public access

Public access around the foreshore in this area is quite well catered for. There are dual use paths are present for a short distance on Burswood Island, as well as the East Perth foreshore. There is also a dual use path at Maylands rehabilitation reserve which allows pedestrians visual access to the samphire flats. The Belmont skiing area has boat ramps at Goodwood Parade and Clarkeson Road allow easy water access. The Maylands and Burswood Park Golf Courses are only accessible to patrons. Belmont Park Racecourse separates the foreshore by fencing and public access is restricted.

Sites of Nyungar & Wider Australian Community Significance

Nyungar significance

Claise Brook campsite was tucked into the recess of the Swan River and has been used by many Nyungar families since colonisation as a camping ground. The area is known as *Mardalup* or the 'place of the small marsupial' (Collard *et al,* 1996). It is near the present day Gloucester Park which is also known as *Yoondoorup* or 'place of a black stumpy tail lizard' (Collard *et al,* 1996). The brook adjacent *Yoondoorup* is known as *Goongoongup*. In the 1930s (East Perth Redevelopment Authority, 1992) it is believed that the freshwater spring was still flowing. As recently as 1985, two Aboriginal families visiting Perth used this site as a camping ground. O'Connor (1989) notes that the residences of Boomerang House (Aboriginal Community Centre) were maintaining contact with the site until the late 1970s. The site is currently being redeveloped by the East Perth Redevelopment Authority. It is believed that Haig Park was also part of this campsite (East Perth Redevelopment Authority, 1992). The Swan River around Burswood Island area is known to Nyungars as *Warndoolier.*

Burswood Island has was used by Nyungars up to the 1920s and possibly later. Apparently many shacks were built all over the island, housing both local Nyungars and others from as far north as Moora who would spend some time at this site.

According to Lyon (in O'Conner *et al* (1986) Maylands Peninsula was known to Munday's people as *Wu-rut.* Two Nyungar archaeological sites have been recorded and these consists of stone artefacts on Maylands Peninsula. Bardon Park at Maylands is known to have been a Nyungar camping ground last century due to its sheltered position. Nyungars call this place *Malgamongup* which means 'on the shoulder, the place of the spearwood camp on the hill'(Collard *et al,* 1996). O'Conner *et al* (1989) record that between 1930s and 1960s up to 30 Nyungar camped here at a time.

Other significance

In 1967 Tranby House was classified by the National Trust.

The Maylands Brickworks kiln and tower have been recently restored as a local landmark and of historic significance to the local area. The adjoining claypits have become artificial wetlands and although they are full of weeds and rubbish they support numerous waterbirds as a roosting site.

In 1890s a park was established at Claise Brook and was known as 'Victoria Park'; it has a band stand, gravel paths and a caretakers cottage. It is believed that some of the mature exotic trees planted in the park are still present and have been incorporated into the new Claisebrook Development.

Haig Park was known to local residents as the 'Bull Paddock' which was, according to local residents, an Afghan camel teamsters' resting area. It is believed that there may have been some Aboriginal camps at this site. Haig Park was established in 1936 by filling in low lying land on the southern bank of Claisebrook.

The East Perth Power Station is considered to be a site of historic significance (East Perth Redevelopment Authority, 1993).

A plaque has been erected to commemorate the Swan Portland number one dredge (built at 1834) at Goodwood Parade. Timber dredges with coal burning engines operated along this stretch between 1927 and 1956 to load barges with shell from the riverbed for making cement. Old jetty piles run along the Rivervale foreshore. It is believed that these are the remains of the jetties which were used to transport materials for pottery manufacture late last century (Vic Fitzsimmons, pers com 1995).

Apart from the dredge, two other river wrecks occur in this precinct and these include at Belmont the

Daisy (built in 1910s) and at Maylands the Trixen (built 1904).

Claise Brook was referred to as the 'Swamp Drain' as it drained the whole area upon which the Perth Railway Station was built. In 1890s conditions were so bad that typhoid outbreaks were common.

Conservation areas

Wetlands

Refer to System 6

System 6

M50 Swan River Foreshore, Maylands

Between Banks Reserve and Clarkson Reserve (Maylands) including the foreshore and Bardon Park, was recommended for environmental management due to its valuable environmental significance. There were several points of concern highlighted in the report. The Maylands Peninsula claypits were sites of infilling and rubbish dumping. The foreshores were subject to erosion and salt marshes were degraded by motor boats and vehicles. The area west of Bardon Bark was highlighted as having been degraded by weed invasion.

The Maylands foreshore is significant for fauna, particularly waterbirds. The Department of Conservation and Environment report (1983) states that the reed beds in the north-west of the Peninsula are feeding grounds for many waterbirds, including such species as swan, coot and crake. The salt marshes, trees and adjoining extensive wading areas in the north-east of the Maylands foreshore area, make up one of the few undisturbed areas along the Swan River which support a wide variety of waterbirds.

The City of Stirling has a foreshore management plan for part of the area and some areas have remained in private ownership (1988).

Precinct Description

Waterform and natural riparian zone

The river takes the form of broad graceful and regular meanders upstream of Heirisson Island to the Maylands Peninsula. The wide channel often inundates the flat alluvial sediments at Maylands Peninsula. This would have been typical at Burswood and other lower lying foreshores, however successive land infilling and dredging has resulted in higher unnatural banks. The river embankment at Belmont Park Racecourse is almost vertical due to the earthworks. In places, such as Trinity foreshore the landfill is eroding and the exposed rubble and rubbish is an unattractive element. There is little unaltered foreshore in this area and most of the riparian features are the result of various land use activities. At Berringa Park, a ribbon of sedges grows in front of the paperbark wetlands. The relatively natural foreshore continues around to the Maylands Golf Course where remnant foreshore communities are present, although some additional planting has been recently completed.

Landform

The landform around Trinity College is very flat, although in places it appears to have subsided slightly where the landfill has settled. The landform rises steeply behind the Trinity foreshore and remains topographically higher and more undulating till the Maylands Peninsula. The foreshore in this higher area is quite flat and narrow and in most places is held back by retaining walls. The peninsula decreases in slope quite rapidly to the foreshore.

From several viewing points along the northern bank of the river, the concave slope of the escarpment is quite evident and is the most influential natural landscape feature in determining how the land use appears to the viewer. The Maylands samphire flats are on flat swampy land, however most of the land behind these areas has been raised by infilling and is relatively flat, apart from the depressions made by the old claypits.

Similarly, the Burswood Peninsula is quite flat and would have originally been subject to regular inundation. The Rivervale area rapidly rises to a steep and tall embankment with very little foreshore until the Ascot Peninsula, where the slope decreases quite markedly. The landform is particularly attractive as it highlights the river meander bends with the flat peninsulas nesting into steeply sloping escarpments of the opposite banks. The escarpment line curves in a parabolic form with the low points being the peninsulas at either end and the central curve tapering to a uniform height.

Vegetation

There is little natural riparian vegetation along the foreshore in this section due to extensive landfill and intensive land use in the area. There has been some replanting of indigenous and other Australian flora adjacent to the Causeway. These are in the form of beds with lawn. In this area, the riparian vegetation consists of a few date palms which have self seeded on the river bank and planted *Juncus* reeds which occur in a few isolated nodes. Between the Trinity carpark and the end of Ardent Street, there are several exotic trees such as small pines and Morton Bay figs. These have been planted with no particular pattern and rather were to simply provide shade to river users.

There has been even spaced planting of exotic trees along the foreshore in front of the gasworks and private residences. Banks Reserve has a mixture of exotic and indigenous plants. The trees tend to be isolated specimens except for more recent plantings of melaleucas close to the foreshore which act as a screen and shelter. The Saint Annes Hospital has an exotic garden on the foreshore which has been attractively landscaped in an electic and formal style. Adjacent to Saint Annes Hospital, there is an area of inundation which is abundant with weeds which grade up to low form grassy weeds in front of the old factory on the hill. The entire area is overrun and has several persistent species such as pampas grass, bulrush and morning glory.

At Berringa Park there is a small paperbark community which is being encroached on by weeds and lawns from the adjacent residential area. Adjacent to the Maylands Yacht Club is a section of overgrown exotic trees and weeds. This has been fenced off, however there are several exotic species encroaching on the already disturbed Maylands rehabilitation foreshore. The foreshore supports an attractive wide belt of reeds, paperbark and samphire

flats. The Juncus reeds are particularly pleasing; they form a wide belt with a very soft brushy texture, while in autumn and winter months the samphire is a striking red.

Tranby House has a cottage garden and the adjacent flats have neatly maintained lawn and a mixture of exotic and native trees. Bath Street Reserve has exotic trees such as coral trees which are rather attractive in this urban environment.

The vegetation between Belmont Racecourse and the Sandringham Hotel consists of remnant reed-paperbark -flooded gum communities, however most of these communities have been seriously degraded. The effect is one of neglect and it is unattractive compared to the original soft tones of paperbark and flooded gum which would highlight the steeply sloping landform and narrow beaches. Elements of the original pleasing foreshore vegetation are the flooded gum branches which often overhang the waterform creating both a horizontal and a vertical element to the riparian vegetation.

Riparian land use

Adjacent to Trinity College there is an exposed drain pipe with an eroding metal head, as well as, several bent metal poles protruding from the river bank. The river banks were constructed with landfill material and as a result the erosive action of the water has exposed the rubbish and rock rubble. The effect is unattractive, however in places *Juncus* has been successfully replanted and may be encouraged to further establish itself along the banks.

The Goongoonup rail bridge occurs adjacent to the site of the Bunbury rail bridge. The Goongoonup bridge is a functional style with v-formed concrete piles and narrow concrete superstructure. At the site of the recently demolished Bunbury rail bridge, a new Burswood traffic bridge is planned to run parallel to the railway bridge. There is a old loading jetty adjacent to the East Perth Gasworks which is quite attractive in the industrial context, however the inconsistent retaining wall materials detract from the foreshore. A small sand bank has formed at the mouth of the Banks Reserve drain and there are retaining walls along the more steeply sloping river banks.

Bath Street Jetty is a particularly attractive feature. Until recently, the steeply sloping foreshore was retained by pine bollards, however these have been replaced by limestone walls which have given the parkland a more formal appearance. The original pine bollards were attractive and were similar in style to the fencing around Tranby House. Hardy Park Reserve has a wooden jetty which provides access to the water and a pleasant node in the area.

The riparian zone around Burswood Island has been redeveloped into a parkland type landscape. There is a mixture of trees, landscaped gardens and native riparian vegetation and the effect is well ordered. Recently a pleasant series of statues have been placed adjacent to the Burswood Casino. The Story Teller commemorates Dame Mary Durack and her story The Swan River Saga, and Hopscotch commemorates traditional games. Both statues provide for audience participation allowing children to play the game or sit on the story teller's bench. The casino gardens have an information centre and several artificial water bodies and gardens.

Belmont waterski area has access ramps at both Maylands and Belmont. The Maylands ramp and carpark is particularly large, however there has been planting of native trees to screen the area. The Belmont carpark and recreation area is rather degraded with the barbecue facilities being vandalised and weeds flourishing in the riparian vegetation. The old dredge which is commemorated in a plaque is mossy and rusting in the river. In addition, weeds flourish and the foreshore is poorly maintained. It is questionable whether it adds an attractive element to the visual landscape. A few remaining piles of an old jetty which used to run along the southern foreshore, emerge from the water among the riparian vegetation.

The foreshore east of the Sandringham Hotel is currently being redeveloped. There are a few old riverside houses which have not yet been demolished but will eventually be replaced by new residential developments. At present, several weeds flourish in this area and it is visually unattractive. There is an old drain which has formed a sand spit at its mouth. The drain in poorly maintained and for some reason an old bath tub has been wedged into the drain retaining bank. The area will clearly be improved by landscaping and revegetation.

Land use

Trinity College has been built in several styles which are typically institutional and functional rectangular shapes. The college is separated from the foreshore by a high cyclone wire fence which is noticeably bent in places. The college has several tall trees planted in the lawned grounds. This is very much the back end of the school, and surprisingly the buildings are not orientated towards the river. Adjacent to Trinity College is an informal carpark which is made up of weed and loose bitumen stone. The carpark needs to be improved and it would be of great benefit to extend the foreshore parkland into this area which would minimise the impact of the school buildings and adjacent Gloucester Park Raceway.

Gloucester Park Raceway has an attractive entrance which is tucked away between Trinity College and the WACA. The raceway has a carpark facing the river foreshore. The raceway itself is separated from the foreshore by several metal boards and sheds. The area is fenced with cyclone wire which is partly screened by large weeds, such as bamboo and fennel. Although the WACA grounds are not directly on the foreshore, its floodlights and stands are a prominent skyscape feature. The six floodlights are large concrete structures which are a dominant vertical element and rise above most of the surrounding buildings. They detract from the foreshore and in particular the adjoining Queens Park and Causeway area. There is an informal parking bay at Arden Street which overlooks the river.

The new East Perth Redevelopment is currently under construction. To date, the Claise Brook drain has been broadened into an inlet. The inlet has become an attractive water feature in the centre of landscaped gardens. Several of the mature trees have been retained and incorporated to the attractive landscaped gardens. The gardens have a visually pleasing mixture of native and exotic flower beds and several pathways which curve with the new raised landforms. The dominant feature is the attractive pedestrian bridge which spans the new inlet. The out door furniture is of high quality and there are several sculptures, in both the gardens and inlet. The inlet curves into the pedestrian crossing and has boat bays on northern entrance wall. The curves then become a rectangular waterbody which creates a formal feature. The surrounding banks have been reshaped to quite steep slopes which will be grassed and interrupted with gardens and viewing areas. The retaining wall north of the inlet appears to give the rivers edge a trained and unnatural edge. The higher land is currently being developed as a high density urban area.

The area has become a show piece for high standards of architecture and, judging on by the current buildings, will be an attractive urban area. Several elements have been retained which indicate its past industrial land use, such as the old warehouses retained for new purposes. An example is the Boans Warehouse which is currently being used for plays and other large patronage events and will be converted to units. One of the most interesting features is that the entire skyscape from the river has changed dramatically since the construction of the inlet. It has allowed the city skyline to be viewed at the mouth of the inlet whereas prior to the construction the skyline was not visible because if trees screening the skyline.

East Perth Power Station - Technical Services and Scientific Section is still operating from the site. These have a new building and two upgraded older buildings. The most dominant feature is the old power station building itself. At present, Western Power and the East Perth Redevelopment Group have a Working Party which establishing what opportunities could be taken for the site. There are several high tension power lines which are quite prominent on the skyline and emphasise the industrial land use of the area.

Banks Park is currently a steeply sloping face which is lawned and has a few scattered exotic trees. There is a drain which runs through the park which is lined with wooden retaining walls and has a small wooden crossing. There is a fenced play equipment section. The park does provide valuable open space, however there is opportunity to improve the gardens, particularly as it is named after the explorer and botanist Joseph Banks.

The Vincent and adjoining Maylands residential areas have a wide range of residential building styles. There are several attractive old houses which have been renovated, newer homes and high density housing. The Saint Annes Hospital overlooks the

foreshore and is several storeys high and consists of a number of buildings. The buildings are institutional in style and are rather unattractive. An unattractive early 1970s highrise apartment block is a prominent feature on the skyscape, and together with the hospital is not complementary to the steep embankments. There are numerous townhouses and units on the Maylands escapement. They vary in style, materials and form and consequently some buildings complement the attractive sloping landform better.

Bardon Park is an attractive area of open space. There are several artificial water bodies and fountains, which create interesting focal points in the steeply sloping and undulating topography. The park has several amenities and barbecues. There is a large square carpark on the hill which is a popular viewing point, however it could be broken up by shrubs which would reduce the impact of the baron flat surface. There are several attractive old houses adjacent to the park including Bardon Park House which was built in 1917. The newer houses have a high degree of urban pride.

At the base of the park is the Maylands Yacht Club which has a mid 1980s brutalist style. The club house has neat grounds and an associated wooden jetty is an interesting focal point. The yacht club is tucked into the curve of the slope and is not intrusive on the river landscape, however from the river the beach area appears bare compared to the adjacent fringing rush communities.

The most prominent featured of the Maylands Peninsula are the old brickworks and claypits. The brickworks building and chimney stack have recently been renovated by the local council and the brick kilns are attractive structures. The area has been cut off from the public by a maroon Federation style fence while the background is the weed filled claypits. The adjacent City of Stirling Peninsula Golf Course has been recently completed and as a consequence the greens are neat and the trees planted are immature. The club house has been constructed in a Federation style to be in keeping with the opposite brickworks. The golf course parking is in front of the brickworks which is rather unfortunate. It may have been better to have the carpark slightly away from the kilns and have a grassed and landscaped area linking the kiln and undulating golf course visually. At present, although neatly landscaped, the carpark and maintenance sheds are the unattractive aspects of the golf course and these are adjacent to the most important historic landscape feature in the area. The golf course restricts other river users, however the nearby Bardon Park does provide other recreation facilities.

The Western Australian Police Academy and stables are located between the golf course and brickworks which isolates part of the peninsula. The buildings which can be viewed from the foreshore are irregularly placed demountables which are low formed. The area has cyclone fencing and the vegetation is generally weeds and a few scattered trees. At present, the Academy is not particularly visually intrusive, however screening of the buildings using indigenous flora would enhance the landscape.

Maylands Tennis Club, Bowling Club and pool have all been constructed in dark brick and are neatly maintained. Native vegetation hides the cyclone wire fences and the buildings and the clubs are quite complementary to the adjoining foreshore reserve.

On the east face of the peninsula, private properties restrict access to the foreshore and the corner block zoned for regional open space is fenced off from Hardey Road. The corner reserve is at present badly neglected and weeds flourish in the low lying land. The adjoining blocks are single residential properties which front onto the foreshore and access is restricted. Adjacent is the Maylands slipways which provide an attractive slightly informal landscape feature. The sheds and boats not only provide colour and activity but have a pleasing land use link with its riparian location.

There has been recent infilling of the lands around the high density Tranby on Swan development. The original townhouses are quite attractive high density buildings which are stepped back from the foreshore and consequently are not particularly intrusive on the foreshore which has a gradually increasing slope towards the northern end of the peninsula. The newer high density townhouses are quite low formed and are similar modern designs. It is unfortunate that these townhouses have been crammed into the

Tranby House viewscape and the attractive historic building is no longer a prominent feature on the landscape. There is a wetland which has been encompassed by the townhouses, which links them to the riparian nature of their location.

The Burswood Island Resort/Casino is a prominent feature on the flat peninsula. Each building has a different form and has been made to stand out rather than complement the river environment. The angular buildings are painted white and have highly reflective windows forming a gleaming structure among bright green lawns. At present, the landscaping is very neat and adjacent to the foreshore Australian flora has been planted. The effect is an open parkland with wide stretches of lawn which is not unpleasant, however it could be broken up with some native flora, especially close to the foreshore, which would provide valuable wildlife habitats on the highly disturbed peninsula.

The industrial wedge on the peninsula is a relic of the past rubbish site land use. Swan Portland Cement has made an effort to reduce the visual impact of the plant buildings by painting them a soft green and planting eucalypts along the boundary, screening much of the complex at standing level. However the chimney stacks and storage tanks are behind the casino complex skyline and consequently the landscape appears industrial.

The Burswood Island Peninsula has an area of land reserved for the Burswood bridge and road which is at present very weedy and the soil is greatly disturbed due to landfill. The area is currently a worksite for the recently completed Goongoongup Railway Bridge. The site has great potential for indigenous plants and wetlands recreated in the transport reserves which would minimise the visual impact of these amenities. It should especially be considered that a wetland and area of inundation could be recreated to compensate for the loss of the original foreshore habitat.

Belmont Park Racecourse has fencing around the raceway which acts as a vertical element on the low lying peninsula and accentuates the unnatural vertical embankment. The carpark and float parking area is wide and would benefit from screening from the river. At present, west of the racecourse a number of high tension powerlines, electric rail powerlines and tracks which are not particularly attractive landscape elements but are vital urban amenities. The workshops on the eastern section of the peninsula are not visible from the river due to the Belmont water ski reserve parkland and residential properties separating this area from the river.

Along the steep escarpment are a few modest single residential houses and the attractive federation St Columbines hospital. East of Hardey Park several high density flats are located on the edge of the escarpment. Generally the styles are not of a high standard of architecture, however those units which are stepped back from the escarpment or are hidden by the tall flooded gums are more complementary than the flat faced taller styles. St John of God Hospital overlooks the river and has a mixture of building materials and styles which are partly screened by the riverside vegetation.

Sandringham Hotel has been built in a low form which overlooks the river. At present, much of the surrounding vegetation is exotic trees and weeds which detract from the riparian landscape. The adjoining carpark and bottleshop are rather prominent and unattractive features when viewing the opposite Maylands Peninsula. In particular, there is a prominent advertising sign.

At present, the foreshore west of Aberenethy Road is being redeveloped as a new residential area. There is the opportunity for the new development to design the landscaping according to the natural sloping gradient and for the foreshore be revegetated using indigenous species.

Dominant Landscape Character

The original landscape character for this precinct would have been the Natural landscape character type. This would have been flat alluvial terraces deposited in front of older dune formations, and covered in flooded gum, sheoak and paperbarks. The natural landscape character type has been dramatically altered leaving only the wide meander of the river around Burswood Peninsula. Even the alluvial islands and irregular foreshores have been dredged and smoothed out.

Today, much of the precinct is suburban in landscape character, with a range of housing styles and suburban land uses such as schools and shopping centres. The Rivervale section of the suburban land use has numbers of flats located on the high paleo dunes adjacent to the river. Similarly at Maylands there are numerous flats and units making up the suburban landscape.

The old East Perth Gasworks and various workshops are the remnants of a once larger industrial landscape. The Bunbury Railway Bridge and several high tension powerlines contribute to the industrial character. Today although many of the old industrial buildings are empty or converted, their style indicates an industrial landscape. This landscape is slowly changing to an suburban landscape with the East Perth redevelopment. At Burswood Island, the Swan Cement chimneys emphasise the light industrial land use on the eastern side of the peninsula. In addition, there are several workshops and sheds in this area.

Much of the precinct has been recently been converted to a parkland and recreational landscape character. The Burwood Island Resort has a number of parks and a golf course surrounding the main complex. It has been included in a recreational landscape, however this could be further classified as a 'resort' landscape which could be found anywhere in the world. Other large areas which are used for recreation are the Belmont Park Racecourse and the Maylands Golf Course. Smaller parklands are found dotted along the foreshore. The foreshore at Clarkson Reserve has some spectacular samphire which although of high conservation value is in an area which is dominated by parkland and sporting facilities. The Maylands slipway is a difficult land use to classify. It has been identified as a recreational landscape character type linking with a small parkland at Tranby House. Tranby House is also difficult to classify as it is so closely surrounded by suburban land use that the house from some angles just merges in with the landscape. However due to the attractive gardens and the ribbon of parkland along the foreshore it has been included in the parkland landscape character type.

Significant Viewscapes

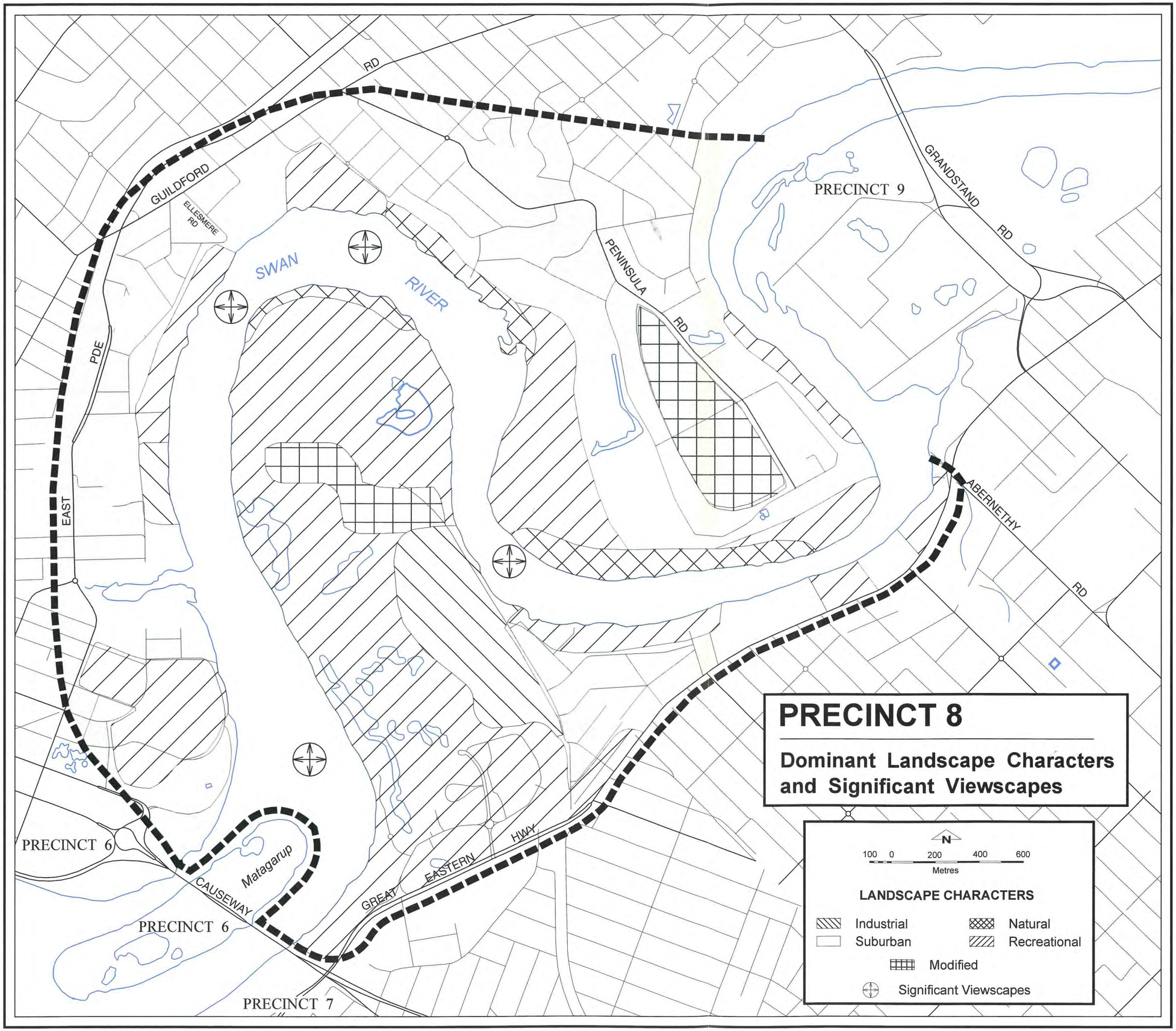
One of the most attractive views of the river is the 180 degree view of the Burswood Peninsula from Bardon Park. The view is balanced with the curve of the Swan River around the peninsula. The land use of the peninsula is not particularly spectacular, however the broad horizon allows a large amount of land to be viewed from Bardon Park.

A limited but important viewscape is of Tranby House and the surrounding parkland, which from certain angles can appear much as it would have been last century. Downstream the Maylands slipway is an attractive riparian land use with informal sheds and scaffolding which fits nicely into the river landscape.

There is a limited but attractive viewscape adjacent to Clarkson Reserve. This is the view of the samphires and the curve of the Rivervale foreshore. The Rivervale embankment is relatively high and steep, while the Maylands foreshore is relatively flat. At the Maylands golf course the old brickworks chimneys are important elements in the landscape. The Swan Cement chimneys are also prominent in the same viewscape.

Conforming and Non Conforming Elements in the Landscape

The Burswood Island Resort is a unique feature along the Swan River as the complex is built a resort style which does not conform to the surrounding land use or landform. The complex itself is well maintained and, given that the surrounding land use is industrial and suburban, the non conformity is not necessarily negative. The Swan Cement chimneys are prominent in the viewscape and are non conforming in the 'resort' landscape. It is interesting that the Australian Power Boat Association has built a headquaters office which attempts to have minimal impact on the surrounding riparian environment. Unfortunately, as the dominant landscape element in this area is the


GUILDFORD RD
ELLESMERE RD
PDE
EAST
SWAN
RIVER
PENINSULA RD
PRECINCT 9
GRANDSTAND RD
ABERNETHY RD
PRECINCT 6
Matagarup
CAUSEWAY
GREAT EASTERN HWY
PRECINCT 6
PRECINCT 7
PRECINCT 8
Dominant Landscape Characters and Significant Viewscapes
N
100 0 200 400 600
Metres
LANDSCAPE CHARACTERS
Industrial
Suburban
Natural
Recreational
Modified
Significant Viewscapes

resort, the low height, spreading verandah and simple style of the boating association office is equally at odds with the surrounding landscape character.

Another example of a building which does not enhance the landscape is the Sandringham Hotel which has a large advertising sign and is located on an attractive ridge overlooking a graceful meander of the Swan River. The building although only one storey is prominent due to is location and style on the ridge.

Tranby House has been surrounded by recent suburban infill. Relatively high density housing and units surround the historic house and garden and it is unfortunate that these elements impose on the viewscape.

The Maylands slipway is an attractive land use in the riparian location. Trees enclose the slipway and isolate it from the surrounding suburban land use. The boats appear attractive on the water, but, it is important that they do not infringe on environmental values and are maintained in good condition, and do not use the fringing vegetation or retaining walls as moorings. The fringing vegetation is an important landscape feature in the area and it is important that it remains in good condition.

Much of the land use around West Perth has not taken advantage of the river views and the buildings tend to have the worst side orientated towards the river. This is partly due to the fact that previously the river views around this area were of industrial land use and waste dumping areas. There is now the opportunity to enhance the foreshore at this point by ungrading the least attractive features, such as the sheds, fences and car parks at Gloucester Park.

There are several small elements which detract from the amenity of the landscape. Banks Park has few trees and a prominent residential fence. The park could be improved by sensitive vegetation planting. The Bardon Park carpark is a large unbroken detracting element in what is a rather attractive recreational area. Low shrubs could be planted to break the spaces into smaller less detracting elements. Several pipes and landfill material are apparent along the Trinity foreshore and these detract from the riparian landscape.

Other features which are detract in the riparian environment are the mixture of retaining wall materials ranging from rubble to limestone walls. Similarly, the remnant vegetation in the area has been degraded by severe weed invasion, which detracts from the community. The indigenous vegetation typically has brushy, fine leaved trees and ribbons of dark green sedges, while the invasion of bright green broad leaved plants detracts from a valuable and enhancing landscape element.

Recommendations for Maintenance and Enhancement of the Present Landscape Character

- The present landscape character of the Burswood Peninsula has been degraded by dredging and weed invasion. There is the opportunity to rehabilitate the foreshore around Burswood Peninsular with endemic riparian species. Similarly, Trinity College banks could be improved by revegetation of the fringing vegetation.
- Several suburban landscape elements detract from the suburban landscape. The car park adjacent to Trinity College has been built without regard for the attractiveness of the riparian location. As a first stage to improving the landscape character the carpark adjacent to Trinity College could be screened using vegetation. The Arden Street carpark could be screened in same manner for continuity.
- There is an opportunity to improve the orientation of Gloucester Park and other riverside buildings towards the river by the temporary screening of fences and other unattractive features.
- The East Perth Power Station presents many exciting options for redevelopment. Currently a working party is examining options. The building has historic value, attractive brickwork and is an important element in the landscape of East Perth. Warehouses can be converted into roomy apartments, entertainment or shopping complexes while retaining the best qualities of the original building and retaining their industrial style.
- To alleviate the impact of the carpark adjacent to the Maylands brickworks the claypits should be improved. By upgrading these into a wetland with indigenous species and providing viewing positions for wildlife watching and admiring the brickworks, the Maylands foreshore would become one of the best areas for wetland conservation and recreation in the region.

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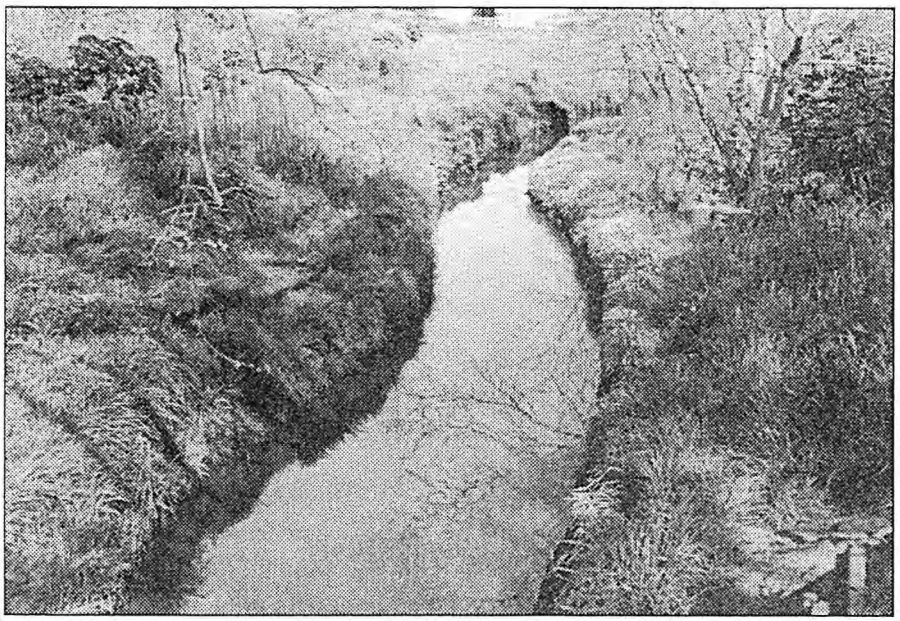

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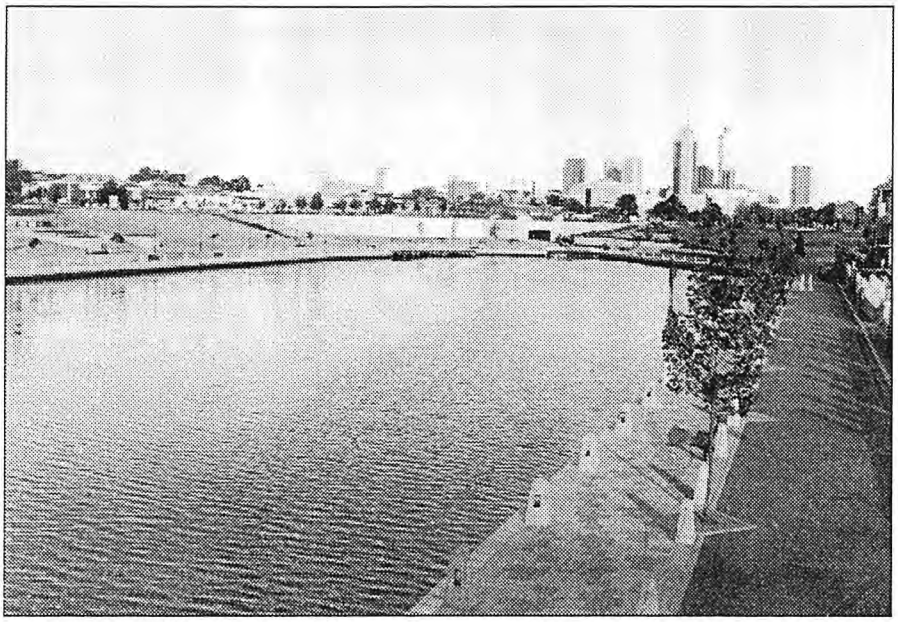
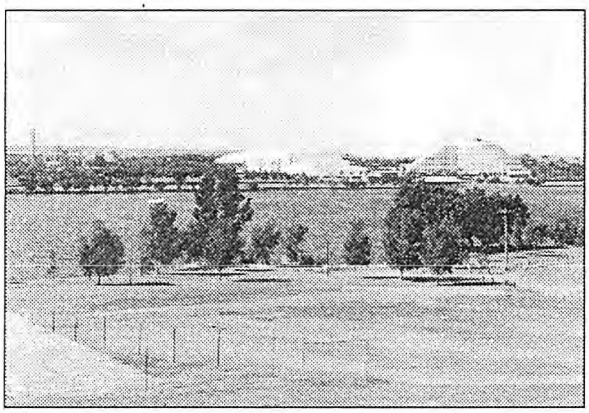


Claisebrook Inlet, East Perth, 1992.

Swan River Trust



Burswood Island from East Perth. 1997.

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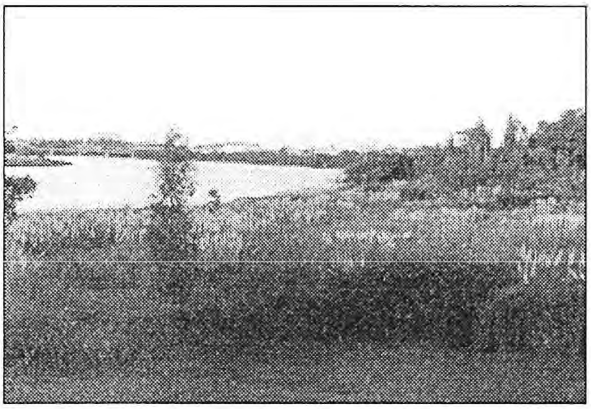
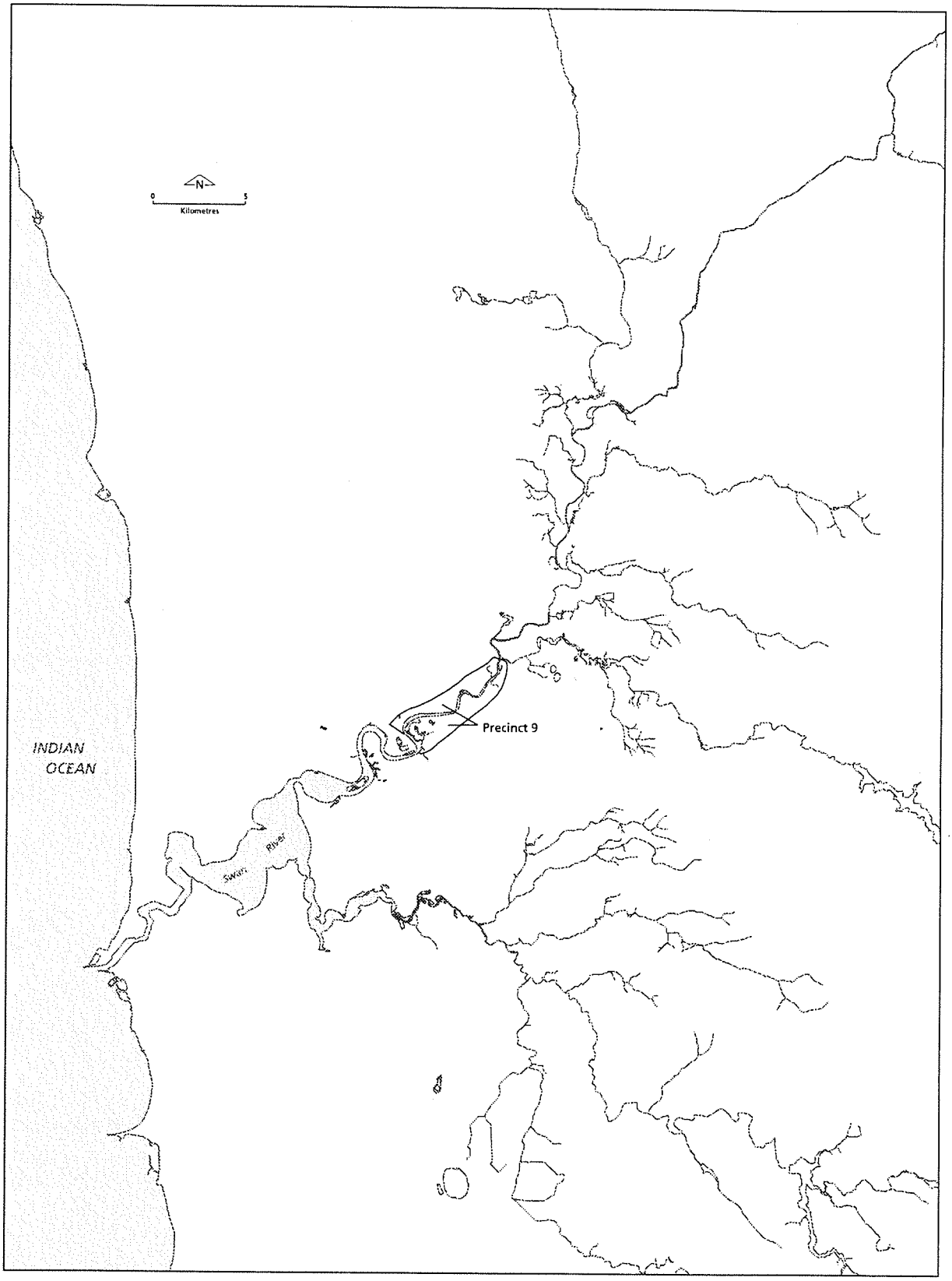


View from Bardon Park, Maylands. 1997.

Swan River Trust.

Precinct 9

Ascot to the Helena River Confluence



Summary

Ascot to the Helena River Confluence

The Swan River takes an irregularly meandering form with sections of straight channel in this section. The Ascot Peninsula forms an attractive water body with several fingers of land extending into the river channel.

A sharp northerly bend in the river occurs after the Redcliff Bridge where the river takes a straight course. A second right angled bend occurs at Ron Courtney Island. The island itself is almost a right angled triangle. Upstream the river is narrower and has a higher sinuosity. The Helena River is a relatively narrow channel which broadens at its t-section confluence with the Swan River. Much of the silty foreshore is highly susceptible to erosion and several sections have been hard walled. The landform in this precinct consists of wide areas of low lying floodplain less than five metres AHD, after which the floodplain meets the Bassendean Dune System. This landform is gently undulating and originally small damplands formed in the swale depressions.

The fringing vegetation communities in this area are often degraded or have been replaced by grassy banks. The indigenous vegetation is dominated by a variety of shore rushes, sheoaks and paperbarks. Often the exotic bulrush has invaded freshwater areas as well as watsonia and several grass species. The original marri-flooded gum woodlands are mainly restricted to public recreation reserves, where the original understorey has been replaced by grasses giving the area a wooded paddock landscape. Sections of low lying foreshore such as Ashfield Flats have samphire community surrounded by fringing rushes and sheoaks.

Due to river 'training' many of the river's original bends have been straightened and to reduce erosion retaining walls have been constructed by many residents using different materials and styles. Similarly, the parks and recreation reserves display a variety of retaining walls. There are several public reserves in the precinct which provide for both passive and active recreation. At present, the Bayswater Riverside Gardens are being constructed and the lack of vegetation and yellow clean fill are prominent landscape features. Similarly the Ascot Peninsula is being redeveloped as a housing estate and the old fill and sand is at present being remodelled. The Ascot Raceway is a large low lying area of flat treeless land which is prominent to the river user. Most of land set back from the floodplain is used for residential purposes and due to the ongoing subdivision the houses range in age and style.

Biophysical Processes

Geological Processes

The main soil association for the Bayswater area is the Bassendean Association, however the site is located on the Swan River flood plain (DCE, 1980). The Bassendean Soil Association is characterised as having a grey surface sand with a brownish yellow subsoil. However upstream and on the southern banks the Guildford Formation is dominant with sandy clays to clayey sands including some alluvium and colluvium. The Guildford Formation consists of sand, clay and conglomerate. Most of the unit is of fluvial origin but it includes estuarine deposits. The Guildford Unit has layers which comprise older layers characterised by duplex soils.

The soil type of the foreshore is generally Bassendean Sands with areas of alluvium, peat, clay and swamp and river deposits (McArthur and Bettenay, 1974). There are pockets of peat, heavy clays and river silt deposits which are particularly evident in the wetlands of Bayswater. At Ashfield, the low river flats consist of heavy dark brown high clay content soil on light brown soil. The clay content decreases on the higher slopes. The swan alluvial terraces have red earths and duplex soils and the fluviatile deposits of the Guildford flat plain consist of medium textured deposits and yellow duplex soils.

Topography

The area is part of the Bassendean Dune System which represent a Pleistocene coastline. The quartz sand dunes consist of low hills with sandy swamps in the swales. In this precinct, flat low lying peninsulas have formed as the result of meandering river flood plains. Most of the naturally damp lands have been infilled so that the land appears artificially flat rather than graded. The edge of the flood plain forms a flat foreshore which rises in some cases quite quickly up to a maximum height of around 10 metres. This higher area is the Bassendean dunes while the lower silty area is the more recent alluvial deposits.

Hydrological Processes

Water features

The Swan River banks and inland at Ascot Peninsula and the Redcliff Peninsula to Kalamunda Road are clay deposits. The opposite banks are loamy deposits with clay deposits on the upper streams. There is little tidal movement and no daily alternation of fresh and salt waters in the Swan River and there are distinct seasonal changes in salinity. As runoff decreases in spring to summer and surface evaporation increases the estuary is quite saline. There are a number of subsurface springs in the area and originally there were several freshwater streams entering the river. Many of these streams have been converted to storm water runoff drains which have been trained and have pipeheads and retaining banks. There are two backwaters on the southern bank of the Swan River in this precinct. The Beverley Terrace backwater has several small channels draining into the river from a pool like wetland. The channels appear to be quite silted up and shallow. In contrast, the backwater at South Guildford is mainly seasonally wet apart from a permanent pool joining the river channel. At Ashfield, there is a large wetland which is circular shaped and has a samphire and *Typha orientalis* community fringing the water. There is a seasonal wetland at Bindaring Park.

Bathymetry

The Swan River is shallow and only 2 to 3 metres deep in this precinct. Parts have been dredged and straightened to allow improved river transport access.

Flooding

At Bayswater the 100 year flood level is calculated to be approximately 4.4 metres AHD and the level is similar for the rest of the river in this area. At Bassendean, inundation of the low lying land occurs following heavy rains and historically the town site has been frequently flooded the most significant years being 1917, 1926, 1945, 1954, 1955 and 1956 (Riggert, 1978). The flood plain reaches up to 1 kilometre in width at Ashfield and is quite irregular in width. A major section of Ashfield Flats is within the 100 year flood fringe.

Erosion and accretion

The river has been subject to ongoing erosion particularly long the Garvey Park foreshore where hard walling has been put in place to reduce the loss of the river bank.. Another prominent area of erosion is the South Guildford foreshore where winter floods have scoured the soil from the fringing tree roots.

Vegetation Communities

Native

Swan Complex

The Swan Complex edges the entire foreshore of this precinct (DCE, 1980). The vegetation ranges from fringing woodland of flooded gum *(Eucalyptus rudis)* and swamp paperbark *(Melaleuca rhaphiophylla)* with localised occurrence of low open forest of sheoak *(Casuarina obesa)* and saltwater paperbark *(Melaleuca cuticularis).*

Along the very fringe of the river the emergent shore rush *(Juncus kraussii)* and pale rush *(Juncus pallidus)* form a closed sedge land..

In addition to these species, the Ashfield fringing rush community has streaked arrowgrass *(Triglochin striata)* (Town of Bassendean, 1988). At the Baigup Wetland Reserve, sword sedge *(Lepidosperma longitudinale)* occurs in small patches among the shore rush . Lake club-rush *(Schoenoplectus validus)* occurs among several exotic species in areas with freshwater springs and wetlands. At Bennett Brook wetland there is a mixture of the native bulrush *(Typha domingensis)* and the introduced species *(Typha orientalis)* which form a closed sedgeland.

There are remnants of the salt water sheoak *(Casuarina obesa)* and the fresh water paperbark *(Melaleuca rhaphiophylla)* along the edges of the Swan River at Maylands and Ashfield (Swan River Trust, 1991). The understorey is commonly degraded and weeds such as the exotic bulrush *(Typha orientalis)* flourish. The indigenous understorey consists of shore rush *(Juncus kraussii)*, club rush *(Bolboschoenus caldwellii)* and divided sedge *(*Carex divisa)*. There is minimal infestation of the by the indigenous dodder *(Cassytha* sp*)* on the melaleucas and mistletoe *(Amyema* sp*)* on the sheoaks.

Melaleuca swamp communities occur as the most extreme freshwater associated complex found along the rivers, but have been severely degraded by weeds. The dominant understorey species consist of twig rush *(Baumea juncea)*, jointed rush *(Baumea articulata)*, sword sedge *(Lepidosperma longitudinale)*, broad leaf rush *(Juncus planifolius)* and pale rush *(Juncus pallids)*. At Ashfield, there is swamp paperbark *(Melaleuca rhaphiophylla)*, mohan *(Melaleuca viminea)* and banbar *(Melaleuca teretifolia)* community forming a sparse woodland.

The woodland of flooded gum *(Eucalyptus rudis)* and swamp paperbark *(Melaleuca rhaphiophylla)* extends along the current Bayswater drain. The understorey consists of shore rush *(Juncus* sp*)* and club rush *(Scirpus* sp*)*. The area also supports coojong *(Acacia saligna)* and exotic bulrush *(Typha orientalis).*

Guildford Complex

South of the Swan Complex at Belmont, the vegetation changes to the Guildford Complex (DCE, 1980). Small patches of this complex are present at Redcliffe and Caversham inland from the Swan Complex. The complex ranges from a mixture of open to tall open forest of marri *(Eucalyptus calophylla)*, wandoo *(Eucalyptus wandoo)* and jarrah *(Eucalyptus marginata)*. The understorey species include bull banksia *(Banksia grandis)*, black gin *(Kingia australis)*, blackboy *(Xanthorrhoea preissii)*, and buttercup *(Hibbertia* sp*)*.

Bassendean Complex

Away from the Swan River on the drier land at Belmont and Bassendean, the flora is identified as belonging to the Bassendean Complex. The vegetation ranges from woodland of jarrah *(Eucalyptus marginata)*, sheoak *(Allocasuarina obesa)*, and various banksia species including firewood banksia *(Banksia menziesii)*, slender banksia *(Banksia attenuata)* and holly leaved banksia *(Banksia ilicifoila)*, to sedge lands on the moister and lower sites.

Southern River Complex

The Southern River Complex occurs on the higher land at South Guildford and Caversham (DCE, 1980). The complex is identified as being jarrah *(Eucalyptus marginata)*, marri *(Eucalyptus calophylla)* and various banksia species with a fringing woodland of flooded gum *(Eucalyptus rudis)* and swamp paperbark *(Melaleuca rhaphiophylla)* along the creek bedlines.

The latter fringing community only occurs where fresh water conditions prevail. The understorey is often a composition of shore rush *(Juncus kraussii)*, pale rush *(Juncus pallidus)*, club rush *(Bolboschoenus caldwellii)*, twig rush *(Baumea juncea)* and divided sedge *(Carex divisa).*

Exotic

Numerous weeds have been introduced to the precinct due to rubbish dumping and infilling. The weeds include buffalo grass *(*Stenotaphrum secundatum)*, kikuyu grass *(*Pennisetum clandestinum)*, couch *(*Cynodon dactylon)*, blowfly grass *(*Briza maxima)*, African love grass *(*Eragrostis curvula)*, the shrub **Hastate orache*, **Atriplex prostrata*, castor oil plant *(*Ricinus communis)*, willow *(*Salix* sp*)*, morning glory *(*Ipomoea* sp*)*, sunflowers *(*Helianthus annuus)*, mint *(*Mentha piperita)*, arum lily *(*Zantedeschia aethipica)*, Paterson's curse *(*Echium plantagineum)*, one leafed cape tulip *(*Homeria flaccida)*, watsonia *(*Watsonia bulbillifera)*, thistles *(*Cardusus and *Sonchus* sp*)*, whiteflower fumatory *(*Fumaria capreolata)*, gladiolus *(*Gladiolus angustus)*, fat hen *(*Chenopodium album)*, triangular leafed thistle *(*Chenopodium glaucum)*, deadly night shade *(*Solanum nigrum)*, duck weed *(Lemna tisulca)*, water couch *(*Paspalum dilatatum)*, clover *(Tritalium sp)*, giant reed *(*Arundo donax)* and bulrush *(*Typha orientalis)*. Lemon scented gums *(*Eucalyptus citriodora)* have been planted along adjacent to the foreshore.

Historical Land use and Resulting Environmental Changes

Captain Stirling described the scenery in the area which was to become Bassendean and Guildford as a 'rich and romantic country' due to the attractive vegetation and winding nature of the river' (Carter, 1986). One of the more notable landowners in the area was James Henty who established Stoke Farm on Location S which included much of today's Bassendean and Ashfield area. The property was later purchased by Peter Broun who renamed the land Bassendean in late 1833. He named the property after his home town in Scotland. The land was used for pasture for sheep and cattle and is now known as Ashfield Flats. Broun also purchased the small parcel of land opposite which was named Saint Anne's. The old Bassendean Homestead originally built by Henty was demolished in 1946 and at that time was the oldest brick structure in the Perth metropolitan area.

In the Goldrush era speculators divided properties into lots such as the Tanner Estate, West End Estate, Eden Estate, Bassendean and the Bindaring Park Estate (Van Nierop, undated). By 1910 there were three bridges over the Swan River which allowed West Guildford to become one of the comfortable middle class suburbs.

The residents of West Guildford with their desire for tidiness and order as a sign of respectability encouraged the alteration of the attractive bushland. Roads and gardens replaced the fragile bushland and increasingly only small pockets of bush were left. There were several attempts to drain and re-divert the streams and damp lands which were a source of mosquitoes and to remove what was thought of as messy vegetation. To reclaim the swamplands drains were cut and ran parallel to the roadways and these drains subsequently became ideal for algae blooms (Carter, 1986). Exotic trees, such as English oaks, were planted along the roadside and neat boarded footpaths were put in place by the local Road Board, having priority over a local school, a consistent water supply and an official railway station. Many of the properties were used as cattle leases, however in the 1920s an outbreak of rinderpest meant that all cattle and goats in the district were killed and burnt to prevent the spread of the disease. The industry never fully recovered and many families sold their properties or earned their income in another way.

In its pristine state the Bayswater area was drained by a series of creeks and swamps to the Swan River (Garis, Undated). A main channel drained towards a swamp lying between King William Street and Slade Street. Due to geomorphological barriers the channel formed a series of lakes and swamps. By the mid 1960s the area was almost entirely used for industrial and urban purposes and the natural channel had been straightened and cleared to form the Bayswater Main Drain.

From 1956 sanitary landfill was used to infill the Bayswater floodplain area (BICM Steering Committee, 1993). This continued for twenty five years. Each day the site was compacted and then covered to reduce the health problems associated with rubbish sites. The original site was separated by a clay bund placed on the tip foreshore behind which the rubbish was dumped. The waste was 75% solid waste and 25% putrescible. The fill included domestic,

commercial, building and industrial solid waste but there was no dumping of any liquid waste. River sand was dumped on the then wetlands so that the site would receive rubbish. The sand was obtained by dredging. The site had sparse vegetation due to the difficulty of establishing trees on the building rubble. The central river bed was dredged in the 1960s and late 1977 (BICM Steering Committee, 1993).

Bassendean Tonkin industrial park was built on an area of open grazing land and wetlands in 1910. The site was used by CSBP Cresco (from 1928) and other industries. Superphosphate was produced in the area and often waste materials entered the Swan River via the Bayswater Main Drain (BICM Steering Committee, 1993). Sulfuric acid was used in the lead chamber process which resulted in a byproduct of sulphate and iron oxide. On site production of superphosphate ceased in 1978. Most of the waste materials were removed from the industrial site in the mid 1970s.

The Bayswater area has been historically mainly used for residential purposes. By 1850 many of the large original lots were subdivided for market gardens and dairy. Chinese Market gardens were established between 1898 and 1929 and some were worked until the 1970s when the second Garratt Road bridge was constructed (Carter, 1986). There were approximately 20 Chinese market gardens in the Bayswater Area. Swan Lake which is west of Garratt Road was originally a large wetland, however infilling has reduced its size. The rich soil was also ideal for horticulture and dairying. Smeeds Nursery (established 1890s) took advantage of the rich soil at Coode Street for several years.

Before 1956, land use within the Bayswater foreshore area was limited as the area was a floodplain which regularly flooded. Some market gardening occurred above the floodplain east of Leake Street and east of Slade Street. Behind this the land was mainly residential. The King William Street Drain divided the floodplain into two sections and was used to carry storm water from the Bayswater industrial site (Swan River Trust, 1990). Dredging took place upstream of Garratt Road Bridge for flood control and the spoil was dumped on the north bank Bayswater.

Present Land Use and Social Patterns

The Baigup Wetland west of Garratt Road Bridge, Bayswater, has been recently the focus of a management plan. In 1986 a SECWA gas pipeline was constructed between Garratt Road Bridge and Kelvin Road to provide additional gas supplies from East Perth to the main Perth Dampier line. To achieve this an access road was built through the wetland with the understanding that following the laying of the pipeline the road would be removed. However it was decided that the limestone road could be converted to a dual use path and consequently it was bituminised and culverts were installed to allow water movement between the river and the wetland (Regeneration Technology, 1994). Unfortunately, there has been a rapid invasion of **Typha orientalis* into the shorerush community since the construction of the pipe line due to the pooling of the fresh water in the culverts. The main storm water drain is referred to as Swan Lake Drain and has been subject to several toxic spills and also blooms of duckweed *(*Lemna disperma)* and water fern *(*Azola ficuloidies).*

A concept plan for the Bayswater Foreshore Area was prepared in 1989. The plan outlined options for transforming the 40 hectares of old sanitary landfill into a community resource and recreation area (Brian O'Brien, 1989). At present, residual rubbish is being compacted, however during the transitory phase rubbish protrudes from much of the old main landfill site. Exotic plants were a major problem in the area, although many have already been removed. Extensive planting of native flora will be implemented once clean land fill has been placed over the existing surfaces. The present plan suggests that the high relief land to the east be used for a community/cultural centre to meet theatrical artistic and related needs, while the flat low lying land of the site would be used to concentrate passive recreational needs. Recreational facilities include children's play grounds, five bridges over the drain, a fishing jetty, cycle paths, toilet facilities and an embayment with paddling beach.

There are two drains at Ashfield which carry road runoff water, the Chapman Street and Kitchener Road drains (Swan River Trust, 1991). Bindaring

PRECINCT 9

Significant Land Use Features

N

500 0 500

Metres

BASSENDEAN

NORTH Point Reserve

Kings Meadow

Helena River

South Guildford Wetland

BRIDGE ST

RD

Daylesford House

Bassendean and Tonkin Industrial Estates

Bindaring Park

CHAPMAN ST

PDE

Pickering Park

RIVERSIDE DR

HWY

SOUTH GUILDFORD

BASSENDEAN

Olive Farm Wines

EASTERN

TONKIN HWY

Riverside Vineyard

KITCHENER

Ashfield Flats

RD

Ron Courtney Island

Sandy Beach Reserve

vineyard

BEVERLEY TCE

GREAT

Beverley Tce Wetland

Garvey Park

Coolgardie Ave Drain

Bayswater Main Drain

Moojebing Reserve

ASHFIELD

GARRATT RD

GUILDFORD RD

Swan Lake

Charles Newman Garden

Gobba Lake

LEAKE ST

Halliday House

Eric Singleton Bird Sanctuary

WRIGHT CR

Claughton Reserve

Redcliffe Bridge

REDCLIFFE

Bayswater Riverside Gardens

A.P. Hinds Park

Kanowna Ave Drain

BAYSWATER

Baigup Reserve

Garrett Rd Bridge

RIVER

Ascot Water Playground

Ascot Inn

Ascot (W.A.T.C) Racecourse

ASCOT

Perth Airport

KELVIN ST

SWAN

GRANDSTAND RD

RESOLUTION DR

Ascot Waters

Bath St Reserve

Belmont International Baseball Stadium (Parry Field)

Grove Farm Reserve

lawn bowls

HWY

EASTERN

GREAT

Park is a natural drainage basin for the surrounding residential and commercial areas. Landfill was dumped at three sites within the area and consisted of soil and rubble, however scrap metal and tyres were also found. Due to dumping of rubbish and samphire degradation of flats by vehicles a management plan was made for Ashfield Parade by the Town of Bassendean (1988) and the Swan River Trust (1991). The plans recommended that indigenous flora be planted in the area and log walls constructed in areas susceptible to erosion.

There are two bridges in the area, Garratt Road Bridge which has a large number of wooden pylons interrupting the flow of the river and Redcliffe Bridge which is the Tonkin Highway crossing. The Redcliffe Industrial area is mainly concentrated on the eastern side of the Great Eastern Highway and cannot be viewed from the river foreshore. The area contains mainly workshops and display centres and is generally of low aesthetic appeal due to the use of large sign boards and vivid building colours.

At Ascot Racecourse there is a high concrete retaining wall above a wire mesh enclosed rocky bank. A wooden jetty and several boat sheds are located at AP Hinds Park upstream of Garratt Road Bridge on the northern bank. At the Ascot horse swimming area there is an approximately 30 metres long 2 metres wide wooden platform.

Much of the higher land in the area is residential. There has been increasing pressure for subdivision resulting in a mixture of residential house ages and styles. The houses which front onto the foreshore are generally well maintained with landscaped gardens of eclectic nature. Often there is a small wall constructed to delineate the edge of the property which gives a horizontal element. In this case, the adjoining public land is relatively inaccessible and typically the gardens are highly maintained compared to the foreshore reserve.

Recreation Nodes

The foreshore in this area has several recreation nodes rather than continuous foreshore access. The wetlands of Ascot Peninsula are a popular spot for small boating and fishing from the boat, however land based activities are restricted to the formal recreation points of Parry Field and Ascot Racecourse. The Baigup Wetland Reserve has a public information shelter, a small viewing platform and a dual use pathway between Kelvin Street and Garratt Road. The adjoining AP Hinds Reserve has water based sporting clubs such as the Australian Natives Association Rowing Club. The Bayswater Riverside Gardens are at present used for passive recreational activities such as walking the dog. There is a boat ramp at Claughton Reserve, Bayswater as well as picnic amenities. The Sandy Beach Reserve has a small picnic area, mowed fairways, a bicycle path and a walk trail, while Pickering Park has a small boat ramp used by the Bassendean Sea Scouts. The South Guildford foreshore is a popular recreational area for teenagers due to the lack of public amenities and the secluded nature of the area. Informal BMX tracks have been created and the area is used for cubbies by younger children. This is one of the few spots along the river which provides for such informal recreation.

Public access

A dual use path occurs between Kelvin Street and Garratt Road along the Bayswater foreshore. On the southern side there is a dual use path between Garvey Park and Grandstand Road on the southern side of the river. Access to the foreshore is limited by properties extending to the foreshore or close to the water's edge, particularly on the southern section of the river due to the swampy nature of the land and the proximity of private land foreshore. However particularly at Bassendean and South Guildford the driver cannot view the river due to private properties being between the road and the river.

Sites of Nyungar & Wider Australian Community Significance

Nyungar significance

Nyungars believe that the Waugal shed its sunburnt skin near Ascot which formed the beds of scale like shells which were abundant along the river channel.

Captain Stirling on his 1927 exploratory voyage recorded that in the area now know as Redcliffe were a *'whole Tribe of about thirty natives'* of whom *'the Warriors followed us along the bank'*. The Nyungars, who made signs of friendship, did not follow Stirling's Party above a *'creek'* possibly Helena River (Hallam, 1981). This was one of the first encounters

that Stirling had with the Nyungar people.

During early colonial times as in other areas of the Swan River, there were periods of considerable tension between the colonists and Nyungar. In 1830, a Nyungar man was reputedly seen robbing a house on the Upper Swan and escaping to the surrounding bush. A local settler, Peter Broun, led one of the first recorded organised military raids against local Nyungar. He claimed to have come across a small group of Nyungars who had been distributing the stolen goods amongst themselves. One Nyungar man was killed and three wounded in the incident. Following this, local Nyungar warriors were reported to have killed a number of Broun's sheep and cows. Broun's shepherd was also later killed in a separate incident (Bourke, 1987).

Robert Lyon, who owned a property adjacent to Peter Broun, spent most of his time in the colony studying Nyungar culture and learning their language. He wrote a series of articles for the Perth Gazette on Nyungar customs and language and asked that their plight be understood and respected. He recommended that to improve black/white relations Nyungars be converted to Christianity and taught to be a '*useful peasantry*' (Carter, 1986).

It is likely that the wetlands adjacent to the Garratt Road Bridge, Bayswater, were used by Nyungar as a family camping ground. Recently, the reserve was named *Baigup* which is Nyungar for 'the rushes'.

Other significance

The Ashfield Pontoon is wrecked in this part of the river. It was built 1942 (Thurlow *et al,* 1986).

Halliday House is classified by the National Trust and was built in 1880s by Henry Thomas Halliday, one of the early settlers to the area and also the first Chairman of the Bayswater Road Board (Carter, 1986). The Road Board used his home as a meeting place. The house has been recently renovated as part of the Bayswater Riverside Gardens project. Nearby is Ellis House on Neville St, Bayswater which is a local historic site (Lund and Martin, 1996).

Daylesford House was built in 1890s and is registered by the National Trust. Cyril Jackson built the house from brick and it has particularly excellent examples of woodwork. Jackson came out from England in 1869 to remodel the whole education system in Western Australia. He established the Teachers Training College at Claremont.

The Pensioner Guard Cottage was built about 1864 and is the only remaining Pensioner Guard residence left in the State. It was originally a brick wall and shingled roof structure, however it has now been rendered and a corrugated iron roof placed over the original shingles. It was originally the home of John Law Davis (Davies) who was granted the land in 1864 and lived here until his death six years later.

At the City of Bayswater an olive tree was planted around 1850. It is the official emblem of the city and open air church services were once held under its shade until the first church was constructed.

Claughton Reserve was originally known as Whatley Cove after Dr J Whatley who was granted land here in 1830. This area offered good landing facilities for goods transported from Fremantle.

Riverside Vineyard is one of the smallest wineries in the State and fronts onto the Swan River. The vineyard was first planted by Luigi Nicoletto in the 1939 to supply table grapes but he later changed to wine making. The Bassendean Estate shiraz wines have won awards in all Australian capital cities. On the opposite bank is Olive Farm which was established in the 1860s by Thomas Waters.

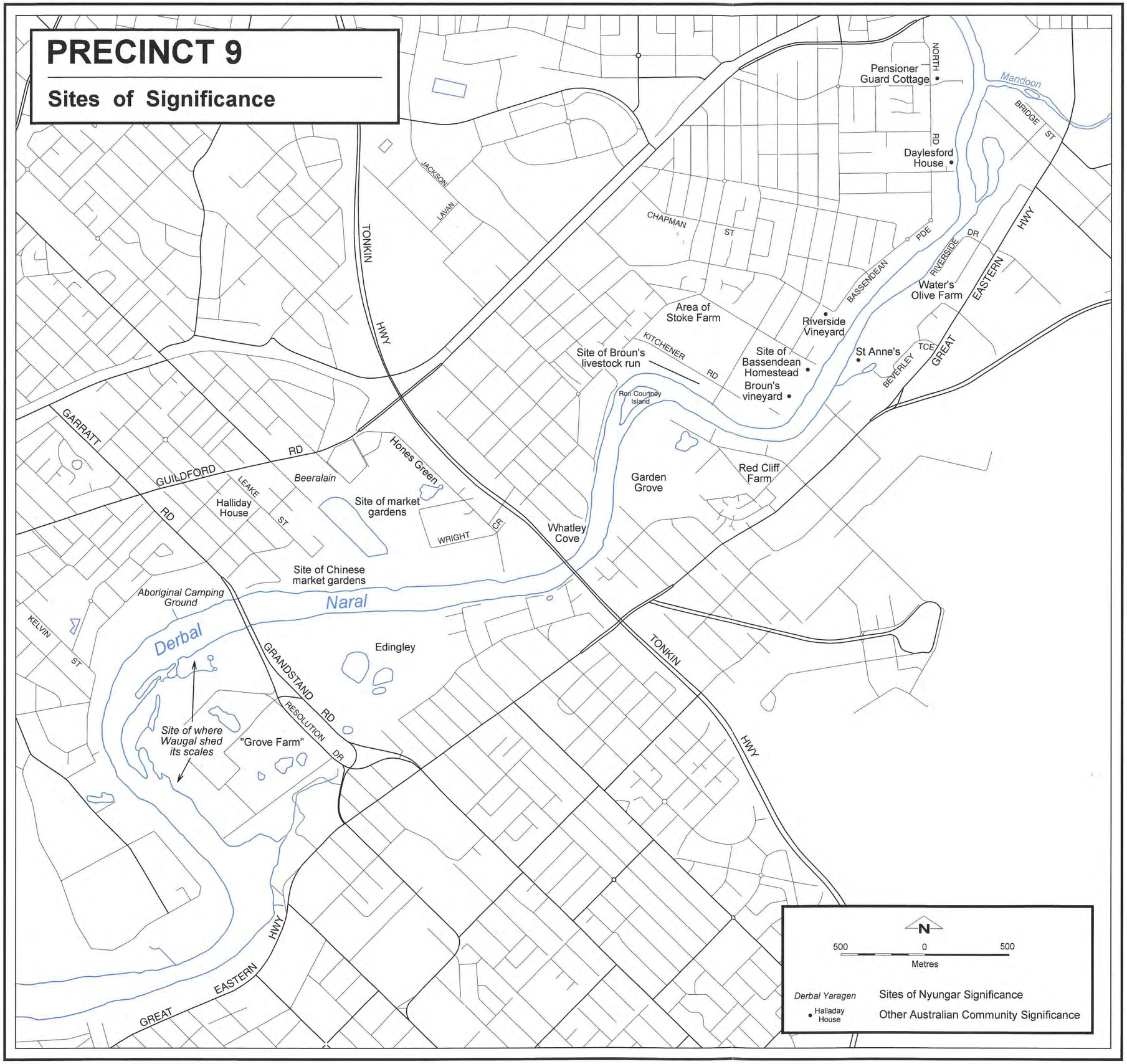
Ron Courtney Island was named in honour of the first chairman of the Swan River Conservation Board which was formed in 1959. Statutory powers controlling reclamation, construction of structures on the river and foreshore and permits for industrial discharge were achieved for the first time with the proclamation of the Swan River Conservation Act 1958.

Eric Singleton Bird Sanctuary was set aside in 1976 as a haven for waterbirds exposed to the disruptions of recreational activities on the river. There have been 74 species recorded there and artificial nesting boxes have proved a great success (BICM Steering Committee, 1993).

During the early years of the Swan River Colony a government farm was located at Bassendean. It under the charge of the colonial botanist James Drummond (Carter, 1986). The farm was used to experiment on

PRECINCT 9

Sites of Significance



suitable produce for the area and included crops, citrus, fruit and vegetables. Several species were grown as trial crops and are now noxious weeds including cape weed *(Arctotheca calendula)*, double gee *(Emex australis)*, and Guildford grass *(Romulea rosea)*.

Conservation areas

Wetlands

See below

System 6

M51 Swan River salt marshes, Belmont and Maylands

The recommended area extends from Garratt Road Bridge to about 1 km downstream along the Swan River. The area is affected by clay extraction. The salt marshes are most extensive on the southern side of the river. The principal species are *Salicornia australis* and *Suaeda australis*. The southern bank has paperbark and flooded gum and the northern bank scattered clumps of swamp sheoak. Downstream there are sand bars which are covered with trees. Inland there is marri and wattle and swamp sheoak. The area supports a wide variety of sheoaks.

M44 Swan River Backwater, South Guildford

The recommended area consists of the backwater south of the Helena River in line with Kalamunda Road. The area contained sewerage and drainage works and a pumping station. There is a saline backwater with open pools of water and vegetation which includes *Suaeda australis, Atripiex hartala* and *Apium prostratum*. The backwater is fringed with scattered trees of flooded gum and salt water paperbark and the understorey has been replaced with *Centella cordifolia, Cynodon dactylon* and *Paspalum distichum*. The area is a good refuge for many species of bird and contributes to open space of regional significance.

Precinct Description

Waterform and natural riparian zone

The Swan River channel takes an irregularly meandering form with sections of straight channel in this section. Ascot Peninsula forms an attractive water body with several fingers of land extending into the river channel. *Juncus* and dead branches form soft boundaries between the waterform and the landform and the relatively dense sheoak fringing community add to the soft textured effect. The area is subject to annual inundation as a result of being flat and low lying. The foreshore edge is meandering on the Ascot bank compared to the smooth curve of the opposite Maylands foreshore which has been altered by hard walling.

Upstream of Garratt Road Bridge the river is relatively straight and even in width. A sharp northerly bend occurs after Redcliffe Bridge where the river course is straight and of even width. Around Ron Courtney Island the river forms a right angled bend. The island is almost a right angled triangle with the two narrow angles pointed into the main river channels at either end. Upstream from Sandy Beach Reserve, the river width is more irregular and narrower than downstream. At Beverley Terrace an island is created by a backwater and two 'drains', however from the river there is hardly any evidence of the backwater except for the two very narrow channels which are fringed by vegetation. A second backwater occurs in line with Riverside Drive. This wetland has a broader channel confluence with the Swan River.

The Helena River is a relatively narrow channel which broadens to a wide confluence, almost half the width of the Swan River channel. The confluence is a t-section and the steeply grading low lying silty banks are eroding exposing tree roots. The foreshore along much of this area is susceptible to erosive processes.

Many of the banks have been retained using various methods which are described below. Despite the mixture of retaining walls, vegetation types and historic channel straightening, much of the foreshore at this section appears to be quite densely vegetated to the river user. The fringing vegetation communities, whether indigenous reeds and fringing woodland or mainly weed species, have a softening effect when the vegetation communities consist of emergent species which grade into the floodplain communities.

The Baigup Reserve wetlands, Bayswater/Maylands, which range from weed dominated communities to thick patches of swamp paperbark and shorerush, is a visually more attractive foreshore that to the barren grassy banks of A.P. Hinds Park. The sandy beaches at the park, however provide an easy access area to the water and an area which is suitable for open space recreation. Upstream of the Garratt Road Bridge the Ascot foreshore becomes increasingly sparsely vegetated. Here, the shorerush forms an attractive ribbon of vegetation, however in front of the raceway the flat bank is mainly covered with grasses. There is an area of seasonal inundation adjacent to Tonkin Highway. The Gobba Lake wetland has an area of samphires, small fringing paperbarks and sheoaks on the flat flood plain. Similar low lying areas occur at Beverley Terrace and South Guildford backwater. The Beverley Terrace wetland has quite a noticeable wide channel leading from the area of inundation to the estuary. The water appears shallow and silty in the wetland area and several submerged branches can be seen exposed during low level waters.

Landform

The land form in this precinct consists of wide areas of low lying floodplain less than 5 metres AHD. Areas such as Ascot Peninsula and Redcliff Peninsula are particularly devoid of any undulations. The land rises to approximately 10 metres on either side of the river, however the location of this small escarpment and its gradient varies considerably. At areas such as Bassendean Parade, the increase in land height occurs as a relatively steep slope from a very narrow flat floodplain. In areas such as Garvey Park, the river escarpment becomes hardly evident and the slope is very flat and gentle. However land use has had a dramatic effect on the landform within the area. This is exemplified at the South Guildford foreshore, where relatively smooth flat areas used previously for grazing have become lumps and depressions. It is interesting to note that due to the relatively low lying Ascot Peninsula the viewscape has the Darling Ranges as a backdrop and this emphasises the flatness of the surrounding land.

Vegetation

The foreshore of Ascot Peninsula has a large area of shorerush species which forms a thick shiney fringing vegetation. The overstorey consists of monospecific stands of sheoak. The needle like foliage of the swamp sheoak allows light to penetrate to the lower storey often resulting in an attractive softly lit foliage. In winter, the samphire communities are a vivid rusty red providing an attractive contrast to the dark green of the casuarina and shore rush. The vegetation is particularly dense viewed from the eastern section of the river where the viewer is unable to see the old rubbish dump site through the foliage. In contrast, the southern section of foreshore has been infilled and weed species such as kikuyu grass and cape lilac are the dominant species on the old rubbish site area.

Vegetation on the opposite Maylands and Bayswater foreshores consist almost entirely weed communities. In front of the View Terrace houses an occasional stand of shorerush occurs among domestic gardens and weedy flood plains. At the Baigup Wetland Reserve, the flood plain broadens and the swamp paperbark-shorerush community is present, however **Typha orientalis* and pampas grass are the most dominant species particularly north of the dual use path. The mono specific shorerush community adjacent to the Garratt Road Bridge is particularly attractive and forms almost a thick spiky carpet against the occasional paperbark and sheoak.

From A. P. Hinds Park to Bayswater Riverside Gardens there is little native vegetation. The dominant trees are exotics such as flame trees and the steeply sloping embankments behind the flood plain are a tangle of weeds. There is the occasional stand of sheoak and shore rush, however the Bayswater Riverside Gardens are currently being developed and there are plans to re-establish indigenous flora to much of the foreshore, although many of the trees will be exotic. Where the Bayswater Main Drain enters the Swan River there are a few flooded gum and jarrah and a weedy understorey. On the southern side of Redcliffe Bridge, there is a patch of disturbed marri- jarrah woodland behind a small area of regular inundation. The understorey is predominantly exotic grasses and shrubs. This area is a samphire flat edged by shorerush species and paperbark trees around the dampland and river foreshore.

At Claughton Reserve there are some attractive mature flooded gum on the undulating floodplain with a grassy understorey. Casuarina and shore rush edge the sandy river banks and kikuyu and couch grass are maintained as a foreshore lawn. The steep banks of Ashfield Parade are the site of a few remnant trees from the fringing paperbark-shorerush communities and marri woodland. However the dominant species are grasses, bracken and other weeds.

Ron Courtney Island has an attractive stand of flooded gum and a fringing community of shore rush and lake club rush. The understorey is predominantly exotic grass species which gives the island a parkland character.

Ashfield Flats has a community of samphire-rush species which are edged by flooded gum woodland. Most of the area, however is flat open grassland as the result of past land use. A very thin belt of shore rush and melaleuca edge the foreshore meeting with the open woodland of Sandy Beach Reserve. The fringing shorerush vegetation is intermittent north of the reserve, however there are healthy stands of shore rush in front of Pickering Park and Point Reserve.

The South Guildford backwater area has a disturbed open woodland of numerous mature flooded gum trees with an exotic grass understorey giving the general appearance of a wooded pasture. There is the occasional coojong, however these understorey bushes are rare. The backwater is dominated by **Typha orientalis* with numerous flooded gum saplings growing on its northern banks. There is also a small samphire community edging the backwater. The Swan River water's edge consists of clumps of shorerush and overhanging sheoak trees, however there are several weed species, including cape tulip, which flourish in the damp conditions.

The fringing rush communities occur intermittently between patches of kikuyu, **Typha orientalis* and watsonia stands which are the dominant species along the Redcliffe foreshore. On the steeply sloping banks, mature flooded gum tend to remain in an area which has been mainly cleared of its indigenous vegetation. The occasional paperbark and sheoak provide an

interesting brushy light texture against the more loosely spaced foliage of the flooded gum.

The Beverley Terrace backwater has an attractive wide section of shorerush species mainly edged by sheoaks and flooded gum on the drier banks. The wetland has less exotic species than along the river foreshore although in between the dark green of the shorerush there are patches of bright green kikuyu grass.

Garvey Park is an open woodland of flooded gum and exotic weed understorey. There are some areas of casuarina edging the foreshore and intermittently spaced shore rushes in areas which are not subject to erosion or have had retaining walls built against the foreshore. The foreshore between Kanowna Avenue drain and the Tibradden Development at Redcliffe is a low casuarina dominated woodland. The understorey varies from shorerush reeds to exotic grasses. There are several melaleuca saplings and bushes within the area which act as a shrub layer and consequently vegetation appears quite dense. The vegetation north of Grandstand Road has been mainly greatly disturbed. The flat swampy land is mainly the site of grasses and other weeds such as the vivid purple flower of Paterson's curse.

Riparian Land use

North of Bath Street reserve there are several types of retaining wall which have been constructed over the years by the various land owners. The materials used include corrugated cement/asbestos and wooden planks. Unfortunately, the result is an unattractive riparian line between the waters edge and the steep gradient of residential gardens. The small patches of shorerush and weed at the edge of some properties are more attractive than the straight elements created by the retaining walls as the river bend has already been smoothed by past dredging giving a linear curve to the waters edge compared to a more natural slightly meandering edge. There are several properties with high fence lines between the edge of the property and the water, they are unattractive and a restrictive element on the foreshore. Many properties have jetties which allow boats to be moored up along the foreshore, which at low density creates interesting focal points to the river user.

A dual use path was recently laid through the Baigup Wetland Reserve. The path is boarded by pine bollards and adds a linear element to the flat flood plain. At present, a new boardwalk and information stand is being constructed adjacent to the Garratt Road Bridge. These structures are relatively unobtrusive on the wetland and sympathetic colours have been used for the shelter. The new grey brick path which leads to the platform is quite reflective and probably a mixture of two similar toned bricks would have had a dulling effect on the pathway. The gas pipeline maintenance point is surrounded by wire cyclone fencing which could be made less obtrusive on the landscape by suitable shrub planting.

Garratt Road Bridge is made up of two separate bridges which have numerous wooden piles, and is low formed. The bridge acts as a visual barrier, however its wooden piles are attractive to boat users who pass beneath them. At Hinds Park, the beach is flat and sandy with almost no riparian vegetation. A small jetty makes an interesting focal point on a bland foreshore. Exotic and Australian shade trees have been planted at regular intervals well back from the foreshore. A number of recreational clubs are based in boat sheds which are of simple design and are currently being upgraded. They have been painted several tones of green which slightly reduces their impact, however planting of attractive gardens would enhance the flat lawn around the buildings. The multicoloured play gym and older pine play equipment are prominent features in this area. The parking area is in front of a weedy embankment and the area is not as attractive as the adjacent Baigup Foreshore.

The Bayswater Riverside Gardens are currently being constructed. The area will be a passive recreation area with the potential to be an attractive area of open space. At present, clean fill has being distributed on the foreshore and consequently the area is a gently undulating sandy pit. The foreshore has been sculptured to form a meandering foreshore with small bays and a small island. A few sheoaks have been retained, however the rest of the gardens have yet to be planted. Adjacent to the new island, a relatively long jetty with a gazebo over the water has been constructed. The viewing platform is particularly prominent in the viewscape, mainly because there are few trees on the adjacent flat foreshore. Halliday House has been renovated as part of the project and

raised paths are currently being constructed to the pale blue homestead and over damplands. Adjacent is the Eric Singleton Bird Sanctuary which is located on a lake created from an old rubbish fill site and also has the Bayswater Main Drain flowing through it. The site has shorerush paperbark flora present, however most species are exotics. Despite the weedy condition, the area provides a valuable wetland bird sanctuary, and it is pleasant to use the dual use paths through the area. The King William Street Drain runs adjacent to the WAWA pumpstation, which although coloured a soft green has been grafitied and is quite prominent due to the flat nature of the land and lack of vegetation. The area is the site of recent tree planting which aims to upgrade the bank into a stream. The drain is currently being landscaped to make it visually more acceptable and appear more like a stream.

The Redcliffe Bridge is a modern concrete superstructure which is a dominant feature on the landscape despite a small wetland on its eastern bank which partly screens the large land based concrete piles.

Claughton Reserve has a small almost informal boat ramp which is adjacent to a sheoak stand. Several different materials are used for bollards around the boat ramp and separating the road from the vegetation. Sandy Beach Reserve has pine play equipment and a few rock barbecues. The area overlooks Ashfield Flats so the viewscape is quite wide despite fences restricting access to the Ashfield Flats area. Pickering Park is less attractive than Claughton Reserve as there are fewer mature trees such as flooded gum. Several trees have been planted around the boundary of the park emphasising the geometric shape of the park, however a few sapplings have been planted within the grassy paddock and this will enhance the area. Bindaring Lake Reserve is separated from Pickering Park by Bassendean Parade. The parkland has a small wetland which is dominated by **Typha orientalis* and melaleuca trees. A number of pine trees occur with a lawned area between the road and wetland. Point Reserve is an attractive narrow parkland opposite the Helena River confluence. The reserve has several mature flooded gum which provide an attractive canopy in the narrow reserve and help to create an enclosed effect. Unfortunately, a sign has been nailed to a tree which detracts from the tree form and the view of the rivers. A simple sign board would have been more aesthetically pleasing. There is a small carpark which is not too obtrusive due to the narrow nature of the parkland. The brick Point Reserve amenity blocks are successfully screened by attractive Australian bushes.

Several residential properties front onto the Bassendean foreshore. These appear less obtrusive than the Maylands properties due to the gentler slope of the land. A mixture of retaining walls have been constructed, however there are quite a few flooded gum, paperbark and shore rush along these properties which break up the straight lines created by these properties.

The South Guildford peninsula at the confluence with the Helena River was originally used as pasture land and consequently the understorey is quite degraded. The soil has become quite lumpy and it is a popular location for local teenagers to display their BMX skills on the dirt paths they have formed over the lumps and ditches. A few informal paths are present through the reedy understorey and the corner provides one of the few informal recreational locations along the Swan River.

Most of the residential properties at South Guildford are well set back from the foreshore and there are few jetties or retaining walls. Olive Farm Wines, however is quite a prominent feature on the landscape due to recent construction of limestone walls and new large cloth green and white pergolas.

Garvey Park is part of the largely undeveloped peninsula opposite Ron Courtney Island. The park has recently had a new raised toilet block and kiosk constructed away from the foreshore. The colours and materials conform with the surrounding flooded gum and old quarry pit wetlands. In contrast, the canoe club building is an unattractive concrete brick building perched on a mound very close to the foreshore. There have been several attempts to reduce erosion in the area using different methods of hard walling. Pine bollards have been placed in some areas while a recently constructed limestone wall is the most obtrusive structure. In addition, a wheel chair access ramp has been constructed using cement and metal poles. The mix of materials is unattractive

compared to the upstream naturally vegetated banks. The surrounding vegetation of Garvey Park is similar to a paddock with trees and grassy understorey.

An unobtrusive raised boardwalk is crosses at the Kanowna drain wetland which allows access between Redcliff Bridge and Garvey Park. The drain itself has an unattractive outlet with corrugated fencing used as a retaining wall. The rest of the embankment is kikuyu grass. There is a small wire fence enclosing the drain area.

Land use

One of the prominent features of the flat peninsula of Ascot is the radio tower which is painted white and red. Other less obvious vertical elements are the Perry Field lights, and the Ascot Racecourse call boxes. The six brick towers of the historic Ascot brickworks can be seen emerging from trees around Grandstand Road, however from the river they are hardly prominent features compared to the Ascot Raceway. The old gateway and grandstand are quite attractive tile and white mortar buildings of style. The grandstand merges into the height of the trees and the surrounding land use while the raceway is located on the flat foreshore where kikuyu grass and a lack of trees or other elements make it a noticeable feature from the river. The old Ascot rubbish fill site is currently being redeveloped into a water front high density residential development with canals, recreation and conservation reserves. The site is being prepared for development and the old fill is being reshaped, so that at present a mound of soil has been pushed to the edge of the river creating a curved artificially shaped landmass compared to the surrounding attractive flat wetlands communities.

The Maylands and Bayswater residential area has houses of mixed styles and ages. There are several quite grand older style houses, however those built in the middle of this century are quite modest. Those single residences built along the foreshore from the 1980s are quite large and more extravagantly styled. There are several townhouses and flats which tend to be built from the 1980s and have modern simple styles. The Maylands residential area is on a slope set back from the foreshore and the nature of the landform and the curve of the river allows the houses to be partly obscured by the surrounding garden trees. The effect is an unobtrusive urban environment which demonstrates that height restrictions and mature gardens create an attractive landscape.

The Bayswater foreshore is a flat landform mainly due to previous land infilling from the flat foreshore. The gently sloping Bassendean Dune has affected the degree of prominence of the houses on the river landscape. Behind the A.P. Hinds Reserve there are a number of residential houses and a senior citizen hospital in an old house. The houses are located on the escarpment which slopes quite steeply from the flat floodplain area and many are hidden from the river by vegetation growing at the base of the escarpment. There are several empty blocks where weeds flourish. In contrast, the residential area in front of the proposed Bayswater Riverside Gardens is currently quite prominent as the large houses are emphasised by the treeless, sandy foreground. However the houses distance from the foreshore and the proposed gardens will make these less obvious elements in the landscape. At present, Camilla Court retirement village is a prominent land use on the flat Bayswater landscape, however the recent establishment of tree saplings and bushes will minimise the impact the single storey brick and tile units. At Wright Street, a few remnant orchards exist which are an attractive reminder of the once dominant use of the damplands.

At Bassendean, the slope of the foreshore is less steep than at Bayswater and consequently residential developments have been set back from the floodplain. The area has several trees which shade the houses and although some buildings are two storeys the flat nature and the setback has resulted in a less obtrusive land use. Several undeveloped blocks or small paddocks occur between Ashfield Flats and Pickering Park. Two small vineyards are located on the northern floodplain and provide an interesting landscape feature among the residential land uses. On the southern foreshore the Olive Farm vines are located adjacent to Great Eastern Highway and are less important in the riverine landscape.

Saint Anne's is an attractive private property behind the Beverley Terrace backwater which has a turn of the century styled house painted white with a cottage style garden. The other houses in the area are quite

modest and are a mixture of 1940s and mid 1960s style. Around Ivy Street and Hay Road, Redcliffe, the few residential properties between the river and the light industrial area.

The residential areas of Ascot, Redcliffe and South Guildford are not particularly dense, although recent residential infilling has occurred at Tibradden. The houses are modest and mainly well set back from the foreshore due to the wide nature of the flood plain. Residential development in the area has been limited by Great Eastern Highway which is very busy and has large blocks of commercial and light industrial land uses on either side of the road. The houses at Tibradden on Swan Estate are mainly modern brick and tile styles which often have a 'Federation' style. The area is quite treeless and there are still several undeveloped sandy blocks. There is a small dampland at Coolgardie Avenue and there are several non residential blocks which are reserved for essential amenities.

Adjacent to the Redcliffe Bridge there are a few horse agistments and several modest homes. There is also a caravan park which is mainly used by permanent residents rather than holidayers. The Ascot water playground is located on a sloping block and the paddling pools take advantage of the slope with the water running into one pool after another. The area is grassy and has shade trees and shrubs and is neatly maintained. The foreshore area has a small wooden jetty which is partly hidden by vegetation. Adjacent to the Ascot Inn and Motel, there is a large empty block. The Inn itself built in the mid 1970s Mediterranean style and painted white with red tiles. The hotel is fairly unobtrusive due to its position on the sloping land and the stepped style of the buildings.

Dominant Landscape Character

The original landscape character type of the foreshore area would have been the attractive paperbark and sheoak community fringed with sedges and samphires typical of the natural landscape character. The fluviatile deposits would have formed flat silty plains in front of the gently undulating Bassendean dunes. At Belmont, the original Guildford landscape character would have been gently undulating fluviatile deposits supporting eucalyptus woodland.

At present, the remnant samphire and sheoak estuarine communities at Belmont are an important natural landscape element as the vegetation community is in relatively good condition and appears to have had minimal disturbance. The Baigup wetland by contrast has suffered weed invasion, however current rehabilitation has improved the condition of the community and it has a natural landscape character. The embankment at Beverley Terrace has a remnant melaleuca community with little understorey except for some sedges at the edge of the river. This community has been classified as being natural landscape despite the degradation. The South Guildford wetland appears in parts to be relatively natural with areas of wetland vegetation in good condition.

There are three isolated rural landscapes in this precinct. Two vineyards in the area are only the size of a block, but provide an important link to the past rural land use of the area. From the river the Olive Farm vineyard from the river does not appear as a rural landscape as there have been extensive additions to the original sheds and homestead and from the foreshore the building appears to be part of a suburban development.

At Belmont, a new suburban development is being constructed on an old rubbish dump site. At present, the landscape character is transitory and has been identified as a modified landscape.

A large portion of the precinct has been classified as a parkland/recreational landscape character. At Bayswater, there is currently a redevelopment of the foreshore to parkland and although the site is still unfinished it has been classified as parkland.

Most of the precinct has been classified as a suburban landscape. In places, the suburban landscape occurs well away from the foreshore area, while in parts of Bassendean the suburban landscape reaches to the foreshore where the blocks extend to the river.

Significant Viewscapes

There are several significant viewscapes in this precinct. The fringing vegetation at Ascot Peninsula makes an attractive view from the river and the Bath Street Reserve. The several backwaters are created by sedges forming fingers of vegetation into the river. The fringing sheoaks are quite dense and the old rubbish dump site is not easily seen from the river.

At the Tonkin Highway, there is a section of sedge and melaleuca community in relatively good condition area of wide open space in the river environment.

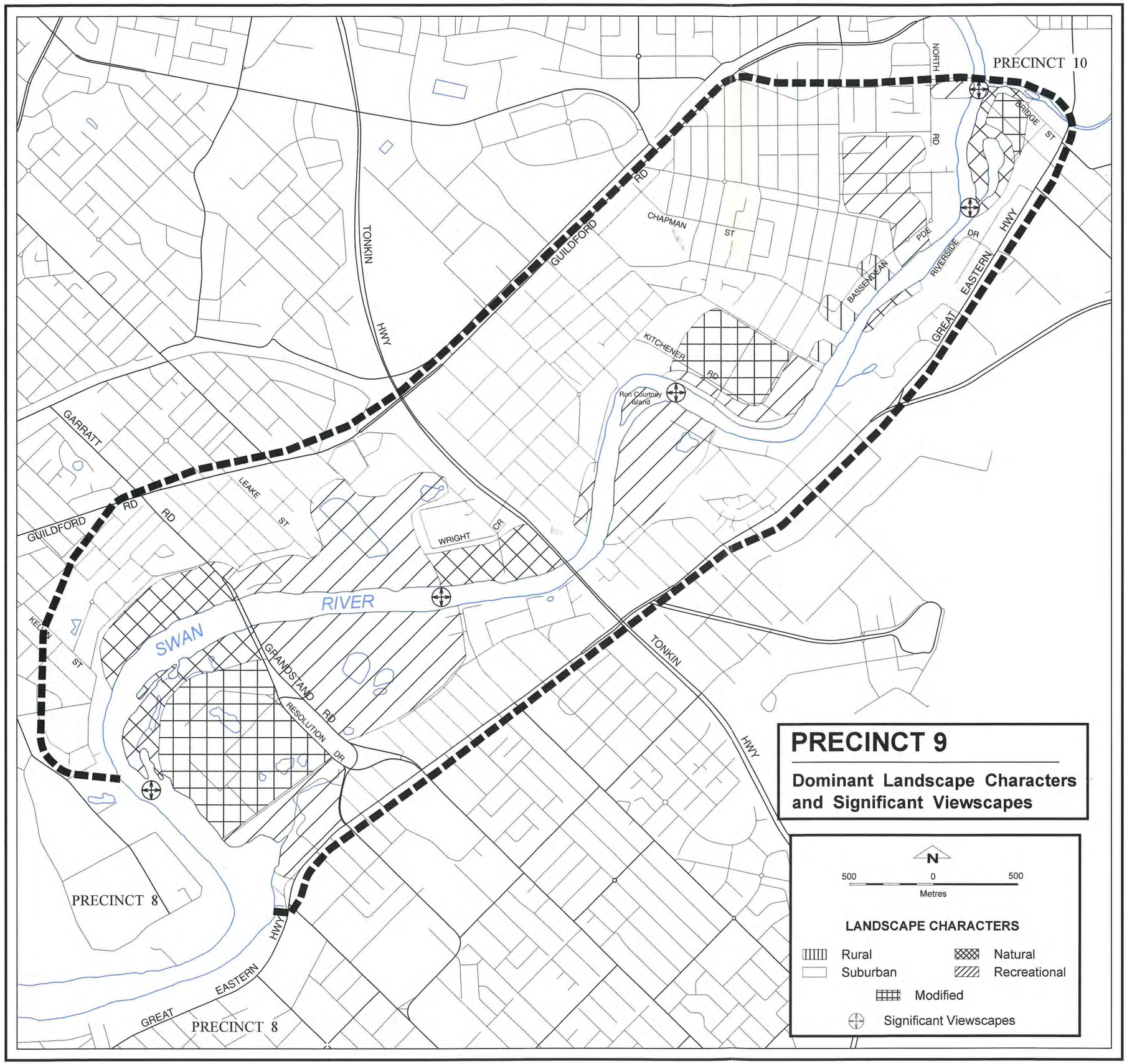
At Garvey Park, the view of Ron Courtney Island provides an interesting element in the fluvial environment. The meander curve is attractive and the raised embankment on the northern side emphasises the river meander.

The confluence of the Swan and Helena Rivers is a significant viewscape. The Swan River broadens slightly after the confluence and the fringing vegetation on the southern side of the river appears relatively natural.

Conforming and Non Conforming Elements in the Landscape

The islands and fringing sedges at Ascot Peninsula are an important element in the natural landscape. It is also an important backdrop to Tranby House as the visitor to the main entrance on the southern side of the homestead can view the river apparently undeveloped against the well maintained house and gardens. It gives the visitor a snapshot of how much of the river would have been at the time the house was built. Retaining this viewscape is important as the view of the homestead from the river is now cluttered with houses and units.

At Garvey Park, the hard walling is made up of several materials including limestone. There is the opportunity to use indigenous vegetation to replace or reduce the impact of retaining walls. A recently constructed limestone wall at Ashfield Flats opposite, Ron Courtney Island detracts from the narrow band of fringing vegetation. The foreshore adjacent to the


PRECINCT 10
NORTH RD
BRIDGE ST
GUILDFORD RD
CHAPMAN ST
TONKIN HWY
PDE
RIVERSIDE DR
BASSENDEAN
GREAT EASTERN HWY
KITCHENER RD
Ron Courtney Island
GARRATT RD
LEAKE ST
GUILDFORD RD
WRIGHT CR
RIVER
SWAN
KEANE ST
GRANDSTAND RD
RESOLUTION DR
TONKIN HWY
PRECINCT 8
GREAT EASTERN HWY
PRECINCT 8
PRECINCT 9
Dominant Landscape Characters and Significant Viewscapes
N
500 0 500
Metres
LANDSCAPE CHARACTERS
Rural
Suburban
Natural
Recreational
Modified
Significant Viewscapes

A.P. Hinds boatsheds is susceptible to erosion and the flat nature of the foreshore makes it ideal for revegetation.

Claughton Reserve has a toilet block located on a prominent earth mound and painted a bright shade of green. Similarly, at the Riverside Gardens at Bayswater, the toilet amenities have been built on a raised suffice and currently are prominent due to the lack of trees in the partly completed garden.

Recommendations for Maintenance and Enhancement of the Present Landscape Character

- It is strongly recommended that the islands and fingers of land at Ascot Peninsula remain in an undeveloped state. The vegetation is an attractive natural landscape character. It is also an important backdrop to Tranby House as the visitor to the main entrance on the southern side of the homestead can view the river apparently undeveloped against the well maintained house and gardens. It gives the visitor a snapshot of how much of the river would have been at the time the house was built. Retaining this viewscape is important as the view of the homestead from the river is now cluttered with houses and units.
- Ascot Peninsula is currently the site of a development proposal. The proposal intends to split the site by forming a regional parkland and river conservation zone on the southern section and a high density residential area on the northern section. There is the opportunity to take into consideration the viewscape of the site and ensure that the housing development does not infringe on the fringing vegetation community.
- There is the opportunity to improve the visual amenity of hard walling at Garvey Park by planting fringing vegetation to screen the different building materials.

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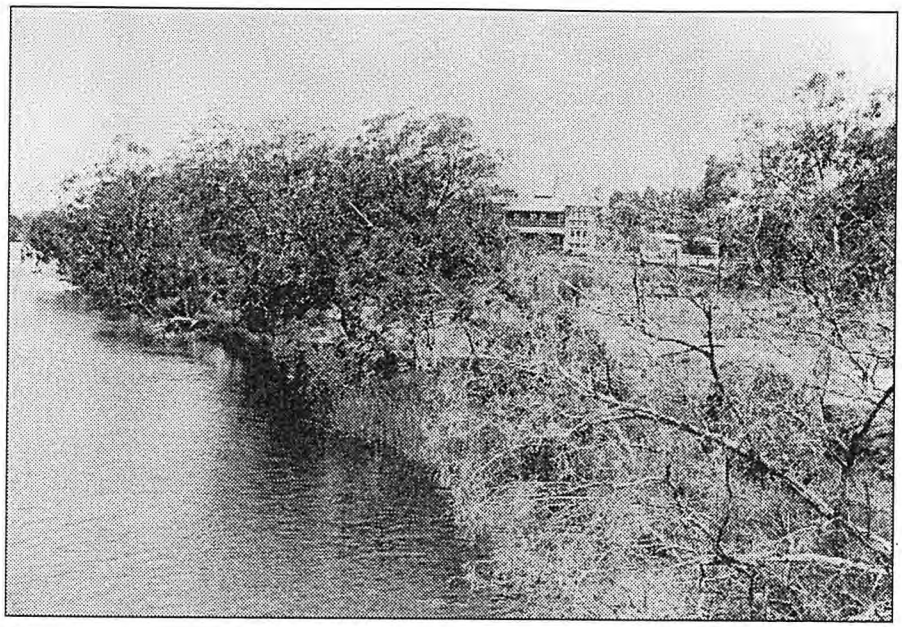
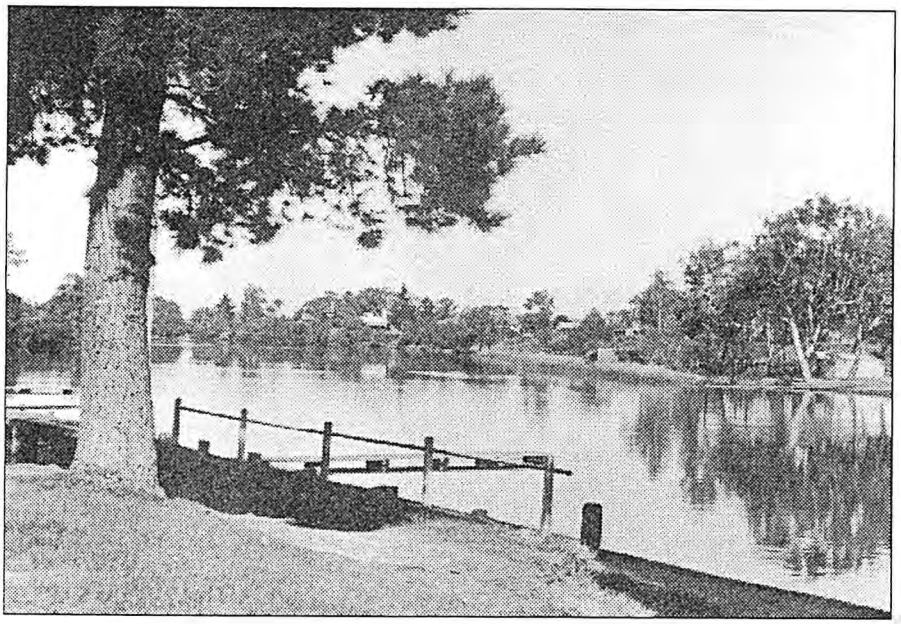


Hotel Ascot. 1892/3.

Battye Library 75004P.



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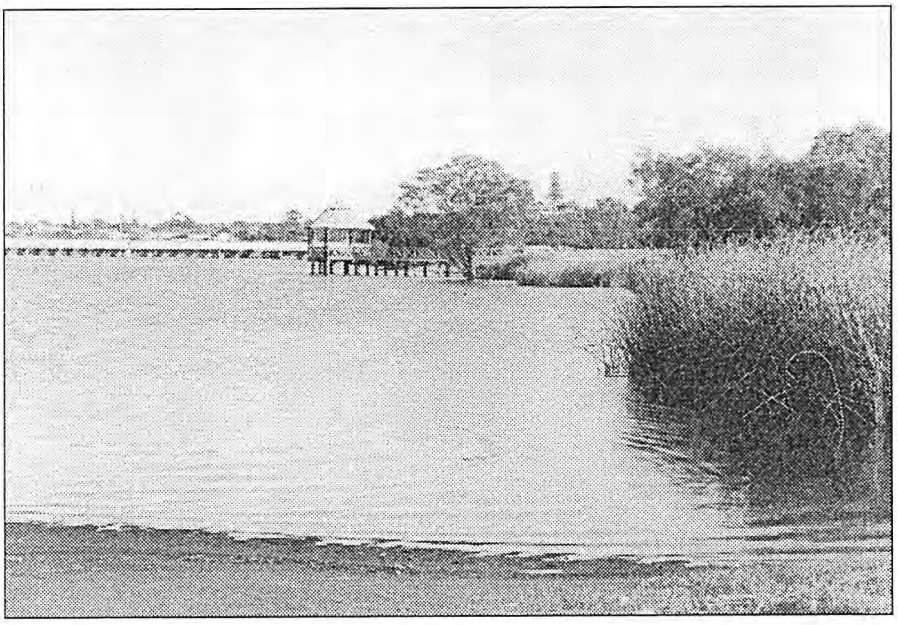
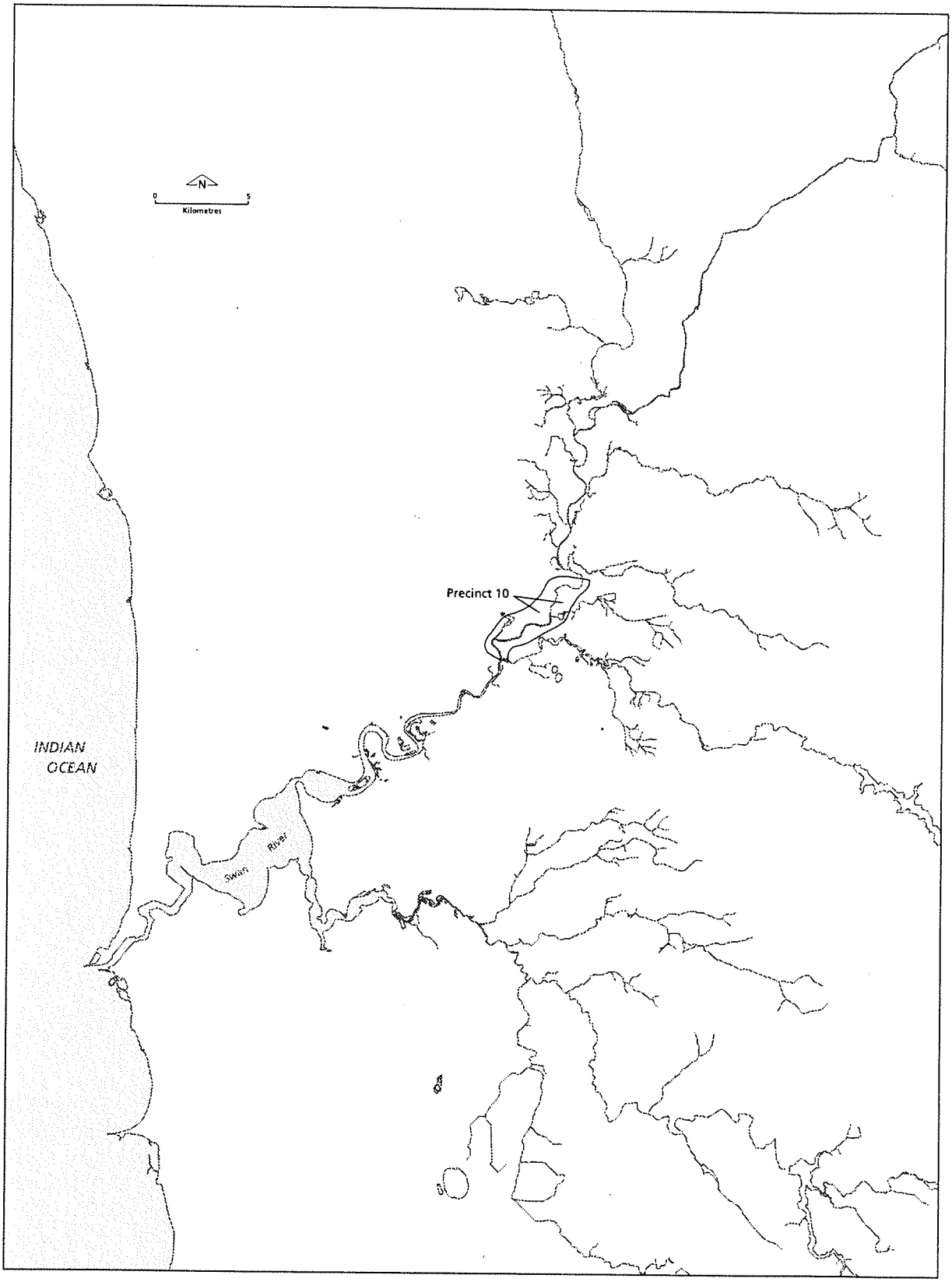


Bayswater Gardens from Bayswater Main Drain. 1997.

Swan River Trust.

Precinct 10

Historic Guildford - North of Helena River Confluence to Middle Swan Road



Summary

Historic Guildford - North of Helena River Confluence to Middle Swan Road

The Swan River takes several broad irregular meanders in this precinct. The river channel is relatively narrow and has several tributaries draining from the surrounding landforms. The riparian section in mainly lined with fringing vegetation including several shore rushes, paperbarks and sheoaks.

The surrounding landform ranges from steep embankments around Success Hill and Midland Brick to flat floodplains, such as those found at Viveash and Caversham foreshores. Sections of the floodplains are quite broad and it is over 50 metres from the river channel before the flat floodplain is delimited by a sharp steeply sloping embankment. The area was once covered in flooded gum woodland and isolated trees still remain along the river. Some of these trees are quite magnificent due to their maturity and form. Unfortunately, the understorey is typically exotic grasses due to historic uses as grazing land.

Man-made riparian features include several traffic and rail bridges as well as smaller wooden jetties. At Success Hill, the spring has been diverted down a concrete lined waterfall and the toilet block placed in the middle of the viewscape. Other more attractive recreational areas include Lilac Hill and Fish Market Reserve, both which have more indigenous vegetation than at Success Hill. The vineyards in the area provide a distinctive landscape feature and the changes in the vine foliage colour give the landscape an obvious seasonality which is less apparent with the indigenous flora. There are several historic and interesting buildings along the foreshore which are important landscape features in creating the precinct's identity.

Biophysical Processes

Geological Processes

The area is predominantly the Guildford Association with some sandy clays to clayey sands including other alluvium and colluvium (DCE, 1980). Most of the unit is of fluvial origin, however does include estuarine and shallow marine intercalations.

The dominant soil type in the area is the Swan alluvial terraces with red earths and duplex soils. Some distance from the river channel on the western bank the soil is the Guildford fluviatile deposits which form a flat plain with medium textured yellow duplex soils (McArthur and Bettenay, 1974). On the southern side of the river, the Southern River sand plain is a series of aeolian deposited low dunes with some intervening swamps, iron and humus podzols, peats and clays.

Topography

The precinct is part of the Pinjarra Plain geomorphic unit which is flat to gently undulating. The unit consists of fluviatile deposited sediments from the Darling Range streams which drop their sediment as they reach the flat plain. As a result wide alluvial fans have formed at the base of the Darling Range. Around the Swan River and tributaries, the unit has been modified by fluvial processes (Seddon, 1972). The flat flood plains are contrasted by the opposite embankments which are quite steep and up to 5 metres high. In many cases the flood plain is particularly broad and the edge is delineated by an embankment up to 50 metres away from the river channel.

Hydrological Processes

Water features

The river channel is relatively narrow around 10 metres in cross section and becoming increasingly narrower upstream, although visually it appears to be a relatively even width for the entire precinct. The river has a low sinuosity and consequently meanders irregularly on the Pinjarra Plain. The river banks range from less than 2 metres in height up to an embankment of around 15 metres at Success Hill. The lower flood plains have rich clayey deposits while the higher banks are mainly sandy.

Bathymetry

The river is shallow in the upper estuary and is only approximately 2 to 3 metres deep. The daily astronomical tidal range at Guildford is less than 80% of that at Fremantle. Dredging has occurred both north and south of the Helena River.

Flooding

The Guildford area is renowned for its flooding and throughout recorded history the low lying sections of the town have often been inundated. One of the earliest floods recorded in the area was May 1830 and there was a second great flood at Guildford in 1872. The flood plain stretches in broad flat plains up to 1 km wide below Middle Swan Bridge and Viveash as well as being very broad between Bennett Brook and West Swan Road.

Erosion and accretion

There are isolated areas of bank erosion all along the precinct, particularly in places where fringing vegetation such as reeds is not present. Areas of particular note are a small area near Fish Market Reserve boat ramp, Success Hill embankment and the steep embankment near Midland Brick.

Vegetation Communities

Native

Swan Complex

The Swan Complex edges the entire foreshore of this precinct. The vegetation ranges from fringing woodland of flooded gum *(Eucalyptus rudis)* and swamp paperbark *(Melaleuca rhaphiophylla)* with localised occurrence of low open forest of sheoak *(Casuarina obesa)* and saltwater paperbark *(Melaleuca cuticularis)*. Along the very fringe of the river the emergent shore rush *(Juncus kraussii)* and pale rush *(Juncus pallidus)* form a closed sedge land.

In some areas there is a remnant woodland of flooded gum *(Eucalyptus rudis)* and swamp paperbark *(Melaleuca rhaphiophylla)*. The emergent species in the precinct include marsh club rush *(Bolboschoenus caldwellii)* and lake club rush *(Schoenoplectus validus)* and are often associated with the casuarina-melaleuca complex and the flooded gum communities which occur along the riverbank.

There are small sections of swamp sheoak *(Casuarina obesa)* and swamp paperbark *(Melaleuca rhaphiophylla)* and some understorey of shore rush (Juncus kraussii) at Bennett Brook confluence and in small nodes further upstream.

Along the river floodplains, flooded gum *(Eucalyptus rudis)*, and swamp paperbark *(Melaleuca rhaphiophylla)* woodland occurs throughout the precinct although all of the communities are remnants and are quite degraded. Prior to clearing the flooded gum open woodland would have consisted of understorey including coojong *(Acacia saligna)*, grey stinkwood *(Jacksonia furcellata)*, spearwood *(Kunzea ericifolia)*, harsh hakea *(Hakea prostrata)*, woolly bush *(Adenanthos cygnorum)*, woody pear *(Xylomelum occidentale)*, blackboy *(Xanthorrhoea preissii)*, zamia *(Macrozamia reidlei)*.

Guildford Complex

Behind the Swan Complex at Midland and Middle Swan vegetation changes to the Guildford Complex (DCE, 1980). Small patches of this complex are present at West Guildford inland from the Swan Complex. The complex ranges from a mixture of open to tall open forest of marri *(Eucalyptus calophylla)*, wandoo *(Eucalyptus wandoo)* and jarrah *(Eucalyptus marginata)*. The understorey species include bull banksia *(Banksia grandis)*, slender banksia *(Banksia attenuata)* and firewood banksia *(Banksia menziesii)*, black gin *(Kingia australis)*, blackboy *(Xanthorrhoea preissii)*, prickly mosses *(Acacia pulchella)*, white myrtle *(Hypocalymma angustifolium)*, Swan River myrtle *(Hypocalymma robustum)*, common hovea *(Hovea trisperma)* and buttercup *(Hibbertia hypericoides)*. Remnant marri *(Eucalyptus calophylla)* woodland communities occur on the sandy hills of the Bennett Brook confluence. The disturbed understorey consists of bracken fern *(Pteridium esculentum)* and exotic grasses.

Southern River Complex

The Southern River Complex occurs on the higher land at South Guildford and adjoining the Swan Complex at the Bennett Brook area (DCE, 1980). The complex is identified as being jarrah *(Eucalyptus marginata)*, marri *(Eucalyptus calophylla)* and various banksia species. Along the various drainage lines there is a fringing woodland of flooded gum *(Eucalyptus rudis)* and swamp paperbark *(Melaleuca rhaphiphylla)* along the creek bedlines. Remnant marri *(Eucalyptus calophylla)*, banksia *(Banksia attenuata and B.menziesii)* woodland communities occur on the sandy hills of Bennett Brook. The disturbed understorey consists of bracken fern *(Pteridium esculentum)* and exotic grasses.

In the relatively undisturbed areas of Bennett Brook the native bulrush *(Typha domingensis)* and the introduced species *(*Typha orientalis)* fringe sand pits created by the local roof tile manufacturer. Other species along the brook include pale shore rush *(Juncus pallidus)*, marsh club rush *(Bulboschoenus caldwellii)*, samphire *(Halosarcia)*, the triangle leaf native herb *(Chenopodium glaucum)*, saltwater sheoak (*Casuarina obesa)*, swamp paperbark *(Melaleuca rhaphiophylla)* and saltwater paperbark *(Melaleuca cuticularis)*. The bracken fern *(Pteridium esculentum)* lines tributaries into the brook.

Exotic

South of Success Hill Reserve has been overrun by giant reed *(*Arundo donax)*. Modified woodland of Success Hill Reserve there is **Ficus* sp, couch grass *(*Cynodon dactylon)*, buffalo grass (**Stenotaphrum secundatum)*, morning glory *(*Ipomoea indica)*, and nasturtiums *(*Tropaeolum majus)*. Other weeds south of Middle Swan Road, include curled dock *(*Rumex crispus)*, couch *(*Paspalum dilatatum)* and blackberry *(*Rubus fruticosa)*.

Historical Land use and Resulting Environmental Changes

Guildford was established in 1829 as an early settlement of WA. The town was central to the best available farmlands and served as an administrative centre, market town for local produce and inland port. The rich alluvial soils of the area appeared attractive to the settlers who assumed that the land was similar to the English environment. Like their counterparts on the Canning River, early crops were a failure, and it was not until 1831 that the first crops were harvested, and even then most food was imported from Asian based colonies (Carter, 1986). Development of the town was constrained at an early stage by the extensive floodplains of the Swan and

Helena Rivers and consequently the houses were built on the higher embankments of the area.

Captain Stirling chose a property in Guildford to build a small cottage and named the home after his wife Ellen Mangles' home Woodbridge, Guildford, Surrey, England (Moss, undated).

William Tanner who arrived at Swan River in 1831 owned the greater portion of the Bassendean area (Carter, 1986). As he owned several properties in England, he was able to finance the Swan River properties without the struggle which plagued most land holders. Tanner named his property Baskerville and later gained Lieutenant Preston's land adjacent to Success Spring, known as Lockridge. Tanner never lived on the properties, however he leased the Woodbridge Cottage from Captain Stirling as well as several Guildford homes. Adjacent was the Pyrton property between Bennett Brook and Riverbank which was owned by the Hamersley family. One of the hardships endured by the family was having most of their land and homestead destroyed in the great flood of 1872. A similar fate occurred at the low lying Lilac Hill park which was originally cleared for farming and was known as the Preston Flats Farm (Bourke, 1987).

Typical of the middle class settlers who were lured to the colony by the prospects of cheap land was William Byrne. He and his family settled at West Guildford and were one time residents at Baskerville, however by 1837 Matilda Byrne, who was overwhelmingly homesick and had lost two daughters to dysentery, returned to England with her four remaining daughters (Bourke, 1987). William followed his family in the following year.

One of the landmarks of the West Guildford area was Cleikum Inn built by James Dodds and his family (Carter, 1986). The first home built by the family was flooded in winter destroying all their possessions, however the family started again this time building on the higher ground. The building is now used as the Saint Vincent's Hospital and Aged Peoples Home.

Prior to the building of the causeway at Burswood, the main route from Perth to Guildford crossed near Dodds' property. A ferry ran at this point between 1831 and 1881 after which the ferry fell into disrepair and sank in the river (Bourke, 1987). Moulton's Landing was the site of the town wharves when Guildford was the junction of road and river transport. Barkers Bridge was built in 1833 and the present West Swan Bridge is the third bridge at this site (Shire of Swan, 1993). To improve river transport, the river was dredged in 1895 to 1896 from Guildford all the way to Claise Brook.

In 1850 convicts were brought to Western Australia to provide the much needed labour under the supervision of Controller General Capt Henderson RE (Carter, 1986). With them arrived the pensioner guards and their families who were given land to build their homes. The guards were responsible for the hiring of convicts and a hire depot was built in Guildford in 1851. Two convicts were employed to be ferrymen between West Guildford and Guildford. Once their sentence expired or were pardoned, most convicts managed to purchase lots in the colony. In 1868 a group of Irish political prisoners (Fenians) worked at the stone quarry near Preston's Creek (Bennett Brook). The stones were used to make the Guildford roads. One of the more notable ex convicts was Malachi Meagher who became a prominent Guildford citizen leasing the Bassendean Estate and later the Sandalford vineyard from John Septimus Roe as well as becoming, among other positions, a councillor of the Guildford Municipal Council.

At the turn of the century, several small industries operated along the Guildford section of the Swan River including a timber mill and a gas powered flour mill. One of the earlier industries which still exists today is the Whiteman Brickworks which were established in 1886 by a Mr Lew. Originally, clay from the river was excavated for brick manufacture by Whitemans at Middle Swan. Midland Brick also excavated clay at this section of the river (Shire of Swan, 1976).

One of the areas which were drained in an effort to establish a wealthy urban suburb was Hay's Swamp which became the site of the Bassendean Oval in the early 1920s. The cost was a particular burden to an area which was suffering the effects of the Depression years. Prior to the infilling, the swamp would occasionally flood surrounding houses but was also the spot for children to play canoes in relative safety.

The river at Success Hill was a popular swimming area for the youths of the district. However there were a number of tragic accidents with children dying as a result of meningitis or head injuries. The Aboriginal children would refuse to swim at Devils Elbow where they would say there was a great feathered serpent called the Waugal and it was too dangerous to swim in the murky waters (Carter, 1986).

Present Land Use and Social Patterns

Guildford Grammar and Preparatory School is one of the major land owners of this section. The current site was developed in 1900 and includes low lying land adjacent to the river. A management plan was entered into with the Swan River Trust in 1991, with funds provided by the Trust for the school and other groups to implement the plan. This included foreshore stabilisation with indigenous vegetation, tree planting and preventing livestock from damaging the river banks and vegetation.

Several other schools occur near the Swan River including, Governor Stirling High School, La Salle College and Guildford Primary School. In 1970, as part of flood control techniques the South Guildford foreshore was dredged and the spoil was used to build the Guildford Primary School fields on the opposite banks. Other community amenities in this area include the Swan Districts Hospital, Bennett Brook housing area for disabled people, the Swan Valley Nyungah Community, and Disability Services Commission. The land on the eastern side of Bennett Brook was designated for a hospital a couple of decades ago, however this has not eventuated.

The historic precinct of the town of Guildford is a popular day trip for tourists due to its several colonial buildings and wineries. Several facilities exist for tourists, such as the Mulberry Farm Convention Centre, Woodbridge afternoon teas and small vineyard sheds/produce stalls. The northern banks of this precinct have a number of vineyards which stretch across the cleared plains and include some well reputed vineyards such as Sandalford and Bendara. Other rural activities include a few citrus orchards and small market garden areas, stock grazing, horse agistments and an animal hospital.

Whiteman's Midland Brick is a dominant land use in the area with the pits and brick construction site taking up almost half the Viveash foreshore. Brickworks also occur adjacent to Bennett Brook. Silica mining took place at Fish Market Reserve in the mid 1960s. The area between Governor Stirling Senior High School and Blackadder Creek was used for landfill for twenty years. Several plans were made for the area in the late 1970s including a sports complex and bird sanctuary. After much controversy, it was decided to divert Blackadder Creek and not form a lake in the low lying land. There are three wooden road traffic bridges within this precinct; these are the Guildford Road Bridge, the West Swan Road Bridge and the Middle Swan Bridge at the northern boundary of this zone. Other crossings are the two steel railway bridges approximately 100 m upstream of Bridge Street. A water pipe line crosses the river approximately 700 m upstream of Bridge Street.

Recreation nodes

There are several recreation areas along the river foreshore. At Kings Meadow Oval there is some play equipment, change rooms and picnic areas. Jetties allow for swimming and fishing. There is a boat launch ramp at Fish Market Reserve which also has a number of picnic tables. Opposite at Success Hill Reserve, there are several barbecue and picnic areas, as well as play equipment and a small jetty. Lilac Hill has a formal oval and picnic areas and is a popular fishing spot. Marshall Park has a swimming area between two jetties and a small school boatshed. Guildford Grammar Rowing Club is situated on the river foreshore adjacent to Woodbridge. Reg Bond Reserve has a small jetty and is the end point for a river trail from Marshall Park. Several small jetties occur along the river for fishing such as the jetty adjacent to Caversham Avenue.

Public access

There are several areas where private property or high embankments make access to the foreshore difficult. However there are some recreation points along the river which allow for informal and organised recreation. Marshall Park to Reg Bond Reserve is a river trail which allows pedestrians to view quite an attractive stretch of river.

PRECINCT 10

Significant Land Use Features

N

100 0 200 400 600

Metres

MIDDLE SWAN RD

SWAN RD

WEST

Sandalford Wines

Mandalay

Brickworks (Whiteman)

Reg Bond Reserve

Brickworks (Midland)

Midland Community Christian Centre

Swan District Hospital

HWY

DE BURGH RD

CAVERSHAM

Caversham House

CAVERSHAM AVE

BENARA

Caversham Caravan Park

Banara Wines

RD

Creek

La Salle College

VIVEASH

NORTHERN

Bristile Quarry

HARPER ST

Blackadder

Riverbank

Old rubbish dump site

GREAT

ST

HAMERSLEY RD

Bennett Brook Wetland

Mulberry Farm Convention Centre

RD

Marshall Park

Govt Stirling jetties

RIVER

LORD ST

Swan Valley Nyungah Community

Govt Stirling Senior High Sch

MORRISON

MARY ST

Brook

Woodbridge

VICTORIA ST

EDEN HILL

Lilac Hill Park

Guildford Grammer Prep School

HWY

EASTERN

Bennett

Pyrton Training Centre and Disability Services Commission

Guildford Grammer School

RD

GREAT

SWAN

Success Hill Reserve

Saint Charles Seminary

ST

TERRACE

St Vincent Hospital and Aged Peoples Home

SWAN ST

MEADOW

EAST ST

Fish Market Reserve

Foothills Sch

Stirling Square

JAMES ST

Welbourne Fairholme Hostel

railway bridge

Earlsferry

BRIDGE ST

RD

Guildford Bridge

GUILDFORD

Guildford Primary School

GUILDFORD

River

Bassendean Oval

BROOK ST

Kings Meadow Oval

Helena

BASSENDEAN

PRECINCT 10

Sites of Significance

N

100 0 200 400 600

Metres

Swan River Nnyungah Sites of Nyungar Significance

• Stirling Square — Other Australian Community Significance

MIDDLE SWAN RD

Area of Priory Park

RD

Lew's Brickworks •

Mandalay •

Site of Wexcombe

SWAN RD

Sandalford

WEST

Spring Dale

Sion Hill

HWY

BENARA RD

Caversham House •

Spring Park

NORTHERN

HARPER ST

Pyrton •

Possible Corroboree ground location

GREAT

RD

Derbal Naral

MORRISON

ST

MARY ST

Creek

Woodbridge •

VICTORIA ST

HWY

EASTERN

LORD

Nyungah meeting ground

Prestons

Preston Flats Farm

Site of Barker's Bridge

Success Hill

Devils Elbow — Permanent Camps 1900's

Garden Hill

Moultons Landing

TERRACE RD

GREAT

Cheikuna Inn

Guildford Town

SWAN ST

EAST ST

Lockridge Hotel •

Fish Market Reserve •

Fairholme •

Stirling Square

JAMES ST

Site of Baskerville

Earlsferry •

GUILDFORD RD

West Guildford

Hay's Swamp

West Hill Farm

Mandoon

Sites of Nyungar & Wider Australian Community Significance

Nyungar significance

At the time of colonisation, Mooro Nyungars considered the western section of the precinct part of their *boodjar* or country. Beeloo Nyungar considered the eastern banks of the Swan River and the Helena River as part of their *boodjar* or country. It is believed that at the time of colonisation, the land from Mount Eliza to just past Broun's farm was the land of Munday's family. From Bassendean to the head of the Swan was considered to be the province of Wiap.

Nyungars believe the Waugal is present at the section where Bennett Brook enters the Swan River below Success Hill. This area was known locally as Devil's Elbow by the early colonists (Bourke, 1987). Many local Nyungars are particularly wary of the location and practice certain rituals before entering the site. It is believed that Success Hill or a location nearby was a meeting ground for Nyungars.

Nyungar believe that Blackadder Creek was formed through the creative activity of the Waugal who still lives there. A corroboree ground was located on the eastern bank of the Swan River near its junction with Blackadder Creek. The exact location of the site is not known and the area has been dramatically altered and the creek diverted several times.

During the early years of colonisation, a number of pastoralists relied on Nyungar labour to supplement paid workers on their farms. Last century, many Nyungar and other Aboriginal families were brought to Guildford by colonists as were they lived on Pyrton and Lockridge had been set up as 'Aboriginal reserves' (Bourke, 1987). Other families who were unable to sustain their traditional life set up permanent camps around the Success Hill area. In 1901, to celebrate the visit of the Duke and Duchess of Cornwall and York, 110 Aborigines were brought from all parts of the south-west to be housed in specially erected iron roofed shelters at Success Hill (Carter, 1986). For many years after the site remained an Aboriginal Reserve.

In 1905, the Aborigines Act gave the Chief Protector of Aborigines the power to place many Aboriginals, in particular part-Aboriginal children, on settlements such as Carrolup (near Katanning) and Mogumber (Moore River). The effect the separation policies on the Swan Valley Nyungars during the 1940s is recounted in Idjhil by Helen Bell. The background information for the story was provided by Cedric Jacob, a Swan Valley Nyungar Elder and it provides an excellent insight into Nyungar family life at this time.

By the 1940s, there was concern by local white residents of Bassendean that there were too many Nyungar families living on the outskirts of the area (Carter, 1986). Many white people believed that the Aboriginal camps and houses where responsible for many of the infectious diseases in the area and voiced their disapproval. However despite opposition by many white residents, the Nyungar families continued to live at Eden Hill as this was the only section of their *boodjar* where they were allowed to remain. The Hamersley family who had purchased the Bennett Brook property allowed Nyungar families to live on their traditional camping grounds around Success Hill and Bennett Brook. This private arrangement continued despite opposition by the Bassendean Road Board. In addition to the already crowed conditions, Nyungar families who had established camping grounds at South Guildford in the mid 1930s, were forcibly moved to the Bassedean area when an army camp was established at Beavis Street, South Guildford.

A number of large blocks around Mary Street, Eden Hill, were mainly owned by Nyungar women in the early 1950s. Many of the families lived in what was considered by the authorities as 'unconventional' housing and this was often a cause of conviction. In the 1950s, the government purchased most of the blocks for State Housing for migrants to Western Australia. A number of houses were made available for the Nyungar families. However the houses were designed for nuclear families and this made it difficult for many families who were larger in size (Carter, 1986). Today many Nyungars, including the Swan Valley Nyungar Corporation, still continue to live in the area. The corporation has a block on the western bank of Bennett Brook where they have a residential area built to the specifications of Nyungars.

In 1981, near Midland Brick, stone artefacts were found which are believed to be around 40 000 years old (Pearce and Barbetti, 1981;Bourke, 1987). At the time it was considered to be one of the oldest

Aboriginal archaeological sites in Australia. The site held over one hundred stone artefacts of different materials including chert and dolerite. The artefacts are believed to have been hand held implements including scrapers and other tools (Pearce and Barbetti, 1981).

Other significance

The town of Guildford was declared to be a Historic Town due to its unique historic architectural forms and noticeable concentrations of historic buildings around Meadow Street. Many of the older homes in the town have an attractive charm and the architectural form is generally consistent with Victorian domestic architecture. The Meadow Street conservation area was classified by the National Trust as an historic precinct and is on the National Estate Register (Carter, 1986) The Historic Guildford District contains 19 features classified or registered with the National Trust and many date back to 1840-1850s.

Fish Market Reserve was designated on the original town plan by Henry Charles Sutherland as an area for the sale of cattle, sheep and other produce from the surrounding regions. However the reserve was solely used as a fish market during the early days of settlement and its designated purpose was never realised.

There are several stories of how the narrow beach on the river meander curve was named Success Hill (Bourke, 1987). Some suggest that Stirling camped the night there and named the spring Success, after his ship. There are no records of Stirling landing or camping on the embankment, and it is believed that it would have been unlikely as he usually camped on flat land well away from cliffs or hills where he was less likely to be attacked. Some beliefs suggested that Stirling named the site Success Hill when successfully discovering a freshwater spring from which he refilled his water barrels, however this myth was created around the 1929 centenary in the enthusiasm to be part of the State celebrations.

Earlsferry House on Nurstead Avenue Bassendean, was built in 1902 for John T. Short who was chief commissioner of Railways and who named it *Briarsleigh*. The building is between the railway and Guildford Road. It remains substantially unaltered apart from the removal of the original wooden valances above the windows, removal of the balustrade along the veranda and the wrought iron finials on the roof and tower. The property was renamed *Earlsferry* around 1945 with the change of owners. In 1950s the property was purchased by Nathaniel Harper who converted the house for mentally retarded girls under the supervision of the Mental Health Services Board. He also purchased *Fairholme* (1870s -1990s) in Market Street on the opposite bank for a mental health home. Earlsferry is now privately owned while the Fairhome building and the adjoining Welbourne's house (1840s) are used as the Welbourne Fairholme Hostel.

On the corner of Anzac Terrace and River Street the Lockridge Hotel was opened in October 1896 by Mr C. Pressentin. The hotel was a popular resort for holiday makers up the river and gained a reputation as a favoured venue for honeymooners. The proprietor had an arrangement with the railways to stop on Sundays at a nearby point so that patrons would not have to walk from the Guildford Station. The building has been used as a hospital, a Salvation Army Old Peoples home and the Guildford Girls High School (Carter,1986). The school catered for the daughters of the middle class and accommodated 30 boarders and approximately the same number of day girls until its closure in 1910. At present, the building is used as the Riverside Lodge.

The Guildford Bridge was the site of the ferry stop until 1885 when the first bridge was built and was referred to as Barkers Bridge (1854) after a Mr Barker who had a warehouse on the corner of West Swan Road and Swan Street. Adjacent to the bridge was Moulton's landing and house (1842) and the house is still used as a private residence. Middle Swan Bridge was built in 1897 (Shire of Swan, 1993).

The Saint Charles Seminary was originally known as Garden Hill. The land was first owned by Alfred Waylen in 1837. His son inherited the estate and built the handsome Meadow Street bungalow in 1895. Several owners used the property as their private residence until 1942 when the Catholic Church bought the homestead and some surrounding

land. The house is now part of the Seminary.

The Woodbridge homestead was built in 1885 and is now owned and classified by the National Trust and is also on the National Estate Register. The Woodbridge property was owned by Sir James Stirling, and then Henry Brockman. Charles Harper the next owner built the fine Victorian house at great expense. It overlooks the site of Stirling's original mud cottage. Guildford Grammar School began as a class started by Harper in the billiard room of the house and it later became Woodbridge House Preparatory School for Boys. The building has also been used as a Women's Hostel and classrooms for Governor Stirling High School. The National Trust completed its restoration in 1970. The original iron lace was removed during the mid 1940s and the present lace is from the old Federal Hotel, Perth, which was demolished in 1969.

At the site of the Riverbank institution was the Hamersley family's home Pyrton which remained until 1960s when it was demolished for the institution.

St Winnols was bought in 1881 and the house was built in 1898 (Bourke, 1987). The house is registered by the National Trust and is on Caversham Avenue. Further down the road is the Caversham homestead which was owned by the de Burgh family and was built in 1851 and later bought by Mr Fred Roe (Battye, 1912).

North of this was the Sandalford property established in 1830s, which was the estate of Captain John Septimus Roe. The Sandalford vineyards is one of the State's finest wine producers although in the past it was used for citrus fruit production as well as grapes. Adjacent to Sandalford is a private residence of historical significance which is called Mandalay (1830s). Mr Thomas Brodie Pow owned the Walland vineyard at West Swan which included part of the Priory Park estate at West Swan. On the eastern bank was Samuel Henry Viveash's property of 'Wexcombe' which is now the present site of the Viveash subdivision (Battye, 1912). The homestead was originally built by Mr Tanner in 1840. The Viveash family bought the adjoining property of Ashby.

Conservation Areas

Wetlands

System 6

M41 Bennett Brook

The recommended area extends along the streamline from Harrow Street to the confluence with the Swan River. The brook and tributaries are seasonal streams which are partly interrupted by agricultural activities. However they retain fringing vegetation of paperbark and flooded gum. The area between Benara Road and Harper Street has been modified by grazing, excavation for clay and damming of the stream, and contains permanent pools which are fringed by paperbark and flooded gum. South of Harper Street the stream spreads out into a swamp approximately 800 metres wide containing a diversity of vegetation, including swamp paperbark and sedge which provide a feeding and breeding ground for birds and frogs. The conservation and recreation values of the area are high and several management recommendations were made.

M19 Swan River - Guildford to Walyunga National Park

The recommended area extends along the Swan River from Guildford to Walyunga National Park. The natural vegetation along much of this length of river is reduced to scattered trees along the banks, though above the Swan's confluence with Ellen Brook the banks are relatively well wooded. Flooded gum, swamp sheoak and paperbark occur throughout the reaches of Middle and Upper Swan, in some sections saplings and seedlings are present but elsewhere animals have prevented regeneration. The land adjacent to the river is mainly used for stock while vineyards occupy most of the remainder of the valley.

Landscape Description

Precinct Description

Waterform

The Swan River becomes increasingly narrow upstream of the Helena River confluence. At the confluence, the river appears broad and straight edged and makes an attractive viewscape. The Swan River takes several broad irregular meanders in this section. The sharp bend just south of the Bennett Brook confluence is emphasised by the height of Success Hill which reaches up to 25 metres. The opposite bank is a flat floodplain which creates an attractive contrast. This section of the river has a restricted viewscape and only segments of water can be viewed from the foreshore at one time which creates an element of expectation for the river user. The river also has several fallen branches and uneven sinuous clayey banks and reeds which create an irregular edge.

Natural riparian zone

The northern banks of the Swan River at the confluence with the Helena River are highly susceptible to erosion due to the lack of fringing vegetation. Recent flooding has left debris on the low lying floodplains of the Swan River and due to the recent abundance of water, weeds are particularly prolific. A section of foreshore south of Guildford Road Bridge has attractive fringing vegetation including several types of rush, a few sheoaks and flooded gum. Several areas of exposed clayey banks occur on the low lying floodplains and these are reddish in colour. The banks become gradually steeper towards Success Hill where large expanses of exposed sandy embankments occur. These banks appear to be highly susceptible to erosion due to their almost vertical slope and little vegetation cover. Bennett Brook appears as a small stream entering the Swan River through a section of melaleuca and reeds, behind which the land is completely cleared. The banks are comparatively low lying with often a small clayey embankment before flattening out to a flood plain. At Middle Swan, areas of erosion, branch falls and reeds provide a complex element to the semi circular shaped flood plain.

There is a section of Viveash foreshore where sedges and melaleuca fringe the edge of the muddy banks while the land behind has a dense stand of mainly young flooded gum. However the understorey is mainly exotic grass species such as Paterson's curse. Upstream, the river embankments become higher and steeper alongside of the Midland Brick foreshore while the opposite bank is low lying and undulating. The opposite northern banks have been altered for riparian land uses and are discussed below.

Landform

The Swan River takes several broad irregular meanders in this section. The sharp bend just south of the Bennett Brook confluence is emphasised by the height of Success Hill which reaches up to 25 metres. The opposite bank at Fish Market Reserve is a flat floodplain which creates an attractive contrast to the high almost scarp face of Success Hill. There is a small tributary which leads into Bennett Brook adjacent to Pyrton Training Centre which has created a small valley between Eden and Success Hills. Between Fish Market Reserve and West Swan Road the southern bank forms a wide flat floodplain behind which a semi circular like higher embankment creates an enclosed viewscape. Upstream, the landform is quite flat until the gentle rise at Woodbridge which continues a small escarpment pas Governor Stirling Senior High School. The opposite bank is wide and flat to Lilac Hill Park where it rises fairly steeply from the river's edge and once again flattens near Riverbank. Upstream, the land is relatively flat after a slight rise from the river foreshore. Around Midland Brick the landform has a steep embankment and then recedes into a flat wide plain south of Middle Swan Bridge.

Vegetation

South of the Bridge Street Crossing, the natural flooded gum vegetation complex has been mainly cleared, however a few magnificent flooded gum still stand on the flood plain. The understorey, however is a mass of exotic grasses, such as barley and blowfly grass. On the higher land there are remnants of a marri woodland with a few trees dotting the empty blocks, however most vegetation has been replaced by the residential gardens. Upstream, there is an abundance of the giant reed on the steeply sloping banks at Success Hill. Other prominent species include marri, peppermint, and flooded gum as the dominant trees, while the understorey consists of bracken fern, watsonia and kikuyu as well as other

weeds. The block adjacent to Success Hill has a badly degraded marri-banksia woodland which is filled with weeds and has been recently burnt creating bare sandy patches between the weeds.

Bennett Brook confluence has had most of its vegetation cleared except for a narrow belt of melaleuca- casuarina and club rush. The Bennett Brook valley has some flooded gum and marri with understorey predominantly of kikuyu grasses and bracken fern. Upstream there is mainly the flooded gum -melaleuca complex which is dotted in thin remnant belts along the river banks and the land behind has been mainly cleared of the natural complex for vineyards and residential purposes. Along the river banks both marsh and lake club rush occurs in patches usually adjacent to the melaleuca complex. At Lilac Hill and sections of the Viveash foreshore, flooded gum woodland occurs with an exotic grassy understorey. Melaleuca and several reed species line the foreshore in a broad belt.

Riparian land use

There is a WAWA drain leading from Brook Street to the river south of Guildford Road Bridge. The drain has been 'trained' which has created a straight channel with grassy banks. There are several flooded gum which are attractive and if the channel was meandering would almost be reminiscent of the original tributary. An old jetty which occurred adjacent to the drain was recently partly demolished in this year's floods, which is unfortunate as these small wooden jetties in low density suburban areas are an attractive foreshore feature.

Kings Meadow Reserve has a large oval with lawn which is not highly maintained and several old toilet blocks adjacent to the foreshore edge. There are several types of outdoor furniture and the carpark area is gravel and partly informal. There are several attractive river gum and peppermint and a quite prominent almost dead pine tree. The banks are highly susceptible to erosion and wooden retaining walls have been constructed near where dredging once occurred and therefore there are no riparian reeds or trees at this section. There are two short wooden jetties which extend from Kings Meadow Reserve to almost half way into the river. The jetties are nicely balanced by two similar jetties at the downstream southern bank of Point Reserve.

The Guildford Road Bridge is a low form wooden pile structure which, although is currently being upgraded, has graffitied concrete abutments. The wooden piles and white wooden balustrades are rather attractive features in the historical context of the river. There are two adjacent railway crossings which have unattractive shaped piles and a wide grey superstructure, however from up and downstream the traffic and rail are in line with each other and appear as one element. The electric power lines also rise above the already tall obtrusive features.

Adjacent to the houses at Success Hill, there is a steep bank which has had small rocks and other debris placed along the river's edge to reduce erosion. The water pipeline is a arched suspension bridge which has a pleasing semi circular curve over the water and makes an attractive feature of an essential service. The overhead powerlines have been placed in the same line as the bridge which minimises the number of vertical elements in the plane.

Success Hill Park is located in a small valley. In the centre of the valley, hence the central viewscape, there is a toilet block which detracts from the attractive landform and also restricts river views. The banks are mainly lawn with a few trees lining the central red brick pathway and a few more recently planted trees on the hill slopes. The edge of the hill before the steep escarpment is emphasised by the lawn extending to the embankment and tall trees growing from the embankment creating a distinction between the two landforms. On the northern bank there are a few pine trees which stand out against the remnant banksia woodland on the adjoining hill. On the opposite bank there are the electricity line towers and a small lookout shelter painted green. From the shelter the viewer can see the arch of the water pipeline. The pipeline is an attractive riparian feature due to its unusual form. A small T-shaped wooden jetty is adjacent to Success Hill spring. The original spring which ran down the escarpment has been directed into a concrete waterfall edged with bauxite rocks and similar bauxite rock bitumen paths lead down the escarpment.

The Fish Market Reserve is an attractive peninsula of mature flooded gum trees and grassy understorey

which give the appearance of a grassy woodland edged with melaleuca and reeds. The parkland has a few picnic facilities and two gravel parking bays. The rock walled entrance defines the park boundary and also has a plaque explaining the significance of the reserve's name. There is a small boat ramp which is ridged concrete, however its small nature, rock edges and surrounding fringing vegetation make it appear rather informal.

Due to the low lying land on either side of the river upstream of Bennett Brook there is little riparian land use, instead residential areas are set well back form the flood plain. A small jetty occurs adjacent to West Swan Road Bridge which is know as Moulton's Landing as it was built to allow supplies for Moulton's Store to be landed last century. The bridge itself is an attractive low lying wooden piled form with white wooden balustrades similar to Guildford Road Bridge. As both bridges are old, they provide an attractive entrance to the historic Guildford area, and give the river user a glimpse of how the river would have appeared earlier this century. At St Charles seminary, the river side has several river accesses, an old concrete bore and a fence. Lilac Hill Park has a cricket oval which has temporary stands erected for games. The rest of the area is wooded flooded gum and grass land which is particularly attractive surrounding for the few pine picnic tables.

Upstream on the northern bank the vineyards extend to the edge of the floodplain. These provide a pleasing land use as the green leaves and red clayey soils suggest fertility and productivity. The end of the floodplain is delineated by a sharp rise in slope on which houses are built. There is a small drain running down from Hamersley Road which passes by mounds of soil which has been moved due to levelling of land for agricultural purposes.

The Guildford Grammar School foreshore has several interesting land uses. There is an old stable building which is constructed of wood with a corrugated iron roof. The roof is rusting and the paint fading giving the building an attractive weathered texture in a location which appears to be rural. The horses have kept the understorey as a grassy layer among the remnant flooded gum trees. Further upstream the Guildford Grammar School rowing shed is a low form shed set into a depression on the hill. Although the shed is in a prominent location the use of olive green paint minimises its impact on the lawned foreshore.

Marshall Park has a number of old river gum which shade a boat shed and two jetties known as the Governor Stirling Jetties or West Midland Pool. At this narrow stretch of river, the jetties provide a partly enclosed swimming area for the school students. There is a rough gravel carpark and flat cleared land in front of the embankment. The landform to the east, although relatively flat is slightly lumpy and subsiding due to its past use as a rubbish dump. The area is treeless and full of grasses and weeds.

The Blackadder Creek confluence with the Swan River has been redirected twice in recent history and its present location is the most northerly location. Originally, it was near the Governor Stirling Jetties. The present day channel is straight and narrow, almost drain like. At the confluence a small wooden bridge has been constructed and a few flooded gum have been planted in two strips along the channel. Unfortunately, the linear planting emphasises the unnatural form of the creek and it would be beneficial to extend the planting in a more natural pattern.

At Viveash the foreshore land use is mainly sections of fringing vegetation with a river trail allowing pedestrians to walk between Marshall Park and Reg Bond Reserve. Adjacent to Blackadder Creek there is a paddock filled with Paterson's curse which is used for a small flock of sheep. A small block of river gum has been retained which provides a valuable attractive feature adjacent to the flat paddock and the new Viveash housing estate.

Land use

Some of the most important land uses of the area for creating the precinct's identity are the several historic houses and riparian features which line this section of the Swan River. The older houses range from grand to modest.

Upstream of Point Reserve, there are several grand riverfront houses which front onto large blocks. The houses include new and old houses built as early as late last century. Most of the older houses have been renovated and had extensions built. These houses have eclectic gardens and several have small vegetable patches. The houses are located above the floodplain

embankment which means that they are often 50 metres or more away from the river foreshore on the lower side. Situated between the Guildford Road Bridge and the Guildford Railway Bridge, is *Earlsferry* which is an attractive Federation style homestead. The two storey house is built of brick and has been recently renovated including a new corrugated iron roof. The prominence of the building is obscured partly by the traffic and rail bridges.

Between Walter Road East and Success Hill Reserve, there is a reserve used for a below surface gas pipe. There is evidence of an old pathway which was originally lined with gravel rocks similar to those of Success Hill, however apart from this the reserve supports a degraded banksia woodland. The houses of Eden Hill were built in the mid 1950s by the State Housing Commission but over time have become individualised as new owners have created their own gardens and added extensions.

Adjacent to the Bennett Brook confluence with the Swan River is the training centre run by Disability Services. The area has several styles of building, however the most prominent building which overlooks the river is grey concrete and brutalist/international style with a flat roof. The area is grassed to the embankment edge and several mature mainly exotic trees dot the lawned area.

Slightly away from the Swan River is the Swan Valley Nyungah Community which is currently building a small community development on the banks of Bennett Brook. The Corporation is currently constructing several individual wooden buildings with attractive half cylindrical iron sheeting roofs painted bold cheerful colours.

Bennett Brook housing for disabled people is a small 1980s style complex with small townhouse like units which allow for independent living.

Opposite to the Bennett Brook confluence is the St Vincent's Hospital and Aged Persons Home which consists of several buildings of differing styles and ages and an attractive garden which grades into the flood plain area. The washing line, sheds and carparks, however are prominent features of the Home to the river user.

The Bristile Quarry site on Harper Street is well away from the Swan River, however its four brick smoke stacks are a prominent feature from the Caversham area.

Saint Charles Seminary is an attractive homestead built in the Goldrush era. The house is a brick and tiled roof single storey bungalow. From the river a gazebo like roof room is the dominant of the now seminary. Remnant exotic gardens occur down the sloping embankment while the dominant area is lawn. A few flooded gum and sheoak fringe the floodplain. There is an old water tank adjacent to the house which due to its box like nature and rusting colour is an unattractive element in the environment. Upstream on this bank are small Federation cottages which have been built on the edge of the curved embankment. The houses have been renovated and provide an attractive backdrop to the grassy floodplain.

The Mulberry Farm Convention Centre is built from brick and tin to be reminiscent of the early houses in the area. However the building style is modern particularly from the carpark entrance. There are several limestone walls in the exotic plant gardens. Several bits of farm machinery are placed in the garden to link the building with the surrounding agricultural land uses. A windmill and dam farm the front entrance feature which is consistent with the adjacent vineyards. Adjacent to the farm are the overhead high tension powerlines which are prominent to both the river and land user due to the flatness of the landform and the lack of mature trees in the area.

Caversham vineyards are particularly attractive. There are a mixture of struts which are either wooden or metal 'v' shapes. The vines provide an all year round change of foliage colour clearly delineating the season on the plain. The neat ploughed rows provide the viewer with a scene of order and rural activity which is a rare feature in the Swan River area. The houses associated with the vineyards range from old tin roof styled homes to modern ornate often reminiscent of the families' Mediterranean backgrounds. Metal sheds and farm equipment are dotted on the land which although rather plain and functional are important in defining the area. Caversham homestead has been greatly altered since its original design and has a corrugated roof and white rendered walls. The gardens obscure most of the house from the river. A small wooden jetty

adjacent to the house is an attractive riparian feature, however the informal nature of the parking area is damaging the banks.

Guildford Grammar School has attractive buildings which have been constructed from the Federation period onwards. The chapel is an attractive Federation Gothic style which is set in the centre of a school modelled on the English grammar schools. From the river only glimpses of the buildings and school ovals can be seen due to mature exotic deciduous and pine trees and the remnant fringing vegetation.

One of the features most popular with river users in the area is Woodbridge House which is a particularly grand Victorian homestead. It has been successfully restored to a state reminiscent of its original condition with attractive brickwork and lace work and iron hipped roof with veranda cantilevered at a lower angle. The gardens are in beautifully maintained cottage and formal styles with a contrasting foreshore of fringing flooded gum and melaleuca and an almost continuous band of shore rush. Recently planted saplings have become a shrub layer in the community creating a relatively dense foreshore. There is an uninterrupted viewscape of the house and gardens leading to the river as the river user moves upstream of the meander at Mulberry Farm, however from a downstream direction the house is obscured by the high embankment and Governor Stirling Senior High School.

The Governor Stirling Senior High School has its main buildings perched adjacent to the steep sandy embankment and the three storey box like buildings accentuate the vertical element in the area. The school's tennis courts are adjacent to Woodbridge House and the areas are separated by large bushes. The school is neat, however the school's sheds and back ends of the buildings overlook the river.

The Riverbank Detention Centre is a series of modern buildings mainly constructed from the 1960s onwards. It overlooks the Viveash subdivision which has occurred in two stages with older houses in the centre and a newer subdivision which is being built around the outside of the older subdivision. The new house are typically of the popular 'Federation' and 'Mediterranean' styles and many are quite large.

Near Blackadder Creek there is the Midland Community Christian Centre which was an old school, the Swan District Hospital and the La Salle College. These are set away from the river and have little impact on its landscape.

The foreshore at Midland - Whiteman Brickworks is steeply sloping and potentially liable to erosion if the weedy embankments were to be subject to high water levels. The embankments have young saplings and remnants of the sheoak-melaleuca community. There are several concrete drains entering the river at this point. The banks are covered with indigenous overstorey and exotic grassy understorey. From the foreshore the large sheds and smoke towers can be seen between the trees, however their impact has been reduced by the use of a light green paint for the shed walls. Within the brickworks grounds, piles of rubble and clay mix are surrounded by scrap metal, weeds and a few planted trees. The main sheds which shelter the clay are very tall, however efforts to screen most of the work have been quite successful.

On the northern banks, Sandalford Wines is the most northern vineyards in the precinct. The homestead is tucked away from the river and only glimpses of the vineyards can be seen. Adjacent to Middle Swan Road are several rural land uses including an animal hospital and horse agistments which have small fenced paddocks shaded by remnant marri and flooded gum vegetation. At present, Middle Swan Road is being realigned and as a consequence the road works block most of the Sandalford peninsula viewscape.

PRECINCT 10

Dominant Landscape Characters and Significant Viewscapes

PRECINCT 11

MIDDLE SWAN RD

SWAN WEST RD

BENARA RD

HARPER ST

MARY ST

LORD ST

HWY

NORTHERN

GREAT EASTERN HWY

MORRISON RD

VICTORIA ST

SWAN ST

TERRACE RD

EAST ST

JAMES ST

GUILDFORD RD

PRECINCT 14

PRECINCT 9

N

100 0 200 400 600

Metres

LANDSCAPE CHARACTERS

- Rural
- Suburban
- Industrial
- Natural
- Recreational
- Modified
- Significant Viewscapes

Dominant Landscape Character

The original landscape character would have been the flat alluvial terraces of the Swan and Guildford landscape. The dominant vegetation community in the damp alluvial soils would have been flooded gum, paperbark and sedges in moist locations. In the drier locations an open eucalyptus woodland would have been found. Today much of the vegetation has been cleared for agricultural and suburban land, however the landform is still a dominant factor in the landscape, in particular, the high alluvial embankments at Success Hill, the town of Guildford and near the brickworks. The flat alluvial terraces at Caversham are emphasised by the lack of trees and the neat vine rows.

At Fish Market Reserve, the landscape appears to be relatively natural due to the remnant woodland. Historically, the land has been used for a number of rural and industrial land uses, however today some flooded gums have regenerated and the fringing vegetation is in relatively good condition. The sedgeland continues upstream of the Fish Market Reserve and appears to be a limited but natural landscape. The central section of Fish Market Reserve was cleared in the 1970s for silica mining. Young flooded gum trees have regenerated and the understorey consists of grasses. The appearance is of an open parkland rather than a natural vegetation community. Several picnic amenities and unsealed roads cross the area.

The dominant landscape of the southern section of the precinct is suburban. One of the most important features of the suburban landscape is that a large number of houses were built last century. This gives the landscape a sense of historic significance. In contrast, the newer housing developments at Viveash provide a more modern suburban landscape.

The Brickworks at Middle Swan are clearly an industrial land use feature which dominates the landscape character in this area. The several sheds, clay mounds and conveyor-belts are the key industrial elements. The Bristile quarry at Harper Street is an isolated industrial landscape typified because of its four chimneys and numerous sheds.

The large portion of the landscape is rural. The vineyards of the Middle Swan area are an important element in the whole Swan River landscape. The vineyards have large sections of land cleared for the neat rows of vines with small clusters of sheds and houses. In addition, the residential buildings associated with the rural land use are sparsely distributed across the landscape.

Significant Viewscapes

There are several significant viewscapes in the precinct. The views of the rural landscape characters are important in an increasingly suburban riparian landscape. One of the most attractive viewscapes is the panoramic view of Woodbridge House and the vineyards opposite the house. The house is an attractive historic element in a relatively rural environment.

The confluence of Bennett Brook and the Swan River provides an attractive view. The confluence of the brook and river is mainly obscured by the fringing vegetation, which appears attractive and natural. In addition, the steep alluvial terrace of Success Hill contrasts with the flat plain of Fish Market Reserve.

Conforming and Non Conforming Elements in the Landscape

The Kings Meadow Reserve is not highly maintained. The toilet amenities are in a prominent position adjacent to the Helena River and detract from the riparian environment. The short wooden jetties at the reserve are an attractive element in the parkland environment and conform with the informal land use of the parkland. Similarly, the Governor Stirling jetties are also attractive riparian features.

The Guildford Bridge although graffitied, was built several years ago and has an attractive old style in keeping with the surrounding suburban area which has a number of houses built last century.

At Success Hill, the original spring which ran down the escarpment has been directed into a concrete waterfall edged with bauxite rocks. Unfortunately, the effect is rather drain like and weeds have grown around the edges and in the waterfall. Similar bauxite rock bitumen paths lead down the escarpment. Possibly it would be more consistent to replace the bitumen with a more natural pathway material or

even the same red bricks which lead to the pathway. In addition, the toilet block at Success Hill is in the centre of the viewscape; if it is upgraded its relocation could be addressed.

Governor Stirling Senior High School, like many buildings adjacent to the river, has not taken advantage of the riverside location. Straight box like buildings accentuate the high river embankment and many of the sheds are located adjacent to the foreshore.

The Midland and Whiteman brickworks have high embankments which screen the industry from the foreshore. The embankments have been planted with some trees to reduce the risk of erosion, however the understorey consists mainly of weeds which detract from the embankment.

Recommendations for Maintenance and Enhancement of the Present Landscape Character

- There is the opportunity to relocate the Kings Meadow Reserve change room amenities and parking closer to Guildford Primary School, leaving an attractive parkland facing onto the confluence of the Swan and Helena Rivers. By retaining the jetties along this section of the precinct, the recreational landscape will be maintained.
- There is opportunity to improve the plantings at Blackadder Creek to cover the whole wetland rather than the linear planting along the stream.
- Blackadder Creek confluence and Viveash foreshore has the potential to be revitalised as an area of public open space with attractive native flora and facilities for public access and recreation.
- Success Hill has an attractive natural landform. There is the opportunity to enhance the natural vegetation and improve the design and location of public amenities at this park.
- Careful consideration of building styles should be taken when planning for future development along the river. The attractiveness of Guildford is its predominantly turn of the century houses and well established gardens. Future development should not compromise this landscape amenity.

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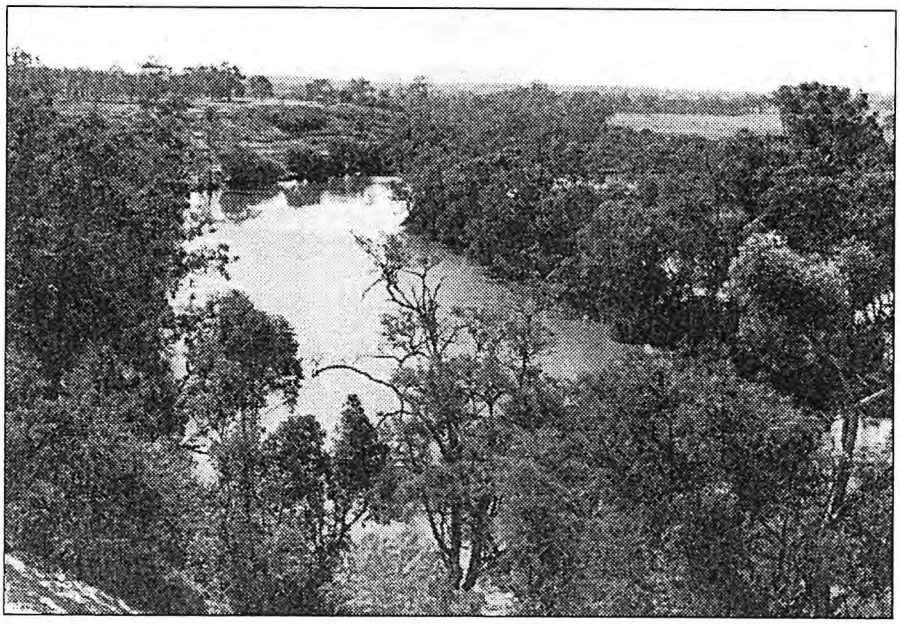
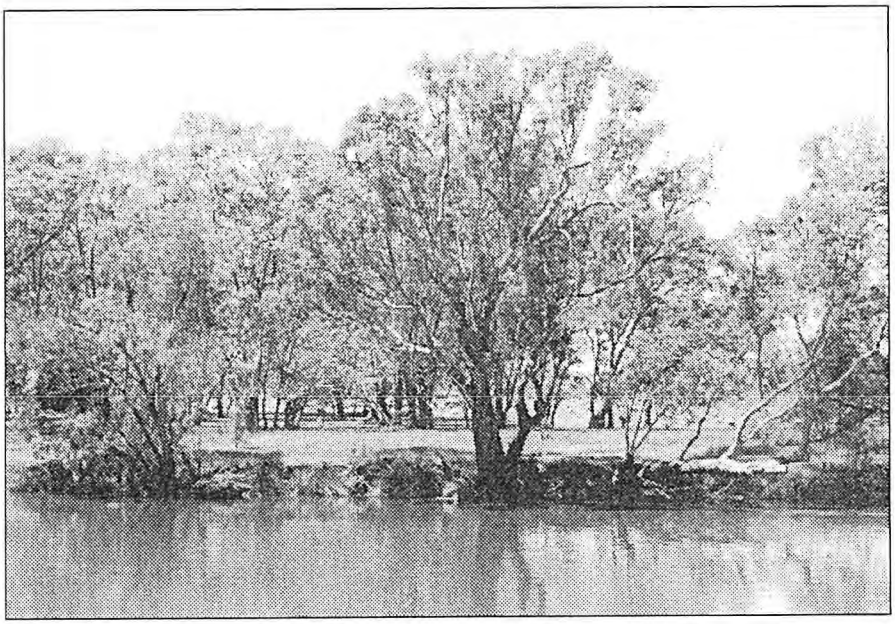


View from Success Hill, Bassendean. 1937.

Battye Library 38995P.

Woodbridge, Guildford. 1993.

Swan River Trust.



Viveash foreshore. 1996.

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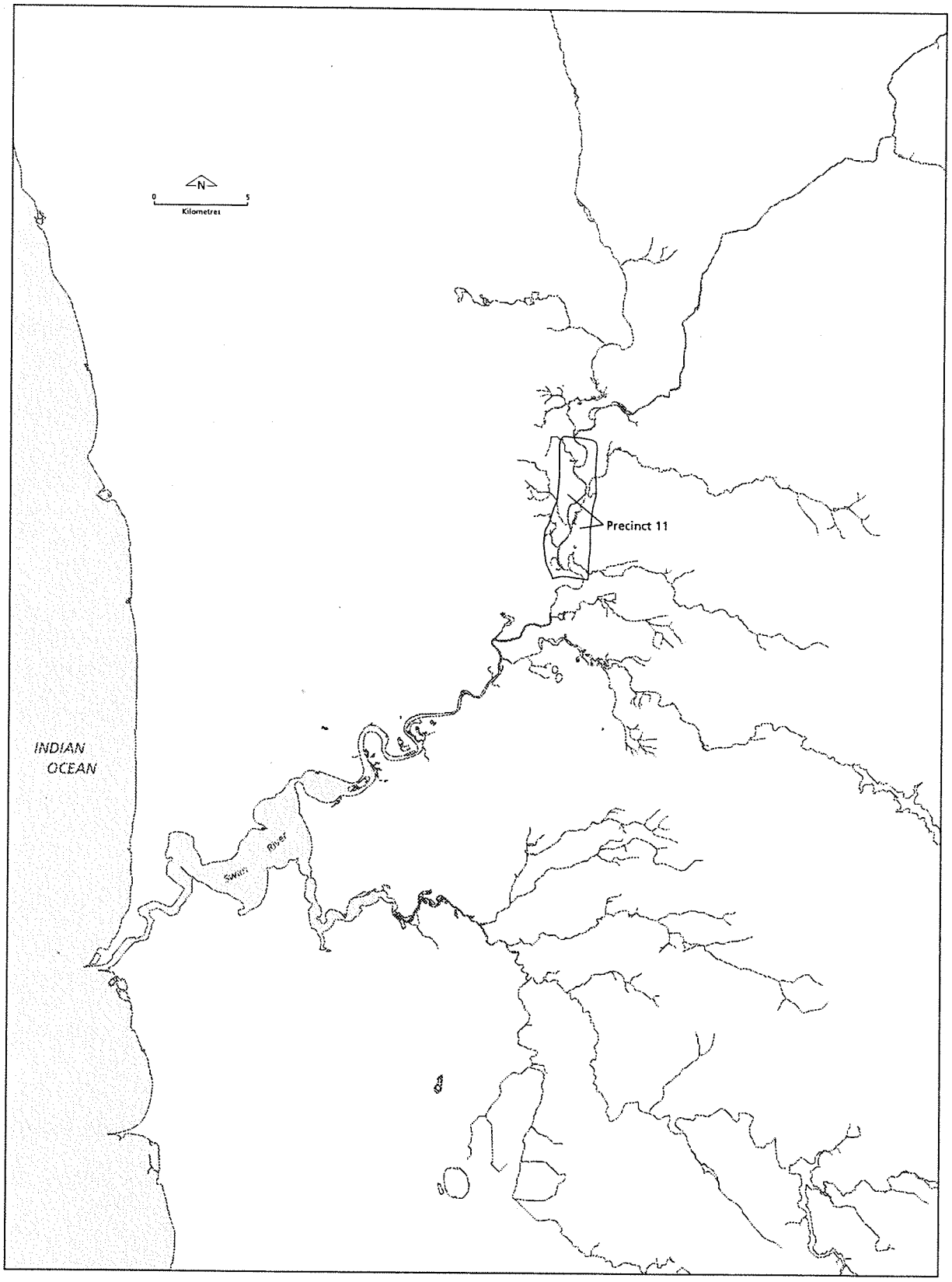
Precinct 11

Middle Swan - Middle Swan Road to Ellen Brook



Summary

Middle Swan - Middle Swan Road to Ellen Brook

The Swan River makes loose, relatively regular graceful meanders forming in places a quite steep river valley. The river channel is quite narrow until it broadens downstream from the Jane Brook confluence. As the river has remained 'untrained', the water forms an attractive irregular pathway through the often quite deep river valley. Several tributaries and smaller drainage lines enter the Swan River at this precinct. These tributaries have gouged fluvial valleys through the soft sandy plains. Small wetlands have formed in the depressions of the undulating plains.

There is a narrow strip of indigenous fringing vegetation along this section of the river. The communities are dominated by flooded gum and swamp paperbark. The river banks are lined with emergent reeds and in places where the riparian vegetation has been removed a variety of weeds have invaded the bank. There are several locations were steep unvegetated banks have eroded due to periods of high water and consequently unattractive scars are left on the river banks.

One of the most dominant landscape elements in the precinct is the vineyards. The rows of the lush green vines against the ploughed red earth provide a distinctive and attractive landscape feature. In addition, there are several historic buildings in the area which provide focal points in the viewscapes. The distribution of the residential dwellings and agricultural sheds is sparse compared to further downstream. Access to the river by the public is quite difficult due to rural land lots adjacent to most parts of the riparian area. There is a small reserve at Middle Swan and an informal path to the river channel at All Saints Church.

Biophysical Processes

Geological Processes

The Swan River flood plains and channel are classified as part of the Quaternary alluvial deposits (DCE, 1980). Adjacent to the river banks are the older Pleistocene deposits of the Guildford Formation. These deposits consist of alluvium which in this area is variably lateritised and podsolised to different extents. To the west of the channel area are the Bassendean Sands and more recent peaty sands in the swales and depressions.

The channel and banks are identified as being part of the Swan Soil Association which is terraces of red earths and duplex soils (McArthur and Bettenay, 1974). Away from the river flood plains on the western bank, is the Guildford Association which is characterised as being fluviatile deposits which form a flat plain with medium texture yellow duplex soils. Away from the river channel on the western bank is the Southern River Association which is characterised by sand plains which have been deposited by aeolian processes which have formed low dunes with some intervening swamps, iron and humus podzols, peats and clays.

Topography

The precinct is part of the Pinjarra Plain geomorphic unit which is flat to gently undulating (Seddon, 1972). The unit consists of fluviatile sediments which have been deposited from the streams which flow down from the Darling Range and as they reach the lower gradients drop their sediments. As a result, wide alluvial fans have formed at the base of the Darling Range. Around the Swan River and its tributaries, the unit has been modified by fluvial processes. The flat flood plains are contrasted by the opposite embankments being quite steep and up to 5 metres high. In many cases the flood plain is particularly broad and the edge is delineated by an embankment up to 50 metres away from the river channel.

Hydrological Processes

Water features

The Swan River is estuarine up to the Ellen Brook confluence, however tidal effects are minimal. Most of this section of the river remains unsnagged and as a consequence the river channel is subject to eddies, and past changes in channel direction are evident adjacent to Pow Street wetlands. Floodplains form flat alluvial terraces and often appear as muddy banks supporting fringing vegetation. Several small drainage lines and six larger brooks enter the Swan River at this precinct. The tributaries drain the surrounding plain forming valleys and channels which irregularly meander through the areas of lowest topography. Adjacent to Herne Street the drainage lines form several pools and small wetlands areas. Similarly, the Pow Street wetland occurs in a depression adjacent to the Swan River and a small tributary. Several small wetlands occur north of Jane Brook. Many of the tributaries and wetlands are ephemeral.

Bathymetry

Beyond Middle Swan Road, the river is very shallow with recently formed sand banks. It is likely that the sand banks have formed since colonial settlement as early settlers were able to navigate right up to the Ellen Brook confluence which is now very difficult.

Flooding

The flood line is quite broad and stretches to over a 1 km in width in this precinct and tends to be widest at the various tributary confluences.

Erosion and accretion

There is particularly severe erosion just upstream of the Jane Brook confluence, while isolated areas of erosion occur on many of the steeper banks. Unvegetated steep banks have been recently eroded during periods of high water. The landslides have formed deep scarring exposing the sandy alluvial soils of the banks.

Vegetation Communities

Native

Swan Complex

The Swan Complex edges the entire foreshore of this precinct from Middle to Upper Swan (DCE, 1980). The vegetation ranges from fringing woodland of flooded gum *(Eucalyptus rudis)* and swamp paperbark *(Melaleuca rhaphiophylla)* with localised occurrence of low open forest of sheoak *(Casuarina obesa)* and saltwater paperbark *(Melaleuca cuticularis)*. Along the

very fringe of the river the emergent shore rush *(Juncus kraussii)* and pale rush *(Juncus pallidus)* form a closed sedge land. Marsh club rush *(Bulboschoenus caldwelli)* is present in the river channel upstream of Middle Swan Bridge and depends on fresh water flushing. There is some lake club rush *(Schoenoplectus validus)* downstream of the Jane Brook confluence. Both of these communities occur as monospecific emergent stands, which normally occur in front of a fringing woodland.

The flooded gum *(Eucalyptus rudis)* - swamp paperbark *(Melaleuca rhaphiophylla)* community occurs almost continuously as a narrow ribbon along the riverbank in this precinct. Adjacent to Middle Swan Bridge, swamp sheoak *(Casuarina obesa)* is interspersed with the flooded gum and paperbark community. The understorey is generally disturbed and is dominated by exotic grasses.

Guildford Complex

The Guildford Complex occurs on the eastern side of the Swan Complex at Herne Hill and Millendon (DCE, 1980). The complex ranges from a mixture of open to tall open forest of marri *(Eucalyptus calophylla)*, wandoo *(Eucalyptus wandoo)* and jarrah *(Eucalyptus marginata)*. The understorey species include bull banksia *(Banksia grandis)*, slender banksia *(Banksia attenuata)* and firewood banksia *(Banksia menziesii)*, black gin *(Kingia australis)*, blackboy *(Xanthorrhoea preissii)*, prickly mosses *(Acacia pulchella)*, white myrtle *(Hypocalymma angustifolium)*, Swan River myrtle *(Hypocalymma robustum)*, common hovea *(Hovea trisperma)* and buttercup *(Hibbertia hypericoides)*. The disturbed understorey consists of bracken fern *(Pteridium esculentum)* and exotic grasses.

A small stand of wandoo *(Eucalyptus wandoo)* occurs north of Wandoo Creek and near Bandyup women's prison. It also occurs at the confluence of Susannah Brook and opposite the Henley book confluence at Millendon. The complex is most often disturbed and the understorey consists of grasses.

Southern River Complex

The Southern River Complex occurs adjacent to Jane and Ellen Brooks. The complex is identified as being jarrah *(Eucalyptus marginata)*, marri *(Eucalyptus calophylla)* and various banksia species. Along the various drainage lines there is a fringing woodland of flooded gum *(Eucalyptus rudis)* and swamp paperbark *(Melaleuca rhaphiphylla)* and sheoak *(Casuarina obesa)*. Remnant marri *(Eucalyptus calophylla)*, banksia *(Banksia attenuata)* and *(Banksia menziesii)* woodland communities are found on the drier areas. This understorey is open and dominated by species such as blackboy *(Xanthorrhoea preissii)* and zamia palms *(Macrozamia riedlei)* and an abundance of exotic grasses. The disturbed understorey consists of bracken fern *(Pteridium esculentum)* and exotic grasses.

Exotic

The vegetation communities in the area are particularly degraded and weed species have invaded the remnant areas. Couch *(*Cynodon dactylon)* dominates the understorey in the open woodlands, while other species such as dock *(*Rumex crispus)* and wild oats *(*Avena fatua)* are also highly prevalent. In the closed banksia woodlands, one sided oats *(*Avena barbata)* and wild oats *(*Avena fatua)* occur. Near Susannah Brook there is a major infestation of blackberry *(*Rubus sp)*. Other weeds species include watsonia *(*Watsonia bulbilifera)*, dandelions *(*Taraxacum officinale)*, dock *(*Rumex crispus)*, giant reed *(*Arundo donax)*, water couch *(*Paspalum dilatatum)* and evening primrose *(*Oenothera* sp*)*.

Historical Land Use and Resulting Environmental Changes

The earliest description of this section of the river by a European explorer of the precinct was made by Vlamingh in January 1697. He noted that 'rounding a corner we found the end of the river which divides itself into many views, that we could not proceed any more' (in Seddon, 1972). In 1801, the French explorers proceeded up to St Leonards Creek and possibly travelled on foot to Henley Brook. At the location south of St Leonards Creek they noted a lake of freshwater 'Etang d'eau douce'. On the journey Bailey wrote that the '*banks of the river appeared almost every where covered with beautiful forests, which extended a considerable way into the interior of the country*'.

PRECINCT 11

Significant Land Use Features

N

500 0 500

Metres

GNANGARA RD

RD

SWAN

Ellen Bk

WEST

Lake Yakine

Memorial Park

Baskerville Oval

Baskerville

HADDRILL RD

MEMORIAL AVE

Henley Brook

Millendon

HENLEY ST

West Swan Reserve

Henley Park

Brook

Richard Edward's House

PADBURY AVE

Brook

Saint

Mritchin

Spring Park Farm

Susannah Smither's Grave

Susannah

RIVER RD

Haddrills

HWY

Ck

Leonards

RIVER

Fawell Park

Fairlawn

NORTHERN

Swan Valley Sports Ground

GEORGE

GREAT

Wandoo RD

St Leonards

Creek

LENNARD ST

Strelley Cottage

ST

HERNE

Guildford Caravan Park

VINE ST

SWAN

Creek

SWAN

WEST

Oakover

DALE RD

Houghton Wines

Strelley Farm Buildings

Cornwall House

Swan Christian High School

COAST RD

Jane

Riverlands Montessori Primary School

POW ST

St Mary's

Swanleigh Hostel

Chaplin's Cottage

YULE AVE

Brook

Bandyup Womens Prison

Rainsworth

MIDDLE

SWAN

RD

Sweeting Bridge

Middle Swan Reserve

Middle Swan Road Bridge

Captain Stirling and his exploratory party were able to travel to the confluence of the Swan River and Ellen Brook in March 1827. They were hindered from travelling any further upstream by debris and the lack of water except for a few pools in the channel. The site of Stirling's camp is marked by All Saints Church (Bourke, 1987).

The relatively rich soils of the Middle and Upper Swan meant that the original land lots were in high demand. Several properties were established as farms which were typically used for several types of agriculture, including wheat crops, fruit and vegetables and livestock such as sheep and cattle. However by the 1840s, settlers such as Thomas Yule had established the first vines in the area which was soon to become the favoured crop. Many of the original homesteads are of historical importance and their significance is outlined below.

During the subdivision of the nineteenth century estates after World War I, southern Europeans were able to develop the land. The Swan Valley foothills were planted to vines immediately after the war when demand for the valley was created by a soldier settlement scheme and by an increase in European migrants. Many of the soldier settlers had no experience in farming and were unable to make their land viable and these properties were generally purchased by European migrants who were used to the trials of intensive horticulture. The vine plantings were quite successful, however after 1940s production declined because of generally unsuitable soils, poor drainage and disease. These settlers were responsible for changing the landscape to a open character with few trees. Small homesteads and horticultural plots dot flat to gently undulating landscape.

Clay from the river was excavated for brick manufacture by Whitemans at Middle Swan (also by the Midland Brick company) although this is no longer carried out (Shire of Swan, 1976).

Present Land Use and Social Patterns

Viticulture is the chief rural land use in the area. The mainly small family run properties produce a range of wines from bulk to premium quality.

Several blocks of land are also used for fruit and vegetable production, with citrus orchards typically occurring on the higher land. Often the vineyards also encourage tourism by selling produce direct to the public and many of the larger vineyards have cafes, restaurants and function centres. Several horse agistments occur around the lower section of the precinct.

Along Great Northern Highway and West Swan Road retail outlets, such as growers markets, farm supplies and delicatessens occur on small roadside blocks. A caravan park occurs on West Swan Road as well as a petrol station and other retail outlets.

Most of the residential dwellings are associated with a larger agricultural property. A small area of higher density housing occurs around Coast Road where a large property has been subdivided into small residential blocks. The houses are mainly modern.

Swanleigh hostel is adjacent to Jane Brook and serves as a residence for country students. The lower land is set aside for horse agistments and riding. Riverlands Montessori primary School and Swan Christian High School occur east of Jane Brook. The Primary school has a small playground while the high school is located on a large block of land which includes gardens and an oval.

Prominent essential amenities include the high power tension lines which cross the southern section of the precinct. West Swan Road has several wooden bridges which cross the tributary valleys. Similar bridges occur at Middle Swan Road. Bandyup women's prison and training centre is a modern complex on Middle Swan Road.

Recreation nodes

At Henley Brook adjacent to the West Swan Road crossing there is a grassed area enclosed by some remnant eucalypt woodland. The area provides for parking, public toilets, tennis, basket ball, and play ground equipment. A small hall is located on the Henley Street side of the reserve.

Baskerville Hall and pavilion is located on Memorial Avenue. The main hall was built in the 1950s in memory of those who served in the world wars. Several additions have been made to the hall. The

centre has a grassed oval, facilities for tennis, cricket and football, and barbecue and play equipment. It is also the site of local community events.

Fawell Park and the adjacent Swan Valley Sports Ground occur east of Great Northern Highway at Herne Hill. The area has several reticulated ovals and facilities for basketball, netball, tennis, cricket, and soccer groups. There several barbecues adjacent to the clubrooms and playground equipment.

Public access

Most of the river remains unsnagged therefore motor boats are unable to access much of the river. Most properties stretch down to the river foreshore and public access is restricted. There is restricted access down to the confluence of Ellen Brook at All Saints Church. The area is fenced and a turnstile gate allows access to a pathway.

Sites of Nyungar & Wider Australian Community Significance

Nyungar significance

The abundance of water in the area would have meant that before colonisation, the precinct would have been an important location for food resources. It was noted by Captain Stirling on his 1829 exploratory voyage that at Ellen Brook where the river ceased to be navigable, the river bank was pitted with diggings for yam (Seddon, 1972). Jane Brook is recorded as a mythological site and also is the location of three scattered camping areas (O'Conner *et al*, 1989). One recent camping area was a seasonal grape pickers' camp located south of Dale Road near the confluence with the Swan River. A second camp was placed west of the present Searle Street (previous precinct) and a third was located outside of the precinct adjacent to the crossing of Toodyay Road and Jane Brook. The third camp was used by families who earned money cutting timber for contractors suppling the Midland and Caversham brickworks early this century (Bourke, 1987).

Nyungars speak about the existence of a creative Waugal in Jane Brook. The upper reaches of the tributaries that flow from Red Hill are *Winnaitch* areas. This means that Nyungars avoid these places due to the evil influence of *wurdaatjis*. Wurdaatjiss are spirits who live in forests and assume a small human like form and are considered dangerous to humans if aroused (Quike, undated).

Other significance

The original Saint Mary's Church was a little octagonal building with rammed earth walls built by the Rev, William Mitchell in 1839-40. It was designed by Mr T.Yule and his father-in-law Dr Harris. The Reverend Mitchell had arrived in 1838 with his family and in that year completed the Guildford Church and commenced building churches in Middle and Upper Swan. The existing church was built in 1868 and consecrated in 1869. The new church was built in the shape of a cross using pressed brick and corrugated iron roof. The Gothic Revival design was by Richard Roach Jewell, the nave was extended westward and transepts were added in later years. Some of the most influential pioneers of the area are buried in the church including the Viveash family and Lucy Yule who was the first to be buried at the site in 1838.

Swanleigh Hostel in Yule Avenue, Middle Swan, was established in 1874 by Archdeacon Brown as a large orphanage for boys. The buildings were also used as an English mission for the local Aboriginal people. However the indigenous peoples were not particularly interested in the schooling or religion offered by the missionaries and it is believed that few Aboriginals were at Swanleigh. Today, the Swanleigh Hostel is used as a residence for country students who are studying at Perth high schools. There are several buildings of historical significance at Swanleigh. Brown House was built in the late 1870s, Cornwall House in the Gold rush era and Waylen House this century. The chaplain's cottage was built in the mid 1870s; there have been several additions and today it is used as a residence for one of the staff.

Middle Swan Bridge was built in 1879 which dramatically improved transport to the rapidly growing town.

The Strelley Farm buildings on Dale Road were established in 1859. There is a barn, slab shed, and workmen's cottages which were built around the 1880s.

Houghton Homestead and Winery are on Dale Road, Middle Swan. The syndicate of Thomas Yule, Vivien

PRECINCT 11

Sites of Significance

N

500 0 500

Metres

Wurerup Sites of Nyungar Significance

• Haddrills Sites of Australian Significance

RD

Gyunning

SWAN

WEST

Lake Yakine

All Saints

GNANGARA RD

Baskerville

Upper Swan *Wurerup*

Henley

Millendon

Henley Park

Brook

Site of Clearwell

Richard Edward's House

Saint

Spring Park Farm

Susannah Smither's Grave

Haddrills

Minchin

Site of Albion Town

HWY

Site of Goodwood

Ck

Leonards

Naral

Fairlawn

NORTHERN

(Boora)

GREAT

Site of Herne Hill

Wandoo

Creek

St Leonards

Strelley Cottage

RD

SWAN

Creek

Derbal

WEST

Site of Spring Mount later West Oakover

Oakover

Aboriginal Camping Area

Houghton Wines

Significant Aboriginal Area

Site of Daviot Park later Priory Park

Strelley

Jane

St Mary's Church

Swanleigh Mission

Brook

Rainsworth

MIDDLE SWAN RD

Lewis and Richard Houghton formally acquired 4000 acres of land on the Swan River on 1 November, 1837 from Revett Henry Bland. Thomas Yule came to the colony in 1830 and named the property after Houghton who never visited the colony. In 1837, Yule married Lucy Harris who died during the birth of their son the following year. She was the first to be buried in then unbuilt St Mary's Churchyard. It is believed that the vines were planted in the early years by Yule, however the main crop was wheat along with several orchards. After the death of his wife, Yule and his son lived with the Harris family at Strelley. The property was sold to Dr John Ferguson in 1859 who claimed to be the first person in the state to use anaesthetic (Battye, 1912). In 1869, local history has it that the bushranger Moondyne Joe was captured nearby while stealing wine from the vineyard. The property gradually changed to a vineyard and is now known for its wines, and the homestead (1863) is used for sales. Also present are servants quarters built around the same period. The site is a popular spot for lunches, music events and other functions.

Oakover House on Dale Road was established in 1860. The barn (1840s) and the stables (1880s) are also classified by the National Trust and included on the National Estate Register (Thurlow *et al,* 1986).

On the west bank of the Swan River at St Leonard's, Albion town was established in the 1830s. The land was originally owned by Mr Lautor who sold it to W. H. Smithers, William Haddrill, David Drig and Mr Marley. The town consisted of these families who were agricultural labourers (Carter, 1986). There is little evidence of the settlement today.

St Leonard's was constructed about 1842 in West Swan and is used as a riding school today at George Street.

Haddrill's House adjacent to West Swan Road was built by Richard Edwards in the 1830s and was owned by William Haddrill (Battye, 1912).

Susannah Smither's grave is dated at 1840 and is located on the riverbank in line with River Road. The adjacent brook was given her name (WA Tourism Commission, 1986).

Jane Brook was once known to local residents as Deep Creek.

Spring Park Farm is located adjacent to West Swan Road and was constructed in the early 1850s. The original owner James Michin was speared to death in 1837 by the indigenous people. Michin's House was constructed of rammed earth and was built in the early 1830s and has since been demolished. However the Spring Park farm buildings built in the period of 1851-1880 are still present. At the turn of the century, Michin's grandson William had several crops and various breeds of sheep on the small property (Battye, 1912).

At Henley Brook, Richard Edwards, a master brick maker, built his house in the 1850s and it is now registered with the National Trust. North of this area is Henley Park which was built in the 1880s and registered with the National Trust (Thurlow *et al,* 1986). There are several ruins including the house (1829-1850) and the stable (1851-1880).

At Ellen Brook a private bridge was built in the period 1881-1900. The Baskerville residence on Memorial Avenue was built around that time and today is still used as a private dwelling. The Baskerville property was owned by Walter Padbury and then Henry Hardwick. Hardwick produced hay for racehorses and apples. He wound down the cattle and dairy operations of the farm and turned to racehorse breeding which proved to be a successful venture.

All Saints Church and graveyard is located on the site used by Stirling as a camp in 1827 and marks the furthermost inland point reached by Stirling on this trip. The one acre of land was donated by Major Irwin and W.Mackie of the Henley Park Estate. The small mud brick church was built by Richard Edwards, a master brick maker from Gloucestershire, England. The church was opened in 1841 and many early settlers were buried in the adjacent graveyard. The Lich-gate was built in 1929 to commemorate the centenary. In 1986, a grant from the Western Australian Government allowed a cottage and cloisters to be built. In 1988, money was received to repair the graves and church. The church was recently restored and a caretaker's cottage and cloisters constructed.

Conservation Areas

Wetlands

There are several small wetlands in the area which are covered in the System 6 area.

System 6

M19 Swan River - Guildford to Walyunga National Park

The recommended area extends along the Swan River from Guildford to Walyunga National Park. The natural vegetation along much of this length of river is reduced to scattered trees along the banks, though above the Swan's confluence with Ellen Brook. The banks are relatively well wooded. Flooded gum, swamp sheoak and paperbark occur throughout the reaches of Middle and Upper Swan, in some sections saplings and seedlings are present but elsewhere animals have prevented regeneration. The land adjacent to the river is mainly used for stock while vineyards occupy most of the remainder of the valley.

Precinct Description

Waterform and natural riparian zone

The river makes loose relatively regular graceful meanders throughout the precinct. It forms a deep valley in the soft fluviatile sediments which are often scoured during periods of high water level. Consequently, small landslide gouges are noted on the steeper gradients. In many places, the braided river channel forms islands and exposed clayey banks or levees such as adjacent to the Jane Brook confluence.

At Middle Swan Bridge, the channel broadens and the surrounding landform slope is gentler than upstream. The reserve has various species of fringing reeds, some of which are emergent; others grow on the river banks and together provide subtle differences in form and colours. Often fallen trees and branches inhibit the flow and provide an obstacle for sediment to build up against. Several tributaries and smaller drainage lines enter the Swan River in this precinct. Jane Brook forms a U-shaped curve moving northwards and back southwards before confluencing with the Swan. The brook is very shallow and has very small meanders which 'snake' across the river bends. Other main tributaries are Wandoo Creek, Saint Leonards Creek, Susannah Brook, Henley Brook and Ellen Brook. These tributaries have gouged fluvial valleys through the soft sandy plains. In the case of Ellen Brook a wide flood plain occurs at West Swan Road and the narrow channel braids and meanders towards the Swan Valley passing through a quite steep hill side. The other tributaries do not form such broad flood plains, and their channel widths are narrow and irregular. The small tributaries such as Susannah Brook have a high degree of sinuosity with irregular meanders across the flat alluvial terraces. Henley Brook forms several pools in the channel adjacent to Brockman Road. There are several wetlands adjacent to Herne Street and Jane Brook. These wetlands are fringed with bulrush and other exotic grasses. The Herne Street wetland has a few juvenile paperbarks, while the Jane Brook wetlands are less disturbed and mature paperbarks and flooded gums are present.

Landform

One of the most important landscape elements in this precinct is the landform, as its gently undulating plains and deeply scoured river valley define the region's identity. In most sections of the precinct, the river user can only view the river by standing on the edge of the fluviatile valley, which is often very steep and subject to erosive processes. The land slides and fluviatile sediments create flat river bank platforms in front of the steep slopes. The flat to gently undulating surrounding landform appears a dominant feature due to the low density of the housing and the linear and low form of the vineyard land use. Any deviation from a flat surface is emphasised by the rows of vines planted in straight rows across the landform.

Vegetation

The flooded gum - swamp paperbark community occurs almost continuously as a narrow ribbon along the riverbank in this precinct. In some sections, the ribbon effect is emphasised by the fringing rushes which form a line of brushy texture along the water's edge.

On the undulating plains, the land has been clear felled except for a few small blocks for agricultural purposes. Vines, orchards and domestic gardens have replaced marri-banksia woodland. Areas which are too low lying for agricultural purposes have retained the vegetation sections.

The Middle Swan Reserve has a grassed open parkland with flooded gum and swamp sheoak. The exotic grasses are mainly mowed throughout the year and there is very little indigenous understorey. Between Middle Swan Reserve to east of Pow Street, there is a grassed open parkland with flooded gum and sheoak and exotic grasses. North of this section flooded gum and swamp paperbark form a narrow band adjacent to the foreshore with lake club rush. The wetland is an important landscape element as it provides a slightly broader belt of relatively indigenous vegetation community in an area which has sparse indigenous vegetation communities. The community is unfortunately relatively inaccessible to the river user and is visually separated by the Pow Street urban area where the trees provide a backdrop to the houses. A similar community occurs at Henley Brook and includes pale rush as an understorey.

Adjacent to Jane Brook, the area is dominated by flooded gum and swamp sheoaks, while further upstream of Jane Brook the vegetation changes to flooded gum and paperbark. Adjacent to the confluence of Wandoo Creek with the Swan River is a small stand of wandoo with a disturbed understorey.

Near Houghton Wines there is closed woodland around a small lake which consists of marri, jarrah, firewood banksia, slender banksia and sheoak. The understorey is open and dominated by species such as blackboys, zamia palms and exotic grasses. At Susannah Brook, there is a modified woodland with flooded gum and swamp paperbark which changes to marri and jarrah on higher ground. Weeds have invaded the understorey. The Herne Street wetland is surrounded by exotic grasses and bulrush and only a few small swamp paperbarks are present.

The plains have been cleared for agricultural purposes and the vegetation consists of the green rows of grape vines and the neat dark green rows of citrus fruit trees. In some areas a few remnant marri and blackboys occur on the roadside reserve.

Riparian land use

The reserve at Middle Swan Bridge is one of the few areas where the public can access the river in this precinct. The area has attractive mature wandoo and flooded gum which shade the gravel carpark and partly grassed picnic area. There are several picnic shelters and barbecues. A small concrete and stone access ramp is adjacent to the carpark, however it is at present rather poorly maintained. The loose gravel carpark is visually preferable a hard surfaced carpark, but the gravel tends to encroach onto the riparian zone which is already subject to natural erosion processes. On the southern bank of the carpark the sparsity of understorey fringing vegetation, means that during high flood periods or overuse by picnickers pressure is put on the banks. The bridge itself is a low form wooden piled structure with white bollards. Its low old form is attractive in the context of a rural environment, however the road and bridge is currently being resurfaced which is temporarily requiring earthworks.

The vineyards, horse agistments and other fields mostly extend right to the river valley. In areas where the riparian vegetation has been removed, such as adjacent Strelley vineyards, the steep embankment has been dramatically eroded and great blocks of the loamy red soil have slipped into the river channel. Adjacent to Upper Swan Bridge, the river valley has been mainly cleared of its fringing vegetation for grazing. However the actual riparian zone has some remnant vegetation.

West Swan Road crosses Saint Leonard's Creek using an attractive wooden piled bridge which stretches across the river channel. On the rise of the southern bank there is a mobile phone transmitter tower which is quite prominent in an area where most land use is below the backdrop landform.

Land use

The Swanleigh Hostel is a large well spaced complex with the original orphanage dormitories forming the central building. Many additions have been made, but most have been in keeping with the older buildings. The two storey Federation styled building is a brick and new red metal roof which is elongated and evenly proportioned. The area is lawned with a neat eclectic garden with several mature trees. On the lower lying land, fields are used for horse stables and riding areas. Adjacent to this area is a thick fringing belt of flooded gum and melaleuca of the Jane Brook and wetland areas.

Saint Mary's Church is an attractive red brick church with areas of white render. The roof is corrugated metal sheeting and the church is neatly maintained. The old gravestones and mature exotic conifers and pines, give a sense of age and time to the location. A red brick wall obscures the parking area from the church grounds and also gives a definite boundary to the area.

The Riverlands Montessori Primary School consists of several small wooden cottages with red tin roofs which are located adjacent to the Jane Brook wetlands. The school is surrounded by several mature wandoo and flooded gum and the gravel driveway is planted with eucalypts. The Swan Christian High School is a modern low formed building constructed of pale brick with a light green tin roof. The school is on the flat land adjacent to Jane Brook. The lawn in front of the school is lawn and has been planted with a variety of eucalypts. In the school ground is a high tension powerlines tower which connects with

the chain of powerlines across the precinct in a south west- north west line.

A few rows of vines edge the Great Northern Highway marking the entrance to Houghton's Winery. The main block of vines is off Dale Road and adjacent to Jane Brook. The vines form neat rows of green foliage between which evening primrose grows in the red soil. There is a large 1920 - 40s bungalow situated on the northern side of Dale Road which has an attractive cottage garden. A block of open marri-banksia woodland occurs on the rise of Dale Road and the road verge is lined with mature lemon scented gums. The northern side has cleared undulating fields with a few remnant jarrah and wandoo. Jane Brook and the associated wetland pools have a quite dense flooded gum - paperbark community. Unfortunately, much of the understorey is grasses and watsonia, giving the area the characteristics of wooded pasture. The water bodies themselves are attractive features in the landform depressions and the Darling Range acts as an attractive backdrop.

The main Houghton homestead is an attractive well proportioned Victorian brick and slate building. The building is an excellent example of the unadorned classical homesteads which were quite popular in the Victorian period and although it may be said that this style is reminiscent of the simplicity of the older Georgian styles, in such isolated areas as the Swan Valley simplicity was a necessity due to the lack of resources and supplies rather than a conscious style. The main homestead still retains the large kitchen, meat room, hay loft and stables, although sensitive modifications have been made for the more recent uses of wine sales and function centres. The court yard is filled with mature exotic trees such as Cape lilac and jacarandas, and the area is grassed. The Swan River can only be accessed by crossing the private property.

The other vineyards in the area create a distinctive landscape. The vines form attractive rows of lush green foliage contrasting with the red coloured soil. The vine struts vary in style and are a mixture of wooden and metal supports. The residences are normally located adjacent to the road rather than in the centre of the vineyard. Many of the houses have a distinctive Mediterranean style reflective of their owners ethnicity. Brick arches and tiled porches are quite characteristic of houses built by some of the viticulturists of southern European origin. Other house styles include older corrugated iron cottages to more recent modern styles which are typical suburban houses with a front garden. Most of the houses are associated with the surrounding rural land uses and few properties are simply residential. Other features on the landform include the many sheds and machinery which is necessary for rural land uses.

The Herne Street wetland is surrounded down to the high water line by vines and paddocks. The wetland has some bulrush and grasses fringing the water's edge and the dark form of the Darling Ranges in the background makes an attractive backdrop. Other land uses aside from vineyards are market gardening and citrus orchards. Several horse agistments also occur on the undulating plains, for example an agistment on Padbury Road is located in an area of low topography adjacent to a relatively wide section of native river vegetation. Other small enterprises include pottery and on the eastern side of Great Northern Highway there are several retail outlets such as delicatessens, and rural land uses.

Memorial Avenue is one location in this precinct where the river channel can be viewed from the road. The fringing vegetation is mainly cleared and the nature of the more gently sloped landform allows river channel glimpses. The Baskerville Memorial Hall was built in the mid 1950s and is a red brick building with a corrugated metal roof. Several additions have been to the original building and a new carpark has been constructed. A playing field and hard courts are adjacent to the road.

All Saints Chuch is located on a hill in front of the confluence of Ellen Brook with the Swan River. The church is a modest rectangular brick building with a small porch and sanctuary and a recently tiled roof which appears like shingles. A small bell tower is located on the end of the gabled roof. A new cottage and cloisters been built adjacent to the churchyard and are complementary to the church building. The gardens and grave sites are neatly maintained, with annual and perennial exotic flowers. Recently, several conifers and exotic trees have been removed from

around the church and new brick pathways constructed around the garden. There are several wooden benches which have been placed overlooking the Swan River valley. Unfortunately, on the adjacent southern block there is a new Federation styled house which is within the viewscape of the church and river. Consequently, the church and the hill side are no longer isolated and it may be useful to screen the new house from the churchyard.

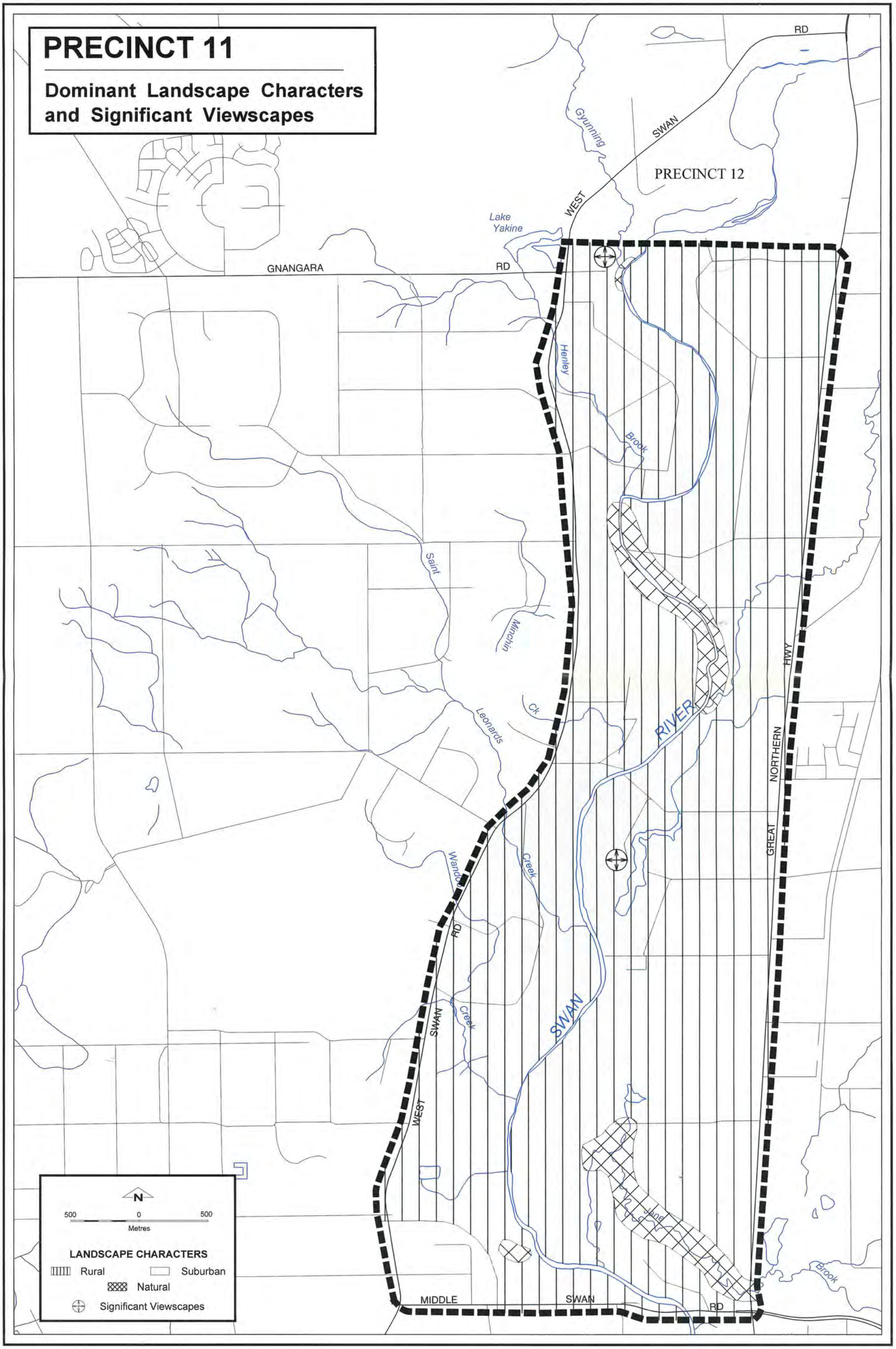
The western side of the precinct is similarly dominated by viticulture, however several other rural land uses in the area include horse agistments, flower cultivation and small fields for livestock. Most of the houses associated with these land uses are located adjacent to the road rather than in the centre of the properties, and they range in style and age. Many of the vineyards have a small restaurant or tasting area for wine sales attached to the sheds or the homestead.

There is a higher density of houses between Coast Road and Middle Swan Road. These homes are within a recent subdivision, where most often the houses have been built from the 1980s onwards although there are several older buildings. All are typical suburban houses and gardens. Adjacent to Pow Street a wetland forms a backdrop of flooded gum and melaleuca.

The Bandyup women's prison consists of several neat low formed buildings surrounded by several cyclone fences topped with coiled wire and other security features.

PRECINCT 11

Dominant Landscape Characters and Significant Viewscapes



Dominant Landscape Character

The original landscape would have been gently undulating alluvial terraces dominated by melaleuca and sedges. Away from the immediate Swan River, the undulating paleodunes and eucalyptus woodlands would have dominated the landscape. Today, although much of the original vegetation community has been cleared, the landform remains as a dominant element in the precinct's landscape.

The dominant landscape character for the precinct is a rural landscape. The vineyards are the major land use in the area. Each winery has a residence and sheds clustered together giving the low density spacing of buildings which is typical of a rural landscape. Many of the residences have small orchards and vegetable gardens.

Most of the immediate river floodplain has been cleared of native vegetation and its place grasses and weeds flourish. However there are narrow belts of eucalyptus woodland and melaleuca. These very limited vegetation communities are important natural landscape elements in a precinct which has been dominated by rural use since the early days of the Swan River Colony.

Significant Viewscapes

There are several attractive views in this precinct. At All Saints Church, there is an attractive panoramic view of the old church, the fringing vegetation, the meander of the Swan River and the vineyards. At the south side of the church, a new house has been built in the viewscape. Although the house has been built in a Federation style, it appears to be too new and the lack of established garden detracts from a landscape with several historic elements.

Adjacent to the Herne Street wetlands, there is a panoramic viewscape. The view includes the fringing vegetation of the Swan River, the vineyards, the wetlands and a backdrop of the Darling Range. There are many similar attractive viewscapes of the rural landscape from the river foreshore in this precinct.

Conforming and Non Conforming Elements in the Landscape

There are several historic elements in this precincts landscape. The buildings are generally not visible on a wide viewscape, however they have historic significance and several are attractive as immediate viewscapes. Consideration of how these elements should be retained in the landscape may need to be undertaken.

The new house adjacent to All Saints has elements of the Federation style which helps link the house to a landscape which has many historic elements. However the house could be screened out of the viewscape of the river by additional planting on the southern side of the church to help maintain the unique viewscape.

The vineyards and other rural land uses such as horse agistments are an important element in the rural landscape. There is a need to examine whether subdivisions will affect the rural amenity and whether the rural landscape is an important landscape element.

Recommendations for Maintenance and Enhancement of the Present Landscape Character

- Retain indigenous and encourage planting of fringing vegetation along the stream lines and river to improve amenity and improve the ecological environment.
- Ensure that historic buildings and elements are retained and are not compromised by new developments and building styles.
- Consider the value of the rural landscape. If the rural character is considered to be a defining and important feature to this section of the Swan River then ensure that the rural elements are maintained.

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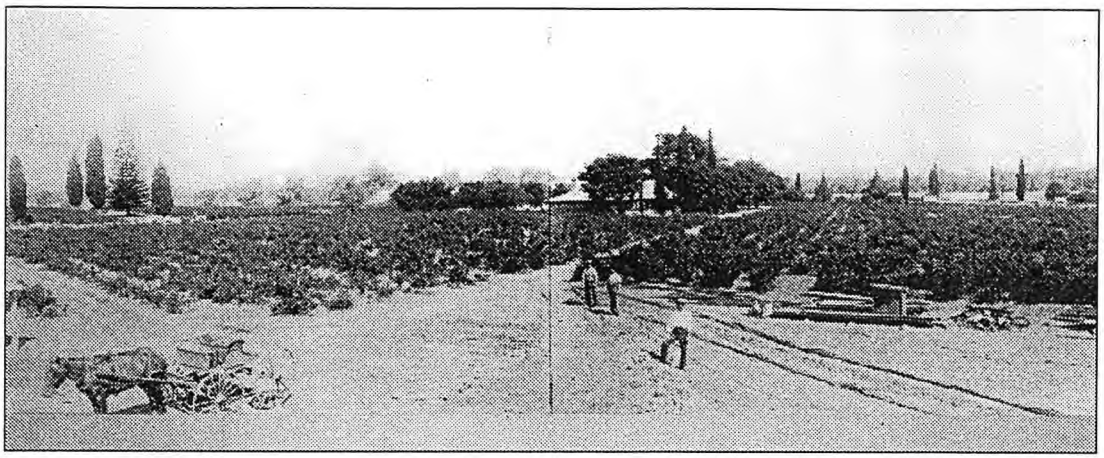
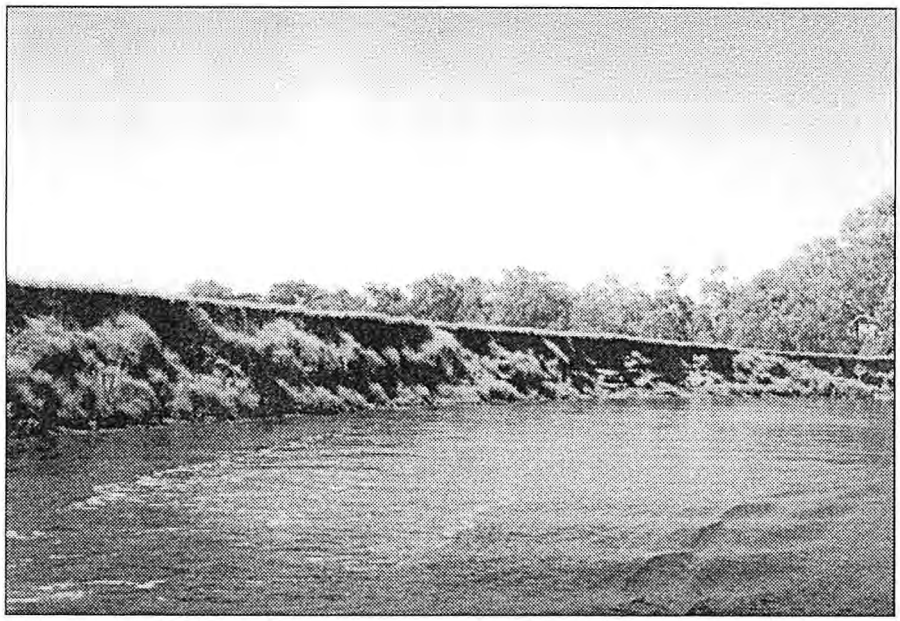


Houghton's Vineyard. 1897.

Battye Library 28398P.



Near Wandoo Creek, Middle Swan. 1995.

Swan River Trust.

Ellens Brook, Middle Swan. 1995.

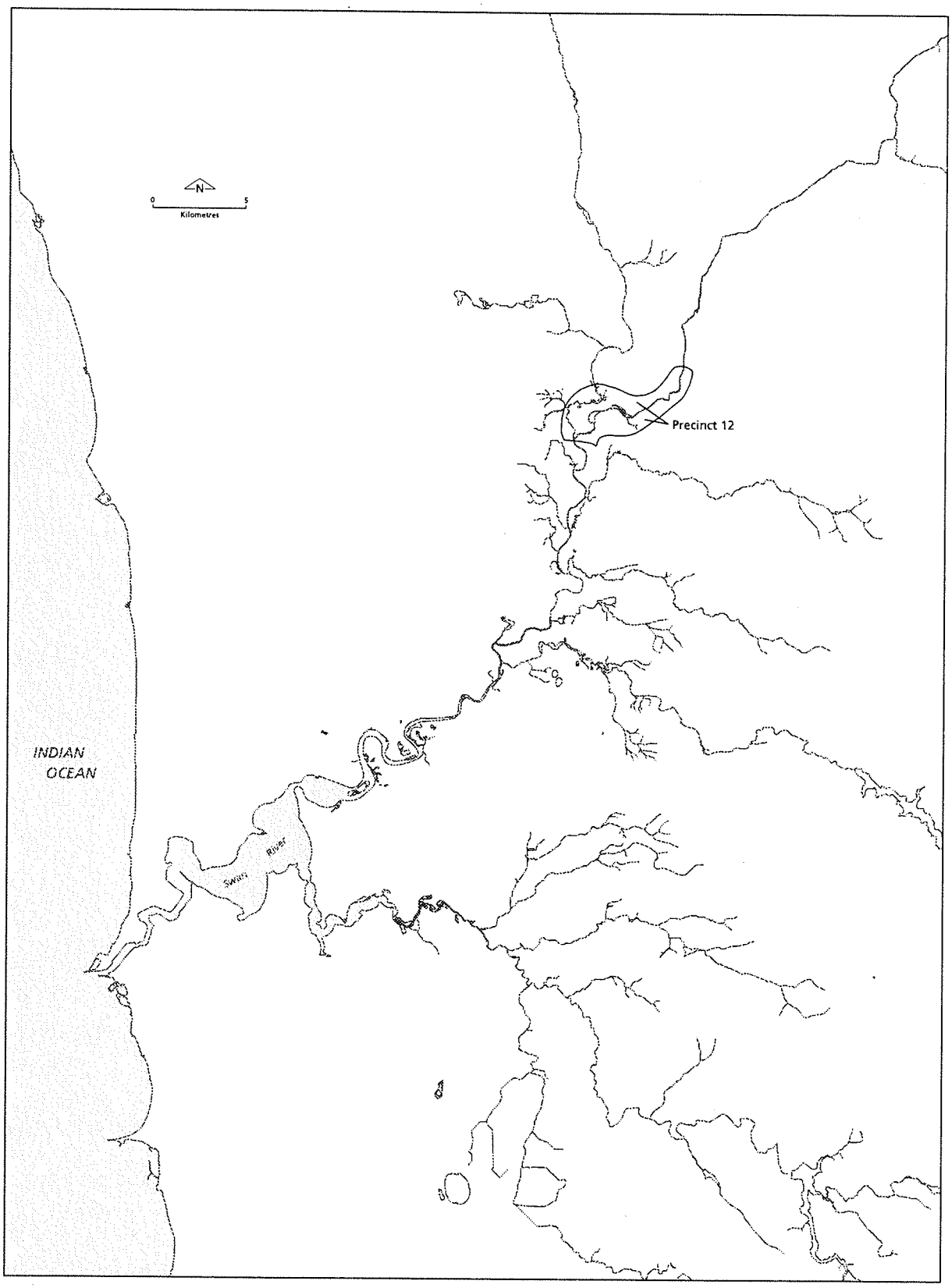
Swan River Trust.

Confluence of Swan River and Ellens Brook. 1995.

Swan River Trust.

Precinct 12

Middle Swan - Ellen Brook to Bells Rapids



Summary

Middle Swan - Ellen Brook to Bells Rapids

The Swan River braids twice into two channels forming silty islands between the Ellen Brook confluence and Upper Swan Bridge. The river meanders in a irregular pattern and has several tributaries and backwaters joining the main channel. The section of river upstream from the Upper Swan Bridge is particularly attractive, as it is untrained and therefore 'natural' in appearance.

Silty banks form against fallen trees and on meander bends, while in several places bank erosion is quite serious. Further upstream at Bells Rapids, the Swan River becomes a series of pools and rapids. Here the water flows over granite outcrops, which have become smooth and polished with continual action. Adjacent to the main river channel the flood plain is made up of coarse river sand and pebbles.

The downstream section of the precinct is a flat alluvial plain which was originally cleared for agricultural purposes. Behind this the landscape becomes more steeply sloping being the alluvial fans in front of the steeply sloping Darling Range. Mount Mambup has a spectacular sloping face which provides a very attractive river valley. There are several rocky outcrops on the steep Darling Range which provide a textual and colour contrast to the flat grassy hills and dot like shrubs.

At Ellen Brook, modified open woodland occurs along the river channel consisting of paperbark, sheoak and flooded gum. Away from the river channel, remnant marri, banksia, and jarrah trees occur as isolated specimens adjacent to pasture, orchards and vineyards. At Bells Rapids, the vegetation communities are less disturbed with a number of different communities occurring. The most extensive vegetation unit in the area is the prickly dryandra and the road side teatrees.

Several river crossings in the form of road, rail and pedestrian bridges occur at this precinct. The main land uses the downstream section of the precinct viticulture and horticulture. Upstream there is a low density rural housing area at Brigadoon. Several horse studs and agistments occur on the lower slopes of the area. Bells Rapids is a recreation reserve which has a gravel road, informal parking areas and no amenities. On the middle slope of the range a railway crosses the Darling Range.

Biophysical Processes

Geological Processes

The precinct has many different geological units in the area. Metamorphic belts from the Acadian period include Chittering schists which are surrounded by granite coarse grained and igneous rocks of Archaean period (DCE, 1980). Chittering Metamorphic Belt has rocks with a regional strike to the north and steep dips to the east or west. They consist of aluminous schist which alternate with various gneisses. The gneisses are most probably metamorphosed sediments which consist of feldspars, biotite and quartz. The geology of the Bells Rapids Park is dominated by granitic and gneissic rocks which outcrop on the steep slopes above the river. Quartz-rich dolerite dykes intrude the granite in places. Clayey soils partially fill the base of the valley and make up river banks. Generally, slopes are covered by shallow soils (Shire of Swan, 1988).

Swan alluvial terraces with red earths and duplex soils are evident along the Swan River channel (McArthur and Bettenay, 1974). The Helena Soil Association which is found in the very deeply incised valleys of the Darling Scarp is characterised as being shallow red or yellow earths. Forrestfield Soil Association is characterised as being the laterite foothills of the Darling Scarp dominated by gravelly and sandy soils of the Ridge Hill Shelf geological unit.

Topography

The Ridge Hill Shelf laterite foothills of the Darling Scarp are dominated by gravelly and sandy soil which grade into the flat Pinjarra Plain. Behind is the steeply sloping Darling Scarp where the hills are relatively topographically high. Against the skyline the Darling Scarp appears as a horizontal line of hills with small depressions where the valleys form.

The Bells Rapid area is situated in a valley which has been cut by the erosive action of the Swan River as it made its way through the edge of the Darling Scarp. Slopes on the northern side are steep, up to thirty degrees. Sediments carried down by the river have been deposited during high waters to produce flood plains which extend down to the coastal plain below (Shire of Swan, 1988). The hills are dotted with rocky outcrops which, due to the sparse low form of the vegetation are very prominent rises on the relatively smooth slopes.

Hydrological Processes

Water features

The Swan River braids into two channels upstream of Ellen Brook, the main channel being the northern section. The island created is quite steep and muddy and supports reeds and melaleucas. Downstream of the Upper Swan Bridge, the river again bifurcates into two channels, with the northern route being the main channel. The island created is substantial in size and the channels are evidence of a constantly changing river route. Several tributaries enter the Swan River at this precinct, with drainage lines following the landform. At the base of Mount Mambup the river channel flows over rocky outcrops creating rapids as the water flow is disturbed by the irregular surfaces. The river channels have well sorted sediments with the flood plains having sections of coarse river sand adjacent to sections of small pebbles.

Bathymetry

The river channel is particularly shallow with the river channel only reaching a maximum depth of approximately one metre. The channel, although wider than it is deep is relatively narrow being in places less than 20 metres across. The channel has not been 'trained' and therefore is irregular in shape and depth.

Flooding

This section of the Swan River is subject to seasonal flooding, particularly in the lower lying sections of the river around the Pinjarra Plain. The upstream sections of the precinct have steep channel gradients and flooding is more often restricted to the wider flatter sections of the river where the flood plain can form unrestricted by rocky outcrops. Backwaters and evidence of flooding are present adjacent to the Upper Swan Railway Bridge.

Erosion and accretion

Erosion is evident in areas where the riparian vegetation has been removed such as on the northern channel of the Swan River adjacent to the Upper Swan Bridge. Scouring of the banks occurs during periods of high water levels. Adjacent to the Upper Swan Railway Bridge there is evidence of erosion caused by flooding and lack of understorey. Backwaters which are seasonally wet have been gouged in the soft alluvial sediments.

Vegetation Communities

Native

Swan Complex

The Swan Complex edges only a small section between the Upper Swan Bridge and the Upper Swan Railway Bridge (DCE, 1980). The vegetation ranges from fringing woodland of flooded gum *(Eucalyptus rudis)* and swamp paperbark *(Melaleuca rhaphiophylla)* with localised occurrence of low open forest of sheoak *(Casuarina obesa)* and saltwater paperbark *(Melaleuca cuticularis)*. Along the very fringe of the river the emergent shore rush *(Juncus kraussii)* and pale rush *(Juncus pallidus)* form a closed sedge land. The shore rush *(Juncus* sp*)*, the native bulrush *(Typha domingensis)* and marsh club rush *(Bolboschoenus caldwellii)* are found in the emergent zone of this section of the Swan River. Occasional stands of lake club rush *(Schoenoplectus validus)* occur just north of the Ellen Brook confluence. Unfortunately, much of the riparian vegetation has been invaded by exotic grasses and other weeds.

Guildford Complex

Along Great Northern Highway, the original community would have been the Guildford Complex. It occurs on drier soils than the flooded gum communities. The complex ranges from a mixture of open to tall open forest of marri *(Eucalyptus calophylla)*, wandoo *(Eucalyptus wandoo)* and jarrah *(Eucalyptus marginata)*. The understorey species include, bull banksia *(Banksia grandis)*, slender banksia *(Banksia attenuata)* and firewood banksia *(Banksia menziesii)*, black gin *(Kingia australis)*, blackboy *(Xanthorrhoea preissii)*, prickly moses *(Acacia pulchella)*, white myrtle *(Hypocalymma angustifolium)*, Swan River myrtle *(Hypocalymma robustum)*, common hovea *(Hovea trisperma)* and buttercup *(Hibbertia hypericoides)*.

Forrestfield Complex

On the Ridge Hill Slope geomorphic unit, the vegetation changes to the Forrestfield Complex. The vegetation ranges from open forest of marri *(Eucalyptus calophylla)*, wandoo *(Eucalyptus wandoo)* and jarrah *(Eucalyptus marginata)*, to an open forest of jarrah, marri and sheoak *(Allocasuarina fraseriana)*, and various banksia species. Understorey species include bull banksia *(Banksia grandis)*, woody pear *(Xylomelum occidentale)*, parrot bush *(Dryandra sessilis)*, zamia palm *(Macrozamia riedlei)*, and blackboy *(Xanthorrhoea preissii)*.

Helena Complex

The Helena Complex occurs along river floodplains and other relatively moist areas. The vegetation ranges from a mixture of open forest of jarrah *(Eucalyptus marginata)*, marri *(Eucalyptus calophylla)* and wandoo *(Eucalyptus wandoo)* through to health and herblands.

Dominant species include jug flower *(Adenanthos barbigerus)*, variable leafed hakea *(Haekea varia)*, currant bush *(Leptomeria cunninghamii)*, beard heath *(Leucopogon capitellatus)*, hairy flag *(Patersonia rudis)*, and common pin heath (*Styphelia tenuiflora)*.

There is a heath dominated by graceful honeymyrtle *(Melaleuca radula)* at the southern bank of the Bells Rapids footbridge. The plant community also has road side teatree *(Leptospermum erubescens)*, a small dryandra *(Dryandra fraseri)* and prickly dryandra *(Dryandra armata)*. Wandoo *(Eucalyptus wandoo)* is often found scattered at low densities in the heath community.

On the slopes of Mount Mambup there is an abundance of prickly dryandra *(Dryandra armata)* and road side teatree *(Leptospermum erubescens)* which are both shrub forms. Most areas have been degraded only having up to 50 % cover remaining (Shire of Swan, 1988). At the base of the slope, flooded gum *(Eucalyptus rudis)* and wandoo *(Eucalyptus wandoo)* are also found among the dryandra and teatree communities. In addition, along the drainage lines marri *(Eucalyptus calophylla)* is present. There are small areas along the south side of the river at Bells Rapids supporting leafless wattle *(Acacia restiacea)*.

The swamp paperbark *(Melaleuca rhaphiophylla)*, mohan *(Melaleuca viminea)* and the lesser bottlebrush *(Callistemon phoeniceus)* form open shrubland on the lower slopes of Mount Mambup and the rocky bed of the river at Bells Rapids. The mohan forms an attractive neat round shrub with dull grey green foliage. The swamp paperbark has a less dense canopy and a larger taller trunk which is often branched. The lesser bottlebrush forms an attractive round dense blue grey bush along the river's edge.

Darling Scarp Complex

The vegetation which occurs on the steep slopes of the Darling Scarp ranges from low open woodland to

PRECINCT 12

Significant Land Use Features

N

500 0 500

Metres

APPLE ST

COONDAREE PDE

railway

STATION ST

ORCHARD ST

ORCHARD ST

WANN CT

PDE

ALMERIA

HALLATT GNS

Bristile

Coondaree Swamp

UPPER SWAN

Mount Mambup

COPLEY RD

Vines Country Club

Pits

Quarry

footbridge

Bells Rapids

water tank

railway

Brook

RD

Pullman Park

HWY

Upper Swan Railway Bridge

Balcolma Quarter Horse Stud

BRIGADOON

Nolan's House

Belvoir

Upper Swan Primary School

State Equestrian Centre

Helipad

Holstein Rd Wetland

Ellen

SWAN

BELHUS

NORTHERN

Dam

BASKERVILLE

Belvoir Valley Amphitheatre

WEST

River

railway

Lake Yakine

AMIENS CR

Baskerville Oval

MEMORIAL AVE

Swan

railway

GNANGARA RD

Henley

GREAT

MEMORIAL AVE

Brook

lichens according to the depth of the soil (DCE, 1980). Woodland components are chiefly wandoo *(Eucalyptus wandoo)*, Darling Range ghost gum *(Eucalyptus laeliae)* and marri *(Eucalyptus calophylla)*. Other plant species which can be found at these sites are rock sheoak *(Allocasuarina huegeliana)*, pincushion *(Borya nitida)*, marble hakea *(Hakea incrassata)*, narrow fruit hakea *(Hakea stenocarpa)*, fuchsia grevillea *(Grevillea bipinnatifida)*, goodenia *(Goodenia fasciculata)*, and spindly grevillea *(Grevillea endlicheriana)*.

Murray and Bindoon Complex

The Murray and Bindoon Complex is represented at the Upper Swan valley floors. The vegetation type ranges from open forest jarrah *(Eucalyptus marginata)*, and marri *(Eucalyptus calophylla)* with some Swan River blackbutt *(Eucalyptus patens)* to low open forest of flooded gum *(Eucalyptus rudis)* to swamp paperbark *(Melaleuca rhaphilophylla)* on the valley floors. Other plants include hairy gland flower *(Adenanthos barbigerus)*, honey bush *(Hakea lissocarpha)*, sword sedge *(Lepidospermum angustatum)* and common pin head *(Styphelia tenuiflora)*.

Exotic

Weeds include buffalo grass *(*Stenotaphrum secundatum)*, one sided oats *(*Avena barbata)*, blowfly grass *(*Brixa minor)*, dock *(*Rumex crispus)*, sedges nutgrass *(*Cyperus* sp*)*, fennel *(*Foeniculum vulgare)*, couch *(*Cynodon dactylon)*, salt water couch *(*Paspalum vaginatum)* and dense stands of Sodom's apple *(*Solanum sodomeum)*.

Historical Land Use and Resulting Environmental Changes

The land north of the confluence of the Swan River and Ellen Brook was explored on foot by Captain Stirling and his party in March 1827. Unable to go any further upstream due to debris and a lack of water in the stream, Stirling recorded that they found a large freshwater lake which is believed to have been Coondaree Swamp and a freshwater lagoon which is believed to have been the lower part of Ellens Brook.

A prominent land holder of the early settlement was Peter Broun who sailed with Stirling on the Parmelia with his family and three servants. He took up a portion of rich alluvial land at the Upper Swan which he designated Coulston after the family home in Scotland. The other land was at East Perth Power House and Perth and Fremantle town lots (Carter, 1986).

The Bells Rapids area was once part of Millendon Station, which was a property used for the agistment of sheep for sale in Perth and live export. A bridge was constructed over the river at Bells Rapids to move animals from one side to the other. The original bridge has since been demolished and pedestrian footbridge replaced it (Shire of Swan, 1988).

In relatively recent times, Bells Rapids and surrounding areas were fertilised and seeded from the air to promote the growth of fodder crops. Pastures sown included a wide variety of clovers and grasses. Intense grazing together with frequent fires have destroyed the indigenous vegetation.

Ownership of the Bells Rapids station moved to the Bond Corporation who subdivided it into rural and residential lots in 1984. A condition of subdivision was that the foreshore area of Bells Rapids be transferred to the Shire of Swan freehold.

Present Land Use and Social Patterns

The Belvoir Amphitheatre is located adjacent to the Swan River. It is open to the public for performances only. Adjacent is Belvoir homestead which was established as a grazing property at the turn of the century. Similarly, adjacent to the Upper Swan Bridge is Nolan's House which was also an early agricultural property.

Upstream of Belvoir and around Nolan Avenue, viticulture and fruit growing are the dominant land uses.

Midland Brick Company has areas around Apple Street, Upper Swan, which were used to excavate clay. Prior to these purposes most of these sites were cleared of native vegetation and developed for pasture. Some of the recent excavations have been subject to environmental conditions as the area is the habitat of the extremely rare and endangered western swamp tortoise *(Pseudemydura umbina)* (EPA, 1991 & 1992). The sites are adjacent to the Ellen Brook Nature Reserve and are outside the study area.

Upper Swan Primary School is located on the eastern side of Great Northern Highway.

Brigadoon is a special rural subdivision which has allowed several new homesteads to be built on what was once pastured land. The homesteads commonly are associated with one or two fields used for horse agistments or low intensity grazing. The homesteads' mainly new large buildings and the gardens are immature.

The State Equestrian Centre is located on Cathedral Avenue at Brigadoon. The site has several fields and a helipad.

At present Bells Rapids is used as a recreation reserve which caters for picnics and passive recreation, although there are no barbecues or toilets in the area.

Recreation nodes

Pullman Park is on the northern bank adjacent to the Upper Swan railway crossing. It is presently inaccessible to the public due to road maintenance. It supports remnant flooded gum vegetation.

Bells Rapids Park is an area of Public Open Space and is one of the Swan River's larger rapids. The area is considered to be of high conservation and recreational value. The Rapids are the last great obstacle of the Avon Descent. The main drop is though a shoot in the centre of the river followed by several small shoots. The several trees in the river are considered easy obstacles in the river.

Public access

Access to Bells Rapids National Park is along a gravel road. There are several pedestrian and horse trails near the State Equestrian Centre. Belvoir Valley Amphitheatre is only open to the public on special occasions.

Sites of Nyungar & Wider Australian Community Significance

Nyungar significance

It is likely that the area around Bells Rapids would have been an ideal camping area for Nyungars because of the presence of food and water. The Swan River in this area has been used by Nyungars as a main thoroughfare from the scarp to the coastal plain.

Other significance

Ellen Brook Reserve and Twin Swamps reserve are on the National Estate Register. These sites are outside the precinct study area.

Behlus Upper Swan was granted to G. Leake in 1829 and leased by William Cruse until 1865. It was purchased by the Barrett Leonard family in 1897. Millendon was established in 1879. Nolan House on Great Northern Highway was established 1870. The original Upper Swan Bridge site was built in 1851 and was one of the first public works carried out by convicts.

Belvoir at Millendon has a house built in 1879 which is now used as a private residence. Farm buildings originate from 1851-1880 and two labourers cottages from the same period.

Conservation Areas

System 6

M17 Ellen Brook and Twin Swamps Wildlife Sanctuaries, Upper Swan

The recommended areas are situated about 4 and 7 km north of Upper Swan and are for the preservation of fauna such as the short necked tortoise, *(Pseudemydura umbina)*, both areas are vested in the WA Wildlife Authority. The adjacent area has a major clay deposit. Clay extraction, in combination with ground water extraction, natural rainfall variations and changes in land use on adjoining land, may lower water levels in the swamps and thus adversely affect the breeding habitat of the tortoises. The reserves also have high conservation value since they are particularly high in aquatic plants and contain a number of rare plants and a variety of invertebrates and fish. It is recommended that a protective buffer area be sought through planning procedures.

M19 Swan River - Guildford to Walyunga National Park

The recommended area extends along the Swan River from Guildford to Walyunga National Park. The natural vegetation along much of this length of river is reduced to scattered trees along the banks, though above the Swan's confluence with Ellen Brook. the banks are relatively well wooded. Flooded gum, swamp sheoak and paperbark occur throughout the reaches of Middle and Upper Swan, in some sections saplings and seedlings are present but elsewhere animals have prevented regeneration. The land adjacent to the river is mainly used for stock while vineyards occupy most of the remainder of the valley.

PRECINCT 12

Sites of Significance

N

500 0 500

Metres

Camping Area Sites of Nyungar Significance

• Belvoir Sites of Australian Significance

APPLE ST

COONDAREE PDE

STATION ST

ORCHARD ST

ORCHARD ST

WANN CT

PDE

ALMERIA

HALLATT GNS

Site of Ellen's Brook later Woburn Park

COPLEY RD

Site of Ellen's Brook later Belhus

Bells Rapids

Aboriginal Camping Area

Site of Coulston

Site of Middleton Station

Derbal Naral

RD

Archaeological Site

Nolan's House

• Belvoir

HWY

Gynning

SWAN

BURGESS CR

WEST

NORTHERN

Site of Baskerville

AMIENS CR

MEMORIAL AVE

GNANGARA RD

MEMORIAL AVE

GREAT

Precinct Description

Waterform and natural riparian zone

Adjacent to Belvoir Valley Amphitheatre, the Swan River braids into two channels forming a central island. This pattern is repeated just before Upper Swan Bridge. The two channels are narrow and silty flood deposited levees form the banks. The islands banks are steep and reach a height of around five metres which is well above the height of the silty levees. The river takes a more east-westerly direction upstream of Upper Swan Bridge to Bells Rapids. The river meanders in an irregular pattern and has several tributaries and backwaters joining the main channel.

The section of river upstream from the Upper Swan Railway Bridge is particularly attractive as it is untrained and therefore 'natural' in appearance. There are several dead trees and branches fallen in the channel. The irregular and meandering channel is shallow compared to its width. Silty banks are formed against fallen obstacles and on meander bends, while areas of erosion are quite evident in several places. The banks are lumpy and the winter floods have gouged the flood plains. Several backwaters are present. During the summer months these dry into muddy basins. Exotic grasses such as kikuyu and couch are present and replace the fringing reeds which only occur in small nodes. In places, the paperbarks overhang the water creating an aesthetically pleasing riparian vegetation. At Holstein Close, Brigadoon, there is a small wetland which has had most of its fringing vegetation removed although the steep retaining banks have some remnant wandoo and marri woodland. Adjacent to the State Equestrian Centre the channel becomes relatively straight although its width is quite irregular.

Further upstream at Bells Rapids, the Swan River becomes a series of pools and rapids. The water flows over granite outcrops which have become smooth and polished with continual action. There are numerous fallen trees, logs and other debris in the channel which also create obstacles to the water flow. The granite rocks during the periods of low water show distinct bands of mud and different shades of colour. The rocks range in size from large platforms to small rocks which provide a textural contrast between the larger flatter boulders. The several rapids are not only visually pleasing but are one of the few spots along the river where the sound of the water rushing over the rocks is one of the dominant noises to the river user. Due to the meandering and the rock forms, the viewer can only see sections of the river which leads to an experience of expectation. There are several melaleuca trees which are emergent from the edge of the channel. The paper like bark becomes darkened when wet and provides a complementary texture to the rocks. There are several sand banks in the river which during low flow periods form exposed tapered banks of sediment. The floodplain has many textures which range from fine silts, to coarse grains and small smooth polished pebbles. These floodplain sediments are typically well sorted so the viewer is presented with ribbons of dark shiny pebbles contrasted with patches of dull light coloured sand.

Landform

This precinct has a range of landforms. At the downstream section, the flat alluvial plains are an important landscape element. The flat gradient is emphasised by the hilly backdrop of the Darling Range. In contrast, the immediate river channel area is a river valley which has been gouged into the soft alluvial sediments. Often the valley has a steep face where landslides are quite regular due to the lack of fringing vegetation. Adjacent to the railway bridge, one of the most salient features of the river area is the cleared ploughed fields. The ploughed areas have been levelled to flat expanses of orange soil which contrast with the edges of green grass and riparian vegetation. The flatness is the dominant landscape feature in the area and due to the lack of trees is the most conspicuous to the river viewer.

Mount Mambup on the north side of Bells Rapids reaches a height of 220 m ADH. The spectacular steeply sloping face adjacent to Bells Rapids reaches a 90 metres AHD and provides an attractive and unique landform to the river. The hill encloses the viewscape and its valley focuses the viewscape on the river channel and rapids. There are several boulder outcrops on the steep slope which provide a contrasting texture to the grassy hills and the dot-like shrubs. The hills have depressions and valleys which provide an irregular skyline and are important for increasing a sense of depth and scale which is not

common along most stretches of the river, where the landform is generally much flatter and depth plays a less important role in the riparian precinct.

In areas where roads and pathways have been constructed a variety of rocks and soils have been exposed. The differing textures and colours of granites and schists make an attractive landscape element.

Vegetation

At Ellen Brook, modified open woodland occurs which has paperbark, flooded gum and sheoak. The understorey is mainly exotic weeds, however along the river edge pale rush and lake club rush occur in isolated patches. North of the Ellen Brook confluence, marsh club rush is abundant. The Darling Range acts as a backdrop to the flat alluvial fans which are cleared for pasture and which give an effect of a pastured woodland idealised by English landscape gardeners. At the Swan River, the narrowness of riparian vegetation emphasises the interesting layering of vegetation. The small brushy melaleucas creating an often dense lower layer above which rise the loosely branched flooded gums.

Around Nolan Road, most of the indigenous vegetation has been cleared for agriculture, however the green vines and often well established residential gardens provide a predominantly light bright green vegetation cover. This contrasts with the backdrop of dark eucalypt green and soft cream of the cleared areas of the Darling Range. Along the river, the riparian vegetation is attractive with the continuing flooded gum and paperbark community providing a soft dark green belt of foliage. The rough pealing bark of both trees adds to the 'naturalness' of the vegetation and emphasises the flood debris that is found along the channel.

At the State Equestrian Centre, there is predominantly shore rush and native bulrush. The lake club rush also occurs along with an abundance of exotic weed species. The riparian area is characterised by remnants of sheoak and melaleuca which occur on the clayey untrained banks.

At Holstein Close, Brigadoon, there are modified freshwater wetlands which have an open woodland of marri, flooded gum and jarrah overstorey. The understorey is a matrix of weeds. Close to the lake flooded gum and swamp paperbark enclose the water feature.

The flora of Bells Rapids is varied with types associated with the river and areas of different soil depths on the slopes. The most extensive vegetation unit consists of prickly dryandra and road side teatrees. This vegetation grows over the northern area where the soil is shallow. In the same area graceful honeymyrtle heath and, the leafless wattle heath, are also abundant. Along the river bank paperbark and an open woodland of flooded gum and sheoak also occur.

Riparian land use

Downstream of the Upper Swan Bridge, the river valley has been cleared almost to the channel for grazing. There are several sections where severe erosion has resulted in cutting back the embankments or evidence of bank slides. The earth slides expose the red alluvial soils and the disturbance is a detracting landscape element.

The Upper Swan Bridge is currently being upgraded. The bridge, as with the others in the area, is low formed and supported by heavy, narrowly spaced, wooden piles.

Further upstream is the Upper Swan railway crossing bridge which is a narrow line of concrete with concrete support structures. The bridge is visually fairly unobtrusive due to the surrounding fringing vegetation. There are several horse trails which run adjacent to the river's channels which like so many other types of riparian land use have resulted in loss of much of the fringing vegetation and the flourishing of weed species.

At Bells Rapids, a wooden pedestrian bridge crosses the rapids. The bridge is an attractive low form structure. The wooden planks have weathered into a soft grey colour which is sympathetic with the fringing vegetation and rocky waterform. Adjacent to the present day bridge, are the old piles of the original crossing. The piles were constructed from local rocks and cement, so, to the casual observer, these small mounds of rocks are not apparent as man made structures. There are several informal carparks at Bells Rapids Park, however there are no amenities or barbecue facilities. Several fireplaces have been built using the rocks from the river. Most of the roads in the park are gravel and the park is scoured with informal paths through the vegetation complexes.

Land use

The Belvoir Valley Amphitheatre is located adjacent to the braiding section of the Swan just upstream of the Ellen Brook confluence. Close to the amphitheatre

are a small tin shed and old derelict farm cottage on the flat plain behind the river valley. In the same viewscape is the metal arch gateway of Belvoir - Shaw Estate, the driveway of which is lined with pine trees. The estate consists of a farm house and several other buildings which were originally built as labourers' dwellings. The farmstead has dark brown wooden walls and a red painted tin roof and is quite a distinctive feature on the landscape. The flat field has only a few remnant gum trees which stand in isolation. The treelessness only serves to emphasise the flat landform.

The Upper Swan Primary School is located on a rise between Great Northern Highway and the railway line. The school buildings have corrugated metal roofs and brick walls. The newer buildings are constructed of rammed earth and are an attractive colour in the context of the surrounding landforms.

Adjacent to the railway line there are several vineyards and stone fruit orchards. The vines run perpendicular to the Darling Range which focuses the viewscape towards the hills. The residential buildings are generally single storey bungalows which are well spaced apart. Corrugated metal sheds for the vineyards are also other land use features. The occasional rows of stone and citrus fruit trees provide a contrasting colour and vegetation type along this section of the river.

At the end of Campersic Road the drainage lines running off the Darling Ranges have been dammed adjacent to Baskerville Wines. As a result, there are two large water bodies near the railway lines. Downstream at Holstein Close, a wetland has formed adjacent to the Swan River. The wetland is a wide water body which is edged by flooded gum and wandoo, with a non indigenous understorey.

Brigadoon Country Club is a low density 1990s housing estate. The estate has a brick entrance which faces the Darling Ranges and has decorative street signs and road bollards. The houses are generally quite large homestead style brick and tile buildings. Due to the previous grazing land use, there are very few mature trees. Most properties have retained the cleared land for horse agistments and lined the paddocks with trees, often with paperbarks and non indigenous eucalypts. Many of the properties remain undeveloped and the proposed commercial centre has yet to be built, the only non residential property along the main road being a small fire station which has been built in a turn of the century style. The area designated for public open space is a dampland and exotic bulrush has invaded the freshwater pools.

The State Equestrian Centre has the Bond Connell Pavilion which is a modern cream bonded styled building constructed in a style similar to many offices. A carpark and entrance way are lined with melaleuca and conifers and several flag poles stand in the entrance viewscape. The caretakers house is a small bungalow adjacent to the entrance of the centre. Several large cleared fields stretch down to the band of riparian vegetation.

The Balcolma Quarter Horse Stud is typical of the riparian land uses on the northern banks of the river. The stud occurs on the wide flat plain in front of the Darling Range. The land is cleared of the indigenous vegetation, except for a few shade trees which are typically flooded gum, wandoo and other eucalypts. The horse shelters dot the fields which are grassed and weedy. Horse agistments are the most prominent land uses in the area. One or two orchards and vineyards still remain south of Copley Road.

At Copley Road, Upper Swan, new homestead styled houses continue to dominate the land use. These 1990s styled houses are large and often two storeys high. Typically, the properties are partly used as horse agistments, although some graze a few cattle and goats. The properties have been cleared of indigenous vegetation although new eucalypts have been planted along the edges of the fields, emphasising the square fields. A water tank at the end of Copley Road is one of the prominent features on Mount Mambup. It is one of the only structures on the rise and despite the green painted roof and some screening vegetation it stands out among the indigenous vegetation. Revegetation around the tank would enhance the viewscape.

Essential services which are visually prominent in the area include the high tension powerlines across the northern section of the precinct. A railway used by a commercial train skirts the hillside adjacent to the river valley. Although not particularly visually intrusive, the noise generated by the trains echoes in the valley.

Dominant Landscape Character

The western foothills would have been gravelly and covered by an open eucalyptus forest. To the eastern side the scarp landscape would have been granite and gneisses with shallow soils and covered in a woodland of wandoo to low heaths. The immediate landscape around the river would have been a rich alluvial terrace with melaleucas and sedges.

Today, most of the precinct's landscape character has been altered to a rural landscape. The original vegetation has been cleared, and replaced by grasses and, in some areas, vineyards and orchards. The residential buildings are sparsely spaced over the landscape. At Brigadoon, the residential area has been built at a relatively low density and most properties have associated paddocks and sheds. The overall landscape character is a rural landscape. North of the Swan River, clay pits have been dug, however most of this industrial land use is well hidden by a buffer of trees.

At Upper Swan and Ellen Brook, new subdivisions are taking place. The residences are closely built with common front gardens. The landscape is suburban. West of Great Northern Highway, there is a small section of older houses which were built in association with the clay mining in the area.

On the eastern portion of the precinct, there is a large area of a relatively natural landscape. This area is mainly steeply sloping granite outcrops unsuitable for rural land use. The vegetation condition and density appears quite natural although there is some weed invasion. There is little infrastructure around the river and that which is there does not significantly intrude on the landscape.

Significant Viewscapes

There are several significant viewscapes in the precinct. The views of Bells Rapids and the steep slope of Mount Mambup is quite spectacular. The viewscape is quite unique in the study area as there are few sections where the Swan River passes through such steep topography and relatively natural vegetation.

From the rise of the scarp at Brigadoon, there is an attractive view of the rural properties in the area. As the rural landscape is increasingly under pressure from suburban land use, this viewscape in the vicinity of the Swan River is an important one.

Conforming and Non Conforming Elements in the Landscape

There are several areas in Upper Swan where the fringing vegetation has been degraded by encroaching rural land use. Several sections of the riparian vegetation have been lost resulting in erosion of the banks, as shallow root exotic grasses are unable to support the bank.

The wooden pedestrian bridge at Bells Rapids is an example of a low formed bridge which has minimal impact on the visual landscape.

Many of the rural properties have planted non endemic species as wind breaks and fence lines. The use of local species would enhance the landscape and give it more local identity.

Recommendations for Maintenance and Enhancement of the Present Landscape Character

- Maintain the natural landscapes so that the condition of the vegetation and other natural landscape elements such as slopes and floodways are not degraded both visually and physically.
- Consider the use of native plants as wind breaks in place of non endemic species. This would provide for improved local identity, visual amenity and ecological integrity.
- Ensure that riparian and surrounding land use does not infringe on the natural landscapes of this precinct.
- Consider the importance of retaining a rural landscape in the Swan River System and consider how retaining rural elements may be achieved. There is great pressure for subdivision of rural properties for suburban developments. Consider developments which enhance the rural amenity with building styles and housing densities.

PRECINCT 12

Dominant Landscape Characters and Significant Viewscapes

N

500 0 500

Metres

LANDSCAPE CHARACTERS

Rural

Suburban

Natural

Significant Viewscapes

PRECINCT 13

APPLE ST

COONDAREE PDE

STATION ST

ORCHARD ST

ORCHARD ST

WANN CT

PDE

ALMERIA

HALLAM GNS

COPLEY RD

RD

Bells Rapids

Nolan's House

HWY

Belvoir

Gymning

SWAN

BURGESS CR

WEST

NORTHERN

Site of Baskerville

AMIENS CR

MEMORIAL AVE

GNANGARA RD

MEMORIAL AVE

GREAT

PRECINCT 11

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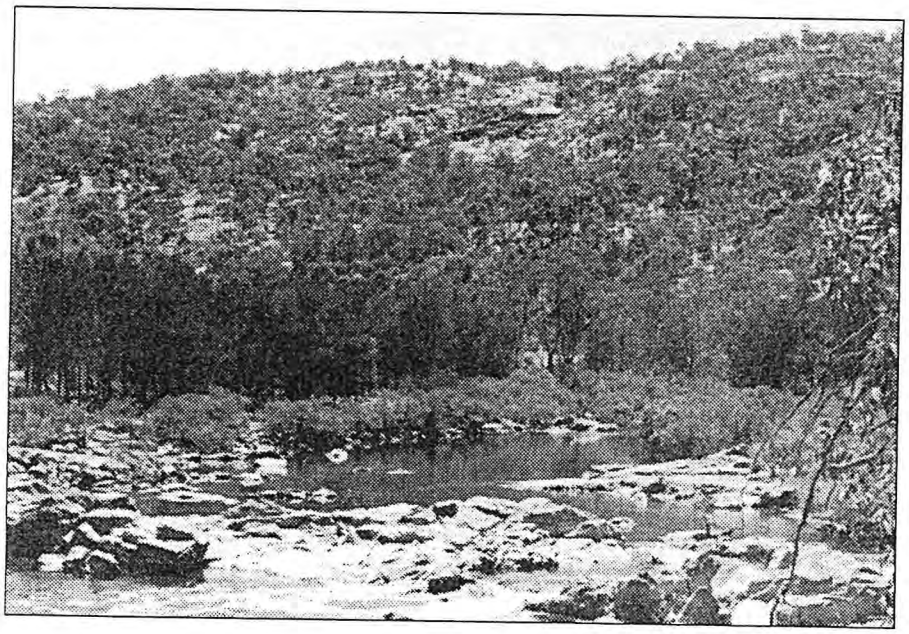
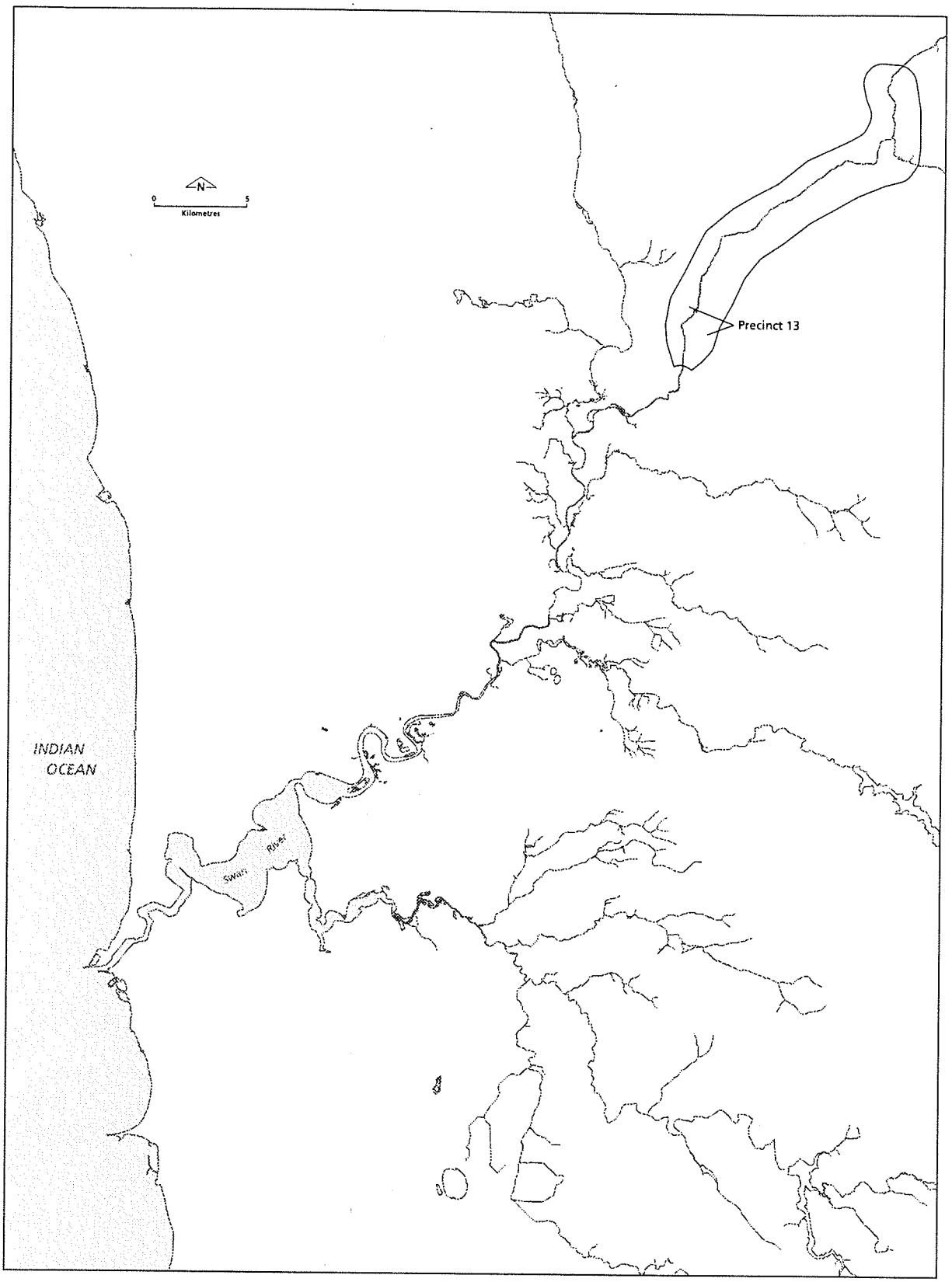


Bells Rapids, Upper Swan. 1995.

Swan River Trust.

Precinct 13

Bells Rapids to Moondyne Brook



Summary

Bells Rapids to Moondyne Brook

This stretch of the Swan River is one of the most attractive precincts for its varied terrain and relatively undisturbed vegetation communities. The river flows over several exposed granite outcrops which creates small waterfalls and rapids.

In low flow periods, the smooth granite boulders which line the stream channel are exposed. The irregular shapes, different colour tones and varied rock surfaces are particularly attractive. Within the flood plain, melaleuca and sheoak trees emerge from the rocky beds which contrast with the bare banks of unvegetated orange soil.

The exposed laterite at Walyunga National Park has black and pale colours of the Ridge Hill sandstone. The major geological formation is granite which is often exposed as blocky boulders which are covered in lichens and mosses. The topography is relatively steep and deep steep valleys and rounded hills are the dominant topography of the area. The dominant vegetation along the river banks is the flooded gum, paperbark and sheoak communities. These provide an attractive tree storey against the relatively sparse understorey around the river pools. On the surrounding hillsides, marri and jarrah are the dominant trees, however wandoo, blackbutt and bullich are also very prominent due to their attractive forms. The understorey appears in relatively good condition particularly on the steeper slopes, and a range of shrubs and bushes are found.

The main land use in this area is the Walyunga National Park which provides a popular recreation location for many Perth people. The infrastructure associated with the park is visually quite low and restricted to the carpark area at Walyunga and Long Pools. The other major land use is the railway which closely follows the river course.

Biophysical Processes

Geological Processes

The area consists of metamorphic belts including Chittering aluminous schists and various gneisses (DCE, 1980). These are surrounded by coarse grained granite and igneous rocks formed in the Archaean period. There are also areas of migmatite which consist of two components, an earlier gneissic rock and a younger granite portion. Along the Swan River channel, there is a mixture of rocks which include granites, migmatite and basic rock. At the confluence with Wooroloo Brook there is a small section of Ridge Hill Sandstone which is made up of ferruginised beach sand with some conglomerate. The main geological formation in this area is Precambrian granite.

There are several soil units within the area which include the Helena which is characterised by very deeply incised valleys with steep rocky slopes and some shallow red or yellow earths (DCE, 1980). The tributaries are also deeply incised valleys with narrow alluvial terraces of red or yellow earths. The surrounding soils are Yalanbee lateritic uplands which are dominated by fine gravels with some duricrust on ridges.

Topography

The area is part of the Darling Range which appears as a relatively uniform series of hills in front of which form the flat alluvial fans of the Pinjarra Scarp. In this precinct, the Swan River is surrounded by deeply incised valleys with narrow alluvial terraces. The river snakes between steeply sloped hills which are up to 250 metres AHD. The steep slopes are frequently punctuated by granite outcrops which appear as smooth and dark against the vegetated steep slopes.

Hydrological Processes

Water features

The Swan River in this section is characterised by sections of rapids and turbulent water which are caused by rocky outcrops within the river channel. After each rapid, the water often forms wide pools before narrowing to a smaller channel. The larger pools have been named and include Walyunga Pool, Bungarah Pool and Boongarup. Due to the variable geology the river channel's width is irregular. The sections of river traversing soft malleable sediments are generally broader than the areas which have more stable rocky banks. The river bifurcates forming an island just below Long Pool. This is where the Swan River becomes the Avon River at the confluence of Woorooloo Brook.

Bathymetry

The channel depth is restricted by the nature of the surrounding geology which often acts as a solid rock channel floor. In the pools the depth is on average 1 to 1.5 metres while in the channels, the depth is usually less than one metre.

Flooding

Periods of high water level occur in the winter season and localised flooding often occurs leaving localised erosion and deposition of sediments and debris. Because the local catchment has retains much of the vegetation, the amount of surface run-off into the channel is less than the cleared catchments.

Erosion and accretion

Bank erosion is not a severe problem in the Walyunga area as much of the riparian vegetation has been retained. There is slope erosion near the confluence of Wooroloo Brook where the surrounding topography is very steep and until recently was subject to quite heavy pedestrian traffic. Adjacent to the pedestrian pathways the steep clayey sediments are subject to erosion and remedial measures have been put in place.

Vegetation Communities

Native

Helena Complex

Along the Walyunga valley a closed woodland of jarrah *(Eucalyptus marginata)* and marri *(Eucalyptus calophylla)* occurs with wandoo *(Eucalyptus wandoo)* scattered through the woodland. The complex ranges from heath to herbland with lichen on the granite rock.

The vegetation community from the Avon Valley National Park southern boundary to Moondyne Brook is similar to that of Walyunga National Park. The woodland slopes have parrot bush *(Dryandra sessilis)* as well as a few juvenile mangard *(Acacia*

acuminata) and exotic grasses. The middle slopes dominant species tend to be prickly moses *(Acacia pulchella)* and zamia palm *(Macrozamia riedlei)*. The upper slopes are characterised by stands of sheoaks *(Allocasuarina fraseriana)* and rock sheoak *(Allocasuarina huegeliana)* with a sparse understorey of prickly moses *(Acacia pulchella)* and zamia palms *(Macrozamia riedlei)*. Between Brigadooon to O'Brien Road, Gidgegannup, the overstorey includes wandoo *(Eucalyptus wandoo)* and powderpark wandoo *(Eucalyptus accedens)*.

Dwellingup Complex

Adjacent to the Helena Complex there is an open forest of jarrah *(Eucalyptus marginata)* and marri *(Eucalyptus calophylla)*. Found within this complex are the jug flower *(Adenanthos barbigerus)*, slender banksia *(Banksia attenuata)*, sheoak *(Allocasuarina fraseriana)*, prickly bitterpea *(Daviesia pectinata)*, York Road poison *(Gastrolobium calycinum)*, honey bush *(Hakea lissocarpa)*, free flowering Lasioptealum *(Lasiopetalum floribundum)*, sword sedge *(Lepidosperma tetraquetrum)*, beard heath *(Leucopogon propinquus)*, zamia palm *(Macrozamia riedlei)*, bracken *(Pteridium esculentum)*, and common pin heath *(Styphelia tenuiflora)*.

Darling Scarp Complex

The vegetation which occurs on the Ridge Hill Shelf of the Helena River ranges from low open woodland to lichens according to the depth of the soil. Woodland components, chiefly wandoo *(Eucalyptus wandoo)* with Darling Range ghost gum *(Eucalyptus laeliae)* and marri *(Eucalyptus calophylla)*, are found throughout the region. In several places, wandoo occurs as a mono specific overstorey. Other plant species which can be found at these sites are rock sheoak *(Allocasuarina huegeliana)*, pincushion *(Borya nitida)*, marble hakea *(Hakea incrassata)*, narrow fruit hakea *(Hakea stenocarpa)*, fuchsia grevillea *(Grevillea bipinnatifida)*, goodenia *(Goodenia fasiculata)* and spindly grevillea *(Grevillea endlicherana)*. Between Brigadoon to O'Brien Road, Gidgegannup, the overstorey includes powder park wandoo *(Eucalyptus accedens)* mixed with the wandoo.

Forrestfield Complex

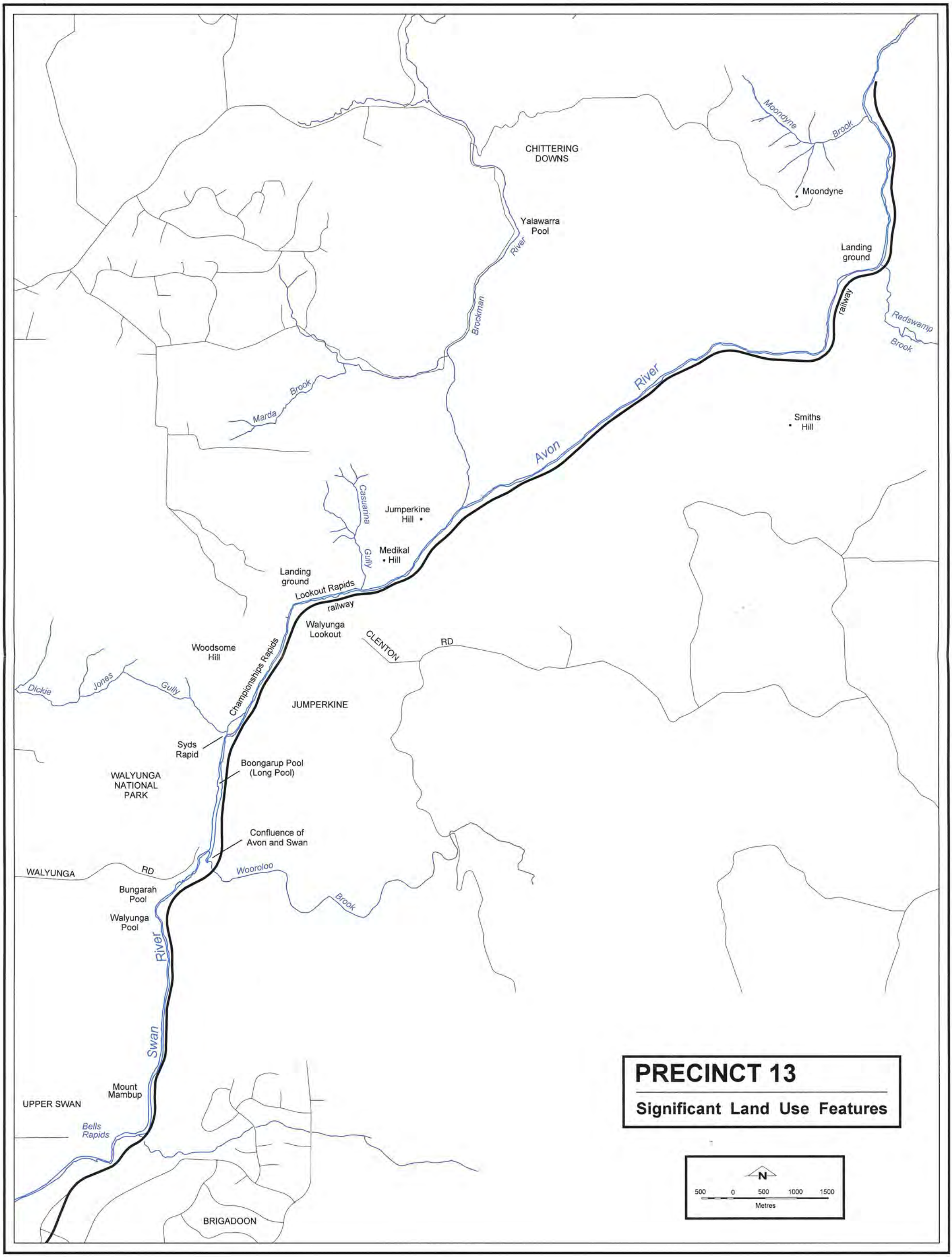
The vegetation ranges from open forest of jarrah *(Eucalyptus marginata)*, wandoo *(Eucalyptus wandoo)* and marri *(Eucalyptus calophylla)* on the gravelly soils along the downstream section of the precinct. Near the river and streams are fringing woodland of flooded gum *(Eucalyptus rudis)* and swamp paperbark *(Melaleuca rhaphiophylla)*. On the gravelly soils bull banksia *(Banksia grandis)*, woody pear *(Xylomelum occidentale)*, parrot bush *(Dryandra sessilis)*, zamia palm *(Macrozamia riedlei)* and blackboys *(Xanthorrhoea preissii)* are found. In the sandier areas, there are remanent pockets of sheoak *(Casuarina fraseriana)*, slender banksia *(Banksia attenuata)*, bull banksia *(Banksia grandis)*, blueboy *(Stirlingia latifolia)*, semaphore sedge *(Mesomelaena tetragona)* and Christmas bush *(Nuytsia floriabunda)*.

Other understorey species include Wilson's grevillea *(Grevillea wilsonii)*, Swan River myrtle *(Hypocalymma robusta)*, prickly moses *(Acacia pulchella)*, parrot bush (*Dryandra sessilis*), hairy jugflower *(Adenanthos barbigerus)*, yellow buttercups *(Hibbertia preissii)*, common hovea *(Hovea trisperma)*, bacon and eggs *(Oxylobium capitatum)* purple tassels *(Sowerbaea laxiflora)*, red ink sundew *(Drosera erythrorhiza)*, painted sundew *(Drosera zonaria)*, and Mangles kangaroo paw *(Anigozanthos manglesii)*. Orchids such as cowslip orchid *(Caladenia flava)*, white spider orchid *(Caladenia patersonii)*, common donkey orchid *(Diuris longifolia)*, and blue china orchid *(Caladenia gemmata)* are also found in the complex.

A similar community occurs at the Avon Valley National Park to Moondyne Brook where the river banks and valley floor are dominated by flooded gum and paperbark. Along the banks of Wooroloo Brook, there are dense stands of prickly moses *(Acacia pulchella)*, parrot bush *(Dryandra sessilis)* and some stunted swamp paperbark *(Melaleuca rhaphiophylla)*. On the high western slopes of Walyunga National Park, the slender blackboy *(Xanthorrhoea gracilis)* is interspersed with the common blackboy *(Xanthorrhoea preissii)*.

Yarragil Complex

There are isolated pockets of jarrah *(Eucalyptus marginata)* and marri *(Eucalyptus calophylla)* on upper slopes. On the valley floors Swan River blackbutt *(Eucalyptus patens)* and bullich *(Eucalyptus megacarpa)* are found with the other eucalyptus. Other species include moonah *(Melaleuca preissiana)*, swamp


CHITTERING
DOWNS
Moondyne
Brook
Moondyne
Yalawarra
Pool
River
Brockman
Landing
ground
railway
Redswamp
Brook
River
Brook
Marda
Smiths
Hill
Avon
Casuarina
Gully
Jumperkine
Hill
Medikal
Hill
Landing
ground
Lookout Rapids
railway
Walyunga
Lookout
CLENTON
RD
Woodsome
Hill
Championships Rapids
Dickie
Jones
Gully
JUMPERKINE
Syds
Rapid
Boongarup Pool
(Long Pool)
WALYUNGA
NATIONAL
PARK
Confluence of
Avon and Swan
WALYUNGA
RD
Wooroloo
Brook
Bungarah
Pool
Walyunga
Pool
River
Swan
Mount
Mambup
UPPER SWAN
Bells
Rapids
BRIGADOON
PRECINCT 13
Significant Land Use Features
N
500
0
500
1000
1500
Metres

banksia *(Banksia littoralis)*, camphor myrtle *(Baeckea camphorosmae)*, winged-stem dampiera *(Dampiera alata)*, silky parrot-pea *(Dillwynia cincerascens)*, rams horn *(Hakea cyclocarpa)*, currant bush *(Leptomeria cunninghamii)*, semaphore sedge *(Mesomelaena tetragona)*, and common pinheath *(Styphelia tenuiflora)*.

Murray and Bindoon Complex

The Murray and Bindoon Complex is represented along the Darlington valley floors. The vegetation type ranges from open forest jarrah *(Eucalyptus marginata)*, and marri *(Eucalyptus calophylla)* with some Swan River blackbutt *(Eucalyptus patens)*, to low open forest of flooded gum *(Eucalyptus rudis)* to swamp paperbark *(Melaleuca rhaphilophylla)* on the drainage lines. Other plants include hairy gland flower *(Adenanthos barbigerus)*, honey bush *(Hakea lissocarpa)*, sword sedge *(Lepidospermia angustatum)* and common pin head *(Styphelia tenuiflora)*.

Exotic

The exotic grasses which have invaded the area include wild oats *(*Avena fatua)* and one sided oats *(*Avena barbata)*. There are stands of African feather grass *(*Pennisetum macrourum)*, lesser blowfly grass *(*Briza minor)* and beard grass *(*Polypogon* sp*)*. The grasses are particularly evident along the railway line.

Historical Land Use and Resulting Environmental Changes

Due to the limitations of transport and the relative unsuitability of the Walyunga area for agricultural purposes, much of the land remained a camping site for the Nyungar people until the late 1800s. It is believed that part of the land belonged to the Sam Copley and was called the Woodsome Estate (Bourke,1987). It is believed that the bushland was used for cattle grazing and although there was no clearing of the bushland the grazing has introduced several weeds into the area. Local residents recall that there was a small citrus orchard near the river, however there is no evidence of this orchard today.

The Coulston and Woburn Park Estates were located at the southern section of the precinct last century (Battye, 1912).

In 1965, the eastern railway was constructed along the eastern banks of the Swan River. The railway closely follows the river. The valleys have been infilled to allow a relatively straight route to be formed.

In 1969, the pastoral property was bought by the State and made the Walyunga National Park.

About thirty years ago a number of rocks were moved in the river channel at Long and Walyunga Pool to increase the flow of the river (CALM, pers com, 1995). This made the pool suitable for kayaking. However in 1991 the rocks were returned to their natural position which reduced the cutting of the Walyunga Pool bank. A rock retaining wall was constructed to reduce bank erosion at the pool.

Much of the Darling Ranges was selectively logged for jarrah and in some instances wandoo, however it is believed that very few trees were logged in this area. It is likely that the only timber that was cut was for fencing for the property.

Present Land Use and Social Patterns

The railway line runs parallel to the Swan River for the entire section of the precinct. Built in 1965, the railway is located on the ridge line and provides an important transport route into the area.

There is a small quarry adjacent to the eastern side of the railway in line with Walyunga Pool. Several gravel quarries occur near Walyunga Road and most of these quarries are no longer used.

Small farms dot the Darling Range in areas such as South Chittering and Moondyne Brook. As a result much of the land has been cleared and its natural vegetation replaced with pasture and several fruit orchards. Some areas have retained a tree storey, but the under storey has been used for grazing.

Adjacent to Jumperkine Hill there is a landing ground surrounded by cleared land.

Recreation nodes

Walyunga National Park has several attractive picnic areas adjacent to the Swan River. The carparks are quite large but are partly screened with landscaped islands of indigenous vegetation. Camping can be arranged with the park ranger. There are two formal picnic areas at Walyunga Pool and one at Long Pool which is the headwater of the Swan River and the confluence of the Avon River. To reduce gullying there has been careful fencing of steep slopes to ensure that pedestrians do not damage the vegetation.

One of the most popular attractions to the area is the Avon Descent which is a power boat and paddle craft event. The event attracts many contestants and spectators every year. Between Moondyne Brook and Bells Rapids there are several spectacular white water areas which provide a challenge to the boat users.

Public access

Much of the river is accessible through walk trails and informal paths at Walyunga National park. There is a lookout on the which overlooks the Walyunga National Park from O'Brien Road which provides a spectacular view of the river.

Sites of Nyungar & Wider Australian Community Significance

Nyungar significance

This general area was used extensively by the Whudjag tribe for campsites. Archaeological evidence suggests that the area has been used by regional tribal groups for over 6 000 years (Pearce, 1983). Quartz and dolerite form rocks strewn in river beds and hills were used by Nyungars for a variety of tools. The abundance of food and the high quality mylonite and quartz made the site an ideal camping area.

The well drained sandy area west of Walyunga Pool is believed to be an old Nyungar camping site Nyungars say that the Waugal took a wrong turn at this part of the river. The Waugal squeezed through a crack in the range, stopped and vomited, leaving the stone for tools. It then come out onto flat land below the range. Here the river bed was formed (CALM, walktrail information).

Nyungars believe that Warrdarchi still live in the Walyunga area. According to tradition, these little hairy creatures caused mischief especially towards misbehaving children (CALM, walktrail information).

The area north of the study area is known as *Chittering*, meaning the place of the willy wag tail (Glauert, 1950).

Other significance

Between 1877-78 , Lord John Forrest and his survey team undertook an extensive triangulation survey of the Swan and Avon Valley. The Walyunga Survey Heritage Trail recognises the difficult conditions under which these surveys were made by outlining the route taken by Forrest and includes two original cairn and pole markers constructed during the original survey.

Woodsome Hill is named after Sam Copley's estate Woodsome.

Conservation Areas

System 6

M18 Walyunga National Park

The recommended area is situated about 40 km north-east of Perth and comprises the National Park and some adjacent land. The area is partly within the Ellen Brook and Wooroloo Brook catchments, both potential sources of water supply. The National Park contains some highly picturesque landforms. It lies along the Darling Scarp and is deeply dissected by the Swan River. Its highest point is 250 metres above sea level dropping very steeply to 30 metres at the river. Wooroloo Brook joins the Swan River within the National Park. The area is covered with woodland and open forest and also contains granite outcrops. Jarrah is common on the lateritic uplands, associated with marri on deeper soils. The understorey is characterised by Wilson's grevillea and hairy jugflower. Wandoo replaces marri and jarrah in pockets of flooded gum presumably sustained by seepage, on some slopes high above the valley floor. Shallow soils in the park especially around the granite outcrops support examples of the Darling Scarp heathlands. The area has high conservation and recreation values and constitutes an area of open space of regional significance.

Chittering

Avon River (Golgular)

Site of
Woodsome
Estate

Aboriginal
Camping
Area

Site of
"Ellen's Brook"
later Woburn Park

Swan River

Site of Coulston

PRECINCT 13

Sites of Significance

N

500 0 500 1000 1500

Metres

Camping Area
Site of Coulston

Sites of Nyungar Significance
Sites of Australian Significance

Precinct Description

Waterform and natural riparian zone

This stretch of the Swan River is one of the most attractive precincts. In several places, river flows over exposed granite outcrops creating small waterfalls and rapids. In high flow periods, pools and rocks form swirling eddies and currents creating attractive water patterns and eroding processes. In flow periods, the small smooth granite boulders which line the stream channel are exposed. The irregular shapes, different colour tones, coarse rock surfaces and contrasting reflective surfaces, are particularly attractive. The fringing paperbark has a soft brushy texture which provides a pleasing contrast between the smooth river boulders. Several swamp sheoaks grow on the flat rocky flood plains and exposed gnarled roots stretch between the smooth boulders.

Upstream of Bells Rapids, the river channel is broad and has a irregular winding path. Just before Walyunga Pool the river channel narrows and is surrounded by the steep slopes of the Darling Range. Here the river is untrained with several trees and other debris blocking the river. The rocky outcrops in the river channel and on the flood plain disrupt the flow creating areas of white water. From Walyunga Pool, the river is very narrow and meandering with thick patches of trees and a few small rapids. Walyunga Pool is approximately 50 metres across and is enclosed by low lying rocks which create a waterfall on the northern section. On the southern section of the flood plain the area has small rocks and pebbles scattered in a flood scree on the southern section. Within the flood plain, melaleuca and sheoak trees emerge from the rocky bed while on the eastern section of the pool there is there is a bank of alluvial soil which is partly unvegetated, creating bands of dark brown orange soil above the sediment. The area is surrounded by high quality riparian vegetation which has few weeds apart from watsonia which is quite abundant on the eastern bank.

Upstream of Walyunga Pool, several small pools occur which often simply appear as a slightly broader and deeper section of the river channel. Upstream of Burungah Pool is the headwaters of the Swan River which becomes the Avon River at the confluence of Woorooloo Brook. In the centre of the Avon River channel, an island forms at the centre of the river. At Long Pool the river bed is gravel and there are a large number of trees across the channel. The next most spectacular feature upstream is Syds Rapid which is approximately a hundred metres long and is a mass of rocky outcrop.

Landform

The exposed laterite on the section of Walyunga National Park closest to Great Northern Highway has black and pale colours of the Ridge Hill Sandstone. This boulders have a very thin layer of soil, however the pale weathered stone often makes an attractive element highlighted by surrounding wandoo. The major geological formation in the area is the granite which is often typified by large exposed rock surfaces. Commonly, the granite has broken into blocky boulders which have sheared in straight plains. The edges have been smoothed and rounded by exfoliation and often the rock is mottled by lichens and mosses. Upstream at Walyunga Lookout, the topography is relatively steep with Medikal Hill and Jumperkine Hill being prominent landscape elements on the northern river bank while the lookout itself is also a prominent feature of the southern section.

Vegetation

In this precinct, the vegetation along the Swan and Avon Rivers is relatively undisturbed. Close to the water's edge, the paperbark and sheoak form soft brushy textures against the rocky boulders and gravelly banks. The understorey is relatively sparse where the land is subject to flooding and introduced grasses often occur. Around Walyunga Pool the dominant tree is the flooded gum which has an attractive smooth barked and twisted branch form. The soft grey and pink light bark and loose canopies contrast with the dark green and shaded texture of the sheoak foliage.

On the higher rocky sandstone, wandoo occurs in mono specific stands and is a prominent and attractive tree. The red old bark peels exposing a white smooth surface which is particularly attractive as a backdrop to the similarly mottled sandstone. Other attractive trees found in the area are the blackbutt which is recognisable by its fire blackened trunk and heavy foliage and thick branches. In

contrast, the bullich is a slender branched tall straight tree with open canopy of long shiny trees. The bark is pale and smooth and makes it easily identifiable.

The dominant overstorey on the Darling Range is the marri and jarrah woodlands. The understorey is particularly attractive with a range of bushes and shrubs which have visually interesting foliage and textures including the blackboys, grevilleas, zamia palms, sedges and banksias. In spring, the delicate flowers of myrtle and grevillea are particularly spectacular.

Land use

There is little riparian land use infrastructure around the precinct. The Walyunga Pool had a rock retaining wall built on the western side of the pool which has helped reduce bank erosion Amenities include a simple toilet block, silver coloured water tank and carpark. The carpark has recently been upgraded with native plants being planted in islands and around the carpark. Slalom wires are strung across Long Pool for paddle craft.

The railway is quite prominent from some aspects of the river, however from most positions on the National Park walk trails the railway cannot be seen due to the surrounding vegetation.

Several small farms dot the Darling Range at South Chittering and Moondyne Brook. Due to the undulating terrain, these cleared and grazed properties cannot be viewed from the river valley and to the viewer it appears that most of the natural bushland remains.

PRECINCT 13

Dominant Landscape Characters and Significant Viewscapes

PRECINCT 12

N

500 0 500 1000 1500

Metres

LANDSCAPE CHARACTERS

Natural

Rural

Significant Viewscapes

Dominant Landscape Character

The precinct's dominant landscape character is the natural Darling Range landscape. It is typified by steeply sloping granitic and gneissic hills and shallow soils. The immediate riparian landscape has pools and riffles of rocky outcrops. Several limited alluvial deposits can be found along the river banks. There are several vegetation communities in the precinct and most areas appear to be relatively undisturbed. However around Walyunga National Park where there has been grazing and human influence there are considerable areas which have weeds.

Significant Viewscapes

There are several attractive viewscapes in the area. The most accessible viewscapes are at Walyunga National Park and Walyunga Lookout. These panoramic viewscapes include the steep hillsides and deep valleys, the water flowing over rocks and forming pools and vegetation which appears relatively natural.

Conforming and Non Conforming Elements in the Landscape

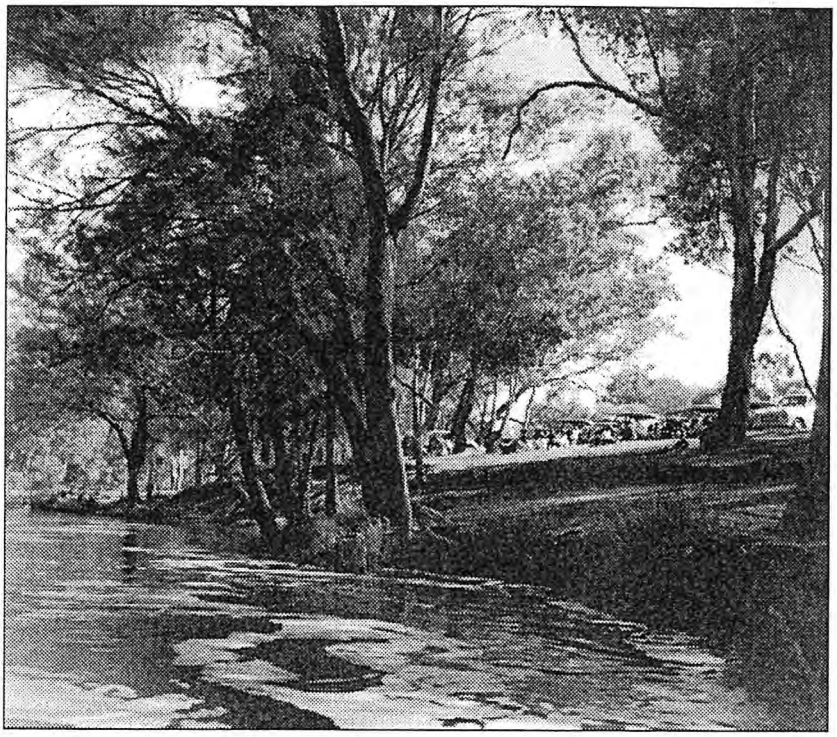
At Walyunga National Park there has been an attempt to have recreational amenities which have minimal impact on the landscape. It is important that all picnic, parking and toilet facilities to not intrude into the relatively natural landscape.

Recommendations for Maintenance and Enhancement of the Present Landscape Character

- Ensure that weed communities do not form monospecific areas, eg *Watsonia,* which detract from the appearance of natural vegetation.
- Support efforts to rehabilitate the natural vegetation communities.
- Ensure that surrounding landuses do not encroach on the visual amenity of the natural landscape character.

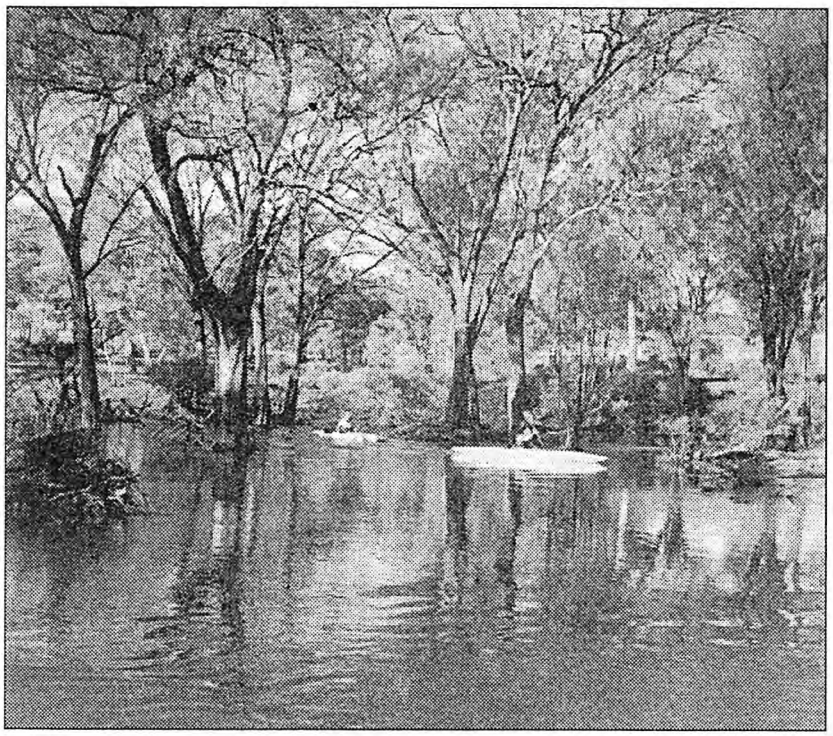
Precinct Specific References

Bourke, M. J. 1987. **On the Swan. A History of the Swan District Western Australia.** University of Western Australia Press. For the Swan Shire Council, Middle Swan WA.



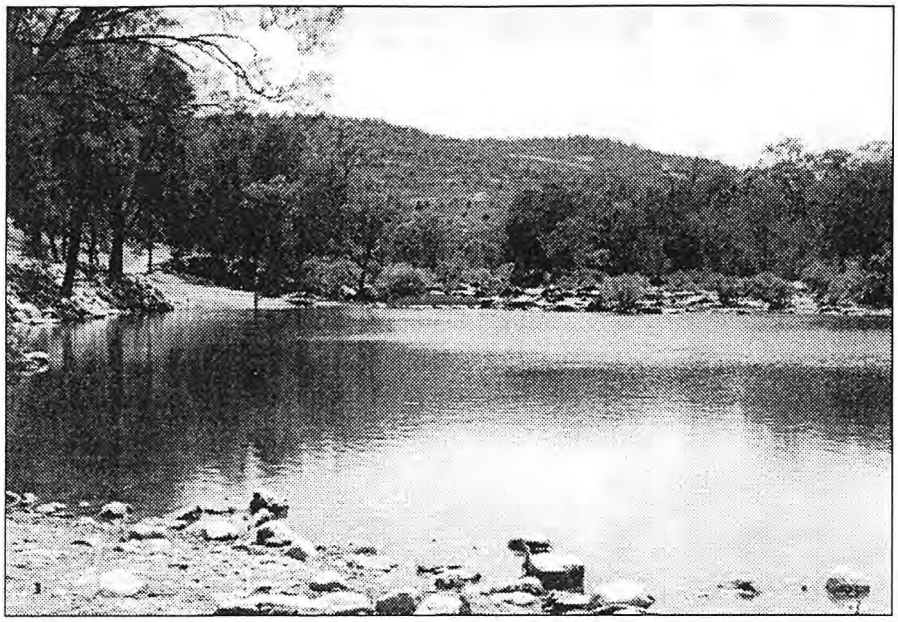
Walyunga Pool, Walyunga National Park. 1967.

Swan River Trust.



Walyunga National Park. 1967.

Swan River Trust.



Walyunga Pool, Walyunga National Park. 1995.

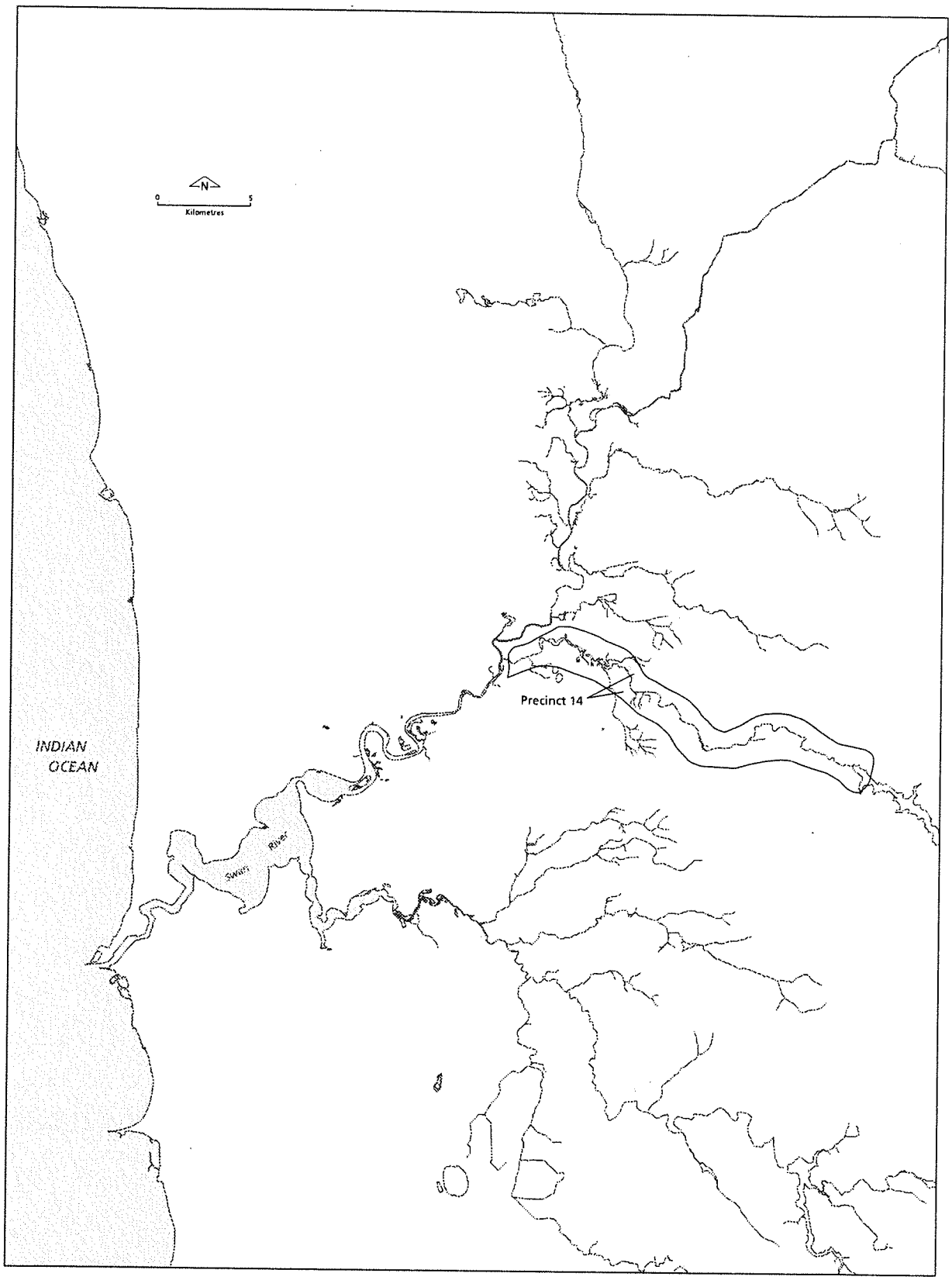
Swan River Trust.

Posselt Ford, Walyunga National Park. 1990.

Swan River Trust.

Precinct 14

Helena River - Swan River confluence to Mundaring Weir



Summary

Helena River - Swan River confluence to Mundaring Weir

The Helena River has been dammed at the Mundaring Weir to supply the Kalgoorlie water pipeline. In the summer months, the lower Helena River channel is reduced to a series of pools and exposed dry river bed. Often central islands of clay are exposed as the braided pools dry up.

In summer, the river channel is only one to five metres across while in the winter months, the waters swell to fill the entire flood plain which at maximum is 100-200 metres across. Around the Hazelmere and Midland areas, several wetlands have formed adjacent to the river and are fed by both natural and artificial drainage lines. The granite outcrops which are characteristic of the Darling Range often cause small waterfalls and eddies created by the disturbance of the water over the protruding rocks. The Mundaring Weir is a spectacular water body which appears as a large, long and narrow lake which fills the Helena Valley up to the dam wall.

The Helena River passes through a range of landforms. At its confluence with the Swan River, the landform is a flat fluviatile plain which grades into the gently undulating ancient dunes of the surrounding areas. At the base of the Darling Range are the lateritised foothills which form fans in front of the linear belt of lateritic uplands of the Darling Scarp. Along the lower Helena River much of the native vegetation has been removed for grazing and urban land uses. Remnant paperbark and sheoak communities line the Helena River and appear as a belt of green among the cleared pasture and industrial land. On the Ridge Hill Shelf, a greater proportion of the native flora remains. Marri, jarrah and wandoo are the dominant trees, however near the Mundaring Weir exotic gardens and pine plantations also occur.

A range of land uses occur along the Helena River, including pastoral, industrial, recreational and residential land uses. The Mundaring Weir is the most spectacular land use in this precinct.

Biophysical Processes

Geological Processes

The geological Cardup Group of dark shales with sandstone , conglomerate and orthoquartzite occurs along the Helena River between South Guildford to Belview (DCE, 1980). Small patches of Yoganup Formation occur at Helena Valley and Hazelmere. The fossil shoreline sands were formed in the Quaternary period and have some heavy minerals within the sands. The geology from Darlington to Mundaring is the Archaean formed granite. The granite boulders would be 2600- 2700 million years old. The isolated outcrops of quartz, feldspar and mica may possibly be older. The laterite at the summit of the hills has formed as the result of weathering from approximately 20 to 100 million years ago.

At the confluence of the Helena River with the Swan River, there are several soil types. The Swan alluvial terraces occur along the river banks between the confluence with the Swan River and the lower pipe head dam. The sediments are characterised by having red earths and duplex soils (DCE, 1980). At West Midland and East Guildford, the soil is classified as the Guildford Formation. It consists of yellow to brown silt with fine to coarse grained laterite, quartz sand and heavily weathered granite pebble. On the southern section of the river at Hazelmere and Helena Valley, the Southern River sand plains occur. In the swampy areas of this formation, iron and humus podzols, peats and clays can be found. At Koongamia and Helena Valley, the soil has been identified at the Forrestfield Association. These lateritised foothills of the Darling Scarp are dominated by gravelly and sandy soils. The Darling Scarp consists of very steep slopes with shallow red and yellow earths and much rock outcrop. From the lower pipehead dam to the Mundaring Weir the sediment is of the Helena Valley Association. It consists of steep rocky slopes and some shallow red or yellow earths. The lateritic uplands surround the Helena Valley Association and these consist of gravels, sands and duricrust.

Topography

The topography of the Helena River precinct changes quite dramatically through the landscape. At the confluence of the Helena and Swan Rivers, fluviatile flat plains occur. At the base of the Darling Range the lateritised foothills are found and are identified as being the Ridge Hill Shelf geomorphic unit. The Darling Plateau is made up of the lateritic uplands and the deep valleys and scarps. Massive granite boulders can be found jutting out from the hill slopes.

Hydrological Processes

Water features

The Helena River is a tributary of the Swan River and has a catchment area of around 65 kilometres from west to east and is about 40 kilometres from north to south. In the summer months the river dries to a series of pools or very narrow channel, while in winter the river is often full to the banks.

Several tributaries join the Helena River including Kadina Brook, Piesse Gully and Nyaania Creek. Numerous tributaries flow into the Mundaring Reservoir including Pickering Brook, Darkin River, Beraking Brook, Rushy Stream, Warin Brook, Wundabiniring Brook.

Around the Darling Range section of the river several granite rocks jut out from the river channel creating small waterfalls and eddies in high flow periods. In low flow periods these rocks often act as barriers to the small flow and pools often form within the rocky channel.

Bathymetry

The Helena River has a bathymetry which is mainly one to two metres. In the upper reaches the depth is quite shallow, however the surrounding river valley is often quite deep. For the lower section of the river there is limited tidal movement, while there is no tidal movement in the upper reaches.

Flooding

The lower section of the Helena River is subject to quite substantial flooding. The flood line is at its widest east of Roe Highway Bridge where it reaches up to a kilometre in width. South of the Lower Diversion Dam the flood line is reduced to approximately 100-200 metres.

One of the most dramatic flood of the Helena River was in 1926 when the water reached a depth of 68 cm over the spillway of the Weir wall.

Erosion and accretion

The fluviatile deposits of the Helena River are the most susceptible to erosion by high water periods. The loose sediments are particularly subject to erosion in areas where the fringing vegetation has been degraded or removed. The shallow red and yellow earths typical of the Darling Scarp section of the Helena River are often eroded along the river channel and banks exposing the underlying granite on the banks.

Vegetation Communities

Native

Swan Complex

On the fluviatile deposits of the lower Helena River, fringing woodland of flooded gum *(Eucalyptus rudis)* and swamp paperbark *(Melaleuca rhaphiophylla)* is found with localised occurrence of low open forest of swamp sheoak *(Casuarina obesa)* and salt water paperbark *(Melaleuca cuticularis)*. At Hazelmere, moonah *(Melaleuca preissana)* and sheoak *(Allocasuarina fraseriana)* occur on the sandier soils.

Guildford Complex

The Guildford Complex mainly occurs on the higher land of the northern banks of the lower Helena River. A mixture of open forest to tall open forest of marri *(Eucalyptus calophylla)*, wandoo *(Eucalyptus wandoo)* and jarrah *(Eucalyptus marginata)*, rare occurrences of salmon white gum *(Eucalyptus lane-poolei)*. Minor components include flooded gum *(Eucalyptus rudis)* and swamp paperbark *(Melaleuca rhaphiophylla)*. Other plant species which are found in the complex include bull banksia *(Banksia grandis)*, black gin *(Kingia australis)* and blackboy *(Xanthorrhoea preissii)* and native wisteria *(Hardenbergia comptoniana)* and buttercup *(Hibbertia* sp*)*. Much of this complex has been cleared for pasture and more recently for urban land uses in this precinct.

Southern River Complex

The flora identified as Southern River Complex can be found on the flat aeolian sands of the lower Helena River. The open woodland of marri *(Eucalyptus calophylla)*, jarrah *(Eucalyptus marginata)* and various banksia species *(Banksia attenuata* and *B.menziesii)*. Often associated with this community is a fringing woodland of flooded gum *(Eucalyptus rudis)* and swamp paperbark *(Melaleuca rhaphiophylla)* along the creek beds and other drainage lines. The understorey would have contained coojong *(Acacia saligna)*, grey stinkwood *(Jacksonia furcellata)*, spearwood *(Kunzea ericifolia)*, harsh hakea *(Hakea prostrata)*, woolly bush *(Adenanthos cygnorum)*, woody pear *(Xylomelum occidentale)*, blackboy *(Xanthorrhoea preissii)* and zamia palms *(Macrozamia reidlei)*. Small shrubs found in the complex include prickly moses *(Acacia pulchella)*, white myrtle *(Hypocalymma angustifolium)*, Swan River myrtle *(Hypocalymma robostum)*, common hovea *(Hovea trisperma)* and cotton heads *(Conostylis aculeata)*.

Forrestfield Complex

Vegetation ranges from open forest of marri *(Eucalyptus calophylla)*, wandoo *(Eucalyptus wandoo)* and jarrah *(Eucalyptus marginata)* which occur on the more gravelly soils to open forest of marri and jarrah with sheaok *(Allocasuarina fraseriana)*, bull banksia *(Banksia grandis)* and slender banksia *(Banksia attenuata)* on the sandier soils. Other species associated with the complex include woody pear *(Xylomelum occidentale)*, parrot bush *(Dryandra sessilis)*, zamia palm *(Macrozamia riedlei)*, blackboy *(Xanthorrhoea preissii)* and species of Hibbertia. On the sander soils Christmas tree *(Nuytsia floribunda)*, semaphore sedge *(Mesomelaena tetragona)* and blueboy *(Stirlingia latifolia)* are also found.

Darling Scarp Complex

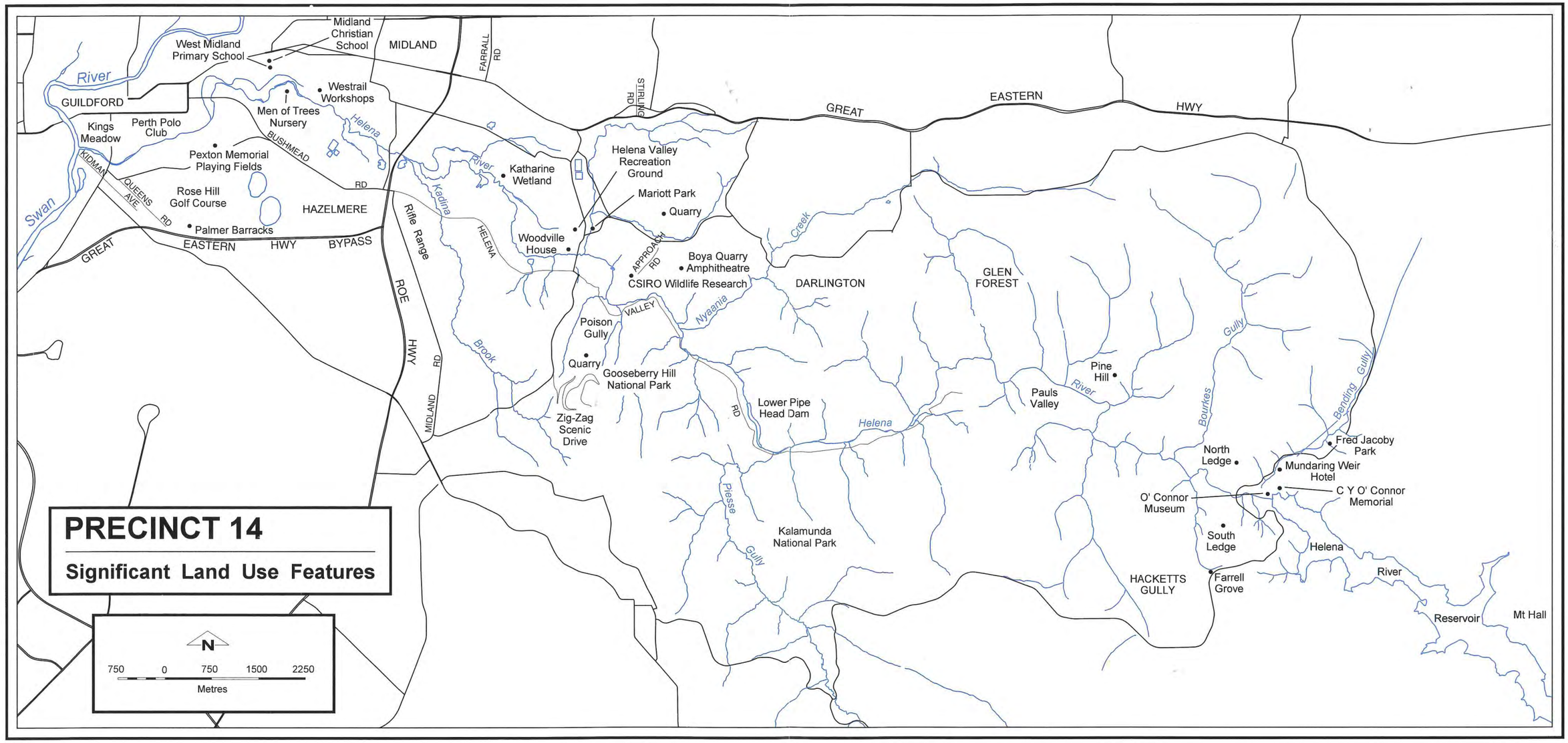
The vegetation which occurs on the Ridge Hill Shelf of the Helena River ranges from low open woodland to lichens according to the depth of the soil. Woodland components are chiefly wandoo *(Eucalyptus wandoo)* with Darling Range ghost gum *(Eucalyptus laeliae)* and marri *(Eucalyptus calophylla)* throughout the region. Other plant species which can be found at these sites are sheoak *(Allocasuarina huegelianna)*, pincushion *(Borya nitida)*, marble hakea *(Hakea incrassata)*, narrow fruit hakea *(Hakea stenocarpa)*, fuchsia grevillea *(Grevillea bipinnatifida)*, goodenia *(Goodenia fasciculata)*, and spindly grevillea *(Grevillea endlicherana)*.

Helena Complex

In the valley sections between the lower pipe head dam to Mundaring Weir the Helena complex is

PRECINCT 14

Significant Land Use Features



dominant. This vegetation type has jarrah *(Eucalyptus marginata)*, marri and jarrah *(Eucalyptus calophylla)* and open wandoo *(Eucalyptus wandoo)* woodland. It also includes areas of health, herbland and lichens. Dominant vegetation types include jug flower *(Adenanthos barbigerus)*, variable leafed hakea *(Hakea varia)*, currant bush *(Leptomeria cunninghamii)*, beard heath (*Leucopogon capitellatus)*, hairy flag *(Patersonia rudis)*, and common pin heath *(Styphelia tenuiflora)*.

Murray and Bindoon Complex

The Murray and Bindoon Complex is represented at the Darlington valley floors. The vegetation type ranges from open forest to jarrah *(Eucalyptus marginata)*, marri *(Eucalyptus calophylla)* with some Swan River blackbutt *(Eucalyptus patens)* to low open forest of flooded gum *(Eucalyptus rudis)* to swamp paperbark *(Melaleuca rhaphiophylla)* on the valley floors. Other plants include hairy gland flower *(Adenanthos barbigerus)*, honey bush *(Hakea lissocarpa)*, sword sedge *(Lepidosperma angustatum)* and common pin head *(Styphelia tenuiflora)*.

Pindallup and Yarragil Complex

Open forest of jarrah *(Eucalyptus marginata)* to marri *(Eucalyptus calophylla)* is found on slopes and open woodland of wandoo *(Eucalyptus wandoo)* with some Swan River blackbutt *(Eucalyptus patens)* in the lower gullies (DCE, 1980). The shrubs in the complex include acacia *(Acacia browniana)*, camphor myrtle *(Baeckea camphorosmae)*, wing stemmed dampiera *(Dampiera alata)*, grey parrot pea *(Dillwynia cinerascens)*, York Road poison *(Gastrolobium calycinum)*, honeybush *(Hakea lissocarpa)*, candle hakea *(Hakea ruscifolia)*, white myrtle *(Hypocalymma angustifolium)*, sword sedge *(Lepidosperma angustatum)*, currant bush *(Leptomeria cunninghamii)*, zamia palm *(Macrozamia riedlei)*, semaphore sedge *(Mesomelaena tetragona)*, hairy flag *(Patersonia rudis)*, globe pea *(Sphaerolobium medium)*, blueboy *(Stirlingia latifolia)*, hazel *(Trymalium ledifolium)*. Particularly on the northern side of the Mundaring Dam the understorey includes fuchsia grevillea *(Grevillea bipinnatifida)*, hibbertia *(Hibbertia commutata)*, blackboys *(Xanthorrhoea preissii)*, harsh hakea *(Hakea prostrata)*, sedge *(Tetraria octandra)*, and bunjong *(Pimelea imbricata)*.

Exotic

Much of the lower Helena River area has been cleared for agricultural purposes. The result has been that exotic grasses such as kikuyu grass *(*Pennisetum clandestinum)*, couch grass *(*Cynodon dactylon)*, and subterranean clover *(*Trifolium subterraneum)* have flourished. Other weeds include the caster oil bush *(*Rinicus communis)*, bulrush *(*Typha orientalis)*, blackberry *(*Rubus* sp*)*, Japanese pepper *(*Schinus terebinthifolia)* and watsonia *(*Watsonia bulbillifera)*. Several pockets of radiata pine *(*Pinus radiata)* have been planted by the Department of Conservation and Land Management at Fred Jacoby Park, Paulls Valley and Hacketts Gully.

Historical Land Use and Resulting Environmental Changes

Many of the early land assignments along the Helena River were made between 1829 and 1841. A rush of land seekers resulted in land being selected which had no qualities which would suit any agricultural purposes. Early settlers along the Helena River included W.Everard, P.A. Lantour, W.M. Carew, J.H. Monger, W.K. Shenton, Lord Talbot (Helena Location 20a) and James Drummond (Helena Location 17). Captain E Pickering was allocated a very rocky section along the Helena River and he quickly reselected new property on a creek now known as Pickering Brook which is outside of the study area.

In 1894, Lord Talbolt's land was eventually sold to the Canning Jarrah Timber and Statham Quarries near Ridge Hill Road. The Canning Jarrah Timber company used the land to build a railway to their Canning saw mill (Quicke, undated).

In the 1890s, a second railway was built by Lionel White and company who had a licence to cut timber at Kalamunda (Quicke, undated). The line was cut in a three legged zig zag up a valley face. The train would often have a passenger carriage in addition to the several timber carriages. In 1903, the government took over the line and a fourth leg was added to the track which later accessed the tea rooms of the Mundaring Reservoir. The track was latter removed, however the zig zag pathway is still used as a recreational walking track.

By the early 1890s, the goldfields were desperately short of drinking water. This was a crisis not only to the people living in the area, but also threatened the wealth of the State which at this time had few known exploitable natural resources except gold. Trains provided gallons of water from Northam to Woolangie. Several proposals for pipe lines from tributaries to the Swan River were made including from the Avon River and Jane Brook. In March 1896, Sir John Forrest first informed the public that the government intended to supply the goldfields water from the Darling Ranges (WAWA, undated). The cost of the scheme seemed to many people outrageous and the exact location of the dam was not revealed until July 1896 when the Bill authorising the proposal was put to the Government Assembly.

In 1895, C Y O'Connor had been asked to produce a practical plan for pumping water to the goldfields. The task was enormous and involved building a railway to supply material to the site in the Helena Valley, a survey of the catchment area and clearing of the lower catchment area to increase the inflow. Excavation for the dam wall commenced in 1898. A fault in the bedrock of the valley caused considerable delay as this had to be excavated a couple of metres before reaching solid rock. Sand for the concrete was obtained approximately one and a half kilometres downstream from the dam site as well as form Lion Mill and Bayswater. The dam was constructed to be a 21 million cubic metre storage reservoir and the water was pumped to Kalgoorlie by 8 steam pumps when it was officially opened in 1903. By 1908 all the private properties at Byfield were resumed by the Crown as they were in the weir's catchment area (Quicke, undated). Since construction, electric stations have been constructed to replace the old steam stations and the main pipeline has upgraded to concrete lined with tar and aluminium with a zinc external lining.

A pine plantation is located at the Fred Jacoby Park. In 1913, the land owned by Fred Jacoby called Greystone was resumed by the Crown. The Forests Department planted the first radiata pine trees for harvesting at this time.

Midland Junction developed as a suburb of Guildford with the location of the government Midland Railway Company locomotive and railway carriage workshops. At the turn of the century, extensive premises including administration buildings, running yards, engine sheds and workshop were located on 'a flat, swampy locality almost at the foot of the Darling Range' (Battye, 1912). The site has been used for painting, electroplating, diesel storage, and engine cleaning. In the 1970s, a waste water disposal pond and concrete floors were constructed on the site. The local council also supplied electricity and power to Guildford and surrounding areas. The residents mainly worked in the municipal and government workshops.

Present Land Use and Social Patterns

Adjacent to the confluence of the Swan and Helena Rivers, there is a small section of residential land use. On the eastern side of Great Eastern Highway, retail outlets and some residential land use occurs. Several new developments have been built in the area, including Rosehill Park and Helena Valley developments. These developments were built on land which was originally cleared for grazing purposes and until recently remained as rural land use.

In between these urban developments, large rural blocks still occur such as along Queens Road West where the understorey has been cleared for grazing. A few flooded gum have been retained for shade while the understorey has been replaced by grasses and other exotics.

The land uses are varied on the fluvial plains and include a poultry farm along Queens Road West and the Men of Trees plant nursery at Stirling Road. The Westrail Workshops run parallel to the Helena River at Midland and several track lines run within the workshop area adjacent to the river. The rail line runs parallel to Great Eastern Highway and then heads in a northerly direction adjacent to Farrall Road.

Several schools are located along the river banks including the Guildford Primary School, Guildford Montessori School, West Midland Primary School, and Midland Christian School.

Some light industrial land use occurs along Bushmead Road. This includes skin drying sheds, stockyards, wholesalers, and scrap yards. Metrobrick

is located on Military Road which is its main sales and distribution point. A rifle range occurs adjacent to Kadina Brook and an army training location is along Midland Road. There are several sand quarries which have mainly been abandoned or redeveloped for new land uses, such as golf courses and housing developments.

Much of Piesse Gully is set aside as State forest, while the remainder is used for orchards and cattle, sheep and horse grazing.

The Helena Valley Road closely follows the southern side of the river through the base of the Darling Range. A number of small rural properties are located between the road and the river, and a new subdivision is being developed. The road cannot be accessed by the public past the lower pipe head Dam. The Lower Helena pipe head dam is at the Darlington section of the river. The pipe head dam on the Helena River was constructed in 1971. It derives its water from the runoffs of the catchment between the dam and the Mundaring Weir. The water is pumped back into the upper Helena River Reservoir (WAWA, 1992).

The most spectacular land use in the precinct is the damming of the Helena River at the Mundaring Weir. The construction on the weir began in 1898 and the dam was officially opened in 1903. At the base of the weir, the old pump house has been converted to the museum. C. Y. O'Connor Memorial gardens are on the northern bank of the weir. The Mundaring Hotel and old hall are of historic interest to the area.

Recreation Nodes

At the confluence of the Swan and Helena Rivers, the King's Meadow recreation reserve occurs on the northern bank. Adjacent is the Guildford Primary School oval which links up to the foreshore reserve. On the eastern side of Johnson Street is the Perth Polo club which is set back from the main flood plain.

On the southern bank the Rosehill Golf Course occurs away from the river, however the clubhouse is on the river site of Queens Road West. The building is a restored farm house.

On the southern bank, are the Pexton Memorial Playing Fields of Guildford Grammar College. Helena Valley Recreation ground located along and separated from the river by a road. The area has a sports centre as well as playing fields.

The Mundaring Weir has provided a popular local recreation spot since it was opened early this century. The C.Y. O'Connor Memorial has several information signs explaining the history of the dam site and a memorial to the architect of the scheme. There are several grassed picnic and barbecue areas, lookouts etc. An attractive walk can be taken along the old railway zig zag route which was built by the Lionel White and Company. The O'Connor Museum is the site of the old pump station number 1 at the base of the Weir. The steam pump station was replaced in 1955 by an electric station. The original pump station was opened as a museum in 1961 and has many interesting displays and equipment. The Mundaring Hall was built in 1908 and was a popular meeting place for members of the local community.

Public access

Public access to the lower Helena River is restricted in summer by the low flow which makes it not particularly attractive for water sports, however access is possible up to the Great Eastern Highway Bridge. Upstream much of the Helena River is difficult to access due to private property adjoining the narrow river reserve. There is restricted access to the lower pipehead dam.

Sites of Nyungar & Wider Australian Community Significance

Nyungar significance

According to Nyungars, the Helena River is fed by numerous springs of 'living water'. There is one Nyungar account which relates the significance of Helena River linking Mundaring *(Mundjallina)* with the Swan River. Another account speaks of the significance of the Helena River between Mundaring and York. These are described below.

According to the Nyungars, the swamp and pools known as *Mundjallina* are located in the deep valley that has since been inundated as result of the construction of the Mundaring Weir. A powerful Waugal associated with rain making lives here.

Nyungars believe that disturbance of the swamp reeds at *Mundjallina* results in cyclonic winds and rain. So feared was this potency that children are not allowed in the vicinity of the swamp.

According to one Nyungar a corroboree ground was located nearby (Quicke, undated). It is believed that Mount Hall and a series of rocky outcrops on the northern side of the reservoir are significant for their association with a Waugal. One story recounts the journey of this Waugal up the course of the Helena River to its source. From here it travelled 18 kilometres overland to York forming the region's rocky hills as it went. A second version recounts how the Waugal formed the course of the lower Helena River from Mundjallina to Guildford. The Helena River was an important travelling route for local Nyungar. It is believed that a corroboree ground exists near the confluence of the Swan and Helena Rivers. The exact location can no longer identified. The Guildford section of the Helena Valley was referred to by Nyungars as Mandoon meaning 'the place of many trees'.

North of the Helena River there is a *winnaitch* or sacred stone at *Beeragunning* which is split down the middle (Bates, 1992). The stone was wide enough for a person to pass through. At the foot of the stone rushes were strewn and Nyungar passing the stone had to pass between it. If they touched either side they would die. Sometimes the stone was 'sulky' or boogur and would close in. If this happened Nyungars knew that it was time for them to die.

There is a hill on the Helena River a hill is called *Jagoolyoo* with a winnaitch or sacred place here with a stone in the middle of it. Nyungars would sweep this spot and keep it clean. Should they visit this place soon after and find a piece of meat on it they knew their death was eminent as the *janga* or 'spirit' in this stone was eating their flesh (Bates, 1992).

Nyungars probably had several names for the Helena River including Mandoon (Green, 1984). They also had a very detailed list of resting places and localities along the river banks. It is believed that around the 1880s, many Nyungars travelled down the Helena River from York working for the farmers.

It is recorded that on a hill in the Helena Valley, Nyungars built a stone wall about one metre high and 20 metres long. It was built in the form of a snake and orientated north-south directly up the face of the hill. Another similar east-west wall was built at the base of the hill. Both ends of the walls joined up with granite boulders. It is believed that this site was important for initiation ceremonies (Quicke, undated).

Soldier Swamp at Kidman Avenue, South Guildford, was used to train young Nyungars in the art of tortoise hunting (O'Conner *et al*, 1989). In the dry season the ground surface dries out. The tortoise dig to the damp mud below and skilled people can identify the disturbances in the mud to locate the tortoise. A ritual procedure would take place before the tortoise was eaten.

There are several records of Nyungar artefacts being found in the area known as 'Wild Horse Hill' and at Beeloo. It is also believed that the area near Army Transport depot was an initiation site and Strathams Quarry and Hazelmere Lakes are mythological sites (O'Conner *et al*, 1989).

The Jacobs family was one of the original Nyungar families which used the area of the Helena River to just below Gingin. At the turn of this century, the family was lead by senior elder's Ted and Les Jacobs and the family still has close connections with the area. (Cedric Jacobs, pers comm).

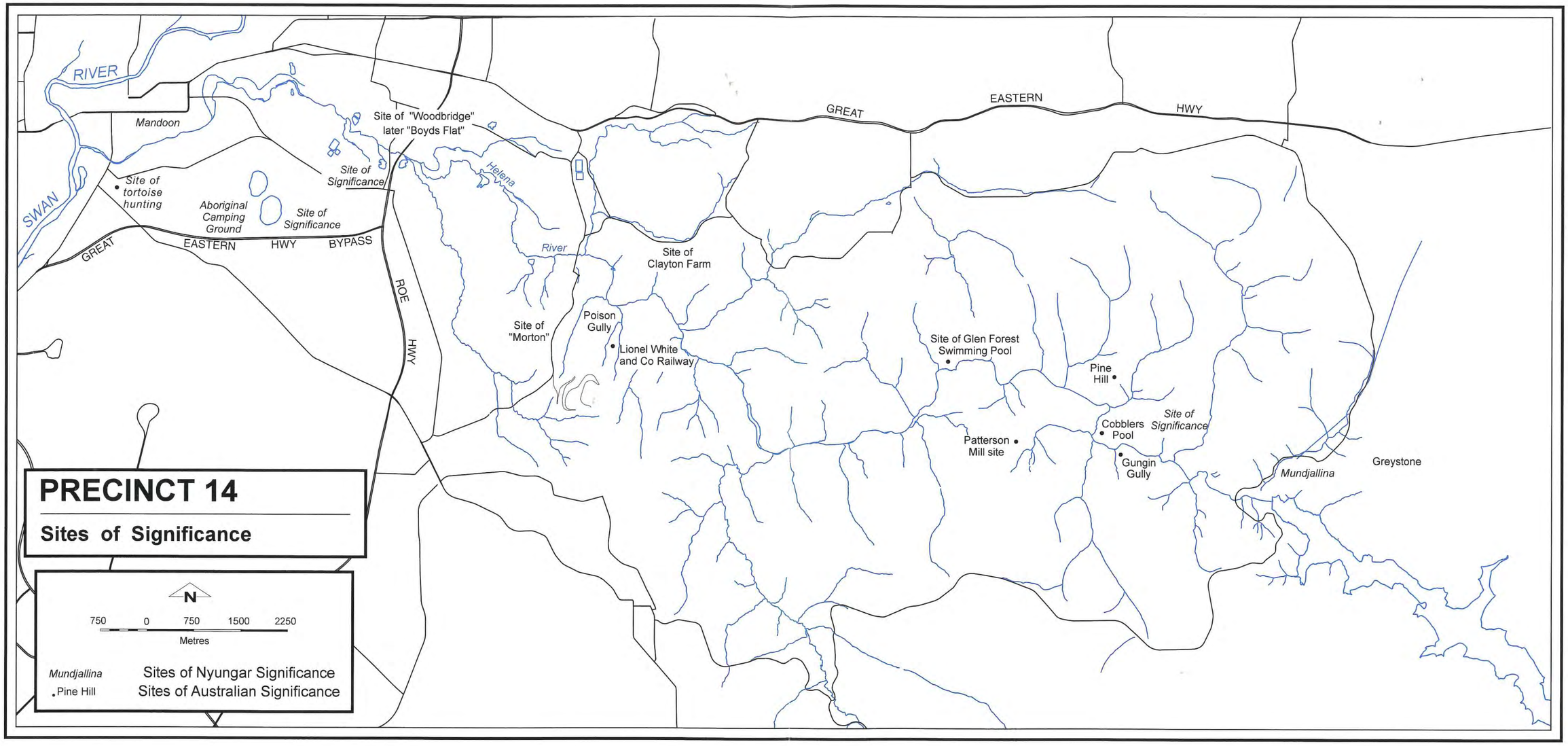
Other significance

It is thought that a 19 year old youth named Robert Dale was the first white explorer of the Helena River. It is believed that he named the river after his sister Helen (Quicke, undated).

Kings Meadow Reserve at South Guildford has retained its name from the original subdivisions. Originally, all crown reserve was marked on the subdivisions as 'King's Meadow'.

Several pools form in the river bed at Darlington and these were used as a local swimming spots.

Poison Gully is a local name for the north-western side of the Gooseberry Hill area which drains into the Helena on the left bank and may have been named after the York Road poison *(Gastrolobium calycinum)* which flourished in the area (Quicke, undated).


RIVER
Mandoon
Site of "Woodbridge" later "Boyds Flat"
GREAT
EASTERN
HWY
Site of tortoise hunting
Site of Significance
Helena
River
SWAN
Aboriginal Camping Ground
Site of Significance
GREAT
EASTERN
HWY
BYPASS
ROE
HWY
Site of Clayton Farm
Site of "Morton"
Poison Gully
Lionel White and Co Railway
Site of Glen Forest Swimming Pool
Pine Hill
Cobblers Pool
Site of Significance
Patterson Mill site
Gungin Gully
Mundjallina
Greystone
PRECINCT 14
Sites of Significance
N
750 0 750 1500 2250
Metres
Mundjallina
Pine Hill
Sites of Nyungar Significance
Sites of Australian Significance

Pickering Brook is named after Captain Edward Pickering who had a 3000 acre property from the brook to Darkin River. Pickering never improved his block and he later lost it as he had not met the development requirements of the property allocation scheme..

The first bridge to cross the Helena River was at James Drummond's property quite close to the present South Guildford bridge. The Helena Bridge was built in 1835 at Guildford but a flood destroyed it in 1862 and a new one was built in 1867 and in 1902. Remains of old piles occur alongside the current bridge.

The Charles Yelverton O'Conner Memorial is located at the Mundaring Weir. It commemorates his life time achievements including the engineering of the Kalgoorlie Water Supply and Fremantle Harbour. The Mundaring Weir itself is a historically significant site, being a monument to the labourers and the engineering feats of early this century.

Conservation Areas

System 6

M33 Helena River - Guildford to Darlington

The recommended area comprises the section of the Helena River from Darlington townsite to its confluence with the Swan River at South Guildford. The river banks retain remnants of the natural vegetation, often in the form a single row of trees. In places there are scattered solitary trees and bare stretches, and often the landward margin of the flood plain is better wooded than the river bank itself. The vegetation enhances the landscape significantly. The area is suitable for walking, fishing, bird watching and general enjoyment of the scenery. The area contributes to open space of regional significance. Important management considerations include the need to encourage growth and regeneration of local indigenous flora and controlling stock access to the river banks.

M34 - Helena Valley

The recommended area includes land which is reserved for Parks and Recreation under the Metropolitan Region Scheme. Public access is restricted by the Public Works Department's Catchment Zone regulations for the Goldfields Water Supply Catchment Area. A range of vegetation types occur in the area and include forest and woodland. The area as a whole has extremely high conservation value for both flora and fauna. Recreation activities within this precinct should therefore be restricted to those which do not diminish its conservation value. It is considered that both conservation of flora and fauna and preservation of water quality are compatible uses. The valley is the only major one close to Perth which is virtually in its natural state and with no major traffic arteries through it. To ensure the protection and enhancement of this valuable open space resource, the management structure of the area requires coordination.

Landscape Description

Precinct Description

Waterform and natural riparian zone

In the summer months, the lower Helena River channel is reduced to a series of pools and an exposed dry river bed. The river levees are exposed brown clayey banks and often central islands of clay form as the braided pools dry up. The islands often have riparian vegetation including paperbark and reeds as well as exotic grasses. In summer, the river channel is only one to five metres across while in the winter months the waters swell to fill the entire flood plain which at maximum is 100-200 metres across. Around the Hazelmere and Midland areas, several wetlands have formed adjacent to the river and are fed by both natural and artificial drainage lines. As the topography increases towards the Darling Range, the river channel is reduced to a small gravelly gully within the steeply sloping valley. Where the fringing vegetation is less dense, it is often possible to view the small waterfalls and eddies created by the disturbance of the water over protruding granite rocks. In summer, these rocks often act as barriers to the reduced flow and small discontinuous pools form. As the Helena River passes through Paulls Valley, the river bifurcates several times forming small islands in the centre of the channel.

There are several tributaries which enter the lower Helena River which are mainly ephemeral and are reduced to shallow gullies. There are several tributaries which enter the Mundaring Weir outside of the precinct. These feed the spectacular reservoir which floods the Helena Valley. The lake is long, narrow and with an irregular shape caused by surrounding hilly topography jutting as spurs into the lake. The reservoir levees highlight the water's edge and the dusty green grey of the surrounding woodland vegetation by forming a dramatic outline of unvegetated orange gravel and boulders.

Landform

The Helena River passes through a range of landforms creating an interesting landscape. At the base of the Helena River, the flat fluviatile plains spread out from the river channel. In places, the plains appear gently undulating reminiscent of the aeolian blown dunes. In front of the Darling Range, the landform becomes more undulating as the dominant topography becomes the ridge hill shelf. The lateritised foothills are the fluviatile terraces which spread out in fan like plains at the base of the Scarp. From a distance, a viewer can identify the separate fans in front the river valleys of the Darling Scarp. The Darling Range forms an almost linear belt of lateritic uplands and scarp which are interrupted by deep valleys.

Vegetation

At the confluence of the Helena River with the Swan River, the fringing vegetation has been degraded by clearing. The riparian vegetation is dominated by bulrush and exotic grasses. On slightly higher land, fringing paper bark provide a soft dusty rounded outline along the river bank. The swamp sheoak has a dull green foliage and irregularly shaped branches. At the lower Helena River, the sheoak is often on the edge of the river channel with the several branches hanging over the water. The flooded gum, also is often found overhanging the waters edge, however there are several remnant trees along Queens Road which are quite spectacular for their size and graceful spreading branches. The surrounding flatlands have a few remnant moonah and kondil on the sandier undulating plains. The moonah has thick twisting branches and soft clumps of foliage and makes a very attractive tree. The kondil is a tall regularly branched sheoak which is often found as a sole remnant tree in the lower areas. The original understorey has mostly been cleared for grazing and other land uses. Grasses and exotic weeds now flourish in the area. The natural riparian vegetation remains in some of the backwaters and small wetlands around the Hazelmere area, however despite the dense coverage there is still a lot of weeds.

On the lower plains, the woodlands of marri, jarrah, wandoo and banksia species have generally been cleared for other land uses, however remnant communities occur particularly on the larger semi rural properties or on industrial land which has a vegetation buffer. Weeds flourishing along the river banks include prominent species such as castor oil and bulrush. On the Ridge Hill Shelf, a greater amount of indigenous overstorey remains due to the unsuitability of much of the land for agricultural land uses. In this gravelly soil, the pale bark and loose open foliage of the wandoo and the graceful dense foliage of the Darling Range ghost gum are particularly attractive features. Interspersed in the community there is the irregularly curved shape of

the marri, and in places the understorey is quite dense with prickly bushes and other small shrubs.

In the valley between the lower pipe head dam and the Mundaring Weir the vegetation is dominated by a marri, jarrah and wandoo open woodland as well as sections of heath and herblands. This is an attractive woodland with the dominant trees having much darker bark and foliage than those of the downstream section. On the higher ground around the Mundaring weir the vegetation community is similar to the valley community, however interspersed with the marri, jarrah and wandoo are the large tall and regularly branched blackbutt trees. Around the Weir, the understorey is in relatively good condition with layers of shrubs and bushes being continuous.

At the weir, there is an interesting contrast to the indigenous woodland with the planting of exotic trees such as pines and confers. Isolated specimens of blue green and rich bright green foliage stand out, against the comparatively olive green of the surrounding eucalypt woodland.

Riparian land use

At the confluence of the Helena River there is the Kings Meadow recreation reserve and the adjoining Perth Polo Club both of which are open fields with a thin line of riparian vegetation. On the opposite bank, there is a section of river reserve which was originally used for pastoral purposes, and as a consequence the riparian land appears very weedy. Plexton Memorial Playing Fields owned by Guildford Grammar extend from the foreshore to Queens West Road. The fields are partly inundated during high flow periods and a small wetland occurs on the north-western corner.

The Great Eastern Highway bridge at south Guildford is a wooden pile bridge which has white wooden railings. On the western side of the bridge are two water pipelines which have been graffitied. There is a footbridge at Hazelmere which allows access to the West Midland Primary School and Midland Christian School from the surrounding suburb. Several small traffic bridges cross the river at Midland; these are all small low formed wooden structures, except for the Roe Highway bridge which has a concrete and steel superstructure with wide piles suitable for carrying heavy traffic loads. A railway bridge occurs at Midland which extends from through Middle Swan across the Helena River and towards Kewdale.

Upstream of Approach Road, Darlington, there is little direct riparian land use until the lower pipe head dam. The river channel at the downstream section of the dam is often dry in low flow periods. In the upper section, the water forms behind the dam filling the river channel and flood plains. The pipeline which carries the water to the Mundaring Weir crosses to the south side of the narrow Helena River channel upstream of the small reservoir.

Land use

On the eastern and western sides of Great Eastern Highway at South Guildford, a narrow belt of urban development includes residential properties and a small ribbon of commercial land use. The retail ribbon, has a vague reference to the Federation style houses, with lace trimmed corrugated iron verandahs. The houses in this area are mixed in age and style although most were built more than fifty years ago. The houses on the northern section are predominantly Federation cottages which have mainly been renovated in keeping with their original designs. Cottage gardens and mature exotic trees dominate the skyscape. There are several mature eucalypts within the residential areas. Guildford Primary School is located on the northern bank adjacent to the Swan and Helena River confluence. The school's ovals link to the adjacent river reserve and wetland.

On Queens Roads West, the land is used for grazing. It is reminiscent of the past land use of the entire Helena River. The fields extend to the belt of riparian vegetation which fringes the river foreshore. Several mature flooded gum remain within the fields providing a parkland type landscape. Further upstream there is the Rose Hill Golf Course which was developed in the early 1990s on the southern side of Queens West Road. The clubhouse and parking is on the river side of the road. The clubhouse is a refurbished house which helps link the past farming land uses with the new land uses. The golf course has required reshaping of the landform into undulating hillocks which have bright green turf. This sharply contrasts with the surrounding flat landform.

Associated with the golf course, a new residential development is currently being built. The styles have 'Federation' and 'Tuscan' elements which are currently popular with new home styles. Most blocks are quite small and all have 'landscaped' gardens and lawns. Few have native flora.

A poultry farm located on the southern bank which of the river is indicative of what was once predominantly rural land use. The farm has several sheds which are partly screened by a private residence and garden. The Men of Trees nursery is located in a depression at Stirling Crescent. It consists of several low formed shade houses and other growing areas. The site includes a wetland area. Opposite on the northern bank, there is West Midland Primary School and Midland Christian School which are separated from the Helena River and riparian vegetation by a road.

The old Midland Westrail workshops have been closed and a decision is currently being made on how the workshop site is to be used. At present, the old wooden and asbestos workshops are derelict and remains of the tracks are still present in the concreted yard. Upstream, the land use around the river becomes light industrial and includes car repair yards, scrap yards, drying sheds, stockyards and Midland brick yards.

Two prominent residential housing estates are located in the Helena Valley. They have been built on land which was previously rural land use. The houses have been built in the 1990s and are generally similar in style to the Rosehill area, however there are more corrugated metal roofs and more natural brick colours. Some remnant vegetation still remains on the subdivision.

Further upstream, riverside rural blocks occur in the valley. The houses are typically styled as small homesteads, although some are more suburban in style. The properties are generally mostly cleared for grazing and small horse agistments. Many have watertanks and sheds which reinforce the rural land use. Most properties extend to the river which has a mature riparian vegetation community. Grazing and rural activities have introduced a high number of weed species into the river area.

One of the features from the distance is the several pine plantations such as the Fred Jacoby Park plantation. These provide a dramatic contrast in colour and texture to the surrounding marri and jarrah forest. The plantations are on the higher topography and provide a backdrop to some viewscapes of the Helena River.

The above ground pipeline which carries the water from the Mundaring pumphouses to the goldfields are a characteristic land use in the area. The silver pipes run directly up the steep valleys and often glint through the forested areas.

The Mundaring Weir is a spectacular feature in the landscape. The reservoir is a great expanse of water, the end of which is out of view from the weir due to the nature of the surrounding topography. The weir is constructed as a massive slope of concrete which stretches across the valley floor. Some of the concrete supports are built into a granite rocky outcrop which is located on the southern bank. The concrete is stained in black on the western face. The streaking reduces the impact of the large concrete barrier by adding an interesting texture to what would originally have been a uniform grey concrete slope. The old water gauge station on top of the weir is an attractive Federation styled building. It is a little round building with a dome roof and finial ordainment. The station has recently been painted pale blue and cream which makes it a rather whimsical feature on the landscape. Although it appears rather delicate surrounded by the concrete wall, the deep reservoir and surrounding dramatic Darling Range, the gauge station is an important key landscape element which immediately allows the viewer to identify the Mundaring Weir. The C.Y.O'Connor Memorial gardens extend the Federation landscape, as the original designers constructed walkways, and viewing platforms and planted exotic gardens on the hillside for picnickers. The gardens are still a popular attraction for their classical design which is in sharp contrast to the marri and jarrah surrounding forests. At the base of the weir is the original number one pumping station. The pump station is a attractive example of the Federation industrial buildings. The red brick building has arches and brickwork which are characteristic style elements of this time. The original steam chimney is also made of red brick and is a strong vertical element in the valley.

PRECINCT 14

Dominant Landscape Characters and Significant Viewscapes

PRECINCT 10

PRECINCT 9

River

Swan

Helena

River

GREAT EASTERN HWY BYPASS

GREAT EASTERN HWY

ROE HWY

N

750 0 750 1500 2250

Metres

LANDSCAPE CHARACTERS

- Rural
- Suburban
- Natural
- Recreational
- Industrial
- Significant Viewscapes

Dominant Landscape Character

The original landscape for the Helena River would have been a transect of landscape types across most of the Swan Coastal Plain. The immediate landscape around Darlington would have been the natural landscape characterised by alluvial deposits predominantly covered by melaleuca-sheoak and sedges. Upstream from Darlington to the Mundaring Dam, the original landscape would have been the Darling Range Landscape ranging from eucalyptus woodlands on the deeper soils and low heathlands on the shallow soils.

At present, there are only a few limited Natural Landscapes west of Midland. These only appear natural in the immediate viewscape and the surrounding suburban and industrial landscapes infringe on the viewscape. The industrial landscape at Midland is composed of numerous workshops and small businesses. Many of the workshops are converted residential buildings. The suburban landscape is increasingly dominating the Helena River with only small sections of parkland. The suburban landscape in most sections dominates the entire riparian area as the Helena River is so narrow that the waterform is often not apparent except in the immediate vicinity.

There are patches of rural landscape upstream of the Helena River which are easily identifiable as intensive agricultural areas such as orchards and market gardens. In addition, several properties are hobby farms and horse agistment. Together, they have cleared land and relatively wide spaces between residential properties. Increasing pressure for subdivision is changing these properties to suburban landscapes with a higher density housing. Below the Mundaring Dam, there are large sections of bushland which appear to be relatively natural despite heavy infestation with weeds.

Significant Viewscapes

One of the most significant viewscapes is the panoramic view from Mundaring Weir. From the pedestrian walkway of the weir and the viewing points at either end there is a spectacular view of the dam itself and the surrounding forested water catchment area. There are also several of the historic water pump buildings in the viewscape. Downstream from the dam, there are several areas where the waterform and relatively natural vegetation provide an attractive viewscape. The confluence of the Swan and Helena Rivers has potential to be a significant viewscape in the precinct if foreshore vegetation was improved in the landscape.

Conforming and Non Conforming Elements in the Landscape

The industrial and suburban landscape intrudes into the very limited natural landscape of the riparian area around Midland.

One of the distinguishing features of the Guildford area, is the number of older cottages and Federation styled houses. These have a mixture of exotic gardens and there are several mature eucalyptus in the gardens. When planning for urban development in this landscape there is the opportunity to consider the historic elements which make Guildford a distinctive landscape.

There are a few rural landscapes in the precinct. These elements stand out from the surrounding bushland with cleared blocks and intensive horticulture including small orchards. Several hobby farms and horse agistments are important elements in this limited landscape. Subdivisions are increasingly altering these landscapes to a suburban landscape.

The Mundaring Weir is a spectacular intrusion in the landscape. The dam has flooded the upper reaches of the Helena Valley and due to water quality requirements the immediate catchment remains uncleared. The collected water forms a broad lake surrounded by eucalyptus woodland. The waterform is unnatural in this landscape type, but it is attractive to most viewers.

Recommendations for Maintenance and Enhancement of the Present Landscape Character

- Enhance the natural riparian vegetation especially at the lower reaches of the Helena River where urban influences have reduced the quality and distribution of natural communities.

- Consider the opportunities which the distinctive Guildford suburban landscape offers. Consider if new developments should conform, complement or stand out from this historic landscape.
- Consider the historic nature of the Mundaring Wier and surrounding buildings when planning land use and developments.
- Consider the attractiveness of the natural vegetation and rural landscape character which considering development proposals.
- Consider the steeply sloping nature of the upper section of the precinct and ensure that development designs do not detract from this geomorphology.

Precinct Specific References

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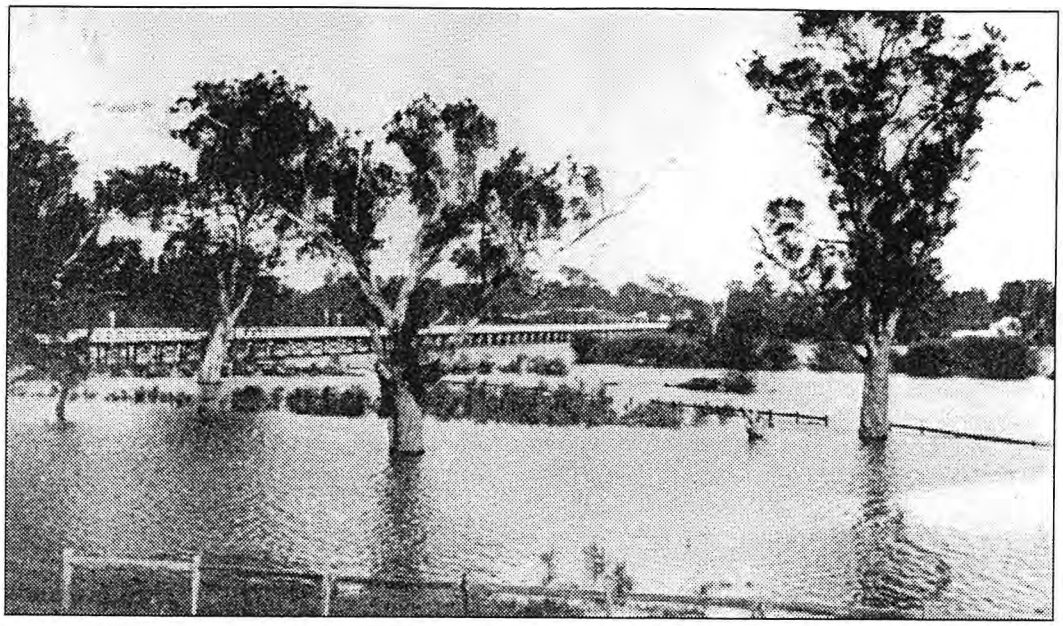

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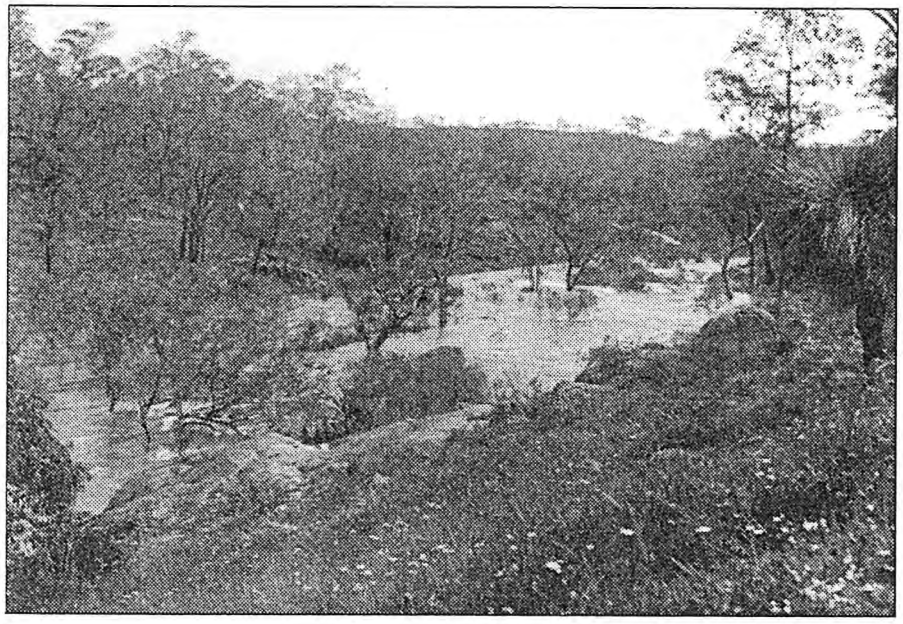

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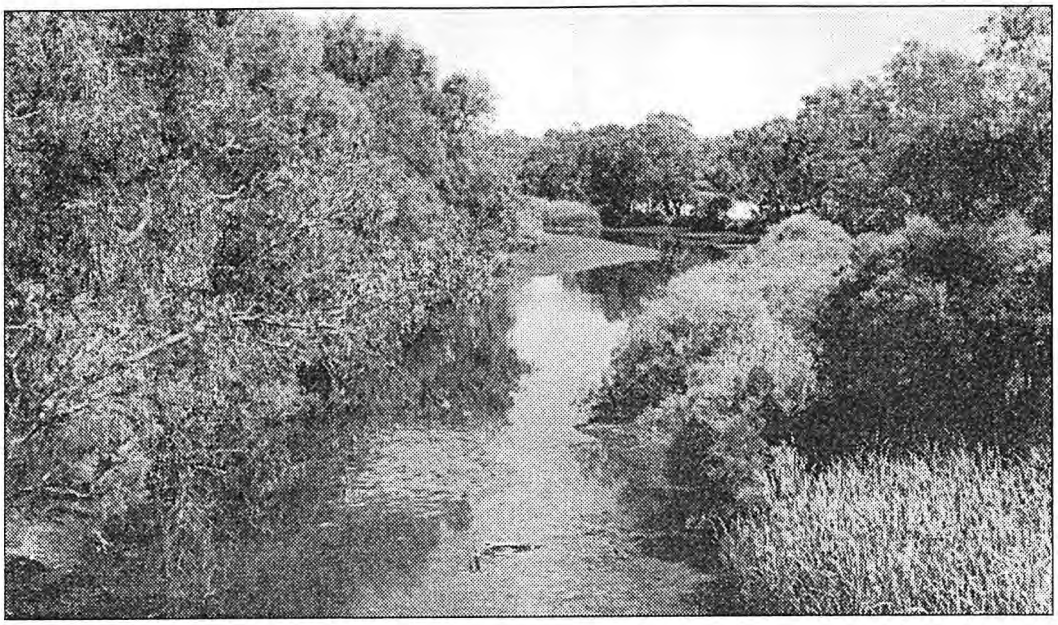

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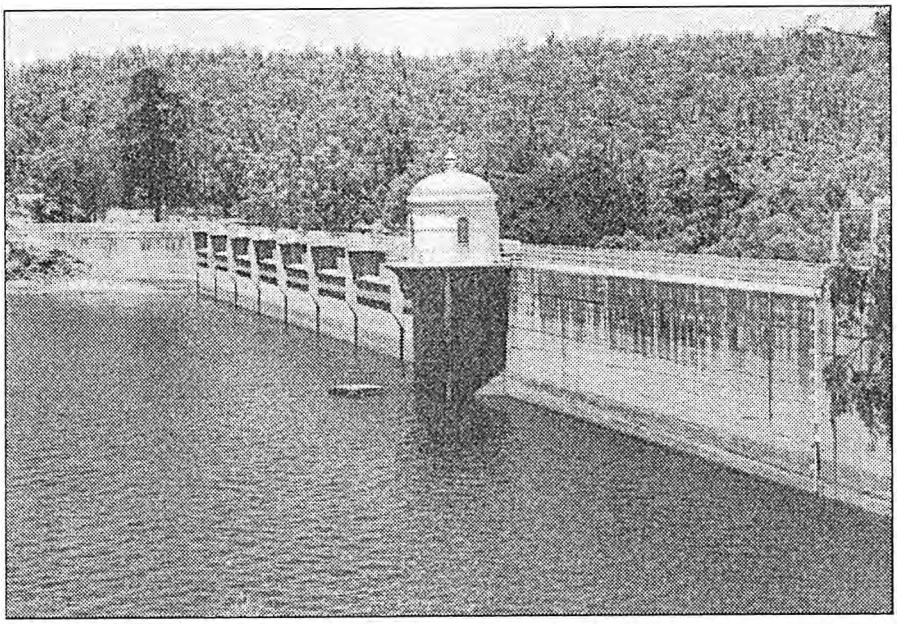

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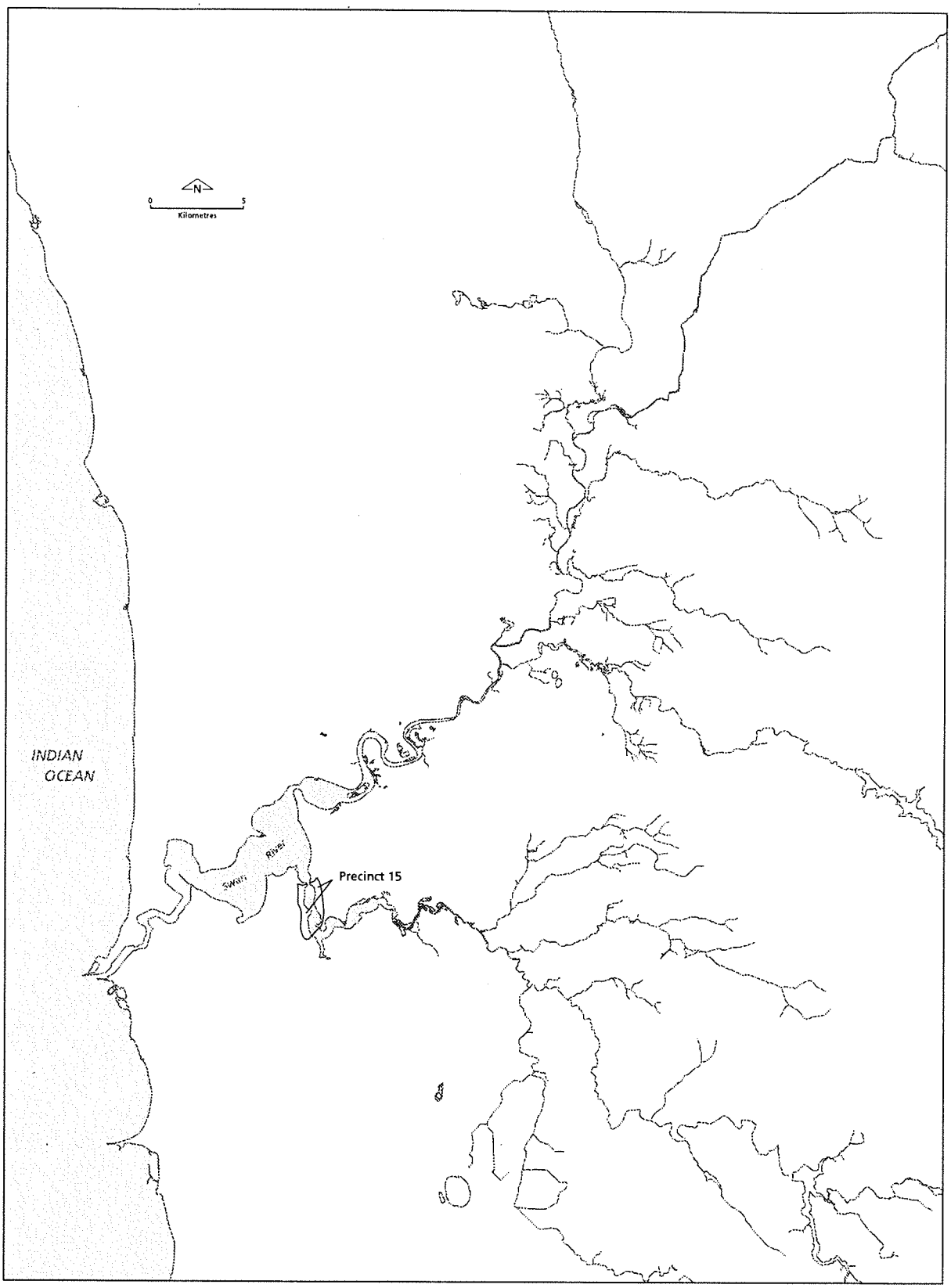
Precinct 15

Canning River - Canning Bridge to Freeway at Mt Henry



Summary

Canning River - Canning Bridge to Freeway at Mt Henry

The precinct includes the section of Canning River between Canning Bridge and Mount Henry Bridge. From the Canning Bridge, the estuary widens into a elongate channel which becomes narrower at the triangular shaped isthmus at Deep Water Point.

The estuary narrows towards the Mount Henry Spit and the confluence with Bull Creek. The eastern bank of the river is relatively linear due to land infilling with the construction of the Kwinana Freeway. The only major curve is Cloisters Reserve which is a slightly convex shaped promontory. The foreshores within this area are mainly unwalled and patches of fringing vegetation remain on narrow sandy beaches. The estuary is situated in the gently undulating low sandy ridges of the ancient coastal dune system. The most dominant natural landscape feature is Mount Henry which rises up to 15 metres above sea level and has several limestone outcrops exposed between the vegetation cover of open woodland. In front of the limestone ridge the slope rapidly decreases to a sandy spit which juts out into the river. The spit is topographically low and subject to inundation which allows a paperbark and reed community to be supported. Much of the fringing vegetation is subject to heavy pressure from trampling, fires and the proliferation of weeds in the understorey. The Mount Henry landform is an aesthetically important landscape element as it acts as an attractive node among several man-made features which detract from the river landscape.

The dominant land use features in this precinct is the freeway reserve and the Canning and Mount Henry Bridges. The Kwinana Freeway is seven lanes wide and is very close to the river foreshore. The Mount Henry Bridge is a long bridge with a narrow superstructure and tall concrete piles. The bridge is lower than the Mount Henry ridge and is in line with the height of the Rossmoyne landform, and as a consequence from most vantage points the bridge does not intrude on the skyline. The Canning Bridge is a low wooden pile bridge which crosses the river at the narrow point once known as 'Hells Gate'. The residential area on the western section of the foreshore has a high degree of urban pride and is set very close to the river foreshore. The residential and institutional land use on the eastern foreshore is set back on the higher land and overlooks the freeway and river. There are patches of remnant bushland in front of Mount Henry Hospital and Aquinas College.

Biophysical Processes

Geological Processes

The Swan Coastal Plain was formed by aeolian deposition of coastal sand in linear parallel dunes during the Quaternary. Calcareous sands formed limestone, by cementation in situ, and by leaching and precipitation around tree roots forming travertine pipes. Examples of the Tamala cross bedded limestone and travertine can be seen on the exposed cliffs of Mount Henry extending from the South of Perth Yacht Club to Salter Point.

The soils of the area have been classified as part of the Bassendean Association (DCE, 1980). These have peaty podsols in the swamps, however this classification has been recently revised (City of South Perth, 1993). It is suggested that they vary from Karrakatta to Cottesloe Associations. At Mount Henry the shallow yellow soils with the limestone close to the surface suggest the Cottesloe Association.

Topography

The area is situated on the edge of the Spearwood Dune System topographic unit, which is predominantly low undulating dune systems. Adjoining this system the Bassendean Dune System begins and consists of low hill systems which have sandy swamps in the interdunal swales. The dominant topographical feature in this precinct is Mount Henry which rises to 15 metres. From this the eastern bank becomes increasingly flatter and sandy beaches originally occurred at the foot of the cliff and adjacent foreshores. Between Deep Water Point and Canning Bridge the foreshore was composed mainly of sandy beaches with some swampy patches. Deep Water Point is a sandy headland which is approximately 1-2 metres above the water level.

Hydrological Processes

Water features

The Coverdale groundwater mound occurs between the Canning and Swan Rivers and the Mount Henry foreshore is part of the outer fringe of the Cloverdale flow system. The estuary channel has a high width depth ratio and takes a relatively linear form before its confluence with Melville Water. The river bed is composed mainly of mud, however nearer to the river banks, sand and shell and clay dominated sediments exist (SRT, 1994). North and south of Deep Water Point there are shell deposits within the channel.

Bathymetry

This reach of the river is estuarine and the tidal influence is experienced up to Kent Street Weir on the Canning River. The mean daily tidal range is 0.36 metres at Barrack Street Jetty (SRT, 1994). The estuary's hydrological condition changes seasonally, the volume of the river flow being the primary factor in controlling the estuary's status. The surface salinity in this stretch of river ranges from 3 ppt to 20 ppt (Riggert, 1978). Beneath Canning Bridge, a pool reaches 10 metres in depth while the rest of the river is on average just over 4 metres in depth. This pool creates a continuous eddy in the river flow. There is a second pool adjacent to Deep Water Point which is over 5 metres in depth.

Flooding

The topographically low areas are subject to inundation during periods of high water conditions. Seasonal inundation on the foreshore has recently caused algae, which has proliferated due to increased nutrient load, to be deposited on the foreshore. This causes a line of rotting algae on the beaches once the waters recede. Limestone walling on the eastern side of Canning Bridge has reduced seasonal inundation along this section of the foreshore.

Erosion and accretion

The river banks adjacent to The Esplanade and Mount Pleasant are eroding due to the removal of riparian vegetation and heavy recreation use. An area of significant accretion occurs beneath Canning Bridge.

Vegetation Communities

Native

Bassendean Complex

The indigenous flora of this precinct is classified as part of the Bassendean Complex (DCE, 1980).

The vegetation ranges from woodland of jarrah *(Eucalyptus marginata)*, sheoak *(Casuarina obesa)*, and various banksia species *(Banksia* species*)* to sedge lands on the moister and lower sites. The various communities which make up this complex are described below.

Juncus community

The shoreline community extends from just below the high water mark and supports the shore rush *(Juncus kraussii)* which occurs in thin sections along the Kwinana Freeway section of the foreshore. Sections occur as isolated stands while in other areas, these have joined up to form a continuous ribbon (City of South Perth, 1993).

***Sarcocornia* and *Halosarcia* communities**

At Mount Henry Spit, there are a small salt marsh community which consists of seablite *(Suaeda australis)* and beaded glasswort *(Sarcocornia quinqueflora)*. In addition, samphire *(Halosarcia sp)* occurs in a monospecific stand at Mount Henry Spit.

***Melaleuca Juncus* community**

Parallel to the Kwinana Freeway there are a number of stands of shore rush *(Juncus kraussii)* and swamp paperbark *(Melaleuca rhaphiophylla)*.

***Casuarina-Melaleuca* community**

There is an isolated pocket of the swamp sheoak *(Casuarina obesa)* and swamp paperbark *(Melaleuca rhaphiophylla)* on the Cloisters foreshore. On the opposite bank the saltwater paperbark *(Melaleuca cuticularis)* is found interspersed in the narrow belt of vegetation at Mount Pleasant. At the Mount Henry Spit this community occurs fringed by a *Juncus* community which often extends into the understorey of the paperbark-sheoak complex. Another understorey includes the saw sedge *(Gahnia trifida)*. On the slightly higher land there is moonah *(Melaleuca preissiana)*.

***Banksia* community**

The flora of the Bassendean Complex would have originally dominated the higher land surrounding this section of the Canning River (City of South Perth, 1993). The ridge in front of Aquinas and Mount Henry Hospital is dominated by banksias including firewood banksia *(Banksia menziesii)*, slender banksia *(Banksia attenuata)* and holly leaved banksia *(Banksia ilicifoila)*. There is an understorey community of small shrubs and weeds.

The sandy slopes of Mount Henry Spit are covered with a low woodland community dominated by Christmas tree *(Nuytsia floribunda)*, sheoak *(Allocasuarina fraseriana)*, spearwood *(Kunzea ericifolia)*, and grey stinkwood *(Jacksonia furcellata)*. The understorey supports low shrubs such as pineapple bush *(Dasypogon bromeliaefolius)*, and leschenaultia *(Leschenaultia floribunda)*. The community once supported jarrah *(Eucalyptus marginata)* however this has been selectively logged.

On the limestone outcrops in front of the main Aquinas building, species such as parrot bush *(Dryandra sessilis)*, basketbush *(Spyridium globulosum)* and cockies tongue *(Templetonia retusa)* occur.

Exotic

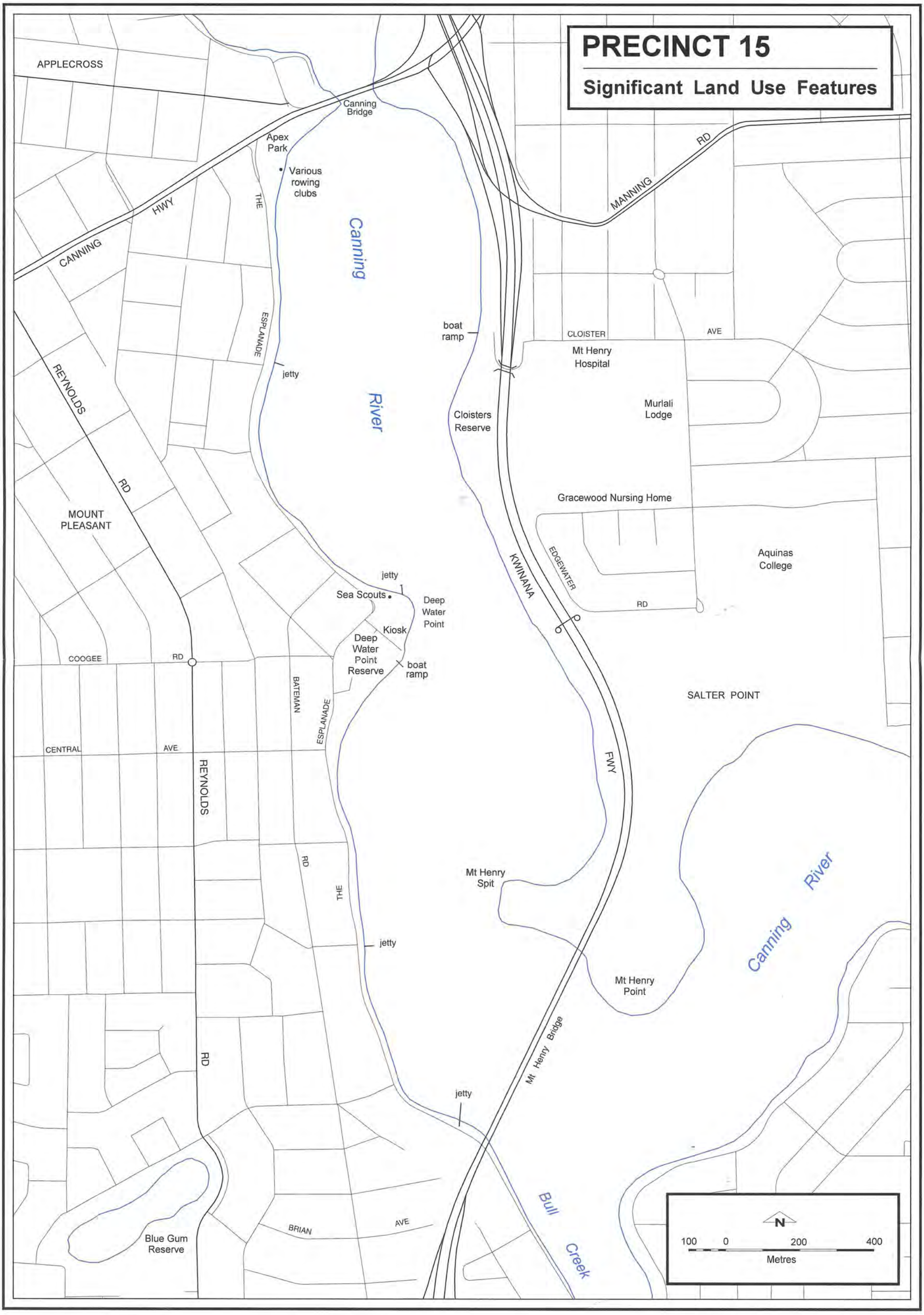
Veldtgrass *(*Ehrharta* sp*)* is prolific within the woodlands. Kikuyu *(*Pennisetum clandestinum)* and couch grass *(*Cynodon dactylon)* are also abundant and have replaced understorey species particularly in remnant fringing paperbark communities. Watsonia *(*Watsonia bulbilifera)* and cape tulip *(*Homeria breyniana)* are common on the foreshores. Morning glory *(*Ipomoea indica)* lantana *(*Lantana camara)* are common in the drier areas of the Bassendean Complex. The exotic bulrush *(*Typha orientalis)* is also present along the foreshores. The endemic species *(Typha domingensis)* is not able to invade areas of remnant vegetation and therefore is under threat from the introduced species. There are Norfolk pine trees *(*Arauccaria heterophylla)* planted adjacent to the Canning Bridge Rowing Clubs. Several exotic and Australian trees have been planted at Deep Water Point Reserve.

Historical Land Use and Resulting Environmental Changes

The Canning River mouth was first recorded by Europeans during a French exploratory expedition lead by Sub-Lieutenant Heirisson. They discovered the entrance to the Canning River which they named Entree Moreau. It is believed that the estuary was named after Midshipman Moreau who was on the exploratory party (Richards, 1991), although other records claim that it was named after General Moreau of Hohenliden (Carden, 1968). They did not venture upstream but speculated that this would be an opening which would link Melville Water to the ocean. In March 1827, a small reconnaissance expedition lead by Stirling explored the Canning River. The river was named by Stirling after the

PRECINCT 15

Significant Land Use Features



influential and controversial British statesmen George Canning. Canning was Prime Minister for a brief period in 1827 and died in office. There is conjecture why the river named after Canning as no mention is made in either Stirling's or the botanist Charles Fraser's diaries (Richards, 1991). Two years later, Captain Fremantle explored the Canning River for about 30 kilometres upstream which proved to be a difficult journey involving dragging the boats through shallow water and avoiding fallen trees. He described the Canning as having 'many large trees spread all over the country some 30 feet (9 metres) in circumference, and the appearance generally very pretty and picturesque, particularly the river'.

Thomas Peel, a cousin of the British Prime Minister of the time, was promised a grant of over 100 000 hectares which included all of the Canning River except the southern section of Bull Creek. The major condition of the grant was that Peel must land his four hundred settler families in the colony by 1 November 1829. In May 1830, the first of Peel's settlers on the ship Rockingham, were wrecked on the beach at the site that now bears the ship's name. Those who survived were neither paid their wages nor given their farms. Peel's land grant was thrown open to other settlers a week after expiry date and within this precinct area the land holders were Waylen and Tanner (Lot 61), Hamilton (Lot 44 and 56), Collett (Lot 66) and Middleton (Lot 26). However in the early years only the upper reaches of the river beyond the present Nicholson Road Bridge were developed. There is no evidence that the land lower down the river was developed to any extent during the 19 th century other than cutting timber for jarrah sleepers and poles, sheoak shingles and firewood, and cattle grazing (Richards, 1991). Owners below Nicholson Road noted that the land was only fertile adjacent to the river and much of this land was subject to inundation. The land owned by Susan Collett was willed to her children and then later sold to James Simpson in 1911. Simpson built a house known as 'The Castle on the Hill', due to its crenellated walls. Waylen did little with his land preferring his Alfred Cove property.

The Canning River was used to transport jarrah logs from the Darling Ranges. The timber was bought by bullock teams to Ben Mason's timber mill erected at Cannington in 1869. The timber was transported down by barge to the Fremantle. To improve access across the Canning River, the first Canning Bridge was constructed in 1849 at Hells Gate and remained for the next 60 years. A second Canning Bridge, built in 1892, was too low for the barges to pass beneath it so it was raised. The first Riverton Bridge was built in 1910, however its centre spans were also raised to allow loaded barges to pass beneath at high water.

A number of families were evicted from other parts of Perth during the Depression and several found shelter under the paperbarks south of Canning Bridge at Cloisters. Rudimentary housing was provided for these families by the service club called the Ugly Men's Association which provided practical assistance to the needy (City of South Perth, 1993). Aquinas College was built in the 1930s and its construction is covered in more detail in Precinct 33. There were two squatters camps on the Cloisters Reserve up until the 1940s.

Mount Henry Point was resumed for freeway extensions and a public reserve in 1959. The Mount Henry Bridge was opened in 1982 as the longest road bridge in Western Australia being 660 metres long and 11.5 metres above sea level. The Main Roads Department planted 101 varieties of native flora along the freeway reserve in this section. The trees were planted before the completion of construction and the plantings were aimed to 'blend with the existing native plant grouping and stabilise the sand embankments'. The value of the paperbark trees along the foreshore and the woodlands at Mount Henry was acknowledged and these areas were fenced off during construction (MRD, 1982).

Present Land Use and Social Patterns

Most of the land use in this area is residential. The houses and flats built in the 1960s along the Manning foreshore are quite modest in style. The Salter Point houses are larger and have a higher degree of urban pride. The Mount Pleasant residential area is only metres away from the river and the houses are generally well maintained. The majority of the gardens are eclectic and have a dominance of exotic species. The Mount Henry Hospital is situated on

the Manning Ridge. It has been constructed in a red brick institutional design. The gardens contain only exotic species. Aquinas College is also visible from this precinct. It has a mixture of building styles; the main building was built in the late 1930s in an attractive style.

There is commercial fishing predominantly at night or early morning by a few licensed craft. Worm digging for bait is allowed at Cloisters ramp with strict guidelines. There is a kiosk at Deep Water Point.

Recreation nodes

This section of the Canning River is a popular river and shore based recreation node due to its shallow and sheltered water. The water based recreational activities include boating, skiing, rowing, sailing, swimming, jet-skiing, fishing and prawning. Prawning is a popular activity in this area of water, however it is often common practice to leave rubbish and unwanted contents from the nets on the foreshore and damage natural vegetation along the river banks. Deep Water Point is a popular power boat area and the craft often generate quite high levels of noise.

The Swan River Rowing Club, Curtin University Rowing Club, Amateur Rowing Association of WA and the Penrhos College Rowing Club have their club houses on the southern banks of the foreshore. This section of the river was used for the 1962 Commonwealth and Empire Games rowing events due to its sheltered nature and relatively wide and straight section. The present rowing club was built on spoil from the Canning Bridge construction. The 1st Deep Water Point Sea Scouts have their club houses on the river beds. There are several public mooring sections within the river precinct. The dual use path hugs the river foreshore of this precinct, providing valuable access for recreational users and bicyclists.

Public access

Public access to the eastern foreshore has been limited due to the presence of the Freeway. However to help provide some access to the foreshore a dual use path way runs adjacent to the Kwinana Freeway and parallel to The Esplanade. The Edgewater Point footbridge allows pedestrians access to the foreshore from the adjacent suburban area. A small road overpass allows access to a small informal boat launch area at Cloisters Park. Around the rowing clubs, people are unsure if the foreshore is private property and another issue is the congested parking often caused by rowing club activities. Erosion control programs could consider limiting access by recreational fishermen and prawners to the foreshore near fringing vegetation.

Sites of Nyungar & Wider Australian Community Significance

Nyungar Significance

The wetlands of the Swan Coastal Plain provided an abundance of food and other resources. The density of the Nyungar population living in what is now the metropolitan area is considered to be one of the highest in Australia (Richards, 1991). A Nyungar family group could consist of several family units. Each Nyungar group had a favoured camping ground or *kaleep* which held special significance. Beyond this a wider hunting and gathering area could be used. At least six family groups are thought to have claimed territorial rights to the present metropolitan area (Richards, 1991). Two of the family groups which are believed to have been associated with the Canning River are the family of Munday in the Beeloo District and family of Midgegooroo in the Beeliar District.

Nyungar leaders, Munday, Midgegooroo and Yagan are especially remembered for their confrontations with the white settlers. Yagan is recorded as being an impressive man who had a distinctive tribal tattoo on his right shoulder indicating his high stature in the Nyungar community. He had a wife and two children. Towards the end of 1831, a Nyungar was shot dead for stealing potatoes at Mr Butler's farm at Freshwater Bay. In October 1832, Yagan was arrested for killing Entwhistle, a servant of Butler whom he had earlier attacked in an act of reprisal for the murder of a member of his tribe (Carden, 1968). He was sent to Carnac Island, later escaped and remained at large for eight months. In April 1833, the two Velvick brothers (employed by John Randell Phillips) were killed near Bull Creek in retribution for the death of a Nyungar man shot by one of William Nairne's labourers. In May of that year Yagan's father, Midgegooroo, was executed by firing squad. He had earlier been accused of ambushing two settlers in reprisal for the killing of Yagan's brother Domjum at Fremantle. Munday, who was also accused of the murder of the Velvick brothers, later received a pardon (Carden, 1968).

PRECINCT 15

Sites of Significance

Entree Moreau
Gabbi Kowangulup

Hells Gate

Wagoorjup

Canning Dyarlgarro River

HWY

CANNING

Site of L.Lukin later Waylen and Tanner's property

Site of T. Middleton's property

N

100 0 200 400

Metres

Gabbiljee Sites of Nyungar Significance

Hells Gate Other Australian Community Significance

KWINANA FWY

Deep Water Point
Booragoon

Site of Hamilton's property

Site of Collett's property

Site of Middleton's property

Bull Gabbiljee Creek

As mentioned earlier Yagan died after he had been fatally shot by William Keates, an 18 year old who was a worker at Henry Bull's Upper Swan property. At Bull's property food had earlier been distributed to local Nyungars and there had been substantial trust between the two communities. At the time of the incident William and his 13 year old brother, James, were out kangaroo hunting. Keates was immediately speared to death by another Nyungar. However James managed to flee by jumping in the river. Before James escaped he shot Heegan, another Nyungar present at the scene. Settlers who were alerted to the incident, removed Yagan's head and flayed his tribal tattoo from his shoulder. His body is reputed to have been buried at the site and is assumed to be close to Mr Bull's property (Dallas, 1986). Yagan's head was smoked and sent to England to be displayed in many museums. It was latter buried in a Liverpool cemetery in 1964. The Australian High Commission is presently negotiating for his remains to be returned to the Swan Valley. It is believed that his body was not removed by Nyungars from the shallow grave made by the settlers. It is often recorded that the other Nyungar buried with Yagan was Domjum. This is unlikely as it is known that he was shot by Peter Chidlow in Fremantle and his body buried in the town (Dallas, 1986). After this, Beeliar Nyungars were lead by of two of Yagan's brothers (or possibly close relatives) and one of his sons.

P. Chauncy claims that *'some of the settlers on the Canning River and in the York district were at times dependent on the natives for food'* (Carden, 1968). An early shortage of labour prompted many colonists to employ local Nyungar as shepherds, guides, constables and servants. Young Nyungar women were often taught to be maids but were frequently taken back by the men to whom they were betrothed at birth (Carden, 1968).

The mouth of the Canning River was termed *Wagoorjup* (place of the Waugal) and the river itself is known as *Dyarlgarro*. The eastern shore of the Canning is named Beenabup and the flats south of the Canning River are called *Wadjup* (Collard *et al,* 1996; Glauert, 1950). The confluence of the Canning and Swan Rivers is known as *Gabbi Kowangulup.* The narrow section at Canning Bridge is known as *Wagoorjup* to Nyungars. Bull Creek is known as *Gabbiljee* (the watery place at the end of the river) and the open waters of the area referred to as *Booragoon.*

Other significance

Despite early favourable descriptions of the fertility of the lower Canning, early land holders complained that the land was useless for productive agriculture. As a result much of the lower Canning was slow to develop. One of the earliest significant land uses was the construction of Aquinas College by the Christian Brothers. Details of this are given in the next precinct description. The area now has the Kwinana Freeway along its eastern shoreline and this is one of the main traffic routes for the Perth metropolitan area.

It is believed that there are two wrecks at Coffee Point, the Lady Ord (built 1878) and Helena Hardy (1897).

Conservation Areas

Wetlands

The Cloisters Reserve was instigated by a gift of land from a Mr Manning of Peppermint Grove on behalf of his mother. The land was registered in the name of Francis Augusta Hall and Florence Juanita Holmes. It has been given an A class reserve status at the request of the bequestors.

System 6

66 Mount Henry Manning

The recommended area comprises the whole of the Mount Henry peninsula including the freehold land owned by the Christian Brothers and the foreshore reserve. The area occupies a prominent limestone outcrop headland. It is covered by open woodland of tuart, marri, jarrah and Christmas tree with a very varied understorey including woollybush *(Adriana quadripartita)* and *Daviesia juncea.* At the base of the hill there is a small stand of swamp cypress. Along the river (Precinct 32) there is *Juncus kraussii, Scipus nodosus* and *Suaeda australis.* The area supports over a hundred native species in all. The area is significant for its value for educational studies and landscape feature and because of its high conservation and recreational value. The area has been recommended for Regional Park status.

Landscape Description

Precinct Description

Waterform

The Canning River from its narrow mouth at Canning Bridge swells into a wide channel which curves around the convex form of Deep Water Point. From Deep Water Point the western bank takes a relatively linear form to Mount Henry Bridge, while the eastern bank curves into Mount Henry Spit forming a sheltered bay to the north of the spit. The southern section of water is wider and open to more prevailing winds due to it curve around Mount Henry and confluence with Bull Creek.

Natural riparian zone

On the eastern bank the foreshore has been allowed to take a natural form and slope from Cloisters to Mount Henry Bridge. The foreshore is very flat and subject to inundation during high water periods. The result is that fringing vegetation is partly submerged and the narrow sandy beaches that are prevalent in summer are not evident. During winter, the land at Cloisters and Mount Henry Spit becomes rather swampy as pools of water form within the depressions of the fringing paperbark communities. On the western bank there are narrow beaches up to the lawn of the Rowing Club foreshores. These beaches continue to Deep Water Point and are held in place by a narrow line of fringing vegetation. At Deep Water Point the lawn grows right to the white sandy beaches of the spit. From the point to Mount Henry Bridge a similar narrow beach with a line of fringing vegetation occurs where in the winter months the fringing vegetation is partly inundated.

Landform

The eastern bank of the Canning River has a relatively topographically flat foreshore. The gentle rise to the low undulating hills behind have been severed by the Kwinana Freeway construction of which involved levelling the land. From the freeway reserve, the land rises quite steeply to a gently curved hill crest which reaches a maximum height of 15 metres at Mount Henry (which is described in the next precinct). The original slope would have decreased quite rapidly from the Mount Henry cliff face to the flat Mount Henry Spit. The spit forms a tapered promontory and rises to low sandy slopes before the ridge. The height of the ridge gives depth to the scene and the gently undulating Mount Henry is visually consistent with the gentle curves of the waterform beneath the ridge.

On the opposite side to Mount Henry, a steep bank rising from the foreshore to the bridge was created by landfill for the bridge construction. The adjacent land has a gentle gradient which slowly rises to the low sandy undulating plain of the ancient coastal dune system. The rise of the hills is in some places very close to the narrow foreshore and road area. However at Deep Water Point the rise of land is joined to the foreshore by the sandy isthmus which is triangular in shape and relatively flat.

Vegetation

The fringing vegetation at Cloisters consists of a paperbark community and shorerush sedge fringe along the water's edge. The paperbark trees are particularly attractive to the pedestrian. They are mature and have a pleasing pale bark with dark streaks and soft dusty canopy. In winter, the estuary usually inundates the fringing sedge community which lines the foreshore. This gives a pleasing continuity of the land and water elements. The understorey is made up of mainly exotic grasses which detract from the community's appearance. A fire in the reserve has recently burnt all the paperbark and rush communities. There are signs of regeneration. It will take many years to return to an aesthetically pleasing vegetation strip. It must also be noted that in the unburnt areas the trees are showing signs of stress as there are no new paperbark saplings or endemic understorey communities. The area south of Cloisters was infilled by the Main Roads Department and the original high water mark was where the present freeway exists. The Main Roads Department planted some endemic and some exotic species and consequently these communities are not as attractive as the mature stands at Cloisters. In this new foreshore section, the vegetation is sparse and the fringing reed community is only present in a few clumps.

The vegetation at Mount Henry Spit shows a transgression from fringing rushes to a heath community. The fringing vegetation includes paperbark which overhangs the water and sedge

communities. As the slope increases the sheoaks, Christmas trees and spearwood provide a dusty soft green grey appearance. There is also quite a dense mat of understorey some of which is the result of the removal of tree cover. A segment of ridge vegetation occurs before the Mount Henry Bridge and is dominated by the rough textured banksias and prickly forms of the parrot bushes. A narrow band of this banksia woodland occurs on the ridge in front of Aquinas College and Mount Henry Hospital. It has the appearance of a healthy and dense community, however a closer inspection reveals many understorey weeds. Originally, the community would have supported jarrah which would have given a more vertical element to the landscape.

The vegetation planted on the freeway reserve is mainly Australian bushes and although the flora is not necessarily endemic to the area, they are ideal for the harsh roadside conditions and their forms and colours are indicative of native vegetation. At Deep Water Point the recreation reserve has been planted with eucalypts which are not endemic to the area as well as a number of exotic species and lawn. The plantings are too sparse to be attractive or provide adequate shade. Adjacent to the rowing clubs there are several Norfolk pines which add a strong vertical element to the foreshore landscape.

Riparian land use

The Canning Bridge is an attractive structure with wide round wooden piles and a white painted superstructure. The bridge acts as a visual delineation between Canning and Melville Waters and the foreshore viewer cannot easily see the water through the dense piles. The foreshore adjacent to the Canning Highway interchange has been retained with a limestone wall and there are lawn and planted bushes behind this area.

The Cloisters foreshore has an informal boat ramp which is a white oyster shell beach. The parking is informal with dirt bays surrounded by vertical log piles and limestone blocks to retain the raised banks adjacent to the freeway. The Cloisters Avenue overpass allows one lane of traffic to enter the small parking area. The pedestrian, once on the riverside of the freeway, has unrestricted access to the river and can either view the river through the vegetation or can walk through the vegetation using various paths to the water.

The dual use pathway runs very close to the water's edge along most of the foreshore within this area. At Cloisters the path runs through the paperbark stand which is a pleasing experience for the pedestrian as the canopy is light and feathery and the bark particularly attractive. At Mount Henry, the pedestrian experiences a different vegetation as the path goes through the scrub - woodland communities. This is contrasted by the pedestrian underpass within the superstructure of Mount Henry Bridge which is a grey concrete c-shape with an open side from which the user can view the river. In some areas the dual use pathway is extremely close to the high water mark and not only inappropriately placed physically, but visually this reduces the foreshore area a small bank of fringing vegetation or a narrow sandy beach. A pedestrian overpass allows access from Edgewater Road to the foreshore. It is painted white rather than green like the Cloisters car access bridge.

The Mount Henry Bridge is long with a relatively narrow depth superstructure compared with its height. The bridge from most vantage points around the precinct appears in line with the adjacent land, and does not intrude on the water or skyline. Considering that the freeway cuts across most of the foreshore regardless of the landform, the bridge does accentuate the curve of the water form along the Mount Henry spit. The design is modern and has thick piles and caps which are a v-shape. The bridge is less intrusive on the landscape than the Narrows bridge which does not nest into the curve of Mount Eliza. There is parking beneath the bridge at Mount Henry Bridge Reserve from where the pedestrian and driver can see the wide piles, the first of which has been graffitied. Here the large size of the bridge is apparent and it becomes the dominant element within the landscape. In sharp contrast, there is a small wooden jetty adjacent to the reserve which has weathered and is quite attractive against the paperbark and reed vegetation.

The Deep Water Point recreation reserve has been cleared and all native vegetation been replaced with non indigenous trees and lawn. The trees are mainly mature and are sparsely placed around the reserve.

The parking is nested into a bank and is a very wide area due to the need for ski boat parking. The kiosk is painted neutral colours, however due to the lack of vegetation, is quite prominent. The 1st Deep Water Point Sea Scouts club house is an inappropriate design due to the flat nature of the point. Its two storey box shape, blue and white paint and lack of vegetation make the building an obtrusive feature. During periods of erosion, sediment is removed from the boat ramp.

At Canning Bridge, the two rowing club buildings are in keeping with the riparian land use. The Penrhos club House being new and unweathered is attractive with its sympathetic design. The Amateur Rowing Association of Western Australia building was built for the 1962 Commonwealth and Empire Games and as a consequence its appearance is rather tired, however it is in keeping with its use and adjacent buildings.

There are a number of visually obtrusive drainage outlets around this section of the river. At Cloister's the drain is very prominent due to the flat nature of the beach and little surrounding riparian vegetation. The drain headwalls at Mount Pleasant and Deep Water Point stand out from the gently sloping beaches and minimal riparian vegetation.

Land use

The suburbs of Manning and Salter Point are on the eastern bank of the river. They are separated from the foreshore by the Kwinana Freeway which has seven lanes of traffic, two wide emergency strips and a wide central island. The freeway reserve is fenced and lined with planted shrubs and bushes. There are several large green traffic signs and the street lights are very tall and evenly spaced features. The road infrastructure is quite prominent on the landscape due to the low formed scrubland at Mount Henry. In contrast, at Canning Bridge due to the busy intersection and adjacent urban land uses the viewer does not notice the street lights.

The flats and houses of Manning are set back from the freeway and are hardly noticeable to the river user and driver. In contrast, there are several large houses at Salter Point which are prominent and have open gardens. The Mount Henry Hospital is red brick and mid nineteenth century institutional style. Only glimpses can be seen from the river due to the remnant banksia bushland in front of it. In contrast, the main Aquinas building is set in a clearing with a wide oval in front of it. The red brick and white painted belvedere is an impressive structure which stands out against the surrounding banksia bushland. The Mount Henry bush land is part of the Aquinas property, while the adjacent spit is under government management. The Mount Henry Bridge Reserve has a small play area, and public amenities which have been painted neutral colours. The Mount Pleasant residential area has large houses which take up most of their block. Most of the houses are modern designs and are often quite close to the road. All have a high degree of urban pride. The gardens are mainly eclectic with large lawns.

PRECINCT 15

Dominant Landscape Characters and Significant Viewscapes

PRECINCT 5

CANNING HWY

Canning River

KWINANA FWY

Deep Water Point

N

100 0 200 400

Metres

LANDSCAPE CHARACTERS

Recreational

Suburban

Natural

Significant Viewscapes

Dominant Landscape Character

The original landscape would have been the natural landscape which would have been characterised by banksia - eucalyptus woodland on the sandy soils and on the moister soils samphires, sedges, casuarina and melaleuca would have occurred. The landscape would have been relatively flat to gently undulating with the remnant paleo dunes dominating the landform.

At present, there is a section of vegetation which appears to be relatively natural at Mount Henry Spit. The vegetation ranges from samphire, sedges to an open woodland of paperbark and sheoak. The freeway separates the Mount Henry Spit from the remnant vegetation adjacent to Aquinas College.

There are several narrow recreational/parkland landscapes in this precinct. These sections have had the natural vegetation mainly cleared and replaced by lawn and non indigenous species. Recreational facilities such as boat launching ramps, club houses and kiosks are part of the landscape.

The suburban landscape character type is dominant in this precinct. Relatively high density housing extends to the foreshore on the western side of the precinct and the foreshore is so narrow that the suburban landscape extends to the water. On the eastern side of the precinct, the Kwinana Freeway is the dominant suburban land use and it separates the residential areas from the river.

Significant Viewscapes

The Canning River has three significant viewscapes at this precinct. From the Canning and Mount Henry Bridges, viewers are able to encompass the relatively straight and broad section of the river. Although the landform has been greatly altered with the construction of the freeway, the viewer is still able to see that on either side of the river the palaeo dunes run parallel to the water and frame the channel like view. From Deep Water Point, there is a panoramic view of the Canning River as the point juts out into the river. From the point, the remnant melaleucas and Aquinas College can be viewed.

Conforming and Non Conforming Elements in the Landscape

The riparian vegetation within this area is under pressure due to unrestricted pedestrian access, fires and adjacent pathways and roads. Due to the narrow nature of the vegetation and its importance as a visual element in the landscape, there is the opportunity to revegetate the understorey and ensure that the fire risk is reduced. At present the vegetation and beach is restricted to a few metres and the beach is easily eroded by wave processes. The unwalled areas around the river are particularly attractive as they give the impression of natural beaches subject to physical forming processes. Re-establishing the fringing vegetation is an aesthetically pleasing solution to eroding beaches and considering the sheltered nature of this stretch of river would be practicable.

There are opportunities to encourage and support the maintenance of the Mount Henry area by Aquinas College and South Perth Council. At present the vegetation appears attractive and is an important remnant which makes the freeway user aware of the type of community that once covered the entire ridge. This sense of identity is important for regional identity.

The 1st Deep Water Point Sea Scout club house is an inappropriate design for the recreation point at the area. At present it is painted bright blue and white which some may argue has become a local landmark. The issue needs to be raised as to whether the aesthetics of the area is more important than the tradition. Originally, the building was white and a soft grey which although marginally more neutral still stood out in the landscape. A possible compromise may be to plant trees to partly screen the building's box shaped form. Ideally a new club house could have been incorporated as part of the new kiosk development which is a single storey visually less intrusive structure. The park is rather bland and there needs to be an attempt to at least screen and plant shade trees within the carpark. The whole park area could be planted with local species with sections of lawn to allow the riparian activities to continue in a less visually bland landscape.

The Aquinas College main building is a local feature which is important in the landscape and gives a local

identity. Features such as the Mount Henry jetty are small features on the riverform which give a visual focus and interest to the river. The Canning and Mount Henry Bridges need to be maintained in excellent condition to ensure that they do not detract from the visual quality of the area.

Recommendations for Maintenance and Enhancement of the Present Landscape Character

- It would help if pedestrians stayed on the dual use paths and only certain sections of riparian vegetation were exposed to pedestrian use. The dual use paths along The Esplanade are very close to the river and do not allow the expansion of the fringing vegetation. Their location also allows ready access to sensitive communities. Moving the pathway closer to the road would mean that pedestrians are very close to the traffic which is not desirable. The solution may be to inform the public of the sensitivity and importance of these remnant populations. Areas such as Cloisters reserve are ideal for a small community group to become involved in replanting. It is narrow and requires intensive revegetation and due to its small size results can be easily achieved.
- Consider appropriate designs, materials and colours for recreational buildings located on the foreshore.

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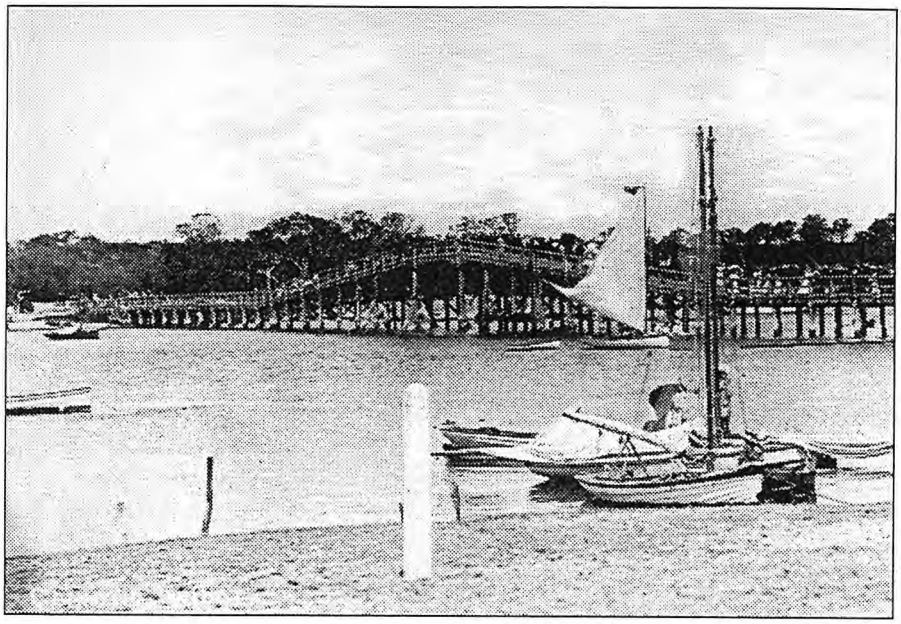
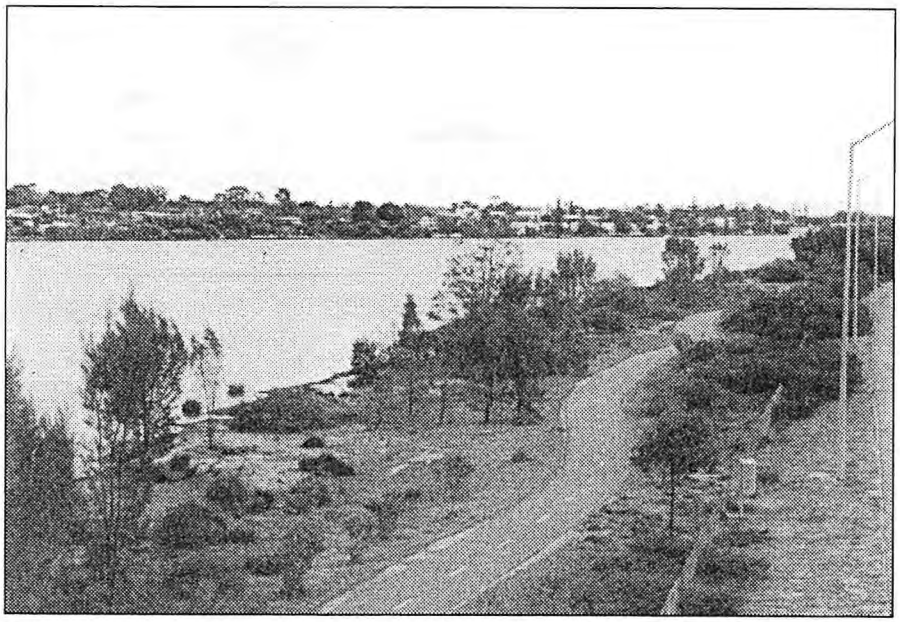


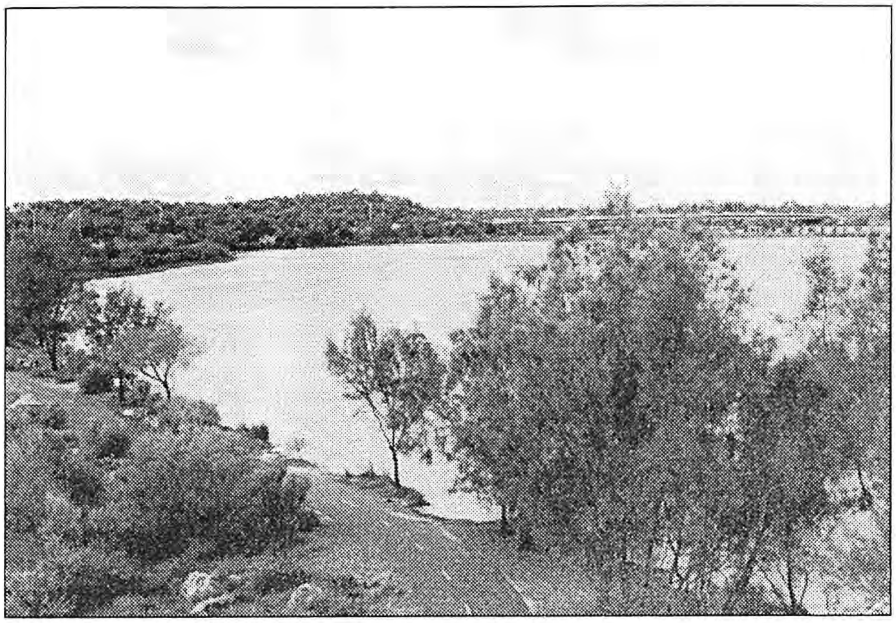
Canning Bridge. c1900.

Swan River Trust.



Kwinana Freeway and Mount Pleasant. 1996.

Swan River Trust.

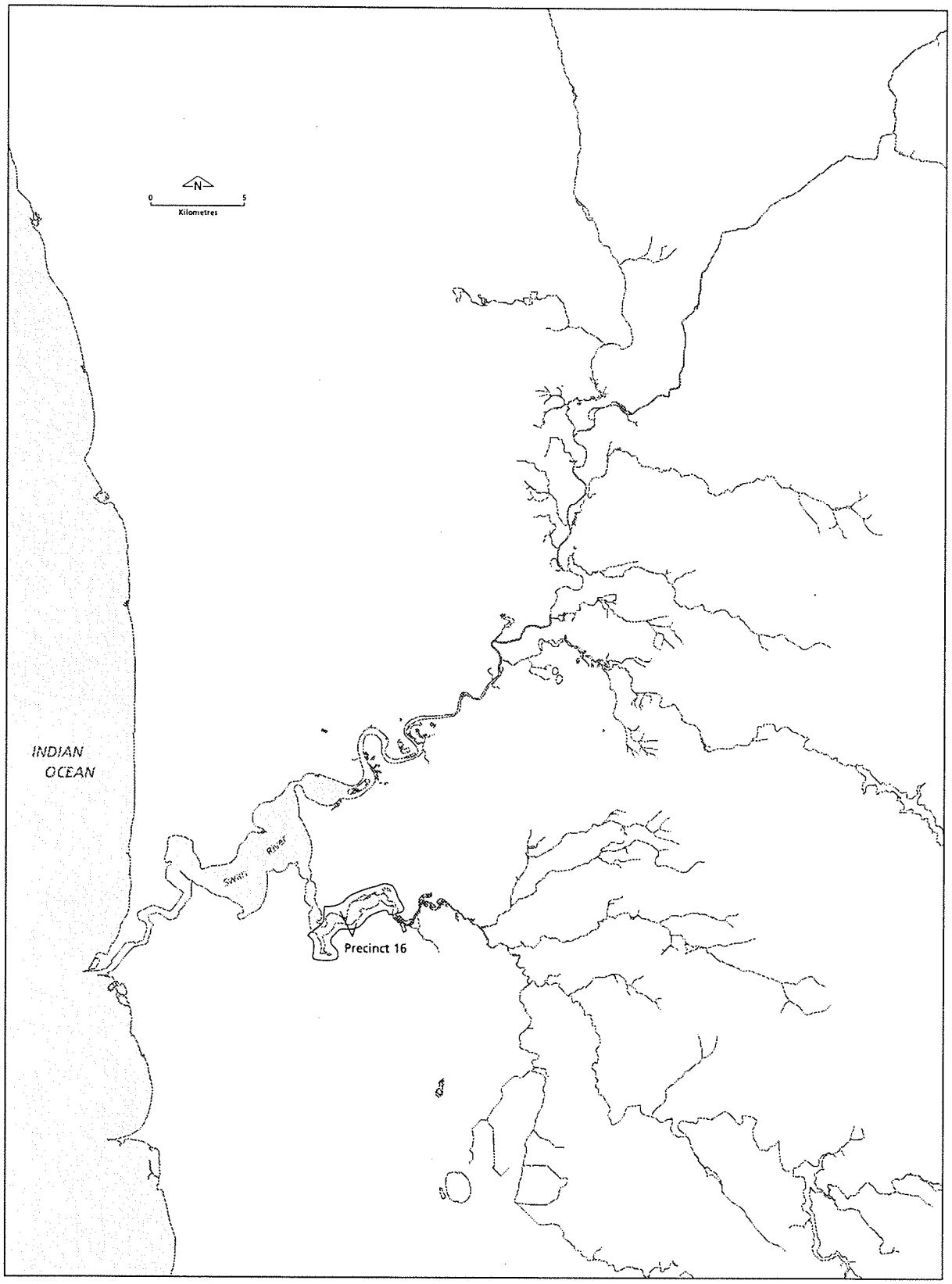


Mount Henry Bridge. Canning River. 1996.

Swan River Trust.

Precinct 16

Canning River - Freeway at Mt Henry to Riverton Bridge



Summary

Canning River - Freeway at Mt Henry to Riverton Bridge

This section of the Canning River forms two wide basins at Aquinas Bay and Shelley Basin. The curve of Mount Henry headland continues as a visual line with the Bull Creek confluence. Bull Creek waterform gently meanders and visually appears to be uniformly wide until its blunt river head. Upstream of Bull Creek, the estuary opens into the broad Aquinas Bay which is bound by the Mount Henry headland and Salter Point.

From Aquinas Bay one of the most prominent features is the old quarry scar which is unvegetated and characterised by yellow sand and exposed limestone pinnacles. The escarpment vegetation is low scrubland to open woodland community.

Shelley Basin forms a long and wide expanse of water and the ridge line of Mount Henry decreases to the flatter lower lying land of Salter Point and adjacent Waterford. At Salter Point there is a small circular wetland within the promontory. The wetland is fringed with rush, sheoak and paperbark communities and the water bodies of the estuary and wetland are particularly attractive. The Waterford residential area has been built on areas which originally would have been subject to inundation. The area is new and quite uniform in house and garden style. The old Clontarf Boys Home buildings are one of the most attractive along the Canning River, however much of the area has been subject to significant disturbance and weed proliferation. The least aesthetically pleasing section of this precinct is the East Clontarf and Centenary Park foreshore. As the result of rough deposition of covering soil, the landform and eroding banks are completely at odds with the adjacent flat low lying land. Rubbish and old building materials are exposed along the foreshore and wetland. The Naval Cadet and Sea Scout buildings are conspicuous landscape features at this section due to the surrounding unvegetated land. The water supply pipeline which crosses the river is also prominent due to its size and location. There is an abundance of exotic species adjacent to the water pipe and the general air is one of neglect.

The Shelley and Riverton Bridges are significant water features. While Shelley Bridge is raised above the surrounding land and is quite modern and obtrusive in the landscape, the old Riverton Bridge has a low form and wooden piles which appear to fit into the surrounding land use. The Shelley and Rossmoyne foreshores are very narrow and residential development occurs within metres of the river. Bull Creek wetland has some attractive fringing woodland vegetation despite much of the area supporting many weed species.

Biophysical Processes

Geological Processes

The Swan Coastal Plain was formed by aeolian deposition of coastal sand in linear parallel dunes. The limestone and travertine pipes were formed by cementation of calcareous sands in situ by the processes of leaching and precipitation around tree roots. Examples of cross bedded limestone and travertine can be seen on the exposed cliffs of Mount Henry and at Redmond Reserve where overlying soil has been eroded (City of South Perth, 1993).

The soils of Mount Henry were listed as Bassendean Soil Association, however this has been revised to the Cottesloe and Karrakatta Associations (City of South Perth, 1993). The soils at Mount Henry Point are shallow brown sand with limestone close to the surface and are classified as Cottesloe Association soil. At Aquinas College the soil is a deep profile which overlies the limestone and is classified as the Karrakatta Association. Behind Salter Point the soils are leached and pale and typical of the grey yellow quartz Bassendean Soil Association with sandy swamps in the low lying areas.

The Bassendean Sand is present around the Bull Creek and Rossmoyne foreshores. This formation was probably laid down on the shorelines and dunes during two or more past periods of sea level transgression. The deposits are poorly sorted quartz sand of mainly fine to medium grain size. The soil associated with this geological unit consists of white to pale grey soils at the surface and cream to yellow soils at depth. These are mainly of low nutrient status and are highly porous.

Deep alluvial estuarine sediment deposits composed of mud and silt with abundant detritus, prevail around Bull Creek. Wide tidal flats occur along stretches of the river between Bull Creek and Riverton Bridge. They consist of muddy estuarine deposits which lie over a shell and sand substrate. Riverton foreshore area touches on the Southern River grey sand and also is characterised by intervening clayey swamps.

Topography

Mount Henry is the easternmost part of the topographical unit termed the Spearwood Dune System and it borders the Bassendean Dune System. The headland is prominent and from the western view appears to be shaped like a saddleback. The limestone outcrops and thin overlying soils are easily eroded. Sandy beaches have developed along the foot of the cliff. Salter Point has a sandy spit in which a lagoon has formed, and a narrow channel leading to the river. The Clontarf foreshore is flat low lying and swampy with a low sandy ridge behind the shore. The low lying and swampy land continues to Riverton Bridge. The southern banks are low lying and gently undulating in particular at the confluence of Bull Creek and the Canning River.

Hydrological Processes

Water features

The Canning River forms two basins in this section of the river, Aquinas Bay and Shelley Basin. These sections of water are quite wide and have a river bed composed mainly of mud, but closer to the river banks the sediments become increasingly sandy and clayey with large shells present. At Mount Henry, Aquinas Bay, Salters Point and Munns Point there are significant shell deposits. Wide shallow estuary margins are present on the northern banks and a wetland is present at Clontarf and Salter Point.

The Cloverdale groundwater mound occurs between the Canning and Swan Rivers and the outer fringe of the flow system occurs at the Mount Henry foreshore. At Bull Creek, the groundwater is less than two metres from the surface, while at Clontarf wetlands there is a freshwater spring flowing from the groundwater mound.

Modifications to the river hydrology have included infilling and dredging of the south side of the river between Fifth Avenue and Shelley Bridge. The construction of the Canning, Mount Henry and Shelley Bridges has altered the banks of this section of the river (SRT, 1994).

At Clontarf the wetland was originally more extensive and extended closer to Manning Road. The Waterford residential development was part of the wetlands until quite recently and was partially submerged with sandbars, low dunes and salt marshes. Bull Creek was swampy and filled with stagnant waters and surrounded by extensive mud flats. At present, the wetlands drain into Bull Creek through four surface storm water drains; only the Bull Creek Main Drain has water in all year round.

Bathymetry

This section of the river has an average bathymetry of 1.2 metres. There are several deeper pools of around 2 metres adjacent to the Shelley Sailing Club and Mount Henry Bridge. The Swan estuary system experiences a mean daily tidal range of 0.36 metres at the Barrack St Jetty (SRT, 1994). The Kent Street Weir which is about 3 km upstream from the Riverton Bridge is the limit of the tidal influence on the Canning River.

Flooding

There is seasonal inundation at Aquinas Bay foreshore which often results in an accumulation of algae on the foreshore. Flood prone areas exist adjacent to the Clontarf foreshore and the eastern bank of Shelley Bridge (SPCC, 1989). At Clontarf there is a predicted 100 year flood level of 1.24-1.29 metres. This would mean that all the foreshore strip would be submerged up to Brother Keaney's Gardens at Clontarf.

Erosion and accretion

Water skiing has contributed to bank erosion in Aquinas Bay. Only deep water take off is permitted in the bay, however water users often ignore this regulation. Erosion of the river banks is occurring adjacent to Tuscan Street and Riverton Drive West, Rossmoyne. Along Mumms Point removal of riparian vegetation has resulted in significant erosion of the banks. The eastern foreshore immediately north of the Shelley Bridge and the banks adjacent to the T.S. Canning Naval Cadets building are also bank erosion problem areas. At Salter Point on the downstream side accretion has made navigation difficult.

Vegetation Communities

Native

Bassendean Complex

The indigenous flora of this precinct is classified as being as part of the Bassendean Complex (DCE, 1980). The vegetation ranges from woodland of jarrah *(Eucalyptus marginata)*, sheoak *(Casuarina obesa)*, and various banksia species *(Banksia* species*)* to sedge lands on the moister and lower sites. The various communities which make up this complex are described below.

Sarcocornia and *Halosarcia* communities

In isolated sections of the Clontarf and Centenary Park foreshores, beaded glasswort *(Sarcocornia quinqueflora)* and samphire *(Halosarcia* sp*)* complexes occur (South Perth City Council, 1994). Adjacent to these monospecific stands, several other species are found including coast sword sedge *(Gahnia trifida)*, seablight *(Suaeda australis)*, and seablite *(Atriplex* sp*)*. This section of the river foreshore supports several areas of the exotic saltwater couch *(Paspalum vaginatum)* which is sometimes mixed with creeping brookweed *(Samolous repens)*.

Juncus communities

The shoreline community of shore rush *(Juncus kraussii)* is present along Salter Point, Clontarf, Centenary Park and Bull Creek foreshores. It occurs either in monospecific stands or mixed with melaleuca. Adjacent to the shore rush communities at Clontarf there are monospecific large flowered bogrush *(Schoenus grandiflorus)* stands.

Casuarina-Melaleuca communities

The swamp sheoak *(Casuarina obesa)*, freshwater paperbark *(Melaleuca rhaphiophylla)* and shore rush *(Juncus kraussii)* are the dominant species of this community. Other understorey species include marsh club rush *(Bolboschoenus caldwellii)*, creeping brookweed *(Samolous repens)* and slender myoporum *(Myoporum caprarioides)*. The Casuarina-Melaleuca complex is found on the southern bank of Salter Point and also on the northern section of the Clontarf foreshore. A small disturbed section occurs adjacent to Centenary Park water pipeline.

Melaleuca-Juncus communities

The swamp paperbark *(Melaleuca rhaphiophylla)* and the shore rush *(Juncus kraussii)* occur together as an important foreshore complex. In this precinct, it is found at the Bull Creek confluence and as a large stand at the northern section of the Clontarf plant community (City of Canning and City of Melville, 1994).

Melaleuca Swamp community

The Melalueca swamp community occurs in two separate stands at Clontarf and is found inland of the *Melaleuca-Juncus* community. In this precinct it is also found around permanent and seasonal wetlands in Bull Creek, Salter Point Lagoon, Clontarf,

Waterford and Shelley Basin. The dominant species includes a band of saltwater paperbark *(Melaleuca cuticularis)* with occasional swamp and stout paperbarks *(M. rhaphiophylla and M.preissiana)*. The swamp sheoak *(Casuarina obesa)* is also present.

***Eucalyptus-Melaleuca* community**

At Waterford, the vegetation includes flooded gum *(Eucalyptus rudis)*, and swamp paperbarks *(Melaleuca rhaphiophylla)* and an understorey of sedges (Pen, 1983). Swamp peppermint *(Agonis linearifolia)* is the one of the dominant species occurring at Bull Creek. The understorey includes shrubs such as bracken fern *(Pteridium esculentum)* and swamp wattle *(Albizzia lophantha)* the latter is rare on the Coastal Plain. Other prominent species include the coastal saw sedge *(Gahnia trifida)*, seablite *(Suaeda australis)*, river pea *(Oxylobium lineare)*, triangle leaf thistle *(Chenopodium flaucum and C.album)* and the creeping brookweed *(Samolous repens)*.

***Banksia* communities**

Remnants of the Bassendean woodland of jarrah *(Eucalyptus marginata)*, sheoak *(Casuarina fraseriana)* and various banksias occur on the sandy higher land. Most of the jarrah *(Eucalyptus marginata)* has been logged at Mount Henry, while a few banksia individuals occur including firewood banksia *(Banksia menziesi)*, slender banksia *(Banksia attenuata)* and holly leafed banksia *(Banksia ilicifolia)*.

On the low sandy slopes near Salter Point are Christmas tree *(Nuytsia floribunda)*, spearwood *(Kunzea ericifolia)*, grey stinkwood *(Jacksonia furcellata)*, pineapple bush *(Dasypogon bromeliifolius)*. On the sandy slopes of Mount Henry there once was a jarrah-banksia woodland which has since been cleared or degraded. Isolated pockets of *Hovea chorizemifolia* also occur on the sandy slopes and are rare this far north on the Swan Coastal Plain.

The limestone embankment at Mount Henry supports parrot bush *(Dryandra sessilis)*, basket bush *(Spyridium globulosum)* and cockies tongues *(Templetonia retusa)*. On the limestone rocks there is a unique species of lichen which is unnamed (City of South Perth, 1993). Fire has increased the number of young specimens of parrot bush *(Templetonia retusa)*, blueboy *(Stirlingia latifolia)* and zamia palms *(Macrozamia riedleii)*.

Exotic

Veldtgrass *(*Ehrharta* sp*)* is prolific on the spit and point of Mount Henry. Kikuyu *(*Pennisetum clandestinum)* and couch grass *(*Cynodon dactylon)* are also abundant and have replaced many indigenous understorey species. Watsonia *(*Watsonia bulbilifera)* and cape tulip *(*Homeria breyniana)* are common on the foreshores. Morning glory *(*Ipomoea indica)* and lantana *(*Lantana camara)* are often found flourishing in the paperbark stands. There are extensive infestations of golden dodder *(*Cassytha* sp*)* and grasses throughout the paperbark stands around Bull Creek and Rossmoyne. The introduced bulrush *(*Typha orientalis)* occurs around water drainage outlets mixed with the endemic species or as a homogenous stand in more disturbed areas. A notable area is on the eastern bank between the Shelley and Riverton Bridges and at Centenary Park.

Historical Land Use and Resulting Environmental Changes

Mount Henry was named after John Henry, 2nd Lieutenant of HMS Challenger who with Captain Fremantle explored the river system in 1829 (Seddon, 1970). There was little development south of Manning Road due to its inaccessibility. The east bank of the Canning River (between just north of the present day Canning Bridge and east to Centenary Avenue) was originally granted to Thomas Middleton who sold it to B. Vigors in 1843 for five shillings. In 1851 the land was resold to Middleton who sold it to 'Henry Manning of High Holbourn in the City of London' five years later. It was transferred to Lucius Alexander Manning of Fremantle, and the land was passed to a number of generations of the Manning family until 1935. Prior to 1935 there was no access by road into the dense bush.

Thomas Middleton also owned Lot 28 at Bull Creek (Carden, 1968). The Middleton's farmed on their land until 1860s, however they only resided on their land for five years and left their residence by 1935. The neighbouring properties were allocated as follows: Lot 27 Adams, Lot 26 Bull, Lot 25 Morgan and Lot 27 Willet. John Morgan described his land as one tenth very fair but the remainder not even worth walking over. Morgan, James Adams and Henry Bull

did not reside on their land after 1835 (Carden, 1968). Captain Willet's land remained undeveloped for many years and it is doubtful whether he ever lived on it. The land south of Adams and Bull's property was owned by The Bateman's who farmed cattle and cut timber for sale. Their homestead, 'Grassmere', was built in 1886 at the head of Bull Creek and was lived in by the Bateman family until the 1970s (City of Canning and City of Melville, 1994). Today the homestead is a private residence. During the first half of this century much of the land in this area was clear felled for timber including the site of the present day Richard Lewis Park which has now regenerated to a dense rivergum and paperbark area. The banksia woodland behind the low lying area was also clear felled and only remnants are found.

The river upstream from Mount Henry was inaccessible to all but flat bottom barges (City of South Perth, 1993). During 1850s convicts and ticket of leave men were employed in the district. The area opposite Salter Point was chosen to be a convict settlement and a camp called 'Fig Trees' was established. The convicts were housed on the dredge 'Black Swan' and they built wattle and daub huts at 'Fig Trees' or possibly further upstream at Mumms Point. The convicts at this site were mainly local men who had been arrested for drunk and disorderly behaviour. They were employed to clear a channel and build the pole and wattle 'fence' used to transport and guide jarrah logs downstream. The fence was built in 1866 and additions and repairs were made in 1869, 1872, 1887 and 1888. Within this area, Francis Bird and Mason Bird and Company employed a large number of men to run their milling operations which would receive the logs from the Darling Ranges (Carden, 1968).

One of the first boats built on the Canning was the 'Dugong'. This was built by the officer in charge of the Fig Trees convicts, Henry Passmore, his son, an Asian carpenter and some of the convicts. The ungraceful boat, despite fears that it would sink, served many years transporting stores and produce.

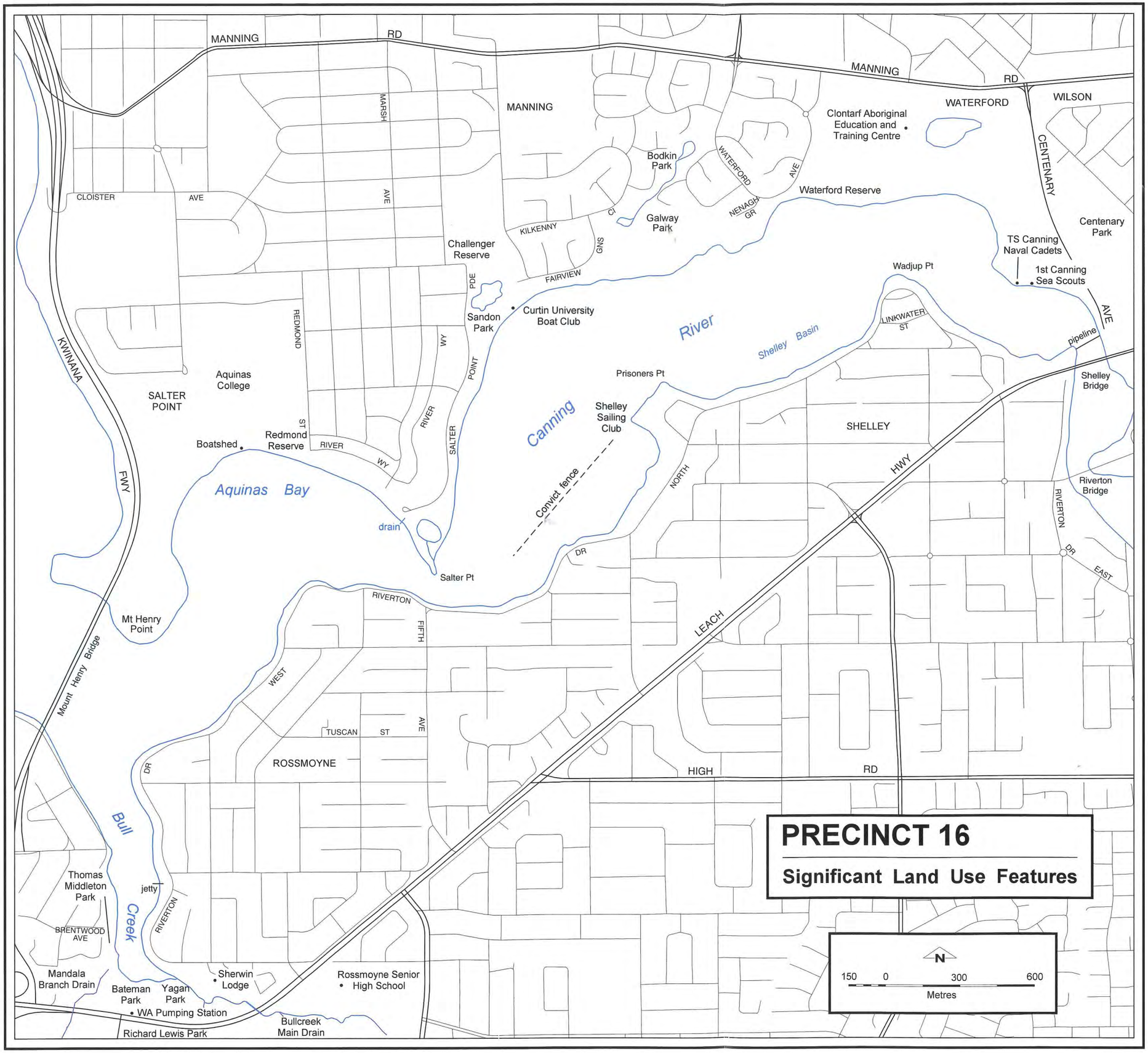
The Irish Christian Brothers established the Clontarf Boys' Home in September 1901, having moved from Highgate to a new site which was held by the Manning family (Crowley, 1962). The site was purchased by the Catholic Bishop of Perth, Dr Gibney. The buildings were designed by Brother Bodkin and also Marie Jackson of Cavanagh and Cavanagh Architects and were recognised as one of the most modern public buildings in the State. The limestone was bought by barge from Cottesloe (South Perth City Council, 1994). Brother Keaney added the chapel and other buildings to the original structures. To build the home, the land was completely cleared from Manning Road to the foreshore. The gardens, orchards, paddocks and grounds were used to give the boys a training in horticulture and farming. Landfill was deposited on the wetlands to raise the ground levels, to protect the built environment and to provide ovals for the boys. Brother Keaney established a garden in front of the home adjacent to a freshwater spring and both the spring and garden are still present, although the garden is not in good condition (South Perth City Council, 1994).

In the 1920s a tram line was opened to Como. This allowed holiday makers to access the beach between Como and Mount Henry (Carden, 1968).

In 1935 the Christian Brothers purchased land including Mount Henry promontory from the estate of the late Victor Manning and Aquinas College was transferred from St Georges Terrace to Mount Henry in 1983. The point at Mount Henry was used as a quarry prior to the purchases by the Christian Brothers. The school's cadets used the quarry as a rifle range, and as the site of army huts (City of South Perth, 1993). The site was also a popular playing spot for the schoolboys. Around 1955 a golf course was cut through the bushland on the ridge, however it was not retained and it reverted back to a more scrubby bushland. Pylons are all that remain of the old Aquinas Bay boatshed which was opened in 1934. The boatshed was replaced by a new land based boatshed in 1971.

The foreshore at Clontarf was used as a rubbish dump and much of this rubbish is exposed along the foreshore.

The Riverton Bridge was commenced in December 1910 by the Jandakot Road Board and was funded by the local settlers (Carden, 1968). The central spans of the bridge were designed to allow loaded barges to pass beneath during high water mark. The official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Waterford Reserve
NENAGH GR
Galway Park
CI
KILKENNY
GNS
FAIRVIEW
Challenger Reserve
PDE
Centenary Park
TS Canning Naval Cadets
1st Canning Sea Scouts
Wadjup Pt
LINKWATER ST
AVE
pipeline
Sandon Park
Curtin University Boat Club
River
Shelley Basin
REDMOND
WY
POINT
KWINANA
FWY
Aquinas College
SALTER POINT
Prisoners Pt
Shelley Bridge
Canning
Shelley Sailing Club
SHELLEY
ST
Redmond Reserve
RIVER
WY
RIVER
SALTER
Boatshed
Aquinas Bay
Convict fence
NORTH
HWY
Riverton Bridge
drain
RIVERTON
DR
DR
EAST
Salter Pt
RIVERTON
Mt Henry Point
FIFTH
LEACH
Mount Henry Bridge
WEST
TUSCAN
ST
AVE
ROSSMOYNE
DR
HIGH
RD
Bull Creek
jetty
RIVERTON
Thomas Middleton Park
BRENTWOOD AVE
Mandala Branch Drain
Bateman Park
Yagan Park
WA Pumping Station
Sherwin Lodge
Rossmoyne Senior High School
Richard Lewis Park
Bullcreek Main Drain
PRECINCT 16
Significant Land Use Features
N
150 0 300 600
Metres

Site of P P Smith's property

Clontarf Boys Home

Site of Thomas Middleton's property

Brother Keaney's Garden

Landfill site

Wadjup

River

KWINANA FWY

Mumms Point

Canning

Aboriginal hunting area

Convict fence

HWY

Rileys Bridge

Aquinas Bay

Site of J Morgan's Property

Quarry site

"Fig Trees"

LEACH

Gabbiljee

Site of Thomas Middleton's property

Grassmere

Site of Adam's property

Aboriginal camping grounds

Site of H.Bull and W.S Wood's property

PRECINCT 16

Sites of Significance

N

150 0 300 600

Metres

Gabbiljee	Sites of Nyungar Significance
Convict Fence	Other Australian Community Significance

name was the Watts Road Bridge. In 1912 it was proposed to be named after a local market gardener, Fred Riley, however Riley suggested the name change to Riverton Bridge. Despite this locals still called the bridge Riley's Bridge for many years.

Present Land Use and Social Patterns

Most of the land use around this section of the river is residential. The Salter Point area remained relatively undisturbed until the building boom in the 1950s. There have been several releases of land since the 1960s, and these have been developed as small blocks which overlook the river. The linear development of Shelley and Rossmoyne has resulted in little foreshore reserve. At Waterford and Salter Point the roads are set back resulting in a difference in depth of foreshore reserve.

In 1972, the Public Works Department dredged a turning basin near the Curtin Rowing Club and pumped sand ashore to form a platform for the 1st Salter Point Parade Scouts. An access channel was dredged to join the southern bank channel.

In 1975, the Environment Protection Authority recommended that the City of South Perth landfill the southern section of Clontarf not being used by the Christan Brothers on condition that the paperbark area was saved. By the late 1970s the plans for the Waterford residential area were finalised.

Landfilling occurred at Salter Point Parade in 1977 which decreased the riparian vegetation.

The Shelley Bridge was opened in 1978 and diverted the Leach Highway traffic which once used the Riverton Bridge. The Shelley Bridge has a superstructure of precast concrete and supports four lanes of traffic.

The reserves associated with Bull Creek have been recently recommended to be gazetted as 'conservation' status, as this wetland has been recognised as an important area for flora and fauna conservation within the urban environment. Much of the area was cleared during the first half of this century and despite this some of the lower lying areas have been regenerated.

The western portion of the Clontarf Estate was recently sold for residential development. The Waterford Estate was built on part of the Canning River wetland which was originally submerged with sand bars low dunes and salt marshes. Clontarf has recently become a centre for Aboriginal education and is called 'Clontarf Aboriginal College' and includes branches of TAFE, Skillshare and Abmus. The Christian Brothers continue to use the chapel and residences. The Skillshare Program has developed a small community market garden adjacent to Manning Road. The old rubbish dump area presently encroaches on the wetlands and foreshore of Clontarf, much of the old rubbish is exposed to the open and the area is particularly lumpy and difficult to access.

The vegetation communities at Bull Creek and Aquinas have recently been subject to frequent fires which encourage the proliferation of weeds. Recently due to the high nutrient load in the Canning River there have been blooms of the benthic blue-green alga Microcystis littoralis. Nuisance levels of the macroalga *Chondria* and *Gracilaria* have also occurred. Rotting algae on the foreshore has produced offensive odours which affect the residents and river users.

Recreation nodes

This section of the river is a popular recreation area due to its sheltered nature. Jetskiing has been restricted to an area north of the spit. The estuary is used for boating, canoeing, rowing, surfcat boating, skiing and power boating. Land based activities include cycling and walking. The Shelley Sailing Club occupies a small part of Mumms Point and has approximately 60 boats associated with the club which use the water between Salter Point and Riverton Bridge. Aquinas Boat Club, and Curtin Boat Club (1971) are situated on the northern banks of this section of the river. The 1st Salter Point and 1st Canning Sea Scouts have their clubhouses on the river banks and use the water for boating experience.

The Mumms Point recreation area is an important recreation node. There is play equipment, toilets and shade and it is a popular spot for beginner windsurfers. Motor bike riders have in the past used Clontarf foreshores.

Bull Creek provides opportunities for various recreational pursuits including passive fitness activities, nature watching and a play area. The local schools also use the areas for educational purposes.

Public access

Vehicle access exists at Salter Point. There is private foreshore access at Aquinas College boatshed. Pedestrian access is possible adjacent to the Kwinana Freeway due to the dual use pathway and the path is heavily used for recreation and commuting. An unlicensed jetty was built by a local resident at Brentwood Avenue, Bull Creek, 15 years ago. There are over thirty informal paths scouring the cliff face at Aquinas Bay and these are quite detrimental to the vegetation communities

Sites of Nyungar & Wider Australian Community Significance

Nyungar significance

There are records of Nyungar occupation in the Bull Creek area and South Perth area. Many Beeliar Nyungar families considered the Canning River foreshores as part of their 'run' which was the part of the route once travelled. At the time of colonisation the Bull Creek area *(Gabbiljee)* was of considerable importance as the wetlands were present in summer and provided many foods compared to other surrounding drier areas.

There are three recorded archaeological sites of Nyungar significance in the Bull Creek area. These are important due to the scattering of quartz artefacts (O'Connor et al, 1989). Henry Bull ,who was granted a property at Bull Creek in the early 1830s, appears to have had an understanding of Nyungars in the area and developed a trusting friendship with Yagan. However as described earlier, relationships with other settlers were less amicable.

All Nyungars were prohibited from entering the City of Perth from 1829 and 1854. This restricted many local families' 'runs'. The latter years of this period of restriction saw the prohibition zone decreased to the city centre. Despite this, many Nyungars who were associated with the land have retained the knowledge and beliefs associated with the area. The Mount Henry area was a Nyungar hunting and fishing ground (City of South Perth, 1996).

Other significance

Clontarf was established in the early 1900s using barges to transport building materials by water up and down the Canning River. The gardens established by Brother Keaney are considered of historic value and at present are in a state of degeneration. Vandalism, rubbish dumping and lack of maintenance, have all contributed to the loss of the islands and lake forms created by the Brother. The area has potential to be restored to the intended form and due to its historic value this should be done.

Mount Henry was named after John Henry, Second Lieutenant, HMS Challenger, who sailed up the river on 3 May 1829 with Captain Fremantle. In June 1829, Henry led an overland expedition to trace the headwaters of the Canning River.

Salter Point was named after a contractor associated with early shipment of timber from Masons Timber Mill at Cannington.

It is believed that a convict barge built in 1866 was sunk in this stretch of water. The Mayflower which was built in 1908 and used as a ferry was sunk on the western side of Bull Creek. The Python built in 1907 is believed to be sunk adjacent to Violet Street at Shelley.

Conservation Areas

Wetlands

The Australian Heritage Commission identified the Canning River wetlands as 'an area of high conservation and recreation value contributing to open space of regional significance'. At Clontarf the original wetland was more extensive than what is present to day. Landfill has been deposited on the wetlands to raise the ground lands.

System 6

M66 Mount Henry Manning

The recommended area comprises the whole of the Mount Henry peninsula including the freehold land owned by the Christian Brothers and the foreshore reserve. The area occupies a prominent limestone outcrop headland. It is covered by open woodland of tuart, marri, jarrah and Christmas tree with a very

varied understorey including woollybush *(Adriana quadripartita)* and *Daviesia juncea.* At the base of the hill there is a small stand of swamp cypress *(Actinostobus pyramidalis).* Along the river foreshore there are wetland species, such as, *Juncus kraussii, Scripus nodosus* and *Suaeda australia.* The area supports over a hundred native species in all. The area is significant for its potential for educational studies and landscape feature and because of its high conservation and recreational value.

M67 Canning River Foreshore -Salter Point to Clontarf

The area is recommended for its high conservation value and recreation value. At the centre of Salter Point there is a lagoon which is connected to the river by a narrow channel. The lagoon is surrounded by a dense band of sedges and samphire and there are several stands of swamp sheoak and paperbarks. The northern portion of the reserve includes the swamps tea tree *Astartea fasciscularis* and rare *Melaleuca leptoclada.* There are also several stands of salt water paperbark. The Clontarf foreshore is flat and has several sedges and shrubs species. This freshwater lagoon is unique to the southern Canning River section.

M74 Bull Creek

Bull Creek flows into the Canning River and has an important natural drainage function. It also contains remnants vegetation which is reminiscent of what much of the surrounding area was like prior to urbanisation. The vegetation contains not only fringing paperbark and sedge communities but also low woodland communities. There are several uncommon species present including the orchid Eriochilus.

Landscape Description

Precinct Description

Waterform

The water's edge is in symmetry as the curve of Mount Henry is reflected in the southern bank. The convex bulge of the Mount Henry shoreline is in line with the Bull Creek confluence. Bull Creek itself has a number of gentle meanders in its waterform and stays a visually uniform width until its blunt river head. Here the land has been infilled and open drains replace the original tributaries to the creek. Upstream of Bull Creek, the river widens to the broad Aquinas Bay which is bounded by the Mount Henry headland and Salter Point. The convex curve of Rossmoyne shoreline nests into the concave form of the bay. The river narrows at Salter Point and once again widens to a second wide body of water which gently undulates into small curves and bays on the northern bank. The southern waterform is relatively straight sections of shoreline due to infilling. The narrow promontories at Mumms Point and the point at Linkwater Street jut from the southern bank into the water. At the western side of Shelley Bridge, the river becomes narrow due to the Riverton bank forming a point. The reverse occurs at Riverton Bridge, as the Manning foreshore forms a point opposite the straight foreshore of Riverton.

There are several boat wrecks which have extremities exposed during low water tides. However the dominant water feature is the convict fence which extends from Salter Point to Mumms Point and as a few piles upstream. It is a landscape feature of historic significance and it is important in giving this river section an identity and a link with its heritage.

Natural riparian zone

At Mount Henry headland, the riparian zone is made up of a fringing sedge and woodland community. The steep nature of the headland has meant that there is little beach, rather a simple continuation of the steep curve of the headland to the water junction. The area adjacent to the quarry has several localised earth slides which have overrun the foreshore forming a gently sloping foreshore.

The steep embankment continues to Salter Point where low lying wetlands have formed. On the western side of the point, a white sandy beach is present during periods of low water level. Behind this the riparian vegetation is dense with a continuous band of sedges along the water section. The triangle shaped promontory has a circular shaped wetland which is filled with water throughout the year. A thin channel enters the river on the eastern side of Salter Point. Salter Point is particularly attractive as it gives the impression of naturalness within the river system. The two water bodies of the wetland and river are interesting to the viewer due to the two waterforms and the division of these landforms by the thin band of riparian vegetation. The rest of the riparian zone has been greatly altered or is so narrow as to be greatly influenced by adjacent land uses, and will be discussed in the riparian land use section.

Landform

Mount Henry is the most prominent landform feature in the area. It has a steep limestone escarpment which has several limestone outcrops which are exposed between the vegetation cover. The escarpment reaches a height of 15 metres and rises quite steeply from the foreshore in the line of a convex hill. The old quarry is exposed due to its lack of vegetation. Here several pinnacles and cuts into the limestone provide vertical rough textured shapes against the soft dusty vegetation and yellow sand. The sand from the quarry is eroding and small land slips have spilled out onto flat ridges and the water foreshore. The sand appears quite yellow when dry and when wet is almost orange in colour and therefore is a very prominent feature. From the quarry the rest of Aquinas Bay becomes more gently sloped. Lower areas which have been subject to small land slips in front of Aquinas College have a more bulging landform closer to the water compared with the relatively linear steep faces which have remnant vegetation. In front of Redmond Street Reserve, the escarpment face is almost vertical and has been recently subject to erosion on its cliff face.

The ridge line merges into the lower land of Salter Point. The wetland at Salter Point forms a triangular point around the small headland-like higher land. From Salter Point the land is flat and would have been originally subject to inundation. Any ridges in the wetlands have been infilled to allow residential development to be raised above the wetland and foreshore. The flat land has also been infilled at Clontarf to allow the buildings and ovals to be

constructed. However the foreshore has remained subject to frequent inundation due to its low lying nature. The Centenary Park area was until recently used as land fill and as a result the rough deposition of covering soil and eroding edges are quite obviously unnatural. The old dumpsite is a rounded hill which also is at odds with the adjacent low lying flats at Clontarf, Wilson and Riverton Bridge. The Wilson landform has been greatly altered due to the construction of the Shelley Bridge. The interchange area rises above the natural low lying areas.

The Shelley area is very flat and so any slight changes in the foreshore topography become apparent due to residential construction. Adjacent to the Bull Creek confluence the land becomes gently undulating and is slightly topographically higher than the adjacent Shelley area. Towards the Bull Creek head water, the land once again becomes low lying with ridges between areas subject to inundation. The Mount Pleasant area is slightly higher in topography than the Shelley area. From the foreshore the landform rises slowly to the gently undulating western foreshore of the Canning River.

Vegetation

The vegetation at Mount Henry is quite dense. Due to the high number of different understorey species there are several shades of grey green and various different forms, from loose open bushes, to dense dusty clumpy bush forms. The banksia trees rise above the bushes in several places and their canopy is spreading and open giving a soft edge to the form of the cliff. At the base of the headland the fringing sedges are brush like and they clump together in nodes of soft texture. There are dead tree trunks protruding above the bushes throughout the headland community. The dead trees have white-grey branches and an interesting form which provides a visual focus in the community. This soft bushland is disrupted at the quarry face where the vegetation has not regenerated. The Aquinas oval has been planted with lawn which encroaches over the embankment and has degraded the remnant vegetation communities. The bright green stands out against the softer green-grey of the natural vegetation. Around Redmond Reserve, the foreshore vegetation has been destabilised causing embankment erosion. Redmond Reserve has a number of the original banksias present, among introduced trees and the lawn understorey.

Salter Point has a quite healthy stand of fringing paperbark and sheoak. These have soft feathery canopy textures and are coloured dark green. The pealing white trunks of the paperbarks stand out against the green leaves and the dark brown blocky textures of the sheoak trunks. The fringing rushes form a dense line along the water's edge and due to their clumpy form the foreshore has subtle indentations in the vegetation. The road reserve is lawn and in several places the bright green kikuyu grass has grown over stands of sedge and therefore the attractive brushy soft green forms are lost amongst the short vivid green grass. At Sandon Park, stands of reeds and paperbark are present in lower lying areas, however most of the park is lawn and the effect is of a landscaped parkland. The fringing vegetation has been kept at Waterford residential area. In many places such as Bodkin Park the understorey has been replaced with lawn and the attractive forms of the trees have been left as isolated specimens.

Clontarf's Brother Keaney's Garden has a few of his remaining planted trees. The garden had originally transformed the wetland into a series of lakes and islands with trees such as willows and palms, which created the type of ideal English parkland. Unfortunately, his garden has been neglected and only a few trees remain. The eastern Clontarf foreshore has a few remnant sheoaks and rivergum. These have been recently burnt and there is a proliferation of weeds among the remaining stands. The fringing rush forms a band of soft texture right along the foreshore and in small clumps at the area of inundation in front of Centenary Park. Centenary Park consists of kikuyu grass, sour sob and other low form weeds. There are no trees or bushes. A small samphire-sheoak community is present at the Wilson foreshore, the colours and textures are attractive, although many of the lower bushes are covered in golden dodder. At the Shelley water pipe there is a proliferation of weed bulrush and castor oil plants, which suggest to the viewer a highly disturbed and neglected vegetation community.

The Shelley and Rossmoyne vegetation communities occur on the narrow infilled foreshore and mainly consist of small clumps of sheoak and paperbark. These have little evidence of regeneration and the communities are stressed by lawn maintenance and weed proliferation. There are some areas of fringing rushes which add definition to the foreshore line. Mumms Point has a quite dense stand of sheoaks adjacent to the foreshore with little evidence of understorey or regeneration. The Shelley Foreshore Reserve west of Mumms Point has a lawn with introduced species including willows, cape lilacs and poplars. There are also several planted white bark gums which are evenly spaced on the roadside reserve. They have an attractive individual form, but are not indigenous to the area.

Bull Creek has a relatively undisturbed paperbark-shorerush complex which appears dense and in relatively good condition to the viewer. However particularly at the western side of the creek head there are so many weeds, including tall stands of bamboo and pampas grass, that from the roadside the viewer cannot see the river or the natural community. For much of the Mount Pleasant foreshore there are stands of paperbark and sheoak with a shore rush understorey. These occur in a narrow strip and are very close to the road.

Riparian land use

The sheltered nature of this area has made it a popular spot for water based activities. There are rowing and several other water activity clubhouses on the foreshore. Curtin Rowing Club is brick with a curved corrugated iron roof. Curtin Rowing Club and Shelley Sailing Club are well maintained and have planted trees to mute their building forms on the foreshore. The Shelley Sailing Club is made of wood and corrugated iron and has been designed to have minimal impact on the environment. In sharp contrast, the 1st Canning Sea Scouts and the T.S. Canning Naval Cadet Buildings appear prominent to the water user due to the disturbed riparian vegetation and the barren Centenary Park mound. There is also a great deal of rubbish, unused scrap equipment, prominent pick up bins and rubbish drums adjacent to the foreshore.

The aboveground water pipe which crosses Shelley Basin and the associated sump filled with weeds also visually degrade this corner of the basin. The skyline is also detracted from by the tall metal power supply towers on either side of the Shelley Basin River bank. The old rubbish dump area at Centenary Park has non biodegradable rubbish exposed at the foreshore and in the Clontarf wetland. There are car bodies, metal sheets, plastics and building materials scattered in areas of low lying land and inundation.

There is a dual use path along the southern foreshore and eastwards from Sandon Park on the west. In places along the Shelley and Rossmoyne foreshore the path is particularly close to the foreshore. The foreshore vegetation is already stressed as most of the vegetation was disturbed by infilling and there is an abundance of lawn species encroaching on the communities. There are several points along the Shelley foreshore where erosion of the banks is destabilising mature trees and consequently their roots are exposed and the visual amenity is reduced. At Mount Henry, Shelley and Wilson there is also pressure from water skiing, and from small boats which when launched from the beach damage fringing vegetation. The result is a non continuous community of sedges along the foreshore which detracts from the area. In comparison, at Salter Point, the sedge species are not only visually attractive but are ecologically important.

The Shelley Bridge is a modern concrete structure which is raised above the surrounding land and as a consequence is the highest point on the landscape from most positions along this section of the river. Unlike Mount Henry Bridge, the flat nature of the background landform means that the line of the bridge shows a band of sky beneath it. Riverton Bridge is an attractive wooden bridge which is low lying and painted white. The adjacent land use is an open parkland with lawn and single trees. The kiosk is prominent although it is painted in neutral colours. The planting of exotic trees around the car park is unfortunate as local species would be visually more pleasing and small shrubs could reduce the car park impact on the foreshore without obscuring the views of the river.

There are several conspicuous drains in the area. At Salter Point the drain head on the western bank

detracts from the line of fringing reeds. The raised WAWA drain at the Mumms Point Reserve at Shelley greatly detracts from the aesthetics of the area. A small wooden jetty at Alton Court and the remains of a jetty at Brentwood Avenue, Bull Creek, are attractive man- made riparian features which enhance the water by providing visual interest points.

Land use

Aquinas College is for the most part set back from the edge of Mount Henry. The buildings are mixed styles and the gardens generally well maintained. Redmond Park is a small park which has attractive river views from its raised position. Due to the escarpment erosion it has been necessary to have wire and pine barriers constructed along the ridge line. The park itself has a few native banksias and the lawn maintained. The enclosed nature and high topography of this little reserve makes it an attractive park. Sandon Park has remnants of the fringing paperbark-reed communities. The lawn has encroached onto these areas which does detract from the naturalness of these pockets. There are pine bollards which protect the vegetation and give the viewer the impression of a parkland with fenced borders. The areas which have stump like vertical bollards without the horizontal bars are less intrusive. The appealing feature of the park is that it is subject to inundation and the flooded water makes an attractive form in the riparian zone.

The Waterford residential area consists of houses built from the late 1980s to very recently. As a consequence they are of similar design and taste. The gardens are relatively unestablished or of the fashionable lawn, conifer and palm landscaping which is very neat and 'treeless'. As the area was built on a wetland, a drain runs through the residential area leading to Bodkin Park. The park has a small channel and parkland which has lawn and local tree species. There are small bridges over the water channel and play equipment. This area is more attractive than the Waterford Reserve which has a linear band of grass and a linear band of fringing rush.

The Clontarf buildings are attractive, but, they require some maintenance and the gardens have lost the formal style and high degree of pride they had when the Christian Brothers ran the boys home. They are an important element in the river section with their wide open ovals, and mature trees and the buildings are old and have a historic quality. This is a welcome break from the suburban developments which have encroached on the wetlands and foreshores.

The Shelley and Rossmoyne foreshore houses were built from approximately twenty years ago, although many are quite recent. They generally have a high degree of urban pride. At Rossmoyne and Bull Creek the rise in topography has allowed many houses to be set back into the landform and there is a multi layering of roof lines as the houses are set on stepped blocks.

The Leach Highway crosses the Bull Creek wetlands and has severed its natural drainage paths. To the water user there is little visual evidence that the freeway is only metres away from the dense vegetation. However the foreshore user has only restricted access to the water due to the difficulty of crossing the freeway and drains.

Landscape Interpretation

Dominant Landscape Character

The original natural landscape would have been gently undulating dunes with swampy depressions with a vegetation cover ranging from open banksia-eucalyptus woodland. At present, only isolated pockets of the precinct remain as a relatively natural landscape. At Mount Henry, the banksia woodland appears to be relatively natural despite weed invasion and an old quarry site.

There are three other locations along the foreshore which have remnant riparian vegetation which appears relatively natural in the context of the surrounding parkland and suburban landscapes. These natural landscapes have remnant riparian species such as sedges and paperbarks and in some sections have relatively little weed invasion.

Much of the foreshore of this precinct has a recreational/parkland landscape. On the southern section of the precinct, the foreshore reserve is very narrow, however some remnant fringing vegetation occurs along the dual use paths. On the northern section of the river much of the indigenous vegetation has been cleared or only a few remnant trees occur with lawn. In several sections, exotic trees have been planted in parks and recreational areas for shade.

Most of the landscape character type in the precinct is suburban. The houses range in age, but most have been built since the 1950s and as a consequence the suburban landscape is relatively modern. Houses close to the river have a high degree of urban pride and there is a range of garden styles.

Significant Viewscapes

There are a number of significant viewscapes of the Canning River at this precinct. The views which are attractive focus on the open water and the opposite banks of the river. Areas which are adjacent to sections of relatively natural vegetation and which are framed with a bay shaped foreshore are visually pleasing. The confluence of Bull Creek with Canning River is particularly attractive as the creek has some quite dense fringing vegetation which ,although weed infested, has a screening effect which creates a sense of expectation. Bull Creek is relatively broad which suggests that it was originally a long natural drainage line.

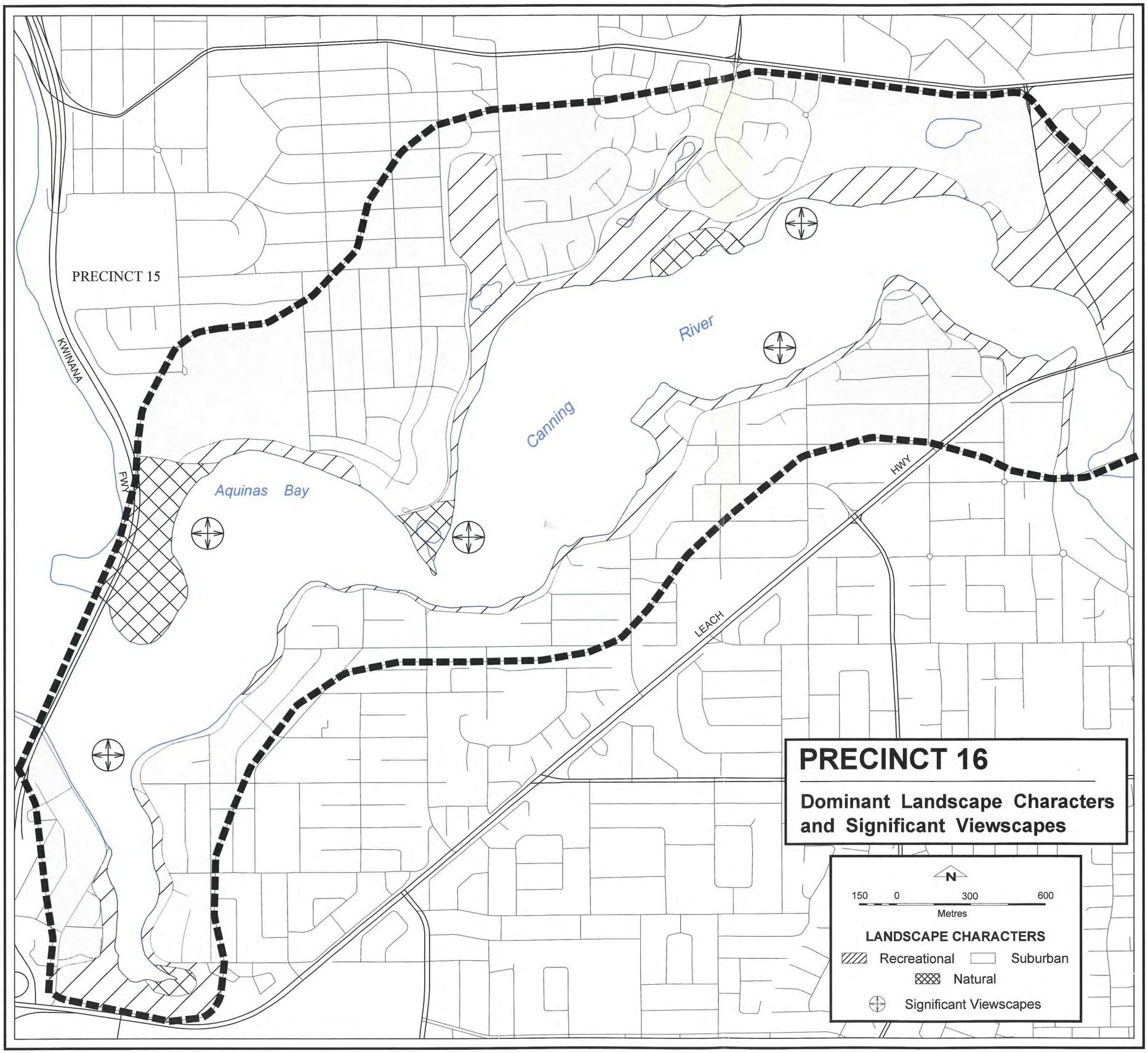
Conforming and Non Conforming Elements in the Landscape

The foreshore around Centenary Park is at present unattractive and there are plans to upgrade the amenity. At present, the main detracting factor is the unnatural rise of the old land fill site. The form of the hill is out of context with the local landform and the rubbish is exposed at several places along the foreshore and in the Clontarf wetlands. The Clontarf wetlands are extremely valuable as a wildlife habitat, however scattered iron rubbish, car bodies and old building materials are present adjacent and within areas of inundation. There is an abundance of bird fauna in the area and rehabilitation of the site would not only improve the quality of the wetland but would also improve the aesthetics of the area. Removal of the landfill and creation of a low lying wetland and lake system would be the most aesthetically pleasing and visually consistent land use in the area. Communities such as flooded gums and paperbarks could be re-established using community groups and local government assistance. The simple pathways and viewing points could be constructed to allow foreshore access.

The Clontarf foreshore has an attractive band of shorerush, however much of the original fringing woodland has been destroyed through past land uses. Any regeneration and removal of exotic species should be encouraged. As the old gardens of Brother Keaney still have their basic design and mature trees, it would be of local historical value to restore them to the original concept. This small garden would be in keeping with the land use of the Clontarf buildings.

The water pipe crossing at Wilson is conspicuous, and realignment to the same line as the Shelley bridge would be expensive. Simple actions, such as removing the exotic bulrush and caster oil plants, would at least improve the aesthetics of the pipe sump area. Improved vegetation planting at the Naval Cadets and Sea Scouts club houses at Wilson would improve the landscape amenity.

The remaining natural vegetation is subject to a number of management issues which are detracting from the landscape. Recreational users in the area illegally launch craft from non designated areas at Aquinas Bay. This is causing damage to the fringing


PRECINCT 15
KWINANA
FWY
Aquinas Bay
River
Canning
HWY
LEACH
PRECINCT 16
Dominant Landscape Characters and Significant Viewscapes
N
150 0 300 600
Metres
LANDSCAPE CHARACTERS
Recreational
Suburban
Natural
Significant Viewscapes

rush which in turn causes erosion of the banks. The enforcement of a ban on fires could decrease damage to paperbark. The stands of paperpark require additional tree planting, and revegetation of understorey species would help. The limestone outcrops at Mount Henry are subject to heavy recreational use and the sensitive banksia woodlands are being degraded by informal paths and weed infestations. Revegetating the Mount Henry quarry site would assist in improving the landscape amenity.

At Bodkin Park, the retention of the native trees is aesthetically pleasing. Although much of the wetland has been infilled the nature and identity of the area is retained in the fringing woodland species. The low forms of the bushes and twisted paperbark trunks are attractive. Exotic trees need not be planted in the parkland and to do so would only detract from the remnant trees.

Bull Creek foreshore has been overrun by weeds, particularly at its headwaters. Removing the weeds would improve aesthetics and environment, in particular the bamboo, pampas grass and blackberry. At Salter Point, kikuyu is encroaching on the sedge community and planting of indigenous shrubs and trees would minimise the competition.

Recommendations for Maintenance and Enhancement of the Present Landscape Character

- Mowing should be restricted and ensure that it does not occur in the fringing woodland understorey. Encourage planting of native species on roadside near sensitive areas such as Salter Point and Bull Creek.
- Consider the best management practices for enhancing the landscape and improving the ecological value of Centenary Park and surrounding waters. In particular there are lots of opportunities to enhance what could be a particularly attractive foreshore with important viewscapes.
- Ensure that Clontaft's attractive buildings are maintained for their historic and aesthetic values.

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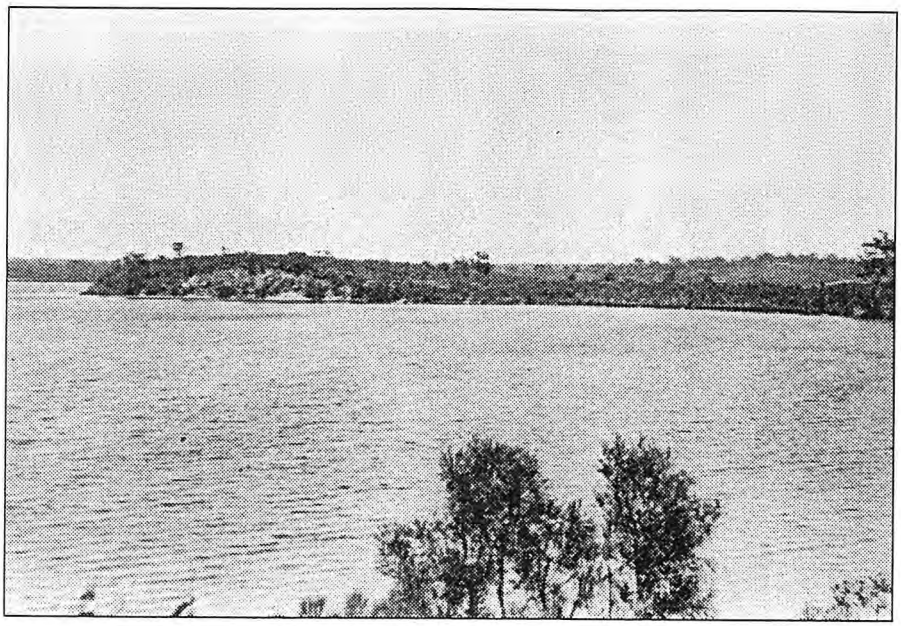
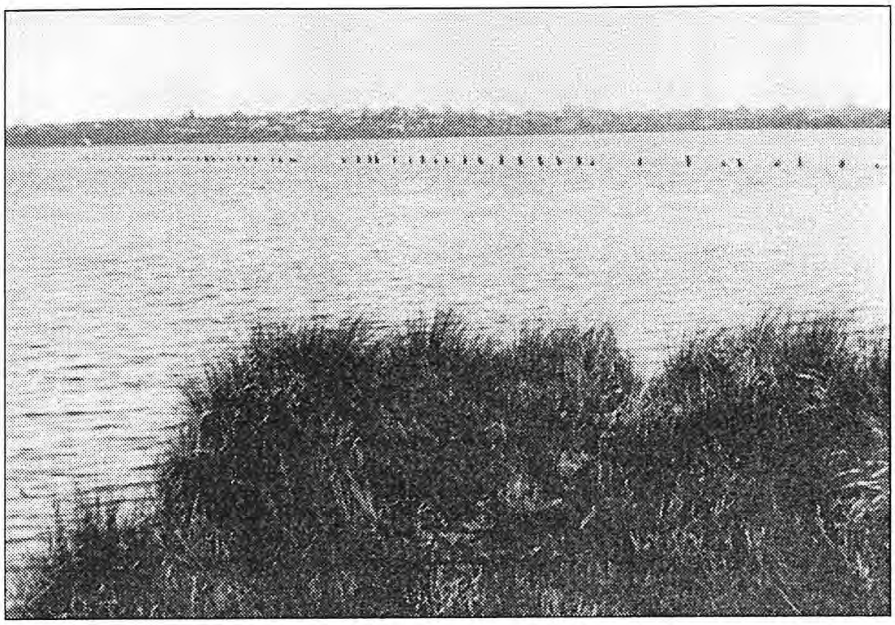


Mount Henry, Canning River. 1921.

Battye Library 3029B/4.

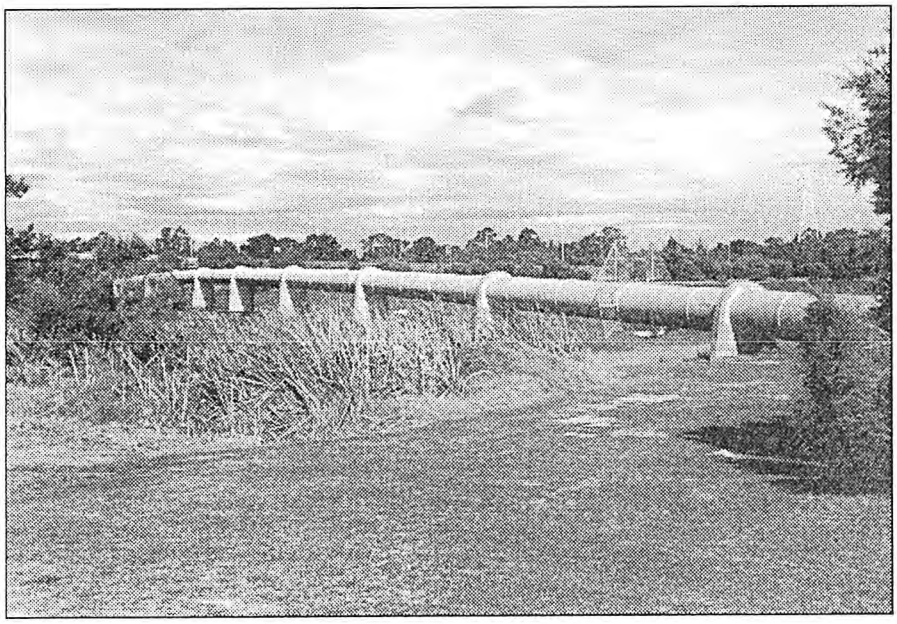
Aquinas Bay, Canning River. 1997.

Swan River Trust.



Convict fence. Riverton. 1980

Charles Powell, Riverton Library,Local History Section.

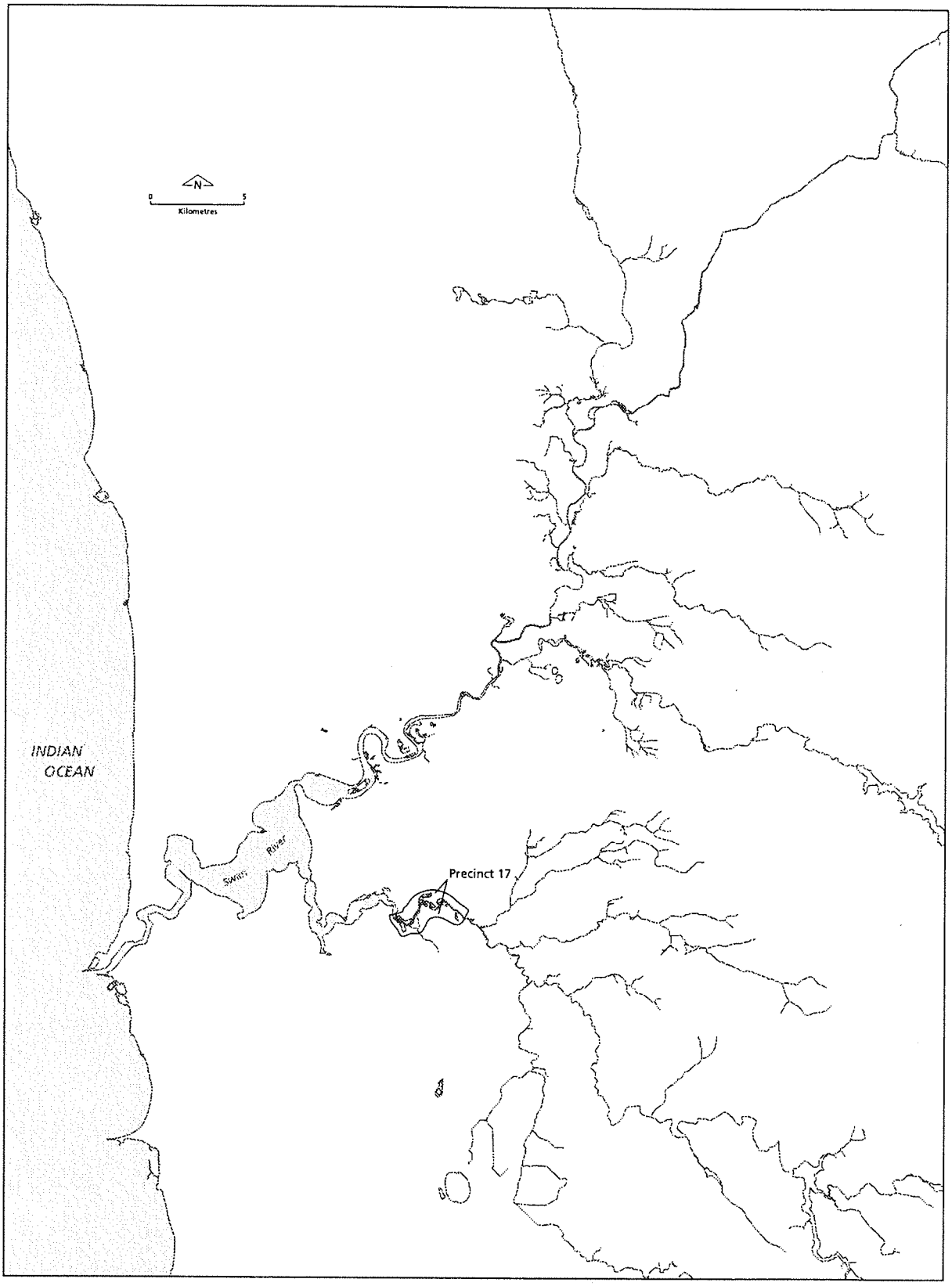


Water pipe east of Centenary Park. 1996.

Swan River Trust.

Precinct 17

Canning River - Riverton Bridge to Nicholson Road Bridge



Summary

Canning River - Riverton Bridge to Nicholson Road Bridge

This precinct includes the Canning River Regional Park which contains some of the best estuarine vegetation in the whole Swan Canning River catchment. The park has a wide diversity of habitats including salt water estuary and islands, freshwater riverine environment and modified woodlands on the floodplains. The immediate environs of the Canning River are tranquil and beautiful due to the fringing vegetation and the complex waterform of the river.

The river has several branches which lead to freshwater inputs, such as Bannister Creek, and areas of inundation. There are several islands within the river channel which form irregular elongated shapes and provide attractive water features. The channel is in the form of loose undulating curves as it crosses the low lying sand plain. The river bank and island forms are accentuated by the fringing reeds and sedges which are emergent in areas of regular inundation. Unfortunately, much of the vegetation consists of weed species which are often the dominant species in the area. These species in most cases detract from the aesthetics of the river. Historically, much of the low lying area has been cleared for rural and urban development. As a consequence, there is only a fringe of vegetation along the river area and a remnant flooded gum woodland.

There are several pedestrian crossings over the river and this allows the river user to view the riverform and vegetation from the centre of the channel. These structures also provide visual interest in the fluvial environment. The Kent Street Weir is now the focus of a recreation node and has a pedestrian crossing on top of the concrete piles. The residential development around the river consists of mainly modest homes built since the middle of this century. The houses are on small blocks set back from the river reserve and have predominantly eclectic gardens. These houses are not easily visible from most positions on the river banks due to the low lying nature of the land. Woodloes House and Castledare buildings are of historic significance along this section of the river.

The entire precinct is encompassed in the proposed Canning River Regional Park. The park will be predominantly for conservation purposes, however facilities for passive recreation will be improved.

Biophysical Processes

Geological Processes

There are two geological units in this precinct which include the Bassendean Sand Geological Formation and the Guildford Formation. The Bassendean Sand is characterised by white and grey quartz sands. The Bassendean Sand forms a series of dunes parallel to the coast. The sand was laid down on shorelines and dunes during two or more past periods of relatively high sea level during the Pleistocene. The deposit is poorly sorted, fine to medium grained sand.

Guildford Formation is characterised by sandy clays to clayey sands including alluvium and colluvium. The formation consists of lenticular interbeds and mixtures of sand, clays and conglomerate which are locally calcareous. Most of the unit is of fluvial origin but includes estuarine and shallow marine intercalcations, especially near the base. The quartz sand ranges from very fine grained to medium grained but contains a small amount of coarser material. The sediments are usually mottled in shades of brown, orange, yellow and grey and are variably laterised and oxidised at the surface (DEC, 1980).

The Southern River Soil Unit occurs on the southern section of the estuary and is characterised as being grey sand dunes with sandy swamps in the low-lying areas. Where sand appears to have been blown over the alluvial soils therefore the swamps often have a clay base. The swamps have iron and humus podzols, peats and clays. The Bassendean Soil Association occurs on the northern bank of the estuary and consist of grey and yellow sand dunes with sandy swamps in the low lying areas. Adjacent to the river channel are the Swan Association soils which are red podsolic and undifferentiated alluvial soils along the present river course (Seddon, 1972).

Topography

The area consists of the geomorphic classification of the Bassendean Dunes which are defined as a sandplain with low dunes and many intervening swamps. Much of the lower land is subject to inundation and as a result forms depressions in the low lying land. Adjacent to the river course, much of the original low lying land has been infilled for residential areas, so the landform is unnaturally high and uniformly flat. The Pinjarra Plain is unconsolidated fluviatile sediments deposited in the form of alluvial fans at the base of the Darling Range. This more undulating land forms a backdrop to the flat river plain area.

Hydrological Processes

Water features

The estuary has several low lying alluvial islands and adjoining wetlands at this section of the Canning River. The islands are the result of the river channel changing towards an easier course as alluvial deposits increase. The width of the channel is irregular and it takes the form of loose irregular meanders downstream from Nicholson Bridge. Shell deposits occur from east of Riverton Bridge to the Castledare foreshore. A deposit of oyster (*Ostrea* sp) which appears to have been secondarily deposited in the silty alluvium near Nicholson Road Bridge was disturbed when the new bridge was constructed.

Several main drains run into the river in this precinct. Several are altered natural drainage lines which have been straightened but remain as open channels. Freshwater input to the Canning River occurs at Bannister Creek which is a narrow channel and enters the estuary from the south.

Bathymetry

The Canning River has a depth of up to two metres in this area, although most of the channel is shallower and often subject to low water flow in summer months. The Canning River at this point has both estuarine and riverine waters divided by the Kent Street Weir. The tidal influence is blocked by the weir and as a consequence the upstream water is relatively fresh particularly in winter months due to the higher seasonal rainfall.

Flooding

The area is flat and low lying and partly subject to seasonal inundation. Prior to infilling of the lower lying land, the 100 year flood plain of the Canning River originally extended east as far as Albany Highway. The flood plains are particularly important for such vegetation communities as the samphire flats and flooded woodlands.

Erosion and accretion

The river banks are subject to the natural process of erosion and accretion. In places where the river bank

vegetation has been removed these processes are accentuated. Since the construction of the Kent Street Weir, the alluvial islands have altered, some disappearing, new ones have formed and others joining up with the main channel banks.

Vegetation Communities

Native

Swan Complex

The indigenous flora of this precinct is classified as being as part of the Swan Complex (DCE, 1980).

The vegetation ranges from fringing woodland of flooded gum *(Eucalyptus rudis)* and swamp paperbark *(Melaleuca rhaphiophylla)* with localised occurrence of low open forest of sheoak *(Casuarina obesa)* and saltwater paperbark *(Melaleuca cuticularis)*. The various communities which make up this complex are described below.

Sarcocornia and *Halosarcia* communities

On the tidal flats such as at Surrey Road there are samphire and other salt tolerant communities. These include the samphire *(Sarcocornia quinqueflora)* and seablite *(Suaeda australis)*, which occur on the lower ground (Pen, 1983). On slightly higher topography marsh club rush *(Bolboschoenus caldwellii)* and glasswort *(Halosarcia indica subsp.bidens)* can be found. All these species are mainly found below the Kent Street Weir only.

Juncus community

The shore rush *(Juncus kraussii)* occurs in areas which are frequently inundated and have lower salinity than the salt marshes. It occurs mainly downstream of the Kent Street Weir in this precinct.

Typha communities

The bulrush *(Typha domingensis)* occurs in low lying disturbed areas, however most of this community has been usurped by the exotic bulrush *(*Typha orientalis)*, which appears more tolerant of disturbed and freshwater conditions. The exotic bulrush is abundant particularly upstream of the Kent Street Weir (Pen, 1983).

Casuarina-Melaleuca community

The swamp sheoak *(Casuarina obesa)* and swamp paperbark *(Melaleuca rhaphiophylla)* community lines the Canning River almost continuously from Riverton Bridge to the Kent Street Weir which is the estuarine section of the river. The understorey often includes shore rush *(Juncus kraussii)*, club rush *(Bolboschoenus caldwellii)*, creeping brookweed *(Samolus repens)*, slender myoporum *(Myoporum caprarioides)*, and twig rush *(Baumea juncea)*. Swamp peppermint *(Agonis linearifolia)*, moonah *(Melaleuca pressiana)*, marri *(Eucalyptus calophylla)* and narrow leafed oxylobium *(Oxylobium linearifolium)* are also found with the paperbarks.

Melaleuca swamp community

This community includes the swamp paperbark *(Melaleuca rhaphiophylla)*, and flooded gum *(Eucalyptus rudis)*. It also includes the saltwater paperbark *(Melaleuca cuticularis)*. This community is found in an isolated pocket at Ferndale Road (Pen, 1983). A second community occurred at Watts Road Lake until this was recently infilled for development. The twig rush *(Baumea juncea)* and shore rush *(Juncus kraussii)* are often found in these swampy conditions.

Eucalyptus-Melaleuca community

The Eucalyptus-Melaleuca community occurs upstream of the Kent Street Weir (Pen, 1983). The community includes flooded gum *(Eucalyptus rudis)* and swamp paperbark *(Melaleuca rhaphiophylla)*. Modified flooded gum woodland occurs at the Ferndale flats with an understorey of many weed species. In swamp areas, the flooded gum-paperbark communities occur with a similar understorey as the river edge communities and in addition include swamp peppermint *(Agonis linearifolia)* and common sword sedge *(Lepidosperma longitudinale)*.

Flooded gum communities

Much of the original flooded gum *(Eucalyptus rudis)* woodlands has been cleared for pasture. The indigenous understorey has been generally replaced by weeds. Among the woodland there a number of wildflowers including many orchids, fringe lilies *(Thysanotus* sp*)*, trigger plants *(Stylidium* sp*)* and sundew *(Drosera* sp*)*. The flooded gum often occurs upstream from the weir where freshwater conditions prevail.

Exotic

The presence of weeds is a serious problem in this precinct as past and present land use have encouraged proliferation among the remnant native vegetation communities. The following species are potentially serious weeds that occur in the area: blackberry *(*Rubus* sp*)*, castor oil bush *(*Ricinus communis)*, pampas grass *(*Cortaderia selloana)*, the giant reed *(*Adunda donax)*, cape tulip *(Homeria species)*, Japanese pepper tree *(*Shinus terebinthifolis)*, coral tree *(*Eruthrina caffra)*, fig *(*Ficus* sp*)*, morning glory *(*Ipomoea indica)* and willow tree *(*Salix* sp*)*. Introduced veldt grasses *(*Ehrharta longifolia and *E.calycina)*, kikuyu *(*Pennistum clandestinum)* and buffalo grass *(*Stenotaphrym secundatum)* flourish often to total exclusion of local species. Bulrush *(*Typha orientalis)* has invaded much of the river and it is believed that it proliferates in the fresher waters to the exclusion of the local bulrush species *(Typha domingensis)*.

Historical Land Use and Resulting Environmental Changes

Early grants were made to William Willet (Lot 21), W. H. Drake (Lot 4 and 23a) Manning (Lot 23), P.P. Smith (Lot 1), Alfred Stone (Lot 2), Wallace and Bickley (Lot 3) and Waylen (Lot 5). W. H Drake was the Deputy Commissioner. Samuel Bickley was land was 13 000 hectares and the largest in the area (Carden, 1968).

Peter Parker Smith had been granted all of Canning Location Number 1, by January 1844. He never lived on the land and it was only used for goats and pigs to ensure that the land would not be resumed by the Crown. In 1847, the Watts family purchased the land and they developed the property for pastoral purposes and farming. The land was eventually broken into smaller lots. In 1897 the Wilson Park area was purchased by the Imperial Brick and Tile company (Carden, 1968). It appears that a brickworks had been built at Yankee Yards (Wilson Park) and it is believed that the kilns, drying sheds and clay pits were located on the eastern side of the Adenia Reserve lake. Part of the property and part of Location 2 became *Kallyamba* owned by Weidenback in 1879.

Canning Location Number 2 was allocated to Alfred Stone in November 1829 who named the property *Speldhurst* and established his home and estate there (Carden, 1968). The following year, one of his servants drowned in the river while attempting to retrieve a duck that he had shot. The man was buried somewhere on the banks near Wilson Park. The land was sold later that year to James McDermott who renamed the estate Cheltenham and the farm was later sold several times after this. Samuel Bickley was the first to receive the original freehold title in 1842.

Canning Location Number 23a was assigned to Charles Churchman in April 1830 (Carden, 1968). He described the property as 'pure sand' and he intended to leave it more or less in its natural state as he believed it was not worth the cost of cultivating. The lower part of the grant was under water in winter and flooded with salt in summer. Despite this he built a house with bricks he had brought from England. He later sold the land to an adjacent land holder in 1833 and was quickly passed on to William Drake by April 1833. The house remained Churchman's property and was to be removed however he died the following month. The land was purchased by the Manning family in 1879 and was held by them until the land was subdivided as the Canning River Estate in the 1920s (Richards, 1991).

Benjamin Mason built the second railway line in the State from Carmel near Kalamunda down to near Bickley Road. Mason and his partner Francis Bird set up a timber mill in the Darling Range, and brought the sawn timber to a wooden railway line which ran along a line of Bickley Road to the river (Richards, 1991). Here the timber was loaded onto barges for Fremantle. By 1866, Mason was employing over one hundred men, mainly in the hills. The land is now called Mason's Landing and the area was a hub of small industries such as blacksmithing, wheel-wrighting and building due to the demand from the saw pits. In 1869 a steam powered sawmill was established by the river side, however by 1874 it was necessary to move the mill site to Canning Mills in the Darling Ranges. Mason's house was adjacent to the landing and is no longer present. Bird's home was 'Woodloes' homestead which was constructed from stone and jarrah shingles (Carden, 1968).

Between 1853 and 1868, the Albany Highway between Perth and Narrogin was built by convicts

and ticket of leave men. The track was made using woodblocks and was the main route throughout the Cannington area. The Canning 'sandplain' section which was notoriously difficult to traverse was completed in early 1868 and dramatically improved communications in the area.

Between 1860 to 1883 William Lacey Gibbs, gradually accumulated most of what is Cannington. His slaughter yards were located near the present day Myer Department Store, Westfield. His brother built the 'Cecil/Waverley' Hotel on the corner of Cecil Road and Albany Highway (Carden, 1968). The hotel was altered many times over the years and was recently demolished for widening of the Albany Highway.

The first Nicholson Road Bridge was built in 1855 (Swartz, undated). It reduced the need for numerous hazardous crossings upstream and its construction allowed paths to these other crossings to be closed. The first bridge was built by the sons of Benjamin Mason who were contractors to the Crown. This bridge was replaced in 1907. In 1927, the river bed was made wider and deeper by cutting the north bank and lengthening the bridge. The third bridge was constructed in 1953, and a fourth bridge constructed in 1987 is a pre stressed concrete bridge. The construction of the last bridge involved disturbing the island that once occurred beneath the site of the bridge and it is no longer present in the river channel.

In the 1890s a number of orchards and farms were established by among others Brookman, Wiedenbach and Riley (Carden, 1968). There were several dairies in the area by the 1920s and 1930s which supplied the metropolitan area and the local people and the Road Board with 'grass cutters'.

Riley's market garden was on sandy soils and was watered from numerous fresh water springs in the area. It was located at the present day Adenia Reserve and was an important supplier of fresh vegetables and fruit to the area. The Wilson and Johns nursery was started in 1897 and was important to supplying a State wide demand for plants (Carden, 1968). Water was drawn from the river for the plants until the nursery closed.

In 1908, the Wharf Street Drain was constructed and the open drain ran from Albany Highway (then Road) to the river. It remained open for over 60 years and was not only a driving hazard but also a feature of the area.

Castledare was an Edwardian 'mansion' which was built by a Mr Flemming and later sold to the Meares family. The McLeod family purchased the house and lastly Archbishop Clune bought it in 1928. Several additional buildings were constructed and a school and home was opened the following year for mainly mentally handicapped boys. However during the Depression there was a lack of resources and the home became used for an orphanage. The home, although officially an orphanage, mainly catered for boys privately placed from poor and separated families. The house was used as the administrative and dining block of the Castledare Junior Orphanage. It was a home for young boys aged between seven and eleven who had their 'spiritual and material needs' supplied by a staff of Catholic Brothers, a matron and her assistants. The home was surrounded by virgin bush and only a short distance from the Kent Street Weir which was a favourite playing area for the boys. The orphanage became known as St Vincent's Junior Orphanage in the 1960s, however the name Castledare is now used.

Riverton was released in 1914 as a place 'where money grows'. The Riverview Estate Ltd suggested that with a small capital investment wonderful results in the pursuit of dairy, stock, fruit or poultry will make the buyer independent. The abundance of water would a 12 month growing season. The opposite 'well known property estate' of William Bateman was used an example of a flourishing market garden in the area (Riverview Estate Ltd, 1914).

The river was 'desnagged' in 1924 and many old barges and boats were pulled out from the old landings including Mason's Landing and the Yankee Yards. Up until the 1960s this section of the river consisted of low lying swamp and mosquito breeding was a problem. At the time it was suggested that the section would 'require a lot of effort and finance to improve before scenic roads and river beautification can take place'(Town of Canning, 1975 and 1981)

As early as 1916 there were discussions on constructing a weir to prevent the movement of salt water up the Canning River. Several petitions were made as to the location of the weir and in 1911 a sandbag weir was constructed at Nicholson Road Bridge to test the effectiveness of such a project. At this time nurseries were pumping water from the river and upstream from this spot and they found that the

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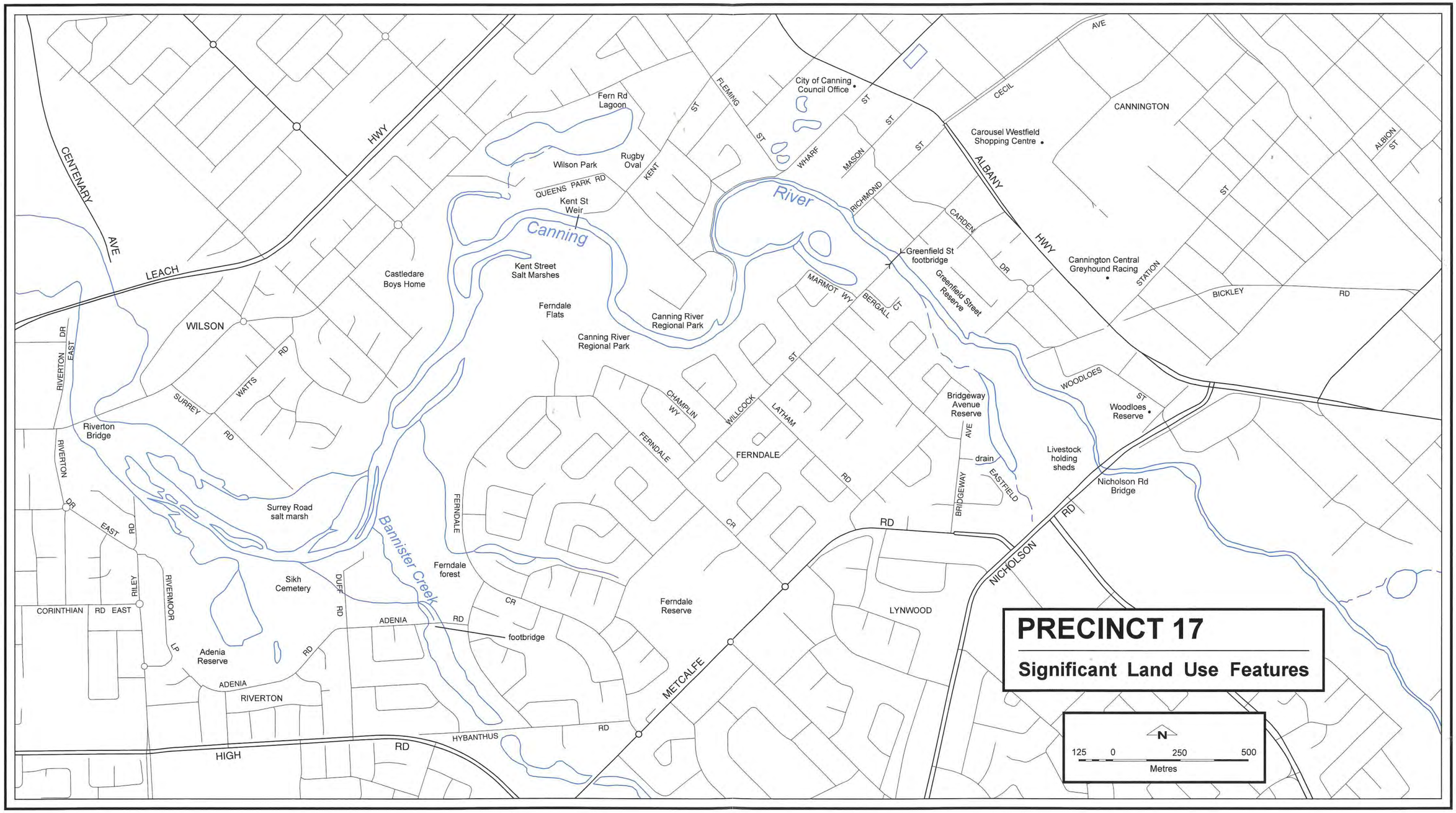
Significant Land Use Features



water was 'too salty' in summer. The barrier was a success and it was maintained over several summers. In 1916 a second sand bag weir was constructed at Kent Street and the following winter flooded the adjacent lands. After several years of petitioning the Kent Street weir was completed in 1927. Salt water, however continued to extend upstream of the weir at certain times of the year. The construction of the Canning Dam in the Darling Range meant that the volume of freshwater reaching the lower river was reduced, so the Kent Street Weir was made a more efficient lock in 1940. Before the Canning Dam construction water was pumped from the Canning River for the metropolitan supply. On occasions the river dried up during the summer months and several times the salty water overflowed into the upstream area. After the dam was completed water flow was managed to allow farmers down the river to continue their pumping systems. Silting up and leaks continued to be a problem and after further upgrading in 1962 the scheme was disbanded. The weir has caused a loss of estuarine vegetation in subsequent years through replacement by riverine vegetation upstream of the weir. The presence of relic salt marsh plants indicates that the estuarine vegetation once extended at least as far as Nicholson Road Bridge approximately three kilometres upstream of the weir (Pen, 1987).

The Greenfield Street Footbridge was constructed in 1964 enabling people quick access from the relatively undeveloped Ferndale area to the older Cannington area where the schools and other amenities were available (Carden, 1968).

In the early 1990s Watts Road Lake was infilled by developers to form the Canning River Gardens Estate. This had a flooded gum and paperbark community fringing the water basin, with several dead trees in the centre of the area of inundation and provided a roosting site for waterbirds. It was considered by the State Planning Commission (1989) that although the lake did have some environmental significance it did not have such value as to warrant reservation. Strong community pressure continued for the area to be included in the regional park, however it was decided that the available funds should be used to acquire other sections of wetland privately owned in the region.

The alluvial islands around Riverton are a significant natural landscape feature and were noted historically for their beauty and the obstruction they caused to river traffic. However due to the changes in river hydrology an island adjacent to Kent Street Weir gradually disappeared and a second near Surrey Road had silted up and joined the northern river bank by the middle of this century. Around Masons Landing there was a rapid which was recorded as dangerous to young children as the current was too strong for them (Richards, 1991).

Present Land Use and Social Patterns

The river is separated from the main areas of development by the six lanes of Albany Highway. Notable developments include Carousel Shopping Centre, Cannington Raceway, Cinema complexes, Canning City Council offices and regional offices of Commonwealth and State government agencies. There is a ribbon of commercial development along the highway and the Carousel Shopping Centre is a substantial group of buildings and was one of the first regional 'all under one roof' shopping centres in the metropolitan area. The lack of reticulated sewerage has been a constraint on development in the area despite the Richmond Street pump station (DPUD, 1991). At present there is a plan to improve the Canning City Centre and upgrade facilities in the area.

Adjacent to the Nicholson Road Bridge there is a property owned by a livestock transport company. The land is used as a sheep holding area and stop for trucks. There is also a small orange orchard on the land. The area is to be vacated in the near future.

At present the weir still acts as a block to salt water, but there have been discussions on removing the weir to reduce the spread of **Typha orientalis* which flourishes in the river system. However over the past eighty years the vegetation has adapted to freshwater conditions upstream, and it is considered that retaining this vegetation for wildlife habitats is more important.

Due to increased pressure on the entire catchment system there have been recent outbreaks of blue green algae Euglena and the aquatic weed, *Hydrocotyle ranunculoides.*

Recreation nodes

Canning River Regional Park extends along the foreshore for the entire section of this precinct's foreshore. At present, land owned privately is being acquired so that it can be managed cooperatively by several cooperative government departments. The area is an important recreational area, however the park managers consider that the primary focus for the park should be conservation.

The Castledare miniature railway consists of over 5 kilometres of track which runs within the Castledare property owned by the Christian Brothers. The railway is run by volunteers and owned by individuals. It is open to families the first Sunday in every month and during school holidays. It has picnic and toilet facilities within the grounds and is a popular visiting feature in the area.

Public access

Public access to the river is in the form of dual use pathways and carpark facilities. It is considered that facilities should be of a minor nature and allow for mainly passive recreation, except for a few active reaction areas within high use areas. There are several dual use and footpaths present along the foreshore, and there are plans to extend these facilities to produce a linked system. Canoe access facilities are present at Riverton Bridge, Kent Street Weir and Woodloes homestead area. It is considered that motorised craft are not suitable for this section of the river due to the noise and river bank erosion, however at present motorised boats are allowed at a speed of 4 knots. Formal carparks are provided at several points around the river reserve.

Sites of Nyungar & Wider Australian Community Significance

Nyungar significance

Beeliar and Beeloo Nyungars are believed to have considered this section of the Canning River as part of their run (O'Conner *et al,* 1984). The Beeloo considered north of the Canning River *(Dyarlgarro)* to the hills as part of their ground while the Beeliar mainly traversed the southern section of the river to the sea. At the time of European settlement, Midgegooroo and Munday were leaders of these people. The Cannington-Wilson area was called *Beeloo* for many years by the local residents (Swartz, undated).

Before colonisation, Canning wetlands were important to Nyungars for food and shelter. As a result, there are artefacts of Nyungar economic practices from the area. There is one reported archaeological site along this section of the river. There is a sparse scatter of quartz artefact material which indicates a possible camping ground. There was also a camping ground at Ferndale which has since been built over. It contained several hundred stone chips and was at least 5000-6000 years old (Richards, 1991).

Other significance

The Carousel Tavern (Waverley Hotel) was recently demolished after a heritage report concluded that it did not have great heritage value. It was originally the Cecil Hotel and was established by Stephen Gibbs (Carden, 1968).

The Woodloes Estate belonged to Francis Bird of Mason and Bird's Timber who designed and built the house in 1874. The house is currently on a small block and efforts are being made to purchase surrounding blocks to expand visitor facilities.

The Wiedenbach property was located west of George Street and was called Kaliamba and supported an orchard (Carden, 1968). Part of the land became Wilson and Johns Nursery and in the 1970s the Canning Shire Council erected the District Civic Centre.

Fred Riley owned a market garden at Riverton established in 1897. The produce grown was taken by horse and dray to the river, transported over in a homemade punt and hauled to the wooden block road (now Albany Highway) which led to Perth. Riley supplied a large portion of the finance for the first bridge in the area and the Riverton Bridge was as a consequence locally known as Riley's Bridge (Carden, 1968).

The suburb of Wilson was named after George Wilson, a former mayor of the Queens Park Municipal Council. However this name was chosen after much controversy as the State Housing Commission had chosen the name Beeloo, while the Canning Road Board and the Post Masters Generals Department had chosen the name Burton. The argument was not

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Sites of Significance

Site of Bickley's property later "Spelhurst"

Site of Wilson and Johns Nursery

Kallyamba Orange Orchards

Site of Wharf St drain

Site of Cecil Waverley Hotel

Site of W.Bickley's property

Site of Drake's property

Site of Wayne's property

Yankee Yards

Mason's Landing

ALBANY HWY

HWY

LEACH

Castledare Orphanage

Dyarlgarro

Aboriginal camping areas in this vicinity

Site of P.P. Smiths property

Mounsey's Footbridge

Masons landing

first rapids

Short Street Bath

Woodloes Homestead

Site of Watts Road Lake

Central Canning Bridge

RD

NICHOLSON

Bannister Creek

Brickwork landing

Sikh Cemetry

Clune Park

Site of William Willet's property

Riley's Market Garden

Claypits and Brickwork

Site of Manning's property

Site of Drake's property

HIGH RD

N

125 0 250 500

Metres

Dyarlgarro Sites of Nyungar Significance

Kent St Weir Other Australian Community Significance

settled until the 1960s even though the residential area had been established since the late 1950s.

Mr and Mrs W. Webb purchased the Riverton Estate for residential release in 1937. The area was called Riverton Bridge to avoid confusion with Riverton, South Australia. The Riverton area has become one of the most desirable residential areas along the Canning River due to its proximity to the river and the city.

Bentley Hill was named after overseer Bentley who looked after the convicts who had a camp on the hill during the construction of Albany Highway. The suburb of Bentley was named from the hill.

There is a Sikh Cemetery founded in 1893 near Bannister Creek on the foreshore of the Canning River.

Conservation Areas

System 6

M58 Canning River, Riverton Bridge to Nicholson Road Bridge

The section downstream from the Kent Street Weir contains of the best estuarine vegetation of the Canning and Swan Rivers. It supports estuarine plants which are absent upstream. The margins of the river banks and islands carry low open-forest and low closed forests of swamp sheoak and paperbark species and a varied understorey of sedges, rushes, shrubs and small trees. The saline river flats carry samphire and sedgelands. In the section upstream from the weir, the vegetation is mainly confined to trees along the river banks. The area is inhabited by about 87 bird species of which 60 are likely to nest there. The recommended area constitutes a site of regional significance because of its high conservation and recreation values and its proximity to the Perth residential areas.

The area has been declared a Regional Park and is under a joint management. The cooperative planning team is currently finalising a management plan.

Landscape Description

Precinct Description

Waterform

Upstream from Riverton Bridge, the Canning River branches into a northern arm which leads to an area subject to seasonal inundation and a main channel. The main channel has three large islands as the estuary curves round Wilson promontory. The islands form irregular elongated shapes within the channel and provide an attractive and complex waterform. To the south of the first island upstream, there is an open drain line channel which isolates part of the Adenia Reserve foreshore into an area of inundation during periods of high water. In line with the second island, there is the Adenia Reserve wetland which has a narrow channel leading to a shallow water body at the site of the old clay pits. The third island upstream is in line with the confluence of Canning River and Bannister Creek. Bannister Creek is a narrow and shallow channel which cuts through the Adenia park reserve in a south-easterly direction. Towards its headwaters the creek cuts through the topographically higher residential area and as a consequence has formed a deeper channel.

From Bannister Creek the Canning River curves around Wilson in a northerly direction. In line with Bywater Way, Wilson, the Canning River splits into two around a small peninsula which is almost an island except for the narrow isthmus-like join at the southern bank. The southern arm is shallower and narrower than the adjacent main Canning River channel.

As the estuary passes upstream of Castledare, the channel splits into three arms with the central arm being the main channel. The first arm forms a small wetland on the southern bank while the northern arm leads to Wilson Park wetland. The estuary forms gentle curve towards Kent Street Weir. The weir causes the water to form small whirlpools and ripples in the water downstream. Upstream the channel forms a S-shaped curve which leads a further branch into a small wetland in line with Marmot Avenue, Ferndale. The channel straightens until it branches with the Bridgeway wetland which in winter abuts the Nicholson Road Storm water drain. The Canning River itself forms relatively tight undulations until the Nicholson Road Bridge and as a result the river channel cannot be viewed for a great distance due to the fringing vegetation.

Natural riparian zone

There is a narrow belt of fringing vegetation all along this section of Canning River. The shorerush and other sedges emphasise the complex forms of the islands as their emergent forms boarder the shallow waters. There are no sandy beaches, rather the banks are covered in riparian vegetation and in winter are swampy and waterlogged. In places where the foreshore vegetation has been disturbed, the alluvial sediment is exposed as dark coloured and fine particles. The vegetation is discussed in more detail below, however it may be noted here that the overhanging branches and undulating tree forms provide a varied and complex riparian zone. The river is also sufficiently wide so that the waterform is open between the two edges of overhanging vegetation.

Landform

The land is relatively low lying and in places close to the Canning River channels form depressions which are subject to seasonal inundation. The residential areas have been raised with landfill in the lower lying areas originally subject to inundation. These raised areas often are obviously unnatural, such as Bergall Court, Ferndale, where the new soil has formed a steep slope behind the foreshore area. The residential area is also flat with little topographically higher land, which results in the river user being unable to see much of the surrounding urban land use.

Vegetation

There is a fringe of shore rush along the channel banks and islands upstream of Riverton Bridge. The rush has a brush-stroke like texture along the river edge and in several places sheoak and paperbark trees overhang the line of reeds. The two dominant trees have pleasing forms, the salt sheoak having equally dividing branches leading to soft round edged foliage patterns, while the freshwater paperbark has a regular shape and dense canopy of fine twigs and leaves.

At the wetland adjacent to the Canning River Gardens Estate there is a samphire community which has a low succulent form against the thin club and shore rushes which occur in a wide belt along the water channel. There is a narrow band of casuarina and paperbark around the fringing rush and a few remnant flooded gum exist close to where the Watts

Lake vegetation complex once existed. The rush community forms an open clearing between the trees and there are two main rush dominated areas at this section of Wilson.

The sheoak and paperbark community lines the Canning River channel up until where the river branches into three arms. The community is dense and overhangs the water edge with various shaped branches and canopies. Behind the narrow band of sheoak and paperbark there is a wider band of shore and club rush which surrounds the Adenia Street wetland in the shallower waters. There is a belt of samphire complex on the eastern side of the Adenia Street.

Where the river splits into three arms opposite Castledare Boys Home, the southernmost arm forms a small lake which has samphire flats and an abundance of soft spiky shorerush reeds. These form a undulating line into the water and a horizontal strata of about a metre in height. This soft streaky texture contrasts with the dark green dusty canopies of the slender formed sheoaks and wide branching flooded gums. It must be noted here that the flooded gum is a very attractive tree as the upper branches have deciduous bark which leaves a soft grey-cream smooth bark, while the lower trunk is rough and flaky. The juvenile leaves are rounded and are prominent against the slender mature leaves and the needle like stems of the sheoak.

Near the residential area of Wilson the roadside reserves are mowed and there are a few isolated common sheoaks and river gums. There is a parkland effect then a narrow belt of riparian vegetation along the river channel.

The vegetation at Kent Street Weir is fully appreciated from the weir where the viewer can see the overhanging paperbarks, dead branches and undulations in reeds along the water edge. The southern section of the weir extends into the flooded riparian zone where the trees overhang and the textures of the paperbarks are particularly attractive. The irregular forms of the trunks often grow almost horizontally before stretching vertically over the water. Behind the band of riparian vegetation there is an open area which has kikuyu and cape tulip as well as several flooded gum. There are openings between the sheoak stands which allow the user to view the river.

At the Greenfield Street Reserve, the bulrush is flourishing within the river channel. There is a thin area of rivergum and open woodland with a sparse natural understorey, most understorey being kikuyu.

At the Bridgeway Avenue Reserve, the riparian vegetation which edges the inundated area has been recently burnt. The paperbarks have black trunks and there is only a little foliage regeneration at present. There is an abundance of kikuyu grass which is smothering the indigenous understorey. Along the Canning River channel there is a line of fringing paperbarks and shorerush reeds. The vegetation obscures the river channel and in places the riverbank appears as islands due to the nature of the vegetation clumping. There are several stands of jointed twig rush along the edge which has thick cylindrical stems which catch the viewer's eye as an interesting texture compared with the peeling paperbark trunks and feathery canopy of the sheoaks.

Riparian land use

The Wilson Roadside reserves adjacent to the river are mowed to the edge of the fringing woodland communities which gives them a parkland effect. There are several open drains leading to the river. The Castledare drain is filled with weeds such as kikuyu grass and bulrush and due to recent heavy rain the banks of the drain have eroded.

From the Rivermore Loop section of Adenia Street Reserve, the river user can see the high voltage power lines of Shelley on the skyline. There are park benches and play equipment and the historic significance of the old Clune Park is well sign posted. Other recreational facilities include a bird lookout tower which enables viewing over the lake and river vegetation.

The Adenia Road footbridge is a small narrow wooden structure which crosses the deep channel of Bannister Creek. The creek can be crossed by car at Hybanthus and Metcalfe Roads.

Kent Street Weir Bridge has the original concrete pillars. Limestone supports have been constructed at either bank and a new walk way constructed so that the old weir acts as a footbridge. The hand rails have an attractive wooden x -shaped structure which is painted pale green. The adjacent parkland has

outdoor furniture painted in the same green and open lawn with several trees remaining in the parkland. As the weir passes into the riparian vegetation the remains of an old wire and pile fence can be seen. This adds character to the area as it reminds the view of the pastoral use of the area until quite recently. The Canning Rugby League Club house is set back from the river and hidden with trees. The oval has boarding around it which has been vandalised and the club takes up almost half of the public recreation area.

The Greenfield pedestrian crossing is a steel structure with upside down v-shaped cross bars within the two horizontal bars. The steel is painted pale grey and stands out against the background vegetation and water. The adjacent southern bank area has been cleared due to the nearby residential area and it is evident from the topography that the soil used to raise the residential area houses has formed a rise in the clear area which is not natural. The northern bank leads to Westfield/Carousel shopping centre. There is a area of inundation adjacent to Mason Street which has recently been subject to sewage contamination from the surrounding areas.

Bridgeway Avenue Reserve has play equipment painted pale green. It has what was once a information shelter but this has been removed due to graffiti which covers the residential fences around the area. High voltage powerlines cross the river at this point and dominate the skyline. The Bridgeway Avenue houses back onto the dual use path which runs near the area of inundation adjacent to Eastfield Court. The Bridgeway Avenue blocks are fenced mainly with corrugated 'asbestos' fences which have in places been graffitied and are quite high creating a barrier between the river and the residential area.

The area of inundation abuts the Nicholson and Spencer Road stormwater drain which is quite prominent to the river user. There is abundance of kikuyu grass and other weeds in the drain and the surrounding area. There is also a storm water drain at the northern section of Eastfield Court. This is fenced with wire and the water snakes its way cutting into the alluvial sediment as it enters the flooded area of inundation.

The Nicholson Road Bridge area has two bridges, the newer higher for traffic going eastwards. The bridges have deep blue painted rails with limestone abutments banks and concrete piles and superstructure. The land has been built up around the river channel to allow Nicholson Road to be of even height, which gives a valley effect. The abutments are supported by irregularly shaped small limestone rocks. The older bridge has the westward traffic and the rails are also painted the dark blue colour.

Land use

Castledare Boys Home is used for a number of purposes including educational courses. There have been several additional buildings constructed over the years and therefore there is a mixture of buildings. These include the original Edwardian homestead and the 1930s school buildings and the 1950s chapel. These are all made from different materials and have been built in the style of the time. There is a model railway which runs around the property and crosses the drain and approaches the river several times. This feature is popular with visiting families and there are picnic facilities. The railway usually runs on the first Sunday of the month and during school holidays. There are several prominent exotic species in the gardens including coral trees and the creeper morning glory which has encroached into the rivergum woodland.

The new Canning River Garden Estate was recently built on the site of the Watts Road Lake. As a result the rivergum edged lake was filled in and replaced with small residential blocks. The houses are mainly the reminiscent 'Federation' style popular with new home builders at present, they all are lawned and have neatly landscaped gardens. The roads are brick paved. The houses are very close to the woodland vegetation communities.

The houses around Wilson Park are neat and well maintained and there are several homes built since the mid 1980s. Very few houses have native gardens and almost all have a lawned frontage. There are a few old weatherboard and corrugated iron roofs on the riverside of Queens Park Road and adjacent areas which are particularly attractive for their state of disrepair and rural connotations.

The Canning City Council offices and gardens are

adjacent to the river and are located between Wharf Street and Albany Highway. The ponds within the council grounds are reminiscent of the wetland nature of the area. The gardens have a mix of exotic and native flora and the buildings are relatively modern. The old town hall is still present on Albany Highway and there is a ribbon development of commercial outlets along the road, including the Westfield Shopping Centre. At present, much of the commercial area is rather gaudy and shabby. There are many large signs and brightly painted buildings which detract from the area. At present, most of the commercial area is cut off from the river, thereby confining the degrading effect to a belt along Albany Highway.

The newer sections of Ferndale residential area consist of houses built in the 1980s which are the typical bungalows of this period. The older areas of Ferndale have modest houses built in the 1960s and 1970s, which compared with other residential sections along the river are quite bland and unattractive. Many are constructed with pale brick which was fashionable at the time of construction. These gardens were originally quite treeless which was typical during the early 1970s and as a result many owners have only recently planted new trees so the gardens are immature.

North of the Nicholson Road Bridge there is a cleared area which is isolated by the Canning River and the Bridgeway Avenue area of inundation. There is a shed and a old orange orchard which is still fruiting and several metal sheds which are fenced with wire from the road. This gives this section a semi rural feel. The area is owned by a livestock transport company and the property is used to store the vehicles and as a holding area for sheep. The site will be vacated in the near future as the land use is not in keeping with the planned Regional Park.

The Woodloes House roof is corrugated iron and rather weathered. It is mainly surrounded by mature trees and therefore is not a prominent landscape feature. It is currently a museum and it is hoped to purchase the land around the building to extend the gardens and provide improved public access.

Landscape Interpretation

Dominant Landscape Character

The dominant landscape character would have been a natural landscape immediately along the Canning River. This landscape would have been identified as being gently undulating paleodunes with more recent fluvial deposits along the stream lines. The vegetation would have been dominated by estuarine vegetation.

At present, there are sections of the foreshore which continue to have fringing estuarine vegetation in reasonably good condition. These sections closely edge the Canning River below the Kent Street weir. With the construction of the weir, the vegetation upstream has altered to a freshwater tolerant community. This landscape has altered from the original natural landscape to a new natural landscape. Several weeds have invaded the recent vegetation complex, however the narrow landscape still appears relatively natural.

There are several sections of fringing vegetation which have had the understorey replaced by grasses and which are mowed to create a parkland environment. In addition, new exotic and native plants have been introduced which add to a parkland/recreational environment. Picnic areas and car parking areas add to the recreational landscape.

Most of the Canning River area has a suburban landscape. From the river banks, much of this landscape is screened by fringing vegetation and is not visible due to the relative flatness of the landform.

Significant Viewscapes

There are several significant viewscapes in this precinct. The alluvial islands which have formed down stream of the Kent Street weir provide interesting focal points along the river. The islands and alluvial deposits have been colonised by samphire communities which turn an attractive red colour at the end of the growing season. There is an attractive panoramic view from the Kent Street Weir of the centre of the river and the fringing vegetation from a perspective usually only possible from a boat or other craft.

Conforming and Non Conforming Elements in the Landscape

The river and its immediate environs provide a visually attractive environment due to the complex nature of the river form and although the natural vegetation is restricted to a narrow belt it is particularly attractive. It contains one of the best remaining examples of estuarine wetland found along the Canning and Swan Rivers. Unfortunately, much of the land behind the river has been cleared both for cultivation and for urban development. It is also unfortunate that much of the area along Wilson foreshore is lawn up until the narrow belt of paperbark community. It would be visually more pleasing if revegetation of indigenous species was implemented which would extend the woodland and give the area a more unique character and a more 'natural' environment.

The Canning Regional Centre plan notes that the present urban area is a comparatively disparate centre of fragmented parts such as disjointed commercial centre and remote bus rail station. The whole centre turns its back on the river and the document argues that there needs to be linkage between the city and the river. However to the river user there are places along this stretch of river which are serene and removed from the urban environment. This is a valuable asset in an increasingly busy and populated city.

It is incredible that only a few years ago the Watts Road Lake was infilled for residential development, removing the attractive vegetation and the local identity of a seasonally infilling waterform. Further infilling of estuarine land in the area should be discouraged as the habitats are under increasing pressure as one of the few remaining estuarine and wetland communities in reasonable condition in the area.

The fringing vegetation at the Castledare Boys Home has been invaded by several exotic species which could be removed to allow the natural vegetation to flourish.

The Ferndale side of Greenfield footbridge has a lawn area which is rather bland and unattractive due to the lack of fringing trees and the proliferation of the exotic bulrush. Bridge Way reserve is also near Nicholson Road Bridge. The parkland has a sole tree and bench and the fringing paperbark community around the wetland has been recently burnt and subject to weed proliferation. A dual use path runs adjacent to the residential properties which have high corrugated asbestos fences which have been graffitied and the river user is not encouraged to stay in the

PRECINCT 17

Dominant Landscape Characters and Significant Viewscapes

PRECINCT 16

LEACH HWY

CANNING

RIVER

ALBANY HWY

Bannister Creek

NICHOLSON RD

PRECINCT 18

HIGH RD

N

125 0 250 500

Metres

LANDSCAPE CHARACTERS

Modified

Suburban

Natural

Recreational

Significant Viewscapes

area. This is in contrast with the downstream area near Kent Street Weir and Adenia Street Reserve which has several recreational facilities and the river user finds it a pleasant place to be.

There are several storm water drains which are aesthetically unattractive as they are usually open and have vertical banks. Planting with native vegetation would help reduce erosion and produce a more visually pleasing utility. The drains also outlet into salt marshes and other wetlands therefore reducing the water and visual quality of the area.

Recommendations for Maintenance and Enhancement of the Present Landscape Character

- Remove graffiti from Nicholson Road Bridge and other riparian structures.
- Consider the preservation of estuarine vegetation and restrict activities which will degrade the vegetation along the entire precinct foreshore.
- Ensure that riparian and adjacent developments do not degrade the visual amenity of the natural landscape character.

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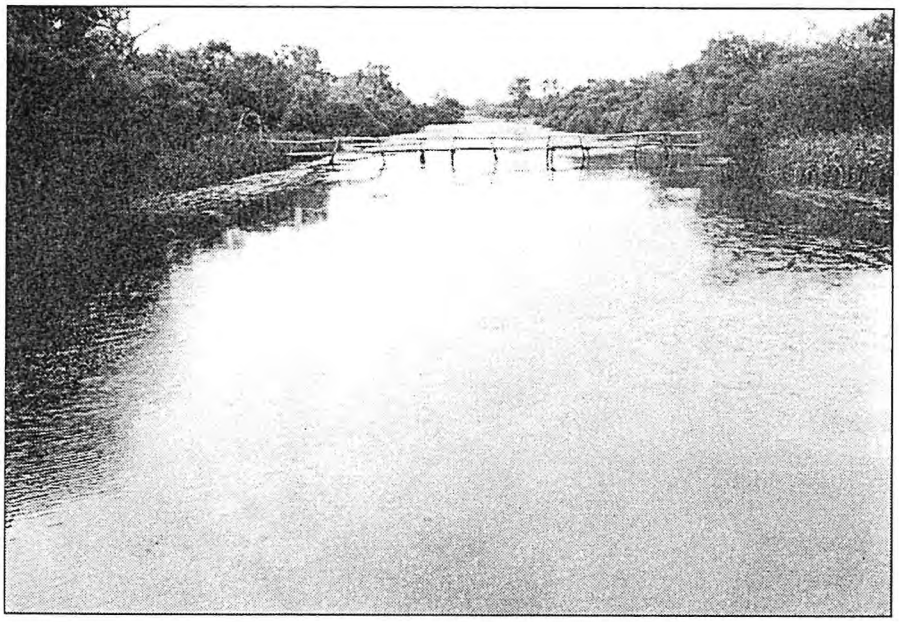
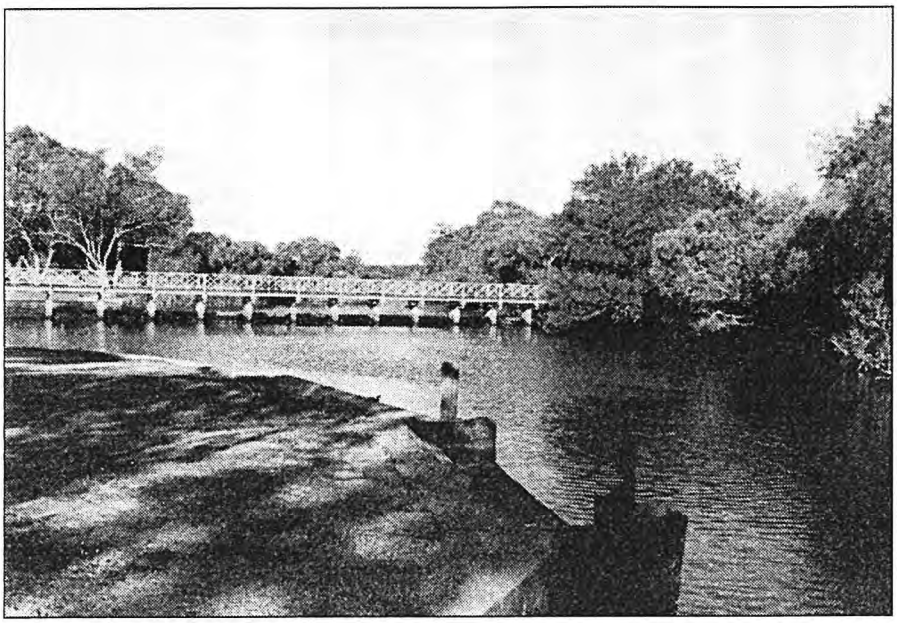


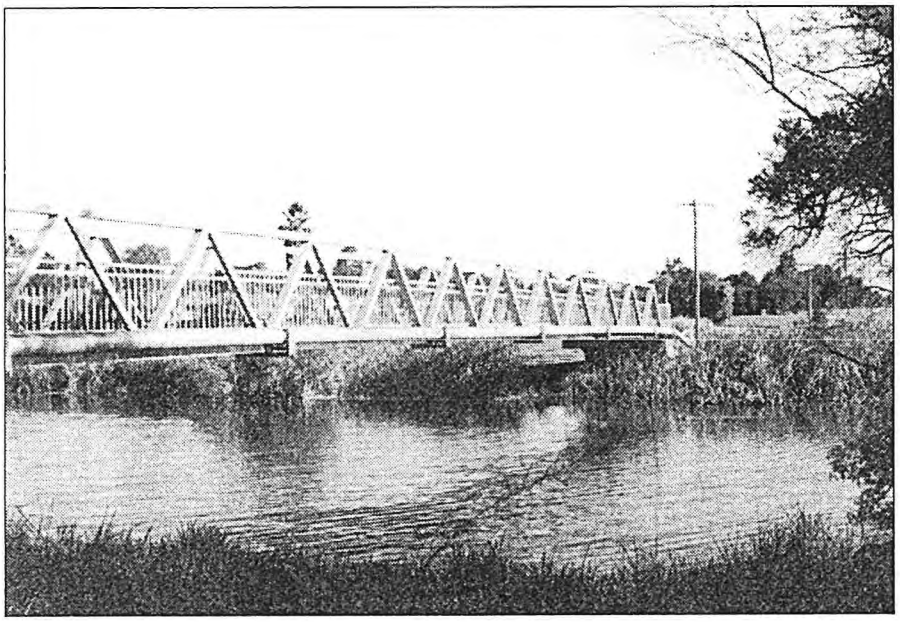
Greenfield Street Footbridge, Cannington. 1966.

Swan River Trust.



Canning Weir, Cannington. 1997.

Swan River Trust.

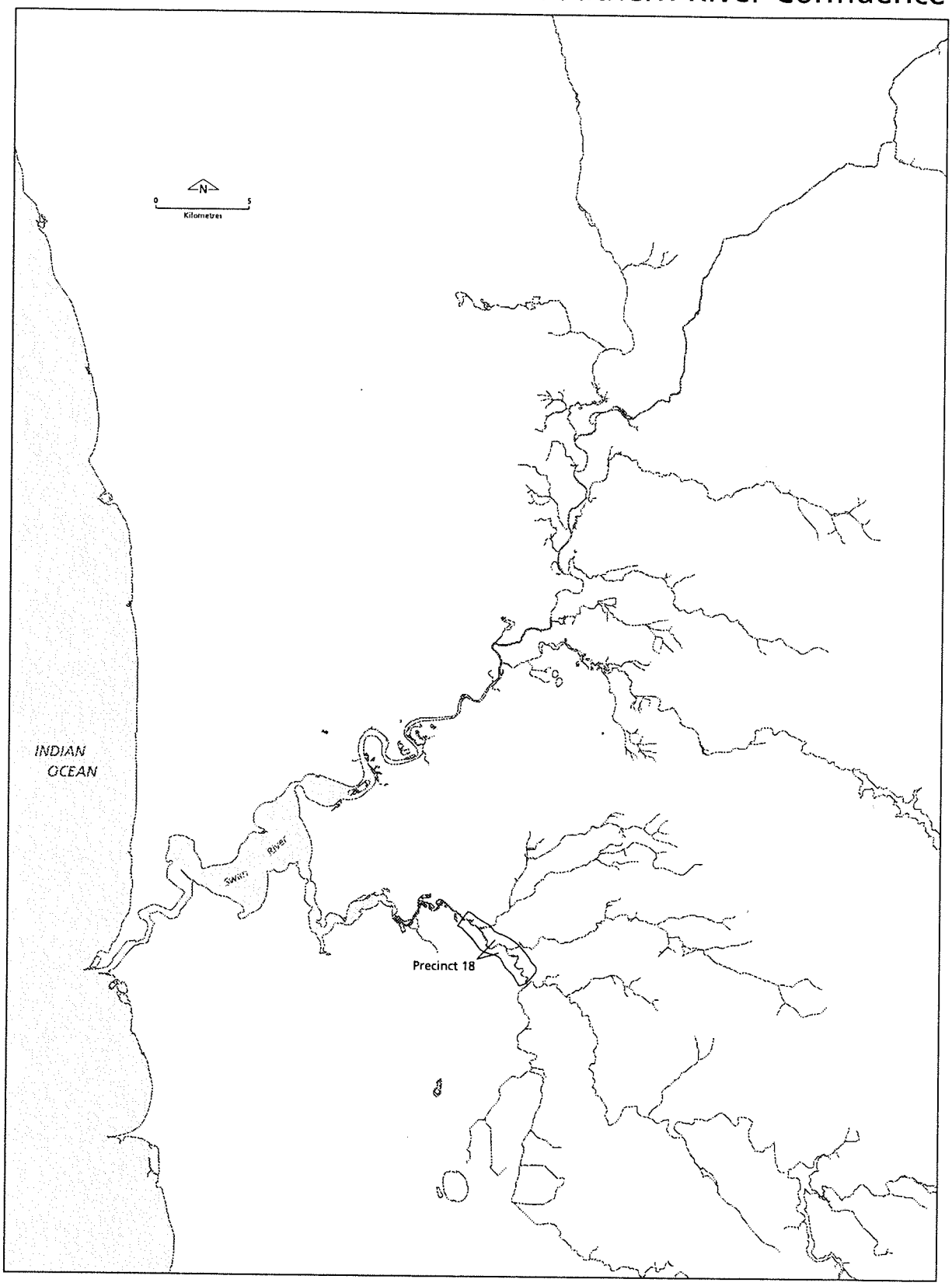


Greenfield Street Footbridge, Cannington. 1997.

Swan River Trust.

Precinct 18

Canning River - Nicholson Road Bridge to Southern River Confluence



Summary

Canning River - Nicholson Road Bridge to Southern River Confluence

The precinct includes the Canning River between Nicholson Road Bridge and its confluence with the Southern River, as well as confluences with Yule and Bickley Brooks. The Canning River in this section is a narrow and shallow channel which seasonally inundates.

Some of the low lying areas become seasonally waterlogged and form damplands and palusplains. Wetland areas, such as Hersey Place, have attractive vegetation and waterforms, however these are detracted from by the adjacent light industrial and commercial areas which have their work yards abutting the wetland. As with much of this area the land has evidence of soil being dumped to form higher land for the commercial areas, the result being a steep face of soil and weeds on the Albany Highway side of the wetlands.

Other water features include Yule and Bickley Brooks which are very narrow channels which due to the encroaching urban land use and the degradation of their fringing vegetation are not particularly attractive and appear like stormwater drains. In contrast, the outward appearance of the fringing flooded gum and melaleuca woodlands of the Canning River are particularly attractive as there is a dense canopy of soft greens and a mixture of tree forms. Unfortunately, weeds proliferate in the understorey, particularly in the damplands and adjacent to the channel.

One of the attractive land uses in the area is the old orchards at Burslem Drive. This provides a link to the historic use of the area and a break from the rather gaudy commercial and industrial areas along Albany Highway and closer to the river. Much of the land has been subdivided into residential blocks, such as Langford and Thornlie. These two suburbs have quite modest homes which are built in the fashions of the 1980s. At Kenwick some of the old orchard sites have been redeveloped into 'villages' of duplexes and small houses. These have been constructed by developers and therefore have been built in a uniform style and materials.

Biophysical Processes

Geological Processes

The Guildford Formation is alluvial and the geological unit occurs around the river channel and the northern banks. The Guildford Formation consists of lenticular interbeds and mixtures of sand, clay and conglomerate, which are locally calcareous.

Behind the river channel on the southern bank is the Bassendean Sand, which is a series of leached dunes of quartz sand parallel to the coast laid down on the ancient shorelines of the Holocene and Pleistocene high sea level events.

Swan alluvial terraces are red podsolic and undifferentiated alluvial soils along the present stream terraces. They are of high fertility and have a rich texture. South of the Canning River are the Southern River grey sand dunes with intervening clayey swamps. To the northern plains are the Guildford Soil Associations which are yellow podsolic soils.

Topography

The Canning River channel is situated within the Pinjarra Plain landform which consists of unconsolidated fluviatile sediments. These formed as alluvial fans as over time the small streams which run over the Darling Scarp deposited their sediments. The area is surrounded by the Bassendean Dune System which represents a Pleistocene accumulation of beach sands along an old coastline. The dunes today are low lying and within the intervening swale sandy swamps have formed. The river channel and associated flood plains are low lying and surrounded by a higher sand plain. Much of this precinct is subject to seasonal inundation. The southern bank was originally sandy swamp while the northern banks were a low lying plain, however much of this original landform has been infilled.

Hydrological Processes

Water features

The Canning River is characterised by a single phase sinuosity and the channel is irregular in its width. The south eastern boundary of Hester Park is the location of 'The Rapids', which was an important crossing point on the Canning during the early years of settlement. The low lying areas are seasonally inundated during periods of high water levels. The flat lands and basins become seasonally waterlogged and form palusplains and damplands. The river is fluvial and by definition there are no tidal influences rather the fresh water flows from the catchment. However there are historical records which suggest that prior to dam construction the river was seasonally estuarine up to Hester Park.

Bathymetry

The Canning River water depth is very shallow and in places is less than a metre deep, although in areas such as downstream from Royal Road the channel is narrow and approximately 2 metres deep. The water volume held in the channel is most often much lower than its total carrying capacity, such as during the summer months when the flow is reduced to a trickle at the base of the channel.

Flooding

Much of the area lies within the floodway and most of the low lying land is below the 100 year flood level. There is a wide flood plain which is seasonally inundated and in areas becomes waterlogged. The flood plain varies from 200 to 300 metres width and up to 5 metres in depth.

Erosion and Accretion

Erosion occurs where riparian vegetation has been removed or degraded along the channel banks. For the most part, vegetation, whether indigenous or exotic, is quite prolific along this section of the river channel and erosion is not a serious problem. Generally, people do not use this section of the river for water activities and the dual use path encourages people to stay away from the riparian vegetation. During periods of high water erosion and accretion occur as part of the channel's natural processes.

Vegetation Communities

Native

Swan Complex

The indigenous flora of this precinct is classified as being part of the Swan Complex.

The vegetation ranges from fringing woodland of flooded gum *(Eucalyptus rudis)* and swamp paperbark *(Melaleuca rhaphiophylla)* with localised occurrence of

low open forest of swamp sheoak *(Casuarina obesa)* and saltwater paperbark *(Melaleuca cuticularis)*. The various communities which make up this complex are described below.

***Juncus* community**

Sedges and rushes such as bare twig rush *(Baumea juncea)*, pale rush *(Juncus pallidus)* and shore rush *(Juncus kraussii)* occur along the river's edge and also in seasonally inundated damplands such as at Hester Park.

***Melaleuca* community**

The swamp paperbark (*Melaleuca rhaphiophylla)* communities are found along the Canning River in swampy areas. These communities have a dense canopy of the small paperbark (less than 10 metres). It most commonly has an disturbed understorey of arum lily *(*Zantedeschia aethiopica)* or ephemeral grasses.

***Acacia* community**

There are three stands of low closed forest of coojong *(Acacia saligna)*. These stands tend to be monospecific and are found near Ellison Drive, Burslem Drive and the north side of the railway crossing. The coojong is not indigenous to this area although it is a native plant.

***Eucalyptus-Melaleuca* communities**

The dominant vegetation along the river edges is the flooded gum *(Eucalyptus rudis)* and swamp paperbark *(Melaleuca rhaphiophylla)* complex. Within this precinct a number of remnant understorey species exist. These include mohan *(Melaleuca viminea)*, swishbush *(Viminaria juncea)*, a tall shrub *(Calycopeplus ephedroides)* and spearwood *(Kunzea* sp*)*.

Exotic

There are several non indigenous eucalypts and casuarinas planted in Hester Park and along the roadside reserves, while exotics such as jacaranda *(*Jacaranda mimosifolia)* and Queensland box tree *(*Lophostemon conferta)* have been planted adjacent to the river reserve. Weeds which are a problem include, veldtgrass *(*Ehrharta* sp*)*, Paterson's curse *(*Echium* sp*)*, blackberry *(*Rubus* sp*)*, docks *(*Rumex crispus, *Rumex conglomeratus)* and cape tulip *(*Homeria flaccida)*, pampas grass *(*Cortaderia selloana)*, arum lily *(*Zantedeschia aethiopica)*, bulrush, *(*Typha orientalis)*, buffalo grass *(*Stenotaphrum secundatum)* and kikuyu *(*Pennisetum claudestinum)*. In the Melaleuca closed woodland, the understorey is invaded by wild oats *(*Avena fatua)* and watsonia *(*Watsonia bulbilifera)*. Other prominent exotic trees include the cape lilac *(*Melia azedarach)*, weeping willow *(*Salix* sp*)*, castor oil bush *(*Ricinus communis)* and fig *(*Ficus carica)*.

Historical Land Use and Resulting Environmental Changes

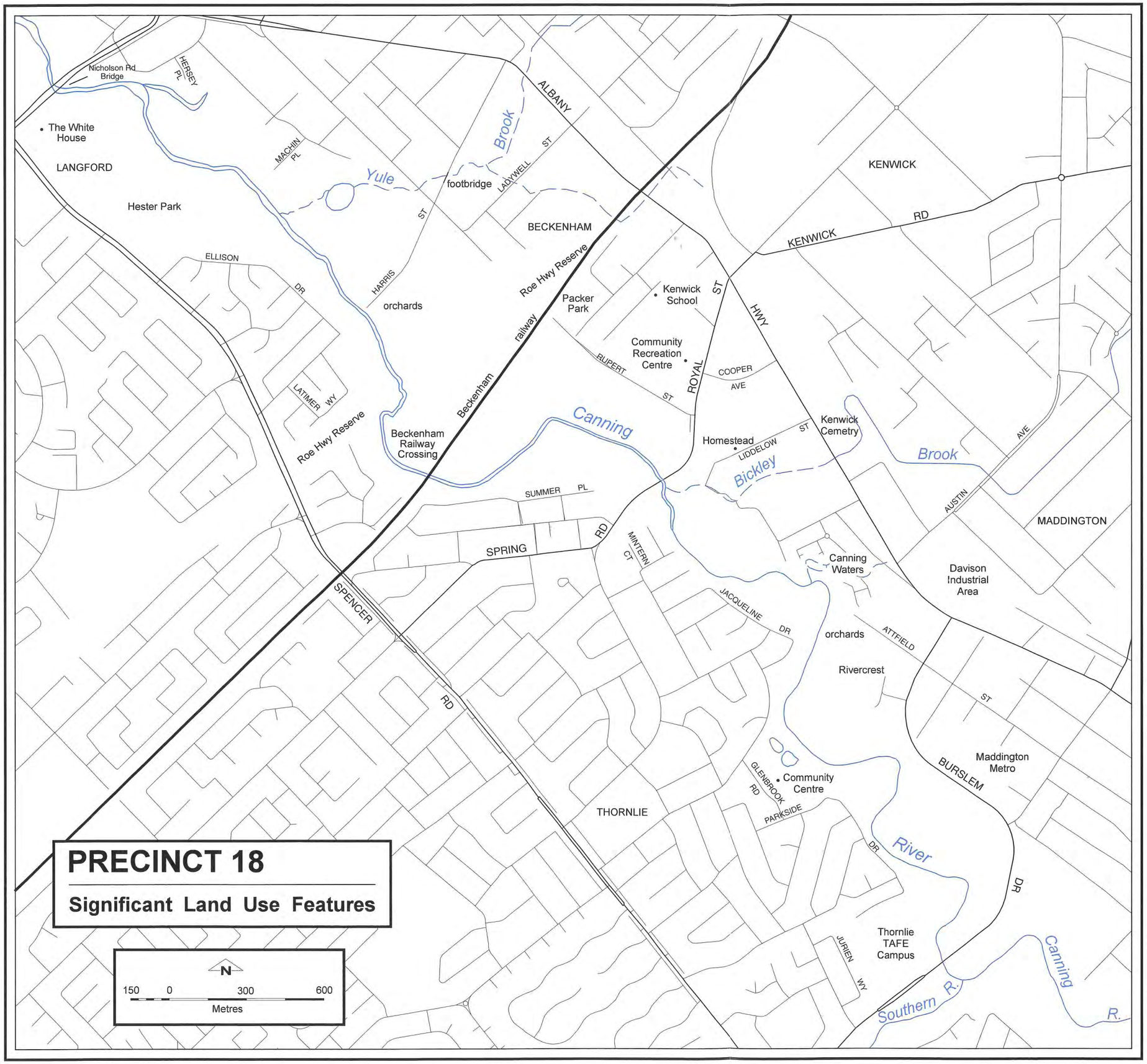
The original grants in the area were made to the following W. Knight (Lot 6), W. Owen, (Lot 7 & 9), C. Simmons (Lot 8), Bull & Wood (Lot 10), G.Morrit (Lot 11), R. Dawson (Lot 12) A.H. Gilbert & Nairne (Lot 13), T. Bannister (Lot 17), P. Pegus (Lot 18), T. Hester (Lot 19) and H.Willet (Lot 21) (Carden, 1968).

The early settlers in the area floundered in the unfamiliar environment. Both Peter Pegus and Thomas Hester planted crops in November and December 1829 which failed to survive the summer heat. They also planted crops of potatoes on the flood plains in the winter of 1930 which became waterlogged or entirely flooded. The Hester family and the Spencers both lost children who were probably buried in the park (McQueen, 1963).

Peter Pegus and his servants arrived in late 1829 and established 'Coleraine'. This property was burnt to the ground in 1834 due to a bush fire and he requested government assistant. Pegus soon left the Canning property for a small government post on the Swan River (McDonald and Cooper, 1988).

His neighbour Thomas Hester was soon to follow bringing with him his family, a flour mill, ploughs, tools, clothing and a piano all up river to his property 'Redcliffe'. The Hester family was plagued with misfortune from the start. One servant died in his sleep while the second wondered off soon after the family arrived. In December 1830, Sophia Hester died in childbirth and the newborn son died a few days latter. By this time Thomas Hester's eyesight was failing and he was almost blind. He and his five remaining children struggled to survive often relying on neighbours and the local Nyungar people for food (McDonald and Cooper, 1988).

R. Dawson did little to his land and Location 12


Nicholson Rd Bridge
HERSEY PL
The White House
LANGFORD
MACHIN PL
Hester Park
Yule Brook
footbridge
LADYWELL ST
ALBANY HWY
BECKENHAM
KENWICK
KENWICK RD
ELLISON DR
HARRIS ST
orchards
Roe Hwy Reserve
railway
Beckenham
Packer Park
Kenwick School
ROYAL ST
Community Recreation Centre
RUPERT ST
COOPER AVE
LATIMER WY
Roe Hwy Reserve
Beckenham Railway Crossing
Canning Bickley Brook
Homestead
LIDDELOW ST
Kenwick Cemetry
AUSTIN AVE
MADDINGTON
SUMMER PL
SPRING RD
MINTERN CT
Canning Waters
Davison Industrial Area
JACQUELINE DR
orchards
ATTFIELD ST
Rivercrest
SPENCER RD
Maddington Metro
BURSLEM DR
GLENBROOK RD
Community Centre
PARKSIDE DR
THORNLIE
River
Thornlie TAFE Campus
JURIEN WY
Southern R.
Canning R.
PRECINCT 18
Significant Land Use Features
N
150 0 300 600
Metres

became the property of Wallace Bickley in August 1833 (McDonald and Cooper, 1988). Despite an arrangement with his neighbour G. Morrit to have half of Location 11, the government did not recognise the exchange and Bickley left the colony. Almost 20 years later he returned from India with his second wife and five daughters. Despite his long absences on return trips to India, his property flourished due to the strong and capable management of his wife. The property included Locations 3. 11, 12 and 18 and produced hay, cattle and horses.

The syndicate Yule, Lewis and Houghton was on Location 8. They called the property 'The Rapids' and bought large numbers of stock (McDonald and Cooper, 1988). The water in the Canning was salty up to The Rapids when the property was first taken up, however by the 1830s weirs were built which controlled the flow of salt water from 'The Rapids' and upstream of this location. Raymond Houghton passed his share on for the more fertile Swan Valley and set up the 'Houghton' vineyards.

Thomas Bannister was given a large property at location 17 which he named 'Woolcoombs'. Only a few weeks later the daily grind of colonial life started to be unappealing to Bannister and he spent most of his time in Albany and Fremantle instead (Swartz, undated).

Dulton owned Location 15, however he had a house at Preston Point and never took up his land on the Canning River probably because of the personal misfortune which had so far plagued him in the colony. The land was sold to William Habgood in 1835 (Carden, 1968).

At the turn of the century W.G. Brookman (Mayor of Perth) established the River View Estate on Location 21 which was 300 acres (McDonald and Cooper, 1988). There are remnants of the vines and orchards at the north-western part of Hester Park. These were watered using the river and Brookman's property in particular was a model farm with a piggery, stables, poultry, orchards and vineyard. The house was stately and contained a ball room and had a uniformed footman. Eleven weatherboard cottages were constructed for his labourers at his property near Nicholson Rd Bridge.

John R. Phillips owned Location 13 as part of his grant and due to financial difficulties sold the land to Major William Nairne in 1833 (McDonald and Cooper, 1988). Details of John R. Phillips are discussed in Precinct 36. Nairne was enthusiastic and enterprising and based his property on wool production. He built a two storey home 'Maddington Park' which is at the end of Olga Road (Carden, 1968). The homestead was one of the grandest in the colony and Nairne's plans for the jarrah and limestone house expanded as the home was constructed. Unfortunately, his finances were less grand and the craftsmanship and materials on the second floor are inferior to the lavish first floor. Nairne borrowed a large sum of money from the Surveyor General J.S Roe and in the end sold the park in 1840 as his debts were too great. John Liddelow bought the land at Maddington Park but his attempts at reviving the property failed and he bought land at Cooper Road (Kenwick). In 1906 his grandson Beverley Liddelow sold Kenwick Park to developers.

Due to the demand in the early years of the Canning Settlement a ferry service ran to Yules Rapids, however by 1835 this service was disbanded due to its unreliability and the dangerous nature of the trip (Carden, 1968). Therefore the only remaining communication was by crossing at Chenies farm to a dirt track which led to Bull's Creek.

Location 18 eventually became the Canning Vale estate which was sold as orchard, poultry farm, garden and dairy lots. It was advertised as having rich moist soils all year round, however these properties were not as fertile as the opposite river bank and the area was too isolated for most buyers (McDonald and Cooper, 1988).

Present Land Use and Social Patterns

This section of the precinct is undergoing land use redevelopment. Much of the area has in the past been the site of intensive horticulture such as orchards and small dairy properties. However due to the high cost of the land and new generations taking over the properties, much of this land has been given over to residential purposes. Some orchards remain on

Burslem Drive and within Kenwick. Examples of recent developments are the Rivercrest and Canning Waters subdivisions where developers have built a large node of small houses and units all of similar design and materials on the one block. These have neat landscaped gardens and common driveways and front lawns. Other areas such as Thornlie and Langford have been subdivided as individual residential areas mainly during the 1980s and although the houses are all of a similar fashion they are individual.

Much of the area in Kenwick and Maddington is commercial and light industrial. There are several retail outlets, the closest to the river being Maddington Metro shopping complex on Burslem Drive. Most of the retail is in ribbon development form along Albany Highway, and the showrooms face onto the highway rather than the river. The light industrial area includes such businesses as car panel beating and clothing factories which often have large work yards adjacent to the river reserve.

The Thornlie TAFE campus is located on the foreshore adjacent to Burslem Drive.

Recreation nodes

Hester Park is a 45 hectare area of open public space located on the western banks of the Canning River, Langford. There are four open drains. The area includes remnant fringing woodlands that have remained despite the clearing for agriculture, grazing, timber cutting and fire. There is a irrigated oval and canoe slalom course, the latter can only be used during periods of high water level. There are also areas suitable for passive recreation such as walking, dog exercise, picnicking, and cycling.

The dual use path runs along the entire southern bank at this section of the precinct; there is mainly a narrow belt of reserve, however this is well used by local residents as there are many young families in the area. Adjacent to Jacqueline Drive there is a cement cricket pitch which allows for an informal game of cricket by the river banks. The Thornlie community centre provides for organised recreation adjacent to the river and there are play equipment structures along the southern banks.

Public access

Public access to the southern banks of the river is well catered for by the dual use path adjacent to the fringing vegetation. However there is no parking in the area and due to the sensitive nature of these wetlands easy public access would not be suitable. Along the northern bank access is rather difficult due to private properties, such as the orchards and residential blocks, and very few people would bother to climb into the inundated wetlands of the Canning River adjacent to the river crossings.

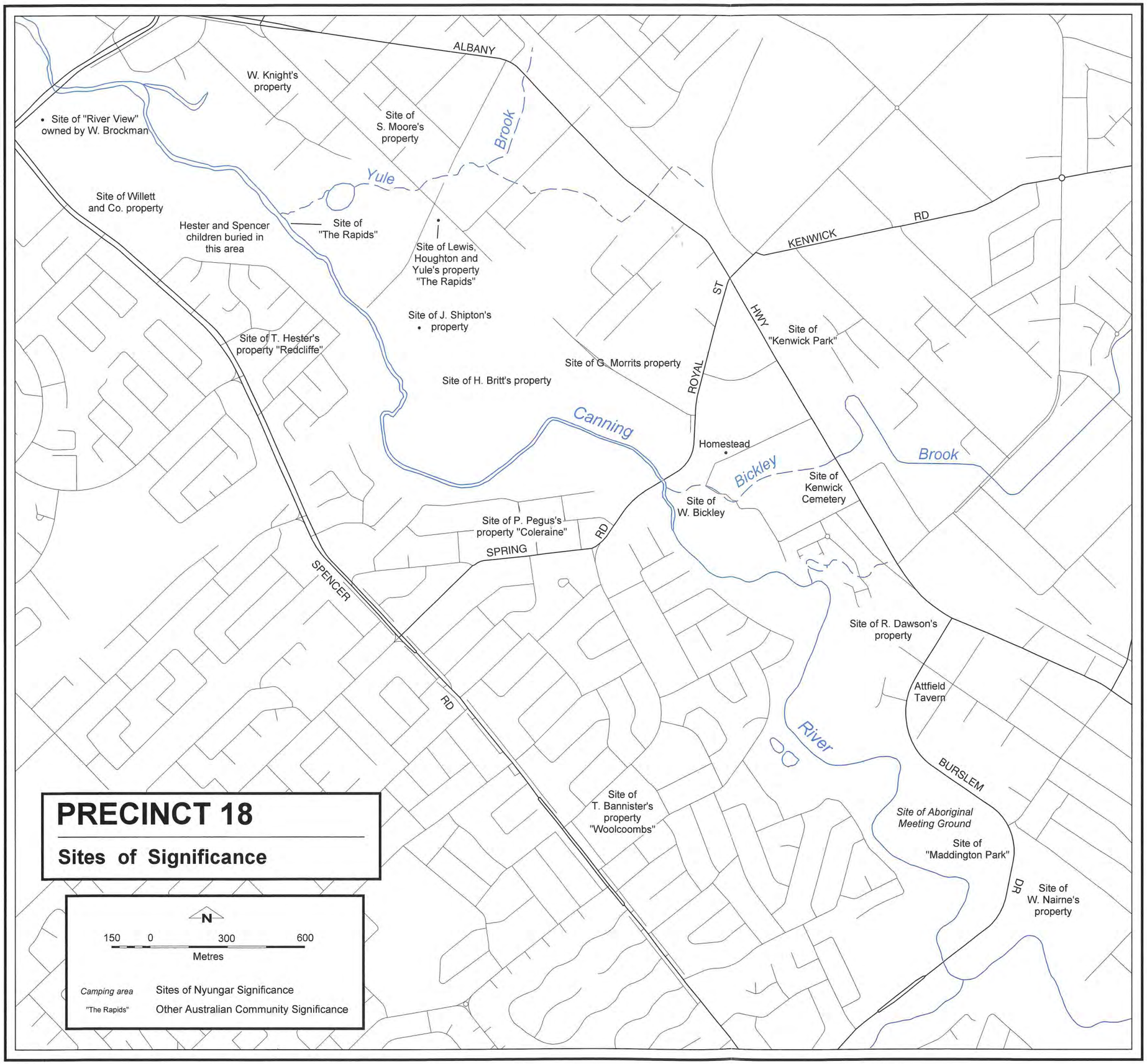
Sites of Nyungar & Wider Australian Community Significance

Nyungar significance

At the time of colonial settlement, the Canning River was the run of two Nyungar groups. The Beeloo, lead by Munday, mainly lived between the river and the Darling Ranges. The Beeliar, lead by Midgegooroo, used the land between the Canning River and the ocean. It is possible that the area of the 'Maddington Park' property was a meeting ground for both groups (O'Connor *et al,* 1984).

The Canning River was one area where conflict between the Nyungar and colonists was particularly heated. Nyungar relied on the wild food resources in the various environments. Their disciplined and ordered nomadic lifestyle required no domestic animals or crops. This lifestyle was not understood by the new colonists, who demarcated their properties with fences and were not willing to share the land (Mc Donald and Cooper, 1988).

A serious incident occurred near Maddington Park in December 1833. Two of Major Nairne's young shepherds, Hokin (11 years old) and Cleulow (9 years old), were walking to the summer pastures at the nearby foothills. Only a short distance from the homestead they came across a Canning River Nyungar, Buoyeen. A woman travelling with Buoyeen asked the boys for bread. (The local Nyungar were often given food by the settlers, mainly to prevent the loss of crops to the Nyungars who still gathered food from their traditional grounds). The boys refused and Buoyeen, offended by their manner, began to threaten the children until Cleulow burst into tears. Hokin turned to run, and was hit in the back by Buoyeen's spear. The Nyungar woman who


ALBANY
W. Knight's property
Site of "River View" owned by W. Brockman
Site of S. Moore's property
Brook
Yule
Site of Willett and Co. property
Hester and Spencer children buried in this area
Site of "The Rapids"
Site of Lewis, Houghton and Yule's property "The Rapids"
Site of J. Shipton's property
Site of T. Hester's property "Redcliffe"
Site of G. Morrits property
Site of H. Britt's property
ROYAL ST
HWY
KENWICK RD
Site of "Kenwick Park"
Canning
Homestead
Bickley
Brook
Site of Kenwick Cemetery
Site of W. Bickley
Site of P. Pegus's property "Coleraine"
SPRING RD
SPENCER RD
Site of R. Dawson's property
Attfield Tavern
River
BURSLEM DR
Site of T. Bannister's property "Woolcoombs"
Site of Aboriginal Meeting Ground
Site of "Maddington Park"
Site of W. Nairne's property
PRECINCT 18
Sites of Significance
N
150 0 300 600
Metres
Camping area
Sites of Nyungar Significance
"The Rapids"
Other Australian Community Significance

was by now enraged by the insulting manner of the boys beat Hokin over the head with her *wanna* or digging stick. Cleulow, terror stricken, turned to run and was bought down by a second spear from Buoyeen. Both boys were left for dead. However Hokin managed to get back to Maddington Park and the boys were attended to by a surgeon and survived the ordeal. Buoyeen was caught and executed within a few weeks (McDonald and Cooper, 1988).

Other significance

The 'River View' mansion at Nicholson Road Bridge was built by a well-known Goldfields identity and later Mayor of Perth, William Brookman, in the 1890s (McDonald and Cooper, 1988). It was a lavish house with uniformed footmen and a ballroom. Adjacent to the house were eleven weatherboard houses for his workers. In the 1960s the home was used as a reception centre.

Woodlupine Brook joins Yule Brook at Mills Park, Beckenham. Woodlupine is an English flower and was the original name for the area, however after a murder of a 17 year old girl, Fairy Compton, in the early 1900s, the name was changed due to notoriety. It was named Queens Park after Queen Alexandra (Carden, 1968).

In 1883 William Green, sold land in the Kenwick district to Walter Padbury. The Padburys built a house for their niece and her husband, Mr James. The name Thornlie homestead was from the James' family residence in India. After the death of the James the Canning property was subdivided in 1932 and again in 1974 (McDonald and Cooper, 1988).

Kenwick Pioneer Cemetery on Albany Highway was established in 1865 and many of the early settlers are buried here.

Conservation Areas

Wetlands

The area has several areas of inundation which are listed as the Canning River palusplain and flood plain in the *Wetlands in the City of Gosnells* (WAWA 1993). These have been classified according to management strategy and within this precinct are areas of High Conservation such as the entire Canning River flood plain; Conservation and Open Space Wetlands such as Hester Park; and Resource Enhancement areas such as the palusplain areas of the Canning River.

System 6

M75 Upper Canning and Southern Rivers

The recommended area comprises the Canning River and its fringes from Nicholson Road Bridge to the boundary of State Forest, together with those parts of the Southern and Wungong Rivers within the City of Gosnells.

The Canning River is well fringed with flooded gums and paperbark along the west bank between Nicholson Road Bridge and Royal Street and the east bank is fairly thickly fringed near where Yule and Bickley Brooks join the Canning River. Native species have been almost entirely lost from the ground flora. At the river's confluences with Bickley Brook and the Southern River both banks are well covered, mainly with flooded gum and paper barks. Grasses and weeds abound. The area constitutes open space of regional significance because of its high conservation and recreational values, its proximity to Perth's residential areas and regional roads passing through the area.

Landscape Description

Precinct Description

Waterform and natural riparian zone

Upstream of the Nicholson Road Bridge, the Canning River forms a small meander before branching into the Hersey Place wetland. The area of inundation forms a three armed water body which in periods of high inundation forms a small island of higher land in the northern section of the wetland. The Hester Park section of the river has a deep channel and shallower areas of inundation where channels overflow in winter months. The main Canning River channel curves in a northerly bend and then takes a straighter form to Yule Brook. Yule Brook is a very narrow shallow channel, which looks more like a drain than a creek due to the adjacent land uses. The brook has small meanders before forming a wetland and island prior to entering the Canning River. The flooded banks of the Canning River give the water form an informal shape as it extends into the fringing vegetation as of shallow pools. Bickley Brook enters the Canning River upstream of Royal Street Bridge. It is a narrow shallow channel and its confluence with the main river appears like a small drain entrance.

The narrow channel near the Beckenham railway crossing broadens downstream after taking the tight meander before Harris Street. The shallow form of the river channel can be seen between the breaks in the paperbark stands adjacent to Jacqueline Drive, where the river branches into a small wetland on the northern bank. The wetland is surrounded by a small belt of remnant paperbarks and a new residential area. The river forms wide tight meanders upstream of the wetlands towards the confluence of the Southern River. However for the most part this section of the river is so shallow and the riparian vegetation so dense it is difficult to view the river and its channel.

Landform

At Hester Park the land takes the form of gently undulating slopes with the depressions filling with water during winter months. The present day landform has a rather clumpy soil surface which is reminiscent of the past intensive horticultural land use. From the residential area the land gently slopes towards the flatter area of the flood plain. The flood plain at Hester Park appears to be a wide bank in comparison with the restricted nature of the opposite northern bank which has had its flood plain infilled. The Langford area is quite flat due to infilling for urban development and this is similar at Thornlie. The areas of infilling have steep embankments which slope down to the flood plain of the river. In many places, such as Summer Place this is quite a steep embankment. The northern bank has mainly a flatter more natural landform and the gradient between the river flood plain and the urban areas is quite gentle.

Vegetation

The precinct has been mainly cleared of its natural vegetation for residential and farming purposes, however the fringing vegetation along the river banks is still present. The vegetation complex along the river at Hester Park is a tall belt of paperbark and flooded gum. The tall stand of *Acacia saligna* within the flood plain adjacent to Ellison Drive, Langford is particularly attractive as a form of bright green shiny leaves among the dense paperbark communities which grow within the flooded banks. There are several trees which emerge from the main canopy and the contrast in height creates visual interest. The lower canopy is much denser and there are contrasts in shades of green within the fringing vegetation. The cleared area has an abundance of weed species all of varying heights and foliage which during the winter months appears lush. The vegetation around Hersey Place wetland has an overstorey of paperbark and sheoak which have an open light canopy and soft bark, however this is detracted from by the weedy nature of the understorey and the adjacent land use.

Unfortunately, the paperbark flooded gum stand near Latimer Way, Langford, has been recently burnt so that the most evident vegetation is the flourishing weeds. There is a remnant banksia woodland on the rise of the southern bank adjacent to the Beckenham railway crossing. The understorey is predominantly weeds and lawn, however these trees are a reminder to the river user of the sandy woodland that once occurred in the now cleared area.

The fringing vegetation at Summer Place is relatively narrow and is separated from the road side mowed verge by the bike path. There are several prominent weeds including a large stand of bulrush and a coral tree at this section of the river. Near Mintern Court

there is a band of vegetation including a variety of mature eucalypts. The fringing vegetation upstream continues to be mainly dominated by flooded gum and paperbarks. The fringing vegetation around Yule and Bickley Brooks is similar to the flooded gum and paperbark communities along the Canning, however they are infested with weeds and in parts the vegetation has been entirely cleared. Similarly, the wetland at Canning Waters is a thin band of paperbark and fringing reeds which is surrounded by the new development and the trees are showing signs of stress with wilted foliage and damaged branches.

The Burslem Road orchards are a rather attractive landscape feature as they are becoming rarer as land prices increase. The fruit provide a colourful element among the shiny green leaves and the pruned tree forms. The understorey is mainly grasses and ploughed land.

Riparian land use

Hester Park is a large area adjacent to Spencer Road, Langford. The park has a few amenities such as outdoor furniture and signs, however the most patronised facility is the concrete dual use path which runs parallel to the fringing vegetation. The rest of the area is a large cleared area with grasses and weeds giving it the appearance of an overgrown paddock. The pump station at Ellison Drive was originally painted sensitively using soft greens and browns so that the square building was not very conspicuous, however the walls have been graffitied in vivid red, blue and white, which has made the structure a most prominent feature.

The Beckenham Railway Bridge required some infilling of the flood plain creating a steep embankment beneath the steel structure. The dual use path passes beneath the bridge on the southern bank and the bridge is supported by limestone and concrete which has been partly graffitied, as has the steel superstructure of the railway bridge. The railway track passes though a cut in the higher land and from O'Dell Road, Thornlie, the vegetation reduces the visual impact of the railway by partly covering the line.

There is a bridge which crosses at Spring Road-Royal Street. This has narrow white barriers and the road dips down to meet the crossing. The adjacent flooded gum rise above the bridge and give an attractive backdrop on either side of the crossing.

At the end of Jacqueline Drive the residential area is set back from the wide meander of the river and therefore there is a wedge of cleared land adjacent to the fringing vegetation. A cement cricket pitch has been constructed and the area is used as an informal recreation area. The dual use path runs adjacent to the houses near Jacqueline Parade.

The Harris Street Footbridge is a low white wooden bridge which crosses Yule Brook before the brook forms a small wetland prior to entering the Canning River. Burslem Drive crosses the Canning River through a narrow band of fringing vegetation and is a busy throughfare considering the small nature of the bridge.

Land use

There is a mixture of land uses around this precinct, including residential, commercial, farming and light industrial areas.

The White House reception centre (River View Homestead) adjacent to Nicholson Road has been expanded in a style which is in keeping with its original facarde. The area has several exotic trees and the lawn is well maintained. There is a low limestone wall marking the boundary near the edge of the flood plain.

Next to Hersey Place wetland there are the frames of old wooden sheds and commercial yards which are located on landfill. The landfill is raised, however in places it has subsided giving a lumpy effect. It has a steep gradient face leading to the flood plain. The adjacent houses are modest homes of various ages and there are several empty blocks which are overrun with weeds and have plant clippings dumped on them.

The Thornlie and Langford residential areas which front onto the foreshore reserves are generally well maintained and have mainly eclectic gardens. Almost all have a front lawn. There is a break in development at Thornlie which is the road reserve set aside for the extension of Roe Highway.

The northern bank of the river adjacent to the Beckenham rail bridge is pasture for cattle and is partly cleared with several stands of river gum. The

Beckenham railway runs past Packer Park which has a particularly unattractive change room block which is box shaped and graffitied. The trees along the reserve, however are mature and improve what would otherwise be a bland landscape. The residential area is quite modest and often unkept.

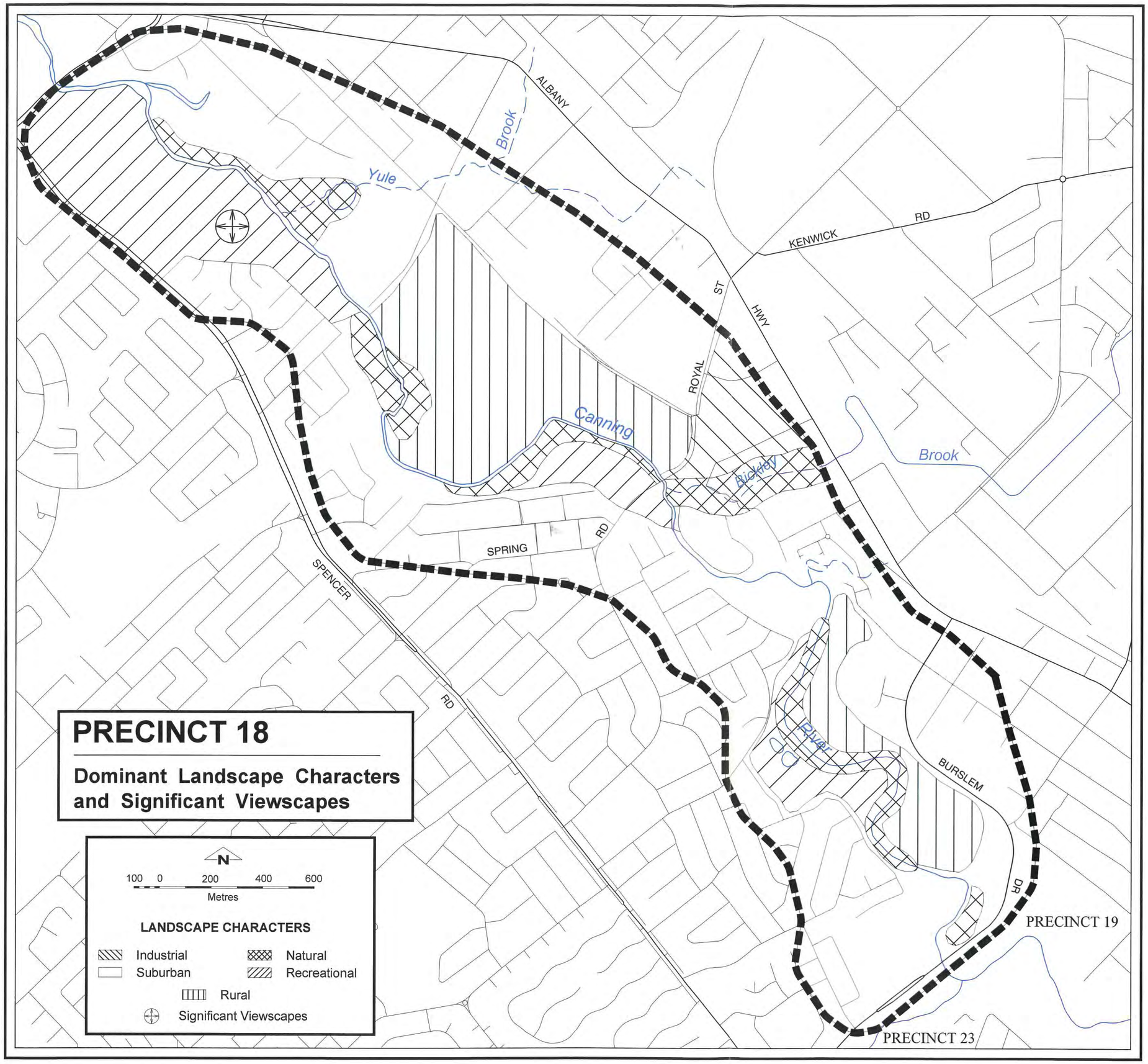
Adjacent to the railway reserve on the southern bank is a group of new units with tiled roof and pale bricks which nest into the cut. The residential area fronts onto the reserve near Lester Drive. On the eastern side of Jacqueline Drive the properties back onto the foreshore and are fenced with various materials.

Along Jacqueline Drive there are several box trees planted along the roadside reserve. These have been shaped into circular forms which conflicts with the attractive irregular forms of the native fringing vegetation. Along Glenbrook Road there is a community centre building which is harmoniously coloured and is built into the dip of the infilled land. Unfortunately, the toilet block is stuck on top of the hill separate from the main building rather than incorporated within the main building. The surrounding area has been infilled, however it gives an attractive undulating and dipping form to the landscape. Mainly native trees have been planted and although they are not indigenous to the area the general colours, textures and forms are concordant with the fringing vegetation of the Canning River. The two man made lakes with islands have been shaped informally and the vegetation is 'unkept' which is attractive and in keeping with the adjacent river form. Due to a lack of foresight a row of gum trees have been planted directly under powerlines. Consequently, they have been cut, and their stumpy forms detract rather than contribute to the landscape. Planting a few metres back could have resulted in a fine row of eucalypts.

Thornlie TAFE centre is located on the southern bank adjacent to Burslem Drive. It is built of pale brick and colourbond corrugated iron. The grounds have been planted with native trees and lawn, and the campus is relatively inconspicuous to the passerby. There is a narrow band of fringing vegetation adjacent to the edge of the campus property. Burslem Drive, Maddington, crosses the river before the Canning River's confluence with the Southern River. This road runs along the edge of a private orchard which nests into the river meander bend. Maddington Metro Commercial complex has a large carpark and windowless facade.

The northern bank of Kenwick until recently consisted of large residential blocks and orchards, however within the last few years many orchard have been redeveloped as small suburban 'villages', which consist of numerous duplexes and uniform houses built by a developer in a uniform style. These homes have very small landscaped gardens and are placed along cul-de-sacs. The Canning Waters Development is very close to the river reserve vegetation of paperbarks and rivergum.

The Liddlelow Homestead is at present closed to the public. It is being sensitively renovated, however it is surrounded by light industrial and commercial properties, so that the passerby would hardly notice the homestead. The light industrial area is unattractive due to gaudy signs and exposed work yards. The Albany Highway commercial area is a ribbon of rather gaudy buildings and carparks. Considering the unattractive development, it is rather unfortunate that from Albany Highway drivers would hardly know that the attractive remnant vegetation of the Canning River still exists.


ALBANY
Brook
Yule
KENWICK
RD
ST
HWY
ROYAL
Canning
Brook
Bickley
SPRING
RD
SPENCER
RD
River
BURSLEM
DR
PRECINCT 19
PRECINCT 23
PRECINCT 18
Dominant Landscape Characters and Significant Viewscapes
N
100 0 200 400 600
Metres
LANDSCAPE CHARACTERS
Industrial
Suburban
Natural
Recreational
Rural
Significant Viewscapes

Dominant Landscape Character

The original landscape character in the immediate vicinity of the river would have been natural with predominantly melaleuca and sedges fringing the flat alluvial terraces of the Canning River. There may have been a greater presence of saline tolerant species along the river prior to the construction of the Kent Street Weir.

Today, the landscape of this precinct is very patchy with several different landscape characters occupying small areas. There are several small patches of relatively natural vegetation which mainly consists of endemic trees and a weedy understorey. These natural landscapes appear isolated and the surrounding suburban and rural land uses infringe on the appearance of these vegetation communities. In general, the urban landscape is quite modest with small houses often on large blocks of land.

The orchards and fields for grazing are remnant land uses in the precinct. The orchards are quite old and there is pressure to develop these properties into residential areas. The grazing land is adjacent to Beckenham railway and it will probably continue to be used for this rural activity until the Roe Highway extension is commenced. These rural landscapes are quite rare so close to the city and river environment. The orchards in particular provide pleasing and attractive viewscapes. They are important characteristics of this precinct and their loss will result in a change of character.

Significant Viewscapes

Hester Park is an important section of this precinct as it provides open space in an area which is becoming urbanised. The vegetation in this area is quite degraded, however the line of flooded gum and paperbark not only is attractive but provides an important ecological corridor and also breaks up the urban landscape.

Conforming and Non Conforming Elements in the Landscape

There are several instances where public buildings and structures have been vandalised making them a detracting element in the landscape.

There are several public toilet blocks and a water pumphouse which have been placed in the centre of viewscapes. Their impact could be mitigated by screening with plants or if possible relocating to a less prominent position.

Thornlie TAFE centre is located on the southern bank of Burslem Drive. The campus has low visual impact on the landscape, as it has low building forms and subtle colours. The gardens have been landscaped with Australian species which are visually sympathetic with the adjoining Canning River vegetation.

Adjacent to the narrow belt of fringing vegetation, tree landscaping has resulted in non indigenous species being planted. Although many of these species are attractive specimens they detract from the subtle colours and form of the indigenous vegetation.

Recommendations for Maintenance and Enhancement of the Present Landscape Character

Regular maintenance of buildings and infrastructure would assist in enhancing the environment. Unfortunately, it is difficult to reduce vandalism and it is often necessary to incorporate upkeep costs into planning.

Areas of open space such as Hester Park are important as buffers between the suburban areas and the Canning River. The park provides opportunity to have areas of natural riparian vegetation and also open grassy parklands for recreation. At present the parkland has few trees and the long weedy grasses make most of the area unattractive visually and for recreation.

Consider the retention of the remnant rural landscapes in the form of orchards and turn of the century houses.

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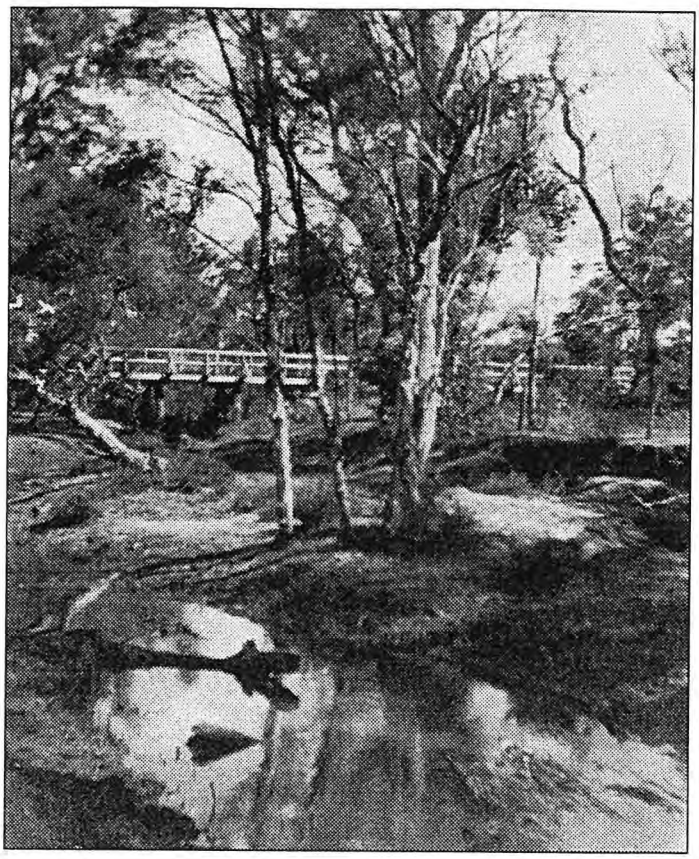
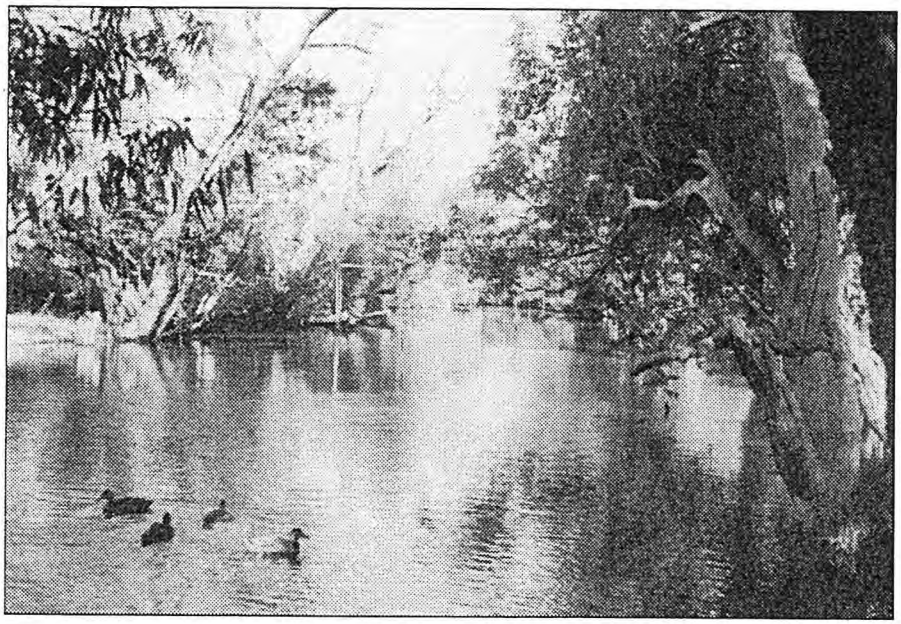


Canning River, Gosnells. 1915.

Battye Library, 209195P.



Hester Park, Spencer Road, Canning River. 1997.

Swan River Trust.

Canning River, near the White House, Nicholson Road. 1997.

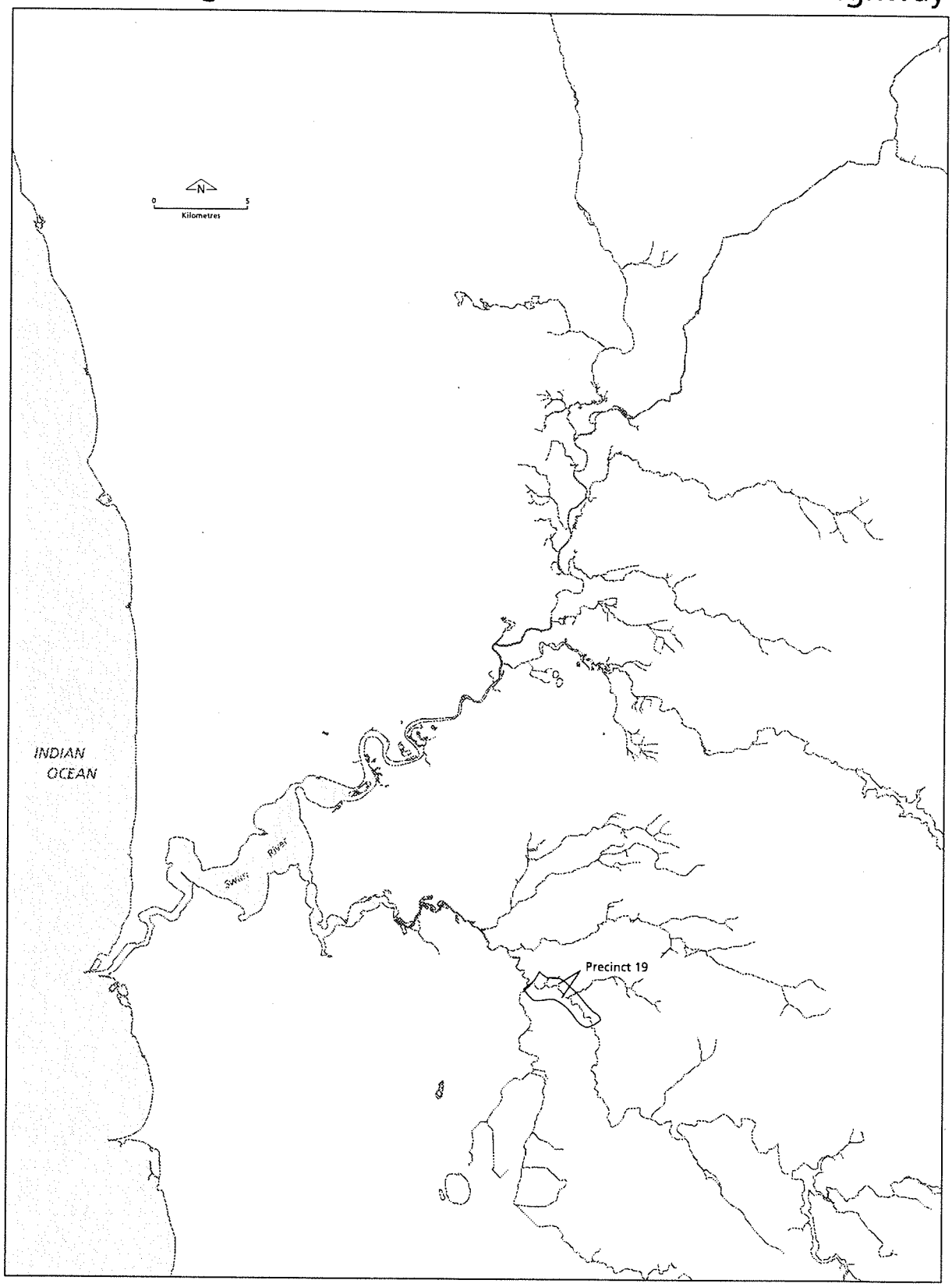
Swan River Trust.

Beckenham Railway Bridge, Canning River. 1997.

Swan River Trust.

Precinct 19

Canning River - Canning-Southern River Confluence to Tonkin Highway



Summary

Canning River - Canning-Southern River Confluence to Tonkin Highway

The Canning River loosely meanders upstream from the confluence of the Southern River. In places, the channel splits into two smaller arms and forms alluvial islands before joining back into a single channel.

The river embankment becomes increasingly incised into the surrounding sediment upstream of the Southern River confluence. There are several tributaries entering the river, the most significant being Ellis Brook, which is narrow and takes an irregular meandering form.

The southern bank is part of the low undulating dune systems which dip to meet the flood plain and river channel. The northern bank is topographically higher than the southern bank and is part of the palaeo alluvial fans which spread in front of the Darling Range. The natural riparian vegetation is an attractive belt of paperbark and flooded gum. The trees are attractive for their maturity and their bending branch forms and foliage which overhang the river. The riparian overstorey is quite dense, however the understorey is prolific with weeds and indigenous species are rare. Most of the vegetation complex around the river has been cleared for grazing and horticultural purposes.

There is a diverse mix of land uses adjacent to the Canning River within this precinct and they include residential, commercial, municipal, horticultural and grazing land uses. A number of citrus orchards remain in the area, however there has been increasing demand to redevelop these properties into small residential blocks. There are several examples within this area where new homes have been built on small blocks, such as the Foreshore Place Development and around Homestead Road. Other orchard and grazing properties have become simply single residential properties with large paddock like gardens. The residential developments in Maddington range in age and style, while the majority of the Gosnells residences were built in the 1970-1980s and are quite modest and built in the fashion of their era.

Other significant land uses are the John Okey Davis Reserve and the Pioneer Park. Both reserves are valuable for their open space and access to the river. Both are well maintained and are important for emphasising the historic significance of the area.

Biophysical Processes

Geological Processes

This section of the Canning River is alluvium which is variably laterized and podsolised and is characterised as being of the Guildford Geological Formation. The adjacent Southern River passes through the younger Bassendean Sand Formation which is made up of leached Pleistocene dunes of quartz sands.

Swan Soil Association, which is found along the present stream course, is classified as being red, podsolic and undifferentiated, alluvial soils. The northern banks are part of the yellow podsolic soils of the Guildford Association. The Southern River Soil Association, which is classified as grey sand dunes with intervening clayey swamps, is evident along the Southern River and southern banks of the Canning River.

Topography

The area is part of the topographic unit called the Pinjarra Plain which consists of unconsolidated sediments of fluvial origin. These palaeo landforms were the result of the many small streams which deposited their sediment load as they left the Darling Scarp and formed the gently undulating alluvial fans. The upstream area of the precinct becomes increasingly topographically higher and the landform appears more gently undulating than the flatter area adjacent to the Southern River confluence.

Hydrological Processes

Water features

The Canning River takes the form of irregular meanders upstream from its confluence with the Southern River. The width of the channel varies, however in most sections the width is greater than the channel depth. The Canning River channel is only 2-3 metres wide, however there is evidence that the channel was quite recently wider as there has been infilling of the flood plain which is only partly vegetated. At the Southern River confluence there are narrow 2-3 metre channels. The channel splits into two anabranches in several places due to alluvial deposits and the low gradient of the river. The Southern River meets the Canning River as a T-section where bodies of water flow towards each other and continue in a southerly direction. There are several tributaries which drain into the Canning River at this precinct and the larger tributaries are located adjacent to River Avenue, upstream of Station Road and Ellis Brook.

Bathymetry

The river is very shallow in this precinct and the water depth is often less than a metre. The water is entirely fluvial in origin and there are several tributaries which drain from the surrounding land.

Flooding

Much of the lower lying area is subject to seasonal inundation, however most of the built up area has been constructed on infill above the hundred year flood level. Since the construction of the Canning Weir the volume of flood water has been reduced.

Erosion and accretion

Breaks in the riparian vegetation have caused isolated points of erosion, however as most of the river banks are covered in a dense layer of weeds, erosion is not a significant problem.

Vegetation Communities

Native

Swan Complex

The indigenous flora of this precinct is classified as being part of the Swan Complex (DCE, 1980). The vegetation ranges from fringing woodland of flooded gum *(Eucalyptus rudis)* and swamp paperbark *(Melaleuca rhaphiophylla)* with localised occurrence of low open forest of swamp sheoak *(Casuarina obesa)* and saltwater paperbark *(Melaleuca cuticularis)*. The various communities which make up this complex are described below.

***Eucalyptus-Melaleuca* communities**

The main complex is the flooded gum *(Eucalyptus rudis)* and swamp paperbark *(Melaleuca rhaphiophylla)* dominant community along this section of the Canning River and the Ellis Brook. In most areas the understorey has been replaced by exotic species, however the shrub *Astartea fascicularis* is present in this section of the river. Some of these areas have become pastured woodland, such as adjacent to Astley Street where the understorey communities have been cleared and grasses have been

encouraged by land use practices. The riparian vegetation becomes particularly sparse west of Albany Highway and adjacent to the intersection of Tonkin Highway.

***Eucalyptus* communities**

The remnant woodland sections of flooded gum *(Eucalyptus rudis)* occur as isolated islands with the understorey consisting predominantly of exotic weeds. This community occurs adjacent to Astley Street and Homestead Road.

Exotic

Exotic species are the dominant understorey species, and prominent weeds include edible fig *(*Ficus carica)*, bulrush *(*Typha orientalis)*, weeping willow *(*Salix babylonica)*, giant reed *(*Arundo donax)*, bamboo *(*Bambusa* sp*)*, dolichos pea *(*Dipogon lignosus)*, grape vine *(*Vitis spp)*, blackberry *(*Rubus* sp*)*, castor oil bush *(*Ricnus communis)* and Japanese pepper *(*Shinus terebinthifolius)*.

Historical Land Use and Resulting Environmental Changes

The original grants included J.Hobbs (Lot 14), J.A. Dutton (Lot 15), Ferres (Lot 15A), J.O. Davis (Lot 16), D. Scott (Lot 16A), and J.R. Phillips (Lot 38).

John Okey Davies arrived from England in 1829 with his wife and children, however he was slow to take up his property (McDonald and Cooper, 1988). Some sources suggest that he was sent to the colony by an English perfume manufacturing company and planned to use his farm at the junction of Southern and Canning Rivers for the cultivation of Arum lilies and the almond trees for the manufacture of perfume. The venture was not very successful as the London market was six months away. However the arum lilies are still present along the river today. The farm was called 'Chenies' and is now known as Homestead Park. The property ran sheep and cattle. Both Davies and his wife died in the mid 1830s leaving the property in the hands of his two teenage sons.

John Randell Phillips prepared for his journey to his Canning property at Fremantle in 1830. His crop seeds and stores were destroyed by Aboriginal burn-off in April 1830 at Fremantle and to add to his misfortunes he was later speared by Aborigines, in October 1830. Despite these delays, he chose grants later known as Maddington Park and Stoke Farm and he started establishing his properties once replacement goods arrived in December. The cost of running the farm was excessive and in 1833 Major Nairne bought Maddington Park (Carden, 1968). Phillips left to take up a post in Albany in 1840.

In 1862 Charles Gosnells bought Location 16 for 200 pounds as an investment. His heirs sold the land in 1902 to the Gosnells Estate Company which immediately set about planning a townsite with 0.8 hectare blocks (McDonald and Cooper, 1988).

By 1893 the railway line from Perth to Bunbury had been officially opened which encouraged the growth of the area. Gosnells was also on the route to Fremantle and Perth and as a consequence the surrounding suburb grew as a half way junction.

In the mid 1930s, the Canning Weir was completed and since this time fine silty sediments have been deposited in the Canning River (McDonald and Cooper, 1988). During the 1930s, the confluence of the Canning and Southern Rivers was approximately 6 metres wide compared with almost half of this now.

Present Land Use and Social Patterns

At this precinct, the Canning River has a diverse mix of land uses including residential, commercial, municipal, horticultural and grazing land uses. The residential area of Gosnells nests into the area between the Southern River and the Canning River. The houses are modest and typically in the designs fashionable at the time of construction. These are placed on quite large blocks and are typically single storey. Along Homestead Road, the new housing developments are on smaller blocks and the properties often have adjoining front gardens. The houses, however are all individually built and are all single storey small homes.

Between Albany and Tonkin Highways, there are several large rural properties on the eastern bank of the river. These are mainly used as pasture for horses and cattle and there are fewer orchards than on the western section of the river.

PRECINCT 19

Significant Land Use Features

N

100 0 200 400

Metres

Maddington Primary School

PHILLIP ST AVE

DR

orchard

orchard

orchard

orchard

orchard

ALBANY HWY

Stokely

Railway

BURSLEM

John Okey Davis Park (Homestead Park)

WINDSOR DR

HOMESTEAD RD

Gosnells Museum

HOMESTEAD RD

LISSIMAN

Canning Brook

Ellis

STATION ST

City of Gosnells Council Offices

MILLS ST

FREMANTLE RD

Railway Markets

Pioneer Park

Station Street Bridge

RD

Lumen Christi College

ST retail area

Civic Centre

STATION

River

HWY

WHEATLEY

ALBANY

WEST

PL CLIFF

MILLS RD

ST ST

HWY

TONKIN

VERA ST

Mary Carroll Park

Southern River

The Gosnells Hotel and Railway Market are prominent features in the area. The market several retail outlets have been built in a style complimentary to the adjoining Gosnells Hotel. Within the building a 270 tonne steam train has been placed as part of the historic precinct and to attract customers into the centre.

The City of Gosnells council offices and municipal buildings are adjacent to the river and provide services such as a library, hall and child minding facilities.

Recreation nodes

The Gosnells Museum is the old Wilkinson Homestead which is located in part of the John Okey Davis Park. The park provides an area of open space and access to the river foreshore. There are seats and barbecues as well as a toilet block.

Pioneer Park is a well designed for community activities and other recreation. The park has several barbecue facilities, wheel chair access, an amphitheatre and other amenities.

Public access

Public access to the foreshore is difficult in most of the precinct. John Okey Davis Park and Pioneer Park have dual use paths and access to public land. However most of the land surrounding the river is private or restricted for railway reserves.

Sites of Nyungar & Wider Australian Community Significance

Aboriginal significance

The entire Canning River has been recorded as a useful track to the Darling Range for the local Nyungars. There have not been any specific sites identified as having significance to Nyungar within this precinct. However there is a Nyungar legend that the local people lived on flat land adjacent to the river. The account tells how the tribe which lived in the area had a snake who they would look after and feed. The snake would play with the children. The group would go into the desert on their search for food. One time the tribe went for such a long time that when they returned they found the snake ill. The old people tried to look after him, but were tired and soon had to sleep. In the morning they woke to find that the snake had died and turned into a long row of hills. The people were no longer sad at his death but knew that the snake was still with them.

As with the entire Canning area, once the colonists began settling along the river there was antagonism between the two communities. One hostile incident occurred when John Randel Phillips was clearing his land on the south-eastern section at Stoke Farm (McDonald and Cooper, 1988). He was approached by a party of eight Nyungars and was speared because he was destroying the Nyungar livelihood. Unwarranted attacks were made by the settlers. For example, one of William Nairne's labourers shot at a group of Aborigines to show his companion how '*natives were treated in other colonies*'. Later in 1839, the retaliations continued when 12 year old John Burtonshaw-Cox was killed by Men-dick while minding Phillips' sheep and goats. Men-dick eluded the settlers for some time before being captured. He was hung and his body left as a warning to other Nyungars.

Other significance

The Wilkinson House is conserved as a museum of Gosnells history and is also known as Orange Tree Farm. There is a pioneer graveyard within the John Okey Davis Reserve.

Conservation Areas

Wetlands

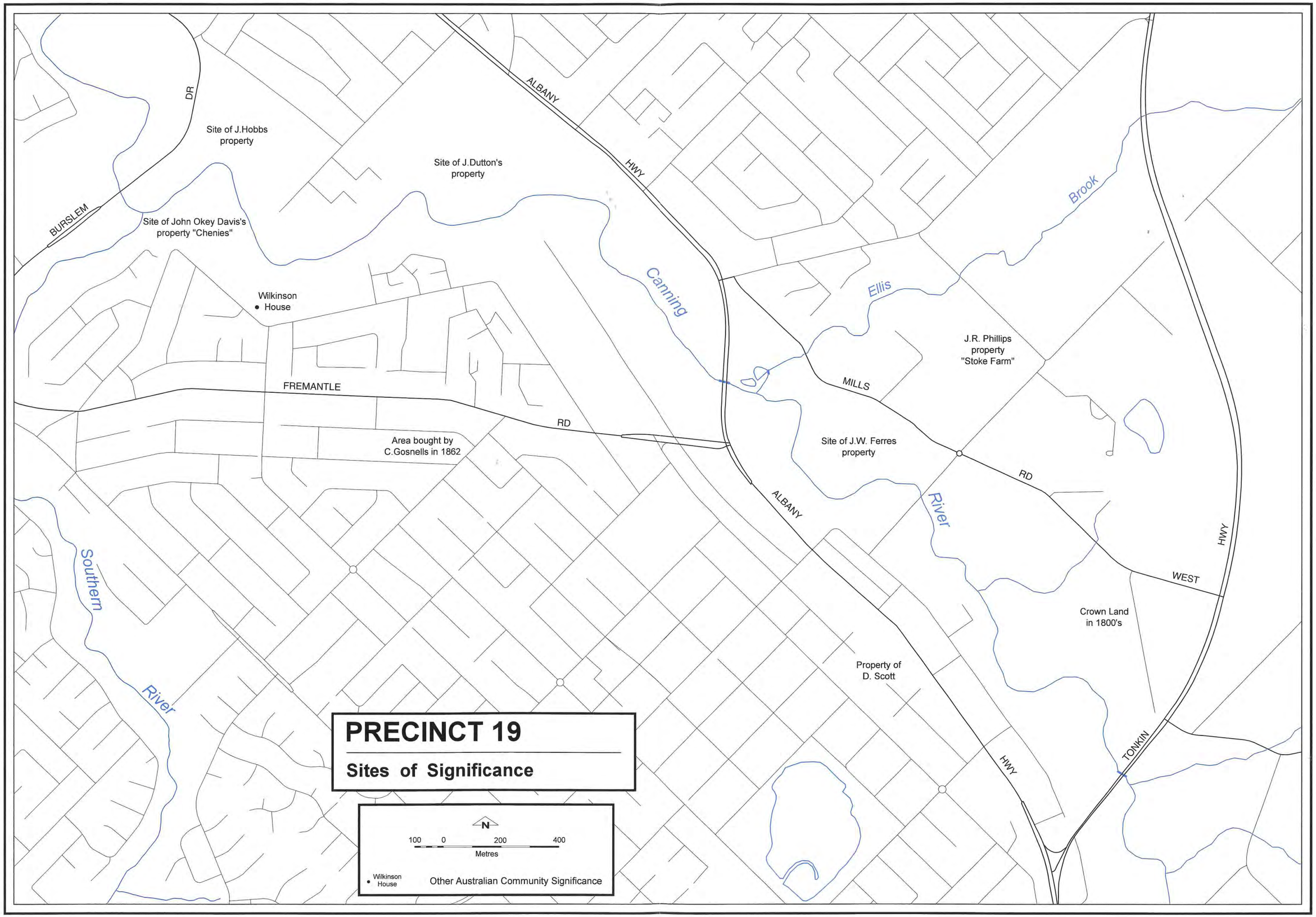
The section of Canning River in this precinct has been identified as a multiple use management category by WAWA, (1993). These wetlands are perceived as having a significant number of ecological, hydrological and social functions which must be considered in the context of 'sustainable' catchment management. It is recognised that these cleared woodlands and grasslands provide a valuable pasture for grazing and also support bird feeding and breeding grounds.

System 6

M75 Upper Canning and Southern Rivers

The recommended area comprises the Canning River and its fringes from Nicholson Road Bridge to the boundary of State Forest, together with those parts of the Southern and Wungong Rivers within the City of

Gosnells. Bickley Brook and the Southern River confluences have banks which are well covered with flooded gum and paperbarks. Grasses and weeds abound. The Southern River from its confluence with the Canning River to its continuation as the Wungong River is fairly well wooded with flooded gum on both banks, although the ground flora has been mostly lost. Along the lower reaches there are paperbark and *Acacia saligna* and patches of *Juncus* and *Baumea* species. Along the Wungong River remnants of woodland of jarrah and marri occur in places on the slopes above the banks with an understorey which includes large clumps of *Cyperus vaginatus* and occasional *Lobelia olata* and *Acacia saligna.* The area constitutes open space of regional significance because of its high conservation and recreational values, its proximity to Perth's residential areas and regional roads passing though the area.


DR
BURSLEM
Site of J.Hobbs property
Site of John Okey Davis's property "Chenies"
Site of J.Dutton's property
ALBANY
HWY
Canning
Brook
Ellis
Wilkinson
House
FREMANTLE
RD
Area bought by C.Gosnells in 1862
MILLS
J.R. Phillips property "Stoke Farm"
Site of J.W. Ferres property
RD
ALBANY
River
HWY
WEST
Crown Land in 1800's
Property of D. Scott
HWY
TONKIN
Southern
River
PRECINCT 19
Sites of Significance
N
100 0 200 400
Metres
Wilkinson House
Other Australian Community Significance

Precinct Description

Waterform and natural riparian zone

The Canning River forms loose meanders upstream from the Southern River confluence. Parallel to Windsor Drive, the river has spit into two channels forming flat alluvial islands. The Canning River channel is very narrow and shallow and the river almost appears as a small creek in places during periods of low water flow. There are several tributaries entering the river, the major one being Ellis Brook. Two man-made lakes are located on higher land adjacent to Ellis Brook and the Canning River. The waterform is particularly attractive when the river meanders and the high clayey channel banks are exposed creating a complex and interesting form.

The natural riparian vegetation is an attractive belt of paperbark and flooded gum. For the most part, the trees that remain are attractive for their maturity and their bending branch forms and foliage which overhang the river. The overstorey is quite dense, however the understorey consists of mainly weed species. The area is frequently inundated and often becomes water logged in the lower gradient of the downstream section of the precinct.

Landform

The southern bank of the Canning River is part of the low undulating dune systems which dip to meet the flood plain. Upstream of the Southern River confluence, the river channel becomes increasingly incised into the surrounding landscape as the river forms a lower gradient route through the surrounding steeper landform.

Much of the flood plain has been infilled for housing developments and therefore there are several sloping infilled embankments in front of the housing estates. At Pioneer Park the landform varies from the gravelly outcrops on the higher land which give way to a steep embankment adjacent to the flat river flood plain. The soil appears clayey where exposed. One of the attractive features of the precinct is that the Darling Range acts as a backdrop to the Canning River. The face of the scarp appears quite steep and the slope rises quite quickly to the undulating series of hills that form the Darling Range. Several quarry faces punctuate the slopes and alluvial fans of the range at Orange Grove and Martin. The exposed granite contrasts with the surrounding dark grey green of the hills vegetation and therefore is a prominent landscape feature.

Vegetation

The vegetation along Windsor Drive, Gosnells, is particularly attractive as there is a mature eucalypt woodland with an understorey of acacia and grasses. The foliage is so dense that the river channel cannot be seen by the viewer, however breaks in the lower storey reveal that arum lilies are abundant within the river channel and damplands. The main complex is the flooded gum and paperbark community. These two trees are particularly attractive as they complement each other both in tree form and foliage types. The taller flooded gum emerges from the dense canopy of the smaller paperbarks. In most areas the understorey has been replaced by exotic species, however the shrub *Astartea fascicularis* is present in this section of the river. Some of these areas have become pastured woodland such as adjacent to Astley Street where the understorey communities have been cleared and grasses have been encouraged by land use practices. The remnant orchards provide an interesting land use vegetation complex along the river and their cultivated forms are attractive visual focal points within the urban environment.

At Pioneer Park an attractive stand of flooded gum and paperbark adjacent to a mowed flood plain provides a pleasant parkland. Much of the parkland near the amphitheatre is lawned and due to the adjacent steep embankment the trees have an attractive parkland enclosure characteristic. The form and height of the trees is quite apparent to the river user as all the amenities are positioned within the vegetation complex. There are several trees which overhand the meandering riverform and they give a dappled light effect on the water surface. There is an abundance of weeds in the understorey and the most prolific is the bright green bridal creeper.

Upstream of Pioneer Park much of the vegetation has been cleared for grazing and the result is a belt of riparian vegetation around the riverform and the adjacent cleared pasture land. The vegetation appears dense and the paperbarks form a band of dense canopy over which the flooded gum form a less dense

foliage strata. The understorey is a thick covering of weeds.

Riparian land use

John Okey Davis Park is attractive for its old orchards and olive trees which have been retained on the banks of the flood plain and gently sloping hills. Most of the park is a wide open field which meets the riparian fringing vegetation at the base of the flood plain. There are several barbecue facilities and a toilet block which is placed in a rather prominent location on the 'hill'. There are few trees to screen this building. The toilet block building has been built in a 'colonial' brick style to fit in with the historic building of Wilkinson House.

A drain enters the Canning River in front of the Foreshore Place housing estate and has some paperbarks and an understorey of weeds. On the opposite bank a small stream acts as a drain to surrounding areas. It is surrounded by orchards and adjacent is the Stokely Railway Bridge. The section of river adjacent to the bridge and railway line is difficult to access due to private property and restricted land. It is unattractive due to the lack of riparian vegetation. The vegetation is cleared around the railway and from the adjacent properties.

Pioneer Park is an attractive area of open space which has been carefully planned with a steeply sloping embankment forming an enclosed flood plain. The garden has steep slopes from the Gosnells Municipal Centre to the flood plain. It has barbecues, seats, an amphitheatre, sundial garden, gazebo garden and wheel chair access. The amphitheatre was funded by Readymix which has its name made up in a tile fresco which is one of the many patterns on the steps and stage of the amphitheatre. In tribute to the pioneers of the area, there are several flat metal 'cut out' type statues of pioneers. Adjacent to the council library and arts centre there is a continuation of the tile designs with an Aboriginal design, and there are also three totem pole like sculptures in tribute to local flora and fauna as well as a mural for Multicultural Year. Unfortunately, there is a large amount of graffiti on the statues and benches which detracts from what would be a very pleasant parkland. Other small acts of vandalism also detract from the riverform such as several shopping trolleys in the river. Within the park is the City of Gosnells Junior Park Ranger Gazebo which has been constructed by the youth group and a garden of citrus, olives and cherry has been retained in the historic style of small horticultural properties in the area. The sundial garden has a good display of local native species and non endemic native species, in particular the groundcovering grevilleas.

Station Street crossing is a one lane crossing of the Canning River. It has white painted rails and is a low form bridge. Adjacent to Cliff Place is an area of open space which provides pedestrian access to an river foreshore. Upstream of Station Street access to the foreshore is difficult. The area has the overstorey of flooded gum, however the understorey consists mainly of weeds and the local council mows the weeds to create a parkland environment.

Tonkin Highway crossing is a large concrete piled bridge which crosses the gully-like cross section of the Canning River. The bridge is relatively low formed. Adjacent to the bridge are the overhead main server powerlines which have conspicuous supporting towers.

Land use

The roadside plantings along Windsor Drive consist of jacaranda which is inconsistent and detracting from the adjacent riparian vegetation. Houses have been demolished at the end of Windsor Drive and the mature trees of the gardens have been retained and include maple and box trees. Replacing the older large blocks is a new housing development which has involved infilling and levelling of the land and the creation of a steep bank and retaining wall adjacent to the topographically lower river and flood plain.

Wilkinson House is of valuable historic significance as it was the residence of early settlers along the river. Its conversion to a local history museum has allowed old agricultural equipment to be kept in the grounds providing visual interest to the area. The building's roof is painted a soft rosy red which is quite attractive, however the walls have been painted a rosy pink, which makes the building quite prominent. The colour is not in keeping with the era in which the house was built nor does it enhance the area. It would be more appropriate to at least paint the walls a lighter toned colour. The building and grounds are

well maintained and although access is only available on the weekends, visual access through the wire fence is possible.

There are several orchard properties along Homestead Road, although most have become simply single residential properties. One of the older properties is 'Shangri-la' which has an old metal arch at the head of the driveway and is one of the more attractive properties along the road. These large blocks and associated orchards are becoming increasingly rare, as the subdivision is occurring, for example at the Foreshore Place Development on the north side of Homestead Road and the subdivision between Fremantle and Homestead Roads. These new houses are built in the fashion of the 1990s and have new neat gardens and in the case of the Foreshore Place Development are separated from the river by landfill and a fence.

At Gosnells , the railway crosses the Canning River in line with Lissiman Street. It passes adjacent to several orchards and acts as a barrier to the river. The Gosnells Hotel and Railway Market are located at the junction of Fremantle Road, Albany Highway, the Canning River and the Railway. The new markets are designed to be consistent with the Federation styled Gosnells Hotel and the hotel has been renovated using similar materials and paint colours.

The City of Gosnells council office is a new mid 1980s building located within a landscaped garden. The building is of pale brick with orange tiles and it is located on higher land while beneath it is an artificial lake and the Canning River. The river has been incorporated as a landscape feature of the park rather than a separate entity which is an excellent example of retaining the riverform and vegetation within an urban environment. The gardens around the council office have several poplars, flower beds and lawn. The several municipal buildings between Pioneer Park and Albany Highway have been built over time using different materials and in several styles.

The residential area of Maddington contains a mix of house styles ranging from small weather board homes built earlier this century, to new houses built in the last decade. The residential area for the most part is separated from the northern bank of the river by Albany Highway. On the southern bank upstream of Ellis Book, the residential development fronts onto the river and is not separated by a road. Within this residential area there is a range of houses which vary in age, style and size and includes single residence and flats. The orchard and pasture blocks continue on the northern banks between Ellis Brook and Tonkin Highway. The native vegetation has mostly been cleared and the paddocks have a few single tree stands. Wire fences extend down to the edge of the orchard properties and access to the river is restricted.

Landscape Interpretation

Dominant Landscape Character

There are several different landscape characters along this section of the Canning River. The most significant is the remnant rural landscape. A number of old citrus orchards are present along the northern section of the precinct, however these are being quickly replaced by suburban subdivisions. At the southern section of the precinct, the rural landscape is made up of horse agistments and cleared pasture.

There is a very narrow ribbon of riparian vegetation south of the Albany Highway crossing of the Canning River. The Mills Road East area is a rural landscape which is visually discrete due to the riparian vegetation acting as a screen to the Gosnells suburban area. The riparian vegetation is made up of tall flooded gum, with an understorey dominated by paperbarks. As the fields in front of the riparian vegetation are cleared, the stratification of the trees can be easily viewed.

The John Okey Davis Park and Gosnells City Council grounds are attractive open parklands. The park has some remnant orchards, however the land is mainly a grassland with a backdrop of remnant vegetation along the Canning River. The Gosnells City Council grounds have been landscaped with lawn and exotic plants. There is a section of remnant riparian vegetation along the Canning River and adjacent stream. The result is a parkland with an attractive backdrop of vegetation along the lines of a classical garden.

The suburban area of Gosnells and Maddington consists of mainly modest houses, often with large blocks. The houses built in the mid 1990s are generally on smaller blocks originating from a large rural block. Along Albany Highway, ribbon development shopping centres occur. These are generally modest developments with conspicuous advertising and signage. The railway cuts through the rural and suburban areas and is a significant landscape element in both landscape character types.

Significant Viewscapes

The John Okey Davis Park is an attractive element in the suburban landscape, and the Gosnells museum and orchards evoke a historical feeling.

The Gosnells City council offices have attractive gardens which can be viewed from Albany Highway. The Railway Market area is made up of several buildings which were either built at the turn of the century or have been built in a complementary style. This area is a significant landscape element which is important in creating a local landmark for Gosnells from Albany Highway.

Conforming and Non Conforming Elements in the Landscape

There are a few old citrus trees along the banks of this development and they are rather attractive as a reminder of historical land uses, however the entire bank is covered in weeds and the neglected nature of the banks is environmentally unacceptable, although from a landscape perspective the scene is rather overgrown and appealing.

Pioneer Park is an attractive area of open space. It is valuable for being close to municipal and commercial areas. Unfortunately, despite efforts to make this park attractive and to celebrate the historic and Aboriginal significance of the area, the park has been subject to vandalism which makes the water user less likely to enjoy the area. The understorey consists of weeds. Is should be possible to rehabilitate the area.

Recommendations for Maintenance and Enhancement of the Present Landscape Character

- Ensure that the Railway Market area remains a local landmark with important historical elements conserved.
- Consider the importance of the rural landscape and the protection of those elements which make up the rural landscape
- Maintain and enhance the riparian vegetation as it provides an important ribbon of natural landscape character in a suburban landscape.
- The paint colour of Wilkinson House needs to be appropriate to the era in which it was built, or at least should be a less vivid pink.

Precinct Specific References

McDonald and Cooper, W. 1988. **The Gosnells Story.** City of Gosnells.

PRECINCT 18

DR

ALBANY

HWY

BURSLEM

Canning

Brook

Ellis

FREMANTLE

RD

MILLS

ALBANY

River

RD

HWY

WEST

TONKIN

HWY

Southern

River

PRECINCT 23

PRECINCT 19

Dominant Landscape Characters and Significant Viewscapes

N

100 0 200 400

Metres

LANDSCAPE CHARACTERS

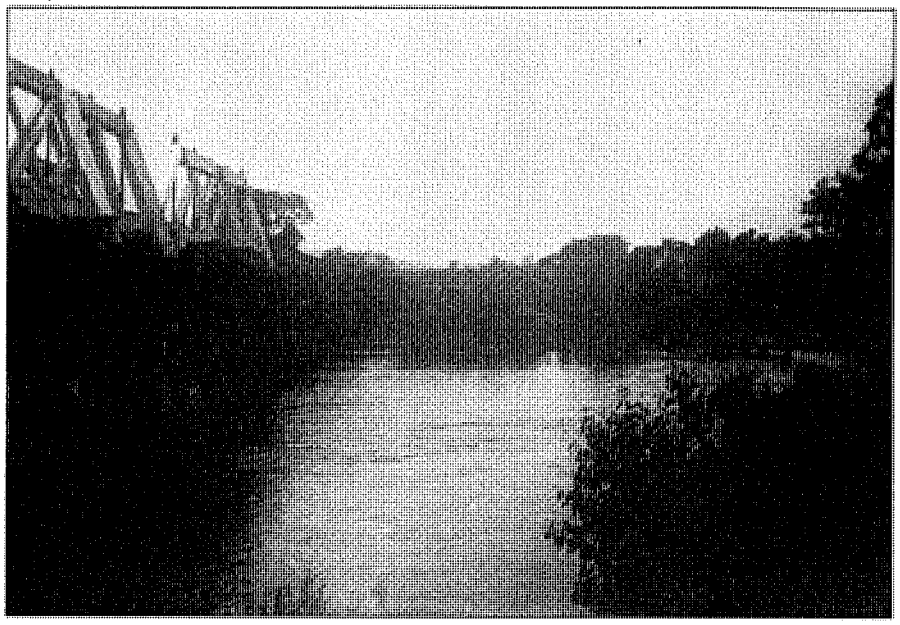
Rural

Suburban

Natural

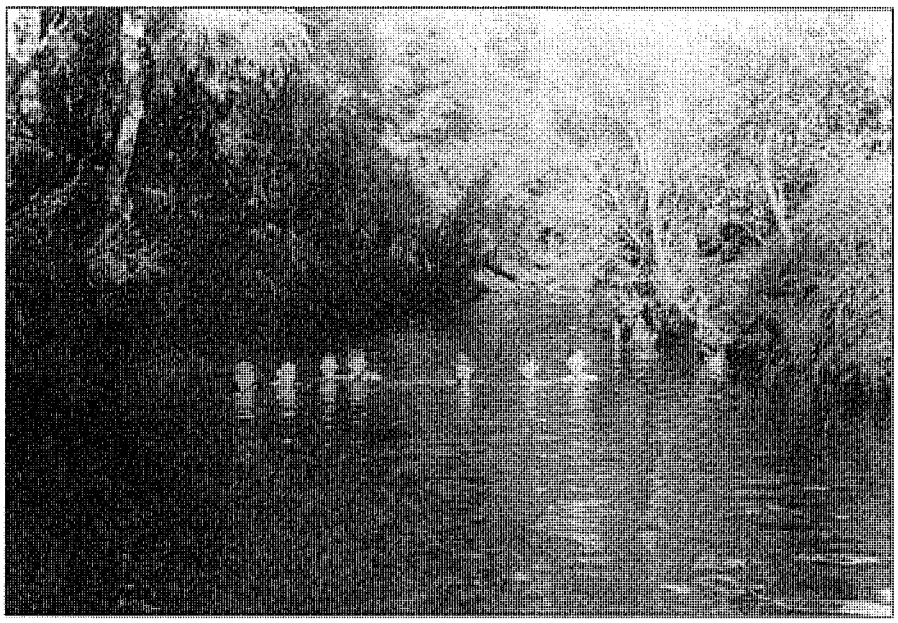
Recreational

Significant Viewscapes



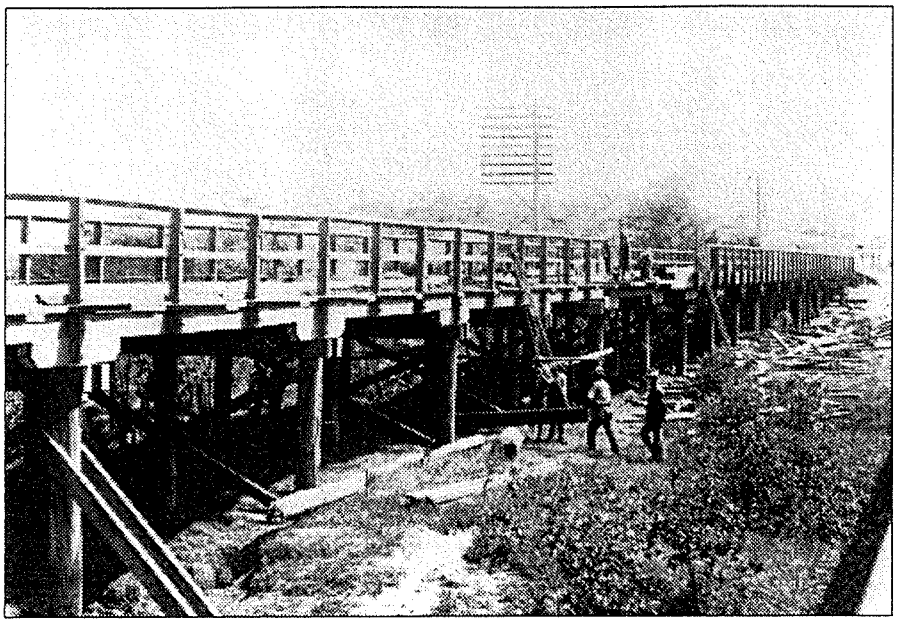
Railway Bridge near River Avenue, Maddington. c1926.

Swan River Trust.



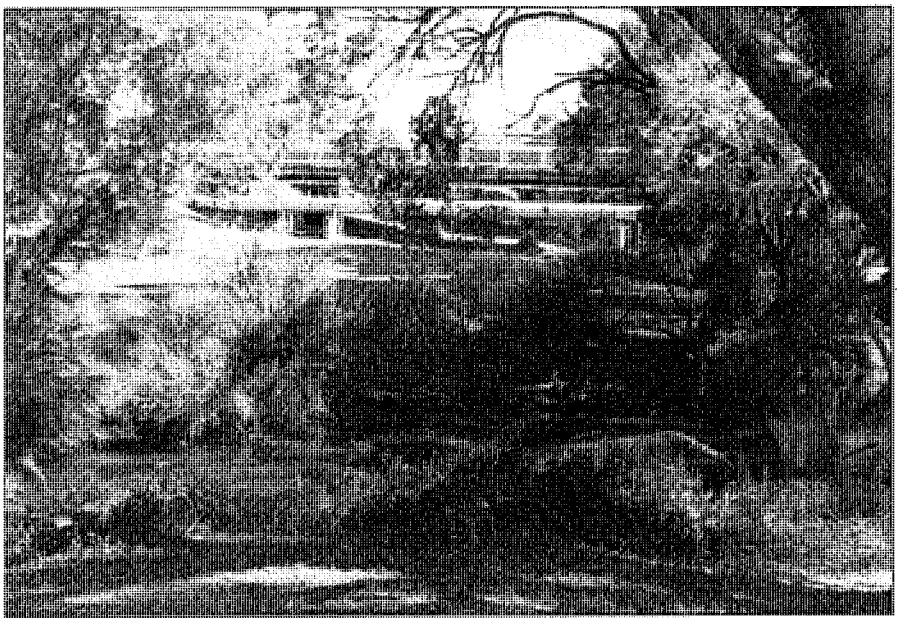
Green's swimming pool, upstream of River Ave, Maddington, 1920s.

Swan River Trust.



Bridge repair, Gosnells. 1920s.

Battye Library 816B/164

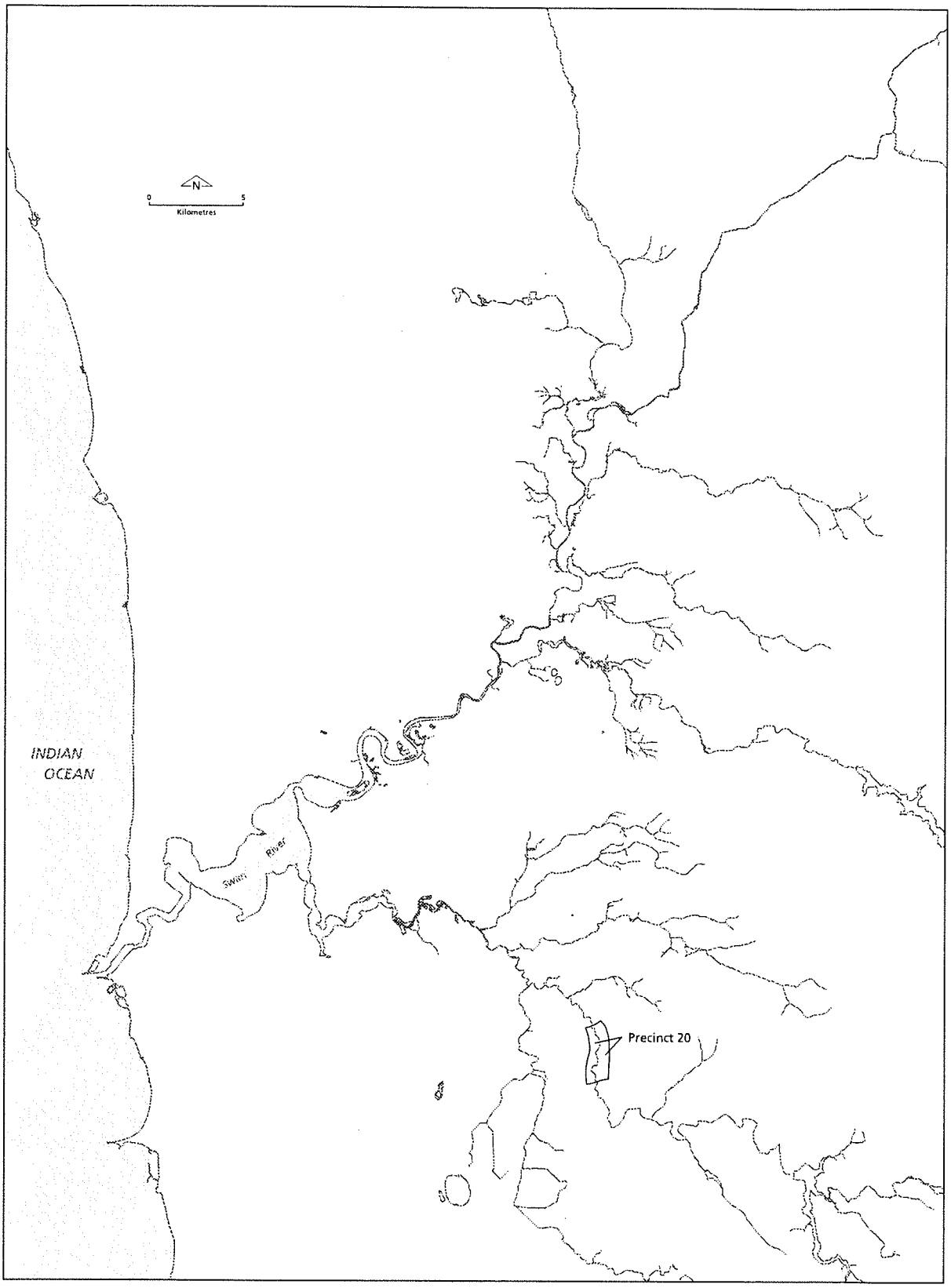


Albany Highway Road Bridge, Gosnells. 1997.

Swan River Trust.

Precinct 20

Canning River - Tonkin Highway to Turner/Brookside Footbridge



Summary

Canning River - Tonkin Highway to Turner/Brookside Footbridge

The Canning River meanders irregularly downstream towards Tonkin Highway in the form of a narrow and shallow channel. The river is quite uniform in width for most of this precinct and has an almost vertical embankment of clayey red alluvium above the river channel. The fringing vegetation is a flooded gum - paperbark complex which due to clearing has been reduced to a narrow belt along the river channel.

There is an abundance of weeds which form a dense understorey in the disturbed riparian vegetation community. The precinct is part of the palaeo alluvial fans in front of the Darling Range and the landform is gently undulating, flat topography on the western river bank. The eastern bank becomes quite hilly with several steep gravelly slopes.

There are two pedestrian crossings within the precinct both of which are functional but are associated with service infrastructure, such as pipelines and powerlines. The adjacent vegetation is also infested with weeds giving the area low aesthetics.

There are several small residential blocks in the area, however most properties are long narrow horticultural blocks which stretch from the road to the river. There is also a large proportion of land owned by the Salvation Army who provide residential support for senior citizens and a rehabilitation centre adjacent to the river.

Biophysical Processes

Geological Processes

The precinct is included in the Guildford Geological Formation which consists of sandy clays and clayey sands, and also includes other alluvium and colluvium. The formation consists of mixtures of sand, clay and conglomerate. The unit is of fluvial origin but includes estuarine and marine intercalations near its base. East of the river there are pockets of the Yoganup Formation which is leached or ferruginised beach sand and conglomerated dunes. This is believed to have been deposited in the Quaternary period as a fore or beach dune under active surf conditions.

The river channel and flood plains are part of the Swan Association red podsolic and undifferentiated alluvial earths and duplex soils. On either side of the riparian soil association, is the Forrestdale Soil Association. This is composed of the gravelly and sandy soils of the latterised foothills of the Ridge Hill Shelf.

Topography

The river is part of the Pinjarra Plain which consists of unconsolidated fluvial originated sediments. The Ridge Hill Shelf is located in front of the Darling Scarp. The shelf formation consists of palaeo alluvial fans which have formed in front of the Darling Scarp by fluviatile processes.

Hydrological Processes

Water features

The river takes the form of irregular meanders within this precinct. The channel is reasonably uniform in width with only a slight broadening at the meander bends. The river cuts through the red alluvium forming steep embankments of approximately two metres in depth. Adjacent to the channel is a narrow flood plain area which quickly rises to meet the undulating sandy plain.

Bathometry

The channel is quite shallow with a depth of less than one metre. The river is entirely fluvial and there are several shallow narrow tributaries which drain the surrounding land.

Flooding

There is a narrow flood plain although most of the area is not subject to seasonal inundation or the formation of damplands.

Erosion and accretion

There is severe erosion of the valley embankment where the main river channel has collided with the edge of the river valley at Pries Park. Tree roots are exposed just upstream of Manning Avenue Footbridge. There are several points of erosion and siltation along the stream between Mc Kenzie Grove and Pries Park Road. There is some erosion due to the effects of grazing livestock on the western bank upstream of Centre Road (Day and Pen, 1991).

Vegetation Communities

Native

Swan Complex

The indigenous flora of this precinct is classified as being as part of the Swan Complex (DCE, 1980).

The vegetation ranges from fringing woodland of flooded gum *(Eucalyptus rudis)* and swamp paperbark *(Melaleuca rhaphiophylla)* with localised occurrence of low open forest of sheoak *(Casuarina obesa)* and saltwater paperbark *(Melaleuca cuticularis)*. The various communities which make up this complex are described below.

***Eucalyptus-Melaleuca* communities**

The *Eucalyptus rudis-Melaleuca rhaphiophylla* low open-closed forest is found fringing the Canning River in this precinct. Few indigenous understorey species remain, and the dominant understorey species include the large exotic shrub *Astartea fasicularis* and variable leafed grevillea *(Grevillea diversifolia)* which occur particularly towards Brookside Avenue. In many areas the riverbanks have been cleared of riparian vegetation and replaced with pasture or else the understorey has been removed and the land converted to pastured woodland.

***Eucalyptus* communities**

The vegetation on the hills behind the river communities is remnant marri *(Eucalyptus calophylla)* and jarrah *(Eucalyptus marginata)* tall open forest formation which provides an attractive background

to the river environment. The understorey is less disturbed compared with the river complex and there is an abundance of blackboy *(Xanthorrhoea preissii)* and hibbertia *(Hibbertia* sp*)*.

Exotic

There are several prominent weeds along the river bank including the castor oil bush *(*Rininus communis)*, bulrush *(*Typha orientalis)*, giant bamboo *(*Bambusa* sp*)*, willow tree *(*Salix* sp*)*, Japanese pepper *(*Shinus terebinthifolius)*, blackberry *(*Rubus* sp*)* and edible fig *(*Ficus carica)*. There are several citrus orchards within the area.

Historical Land Use and Resulting Environmental Changes

The area has been historically used as pastoral land and this has resulted in the clearing of the native vegetation (McDonald and Cooper, 1988). Many orchards were established on the relatively rich soils and some of these remain today.

Present Land Use and Social Patterns

The Harry Hunter Rehabilitation Centre is located on the northern side of the Canning River and is secluded by bushland. On the opposite bank the Seaforth Senior Citizen's Centre run by the Salvation Army is a series of single storey units. Adjacent to the rehabilitation centre is a block of bushland being the site of a proposed crematorium.

There are several large rural blocks which stretch to the river foreshore. These are used as rural residential lots, horse paddocks and small orchards. There are several citrus orchards within the area, the larger of which are just south of Tonkin Highway and in line with Lake Road on the western side of the river. Behind Cunnell Avenue are small residential blocks which have been formed as the result of subdividing the larger original blocks.

Recreation nodes

There are several recreation nodes within the area. Pries Park is the largest area and has facilities for a soccer club, pony club and other organised sports. Quarry Park is on the corner of Cockram and Mills Roads and has a shallow creek and barbecues in shaded grass areas. Wright Brook Regional Park is adjacent to the study area and has significant conservation and educational value.

Public access

Public access to the river is limited to the Manning Road and Turner Avenue pedestrian bridges. The majority of the land adjacent to the river is private and fenced right down to the fringing vegetation line which makes it difficult to access.

Sites of Nyungar & Wider Australian Community Significance

Nyungar significance

The Beeliar and Beeloo or river people are believed to have considered this section of the Canning River as part of their run (O'Connor *et al,* 1989). The Beeloo considered north of the Canning River *(Dyarlgarro)* to the hills as part of their ground while the Beeliar mainly traversed the southern section of the river to the sea.

Other significance

There was a traffic bridge at Turner Road until 1981 when it was demolished and replaced with a new pedestrian walkway (McDonald and Cooper, 1988).

Conservation Areas

Wetlands

The section of Canning River in this precinct has been identified as a multiple use management category by WAWA (1993). These wetlands are perceived as having a significant number of ecological, hydrological and social functions and are recommended to be considered in the context of 'sustainable' catchment management. It is recognised that these cleared woodlands and grasslands provide valuable pasture for grazing and also support bird feeding and breeding grounds.

System 6

M75 Upper Canning and Southern Rivers

The recommended area comprises the Canning River and its fringes from Nicholson Road to the boundary

PRECINCT 20

Significant Land Use Features

N

100 0 200 400

Metres

ALBANY HWY

TONKIN HWY

MILLS RD EAST

Quarry Park

VERA ST

LOCKHART PL

MANNING AVE

footbridge

Caravan Village

Canning River

SEAFORTH AVE

Harry Hunter Rehabilitation Centre

Seaforth Senior Citizens Home

LAKE RD

McKENZIE GR

Pries Park

Pony and Soccer Club

AVE

Wright Brook Regional Park

PRIES PARK RD

COCKRAM RD

CONNELL RD

LAKE RD

CENTRE RD

CENTRE RD

Turner-Brookside footbridge

AVE

RAILWAY

John Wollaston Anglican Community School

Wright Brook

PRECINCT 20

Sites of Significance

N

100 0 200 400

Metres

ALBANY HWY

TONKIN HWY

MILLS RD EAST

VERA ST

LOCKHART PL

MANNING AVE

SEAFORTH AVE

Canning River

LAKE RD

McKENZIE GR

AVE

PRIES PARK RD

COCKRAM RD

CONNELL RD

LAKE RD

CENTRE RD

CENTRE RD

RAILWAY AVE

Wright Brook

of the State Forest, together with those parts of the Southern and Wungong Rivers within the City of Gosnells. Much of the area is reserved for parks and recreation under the Metropolitan Region Scheme. The river is well fringed with flooded gums and paperbark although the ground flora has been almost eliminated by grazing and clearing. The area is significant for its open space of regional significance and its proximity to Perth's residential areas. The recommendations include encouraging the growth and regeneration of flora and fauna and preventing vehicular access while allowing low impact access to the river.

Landscape Description

Precinct Description

Waterform and natural riparian zone

The river takes the form of a narrow and shallow channel which in parts has almost vertical embankments through the red alluvium. The steep embankments and restricted flood plain are generally vegetated with weeds. There are several tributary streams entering the river. The larger tributaries are the Quarry Park Stream and Wright Brook which run through the Harry Hunter Rehabilitation Centre. These streams are narrow shallow channels which are fringed by vegetation until the edge of the channel embankments. The stream embankments are generally void of vegetation and the red colour of the alluvium is exposed on their steep sides. The streams form pool and riffles where the laterised bedrock is exposed.

Landform

The precinct is part of the alluvial fans in front of the Darling Range and as a consequence the landform takes a gently undulating flat topography on the western river bank, while on the eastern bank the land becomes quite hilly. The eastern bank around Wright Brook Regional Park has several steep gravelly hills which give way to a flat sandy bank before the river. The Darling Range acts as a dramatic backdrop to the relatively flat landscape.

Vegetation

The vegetation along the river channel continues to be the flooded gum and paperbark complex. Most of this has been cleared except for a line of vegetation along the river and the understorey consists of a dense mat of weeds. There are few areas of uncleared land, however near Cockram Road and Wright Brook there is an area of remnant marri and jarrah tall open forest community which provides an attractive background to the river environment. The understorey is less disturbed compared with the river complex and there is an abundance of blackboys and hibbertia. Unfortunately, part of the Cockram Road bushland has been recently burnt which has temporally reduced the scenic quality of the vegetation.

Riparian land use

Manning Road pedestrian bridge is an unattractive feature as it is graffitied and has wide exposed concrete abutments. Adjacent to the pathway is a concrete half drain which guides stormwater into the river. A large silver water pipeline runs parallel to the bridge and has a wire fan shaped barrier to prevent people climbing on the pipe. There is a light pole and pine bollards which also add to the clutter of amenities. On the eastern bank is the very tall metal main distributary powerline which dominates the skyline. The pedestrian bridge area becomes a node of service infrastructure and due to the abundance of weeds within the fringing vegetation is an unattractive viewscape.

The Turner Place pedestrian bridge is a simple narrow concrete superstructure with of steel wire with metal hand rails. The abutment is made up of local red rocks and there are small steps cut into the rock allowing access to the river channel. There are two service pipes which cross the river adjacent to the bridge.

Land use

The houses south of Tonkin Highway are on large blocks and they all have a semi rural feel created by informal gardens, vegetable patches and rural-styled wooden and wire fences. South of Manning Road the blocks become long narrow pieces of land which front onto the river. These are mainly used as paddocks and orchards. Many of the properties have small informal shops or sheds adjacent to Albany Highway from which fruit, vegetables and flowers are sold and these provide a rural character to the area. Several plant nurseries are located along the highway.

The Salvation Army owns land on the western and eastern banks of the Canning River. They have the Seaforth Senior Citizens Centre and the Harry Hunter Rehabilitation Centre. Both of these have neat modern housing units which are built away from the road and close to the river. The Senior Citizens Centre is mainly devoid of trees, however there are some gardens around the complex which are well maintained and have a colourful display of flowers.

South of the Seaforth Centre is a caravan village which has mature local and non indigenous gum trees planted for shade. The caravans are mainly occupied

by permanent residents and therefore many have small gardens around their lots. The caravan park has lawn up to the thin line of natural riparian vegetation.

There is a small housing development around Ciro Road which was established in the 1980s. The houses are on small blocks and are generally neatly maintained. The end properties face onto Wright Brook.

Pries Park has facilities for several sporting groups. Kelmscott Pony Club at the end of Cockram Road is 'Strictly Members Only' and has several paddocks with equestrian equipment in the fields. Much of the vegetation has been cleared and the main field is very sandy. On the rise of the hill are two ovals and clubhouse. The clubhouse has several sponsors signs on the walls. The area is well fenced and it is difficult to access the river.

Quarry Park is a small recreational park created by a local quarry company. It is open to the public during the daytime, however is closed during the evening. The park has a small creek and the land that was once cleared has had several trees replanted to create a parkland effect. The park has barbecue and play equipment facilities.

Landscape Interpretation

Dominant Landscape Character

This precinct is dominated by a rural landscape character. There are many relatively large blocks which are being used for orchards, horse agistments and small market gardens. These properties have been cleared of the indigenous vegetation, except in some cases where a very narrow ribbon of riparian vegetation remains. There are several large blocks which are only being used for residential purposes, however these have the appearance of a rural land use, due the low building density.

Increasingly, the large blocks have been subdivided for relatively high density residential developments. These pockets of suburban landscape are characterised by modest style houses and eclectic gardens. There are several retirement complexes in the area, the largest being the Seaforth Senior Citizens Centre on Albany Highway.

There are two recreational landscapes. Quarry Park is generally a passive recreational landscape with facilities for picnics and walks. Pries Park is used for several organised sporting activities which have infrastructure such as equestrian equipment on the landscape.

There is a very thin ribbon of riparian vegetation along this reach of the Canning River. Generally, there is little indigenous understorey as this has been replaced by soft leafy weeds. The Cockram Road bushland is made up of a marri-jarrah open woodland. The understorey is in relatively good condition, although increasingly under threat from fire, weed invasion and urban influences.

Significant Viewscapes

From the western bank of the Canning River, the Darling Scarp provides an attractive viewscape. The steep fan shaped fluviatile deposits which have formed in front of the elevated Darling Scarp provide a complexity of landform which contrasts with the flat sandy plain on the western side of the Canning River. In addition, there is some remnant eucalyptus woodland remaining on the scarp which provides an attractive landscape element, compared to the suburban and rural landscape of the Swan Coastal Plain.

Conforming and Non Conforming Elements in the Landscape

The Turner and Manning pedestrian bridges are a clutter of service pipelines and other structures. In both cases it would have been aesthetically more pleasing to run the pipes adjacent to the crossings in the same line as the superstructure and close to the bridge rather than several metres away.

Much of the riparian vegetation along this section of the Canning River is in poor condition. There is the opportunity to improve the environmental condition and the aesthetics of the landscape by removing the abundant leafy weeds and grasses and encouraging the regrowth of the attractive flooded gum and paperbark community.

At present, Pries Park is an detracting element in the landscape. The park could be enhanced by planting indigenous species around the edge of the park and improved maintenance of the grounds. At present, there are large advertising signs and rubbish tends to collect along the fence line of the property.

Recommendations for Maintenance and Enhancement of the Present Landscape Character

- Rehabilitation of the riparian vegetation and erosion points along this reach of the Canning River. The area is particularly weedy and the riparian natural landscape needs to be widened to improve the aesthetics of the area.
- Improved maintenance of parklands and other public infrastructure and facilities.
- Improve public access to the riparian area.
- Consider the appropriateness of retaining low density development in some areas of this precinct.
- Ensure that developments have styles which are complimentary to the gently sloping landform.

Precinct Specific References

McDonald and Cooper, W. 1988. **The Gosnells Story.** City of Gosnells.

PRECINCT 20

Dominant Landscape Characters and Significant Viewscapes

PRECINCT 19

PRECINCT 20

HWY

ALBANY HWY

TONKIN HWY

MILLS RD EAST

LAKE RD

AVE

RAILWAY

Canning River

Wright Brook

N

100 0 200 400

Metres

LANDSCAPE CHARACTERS

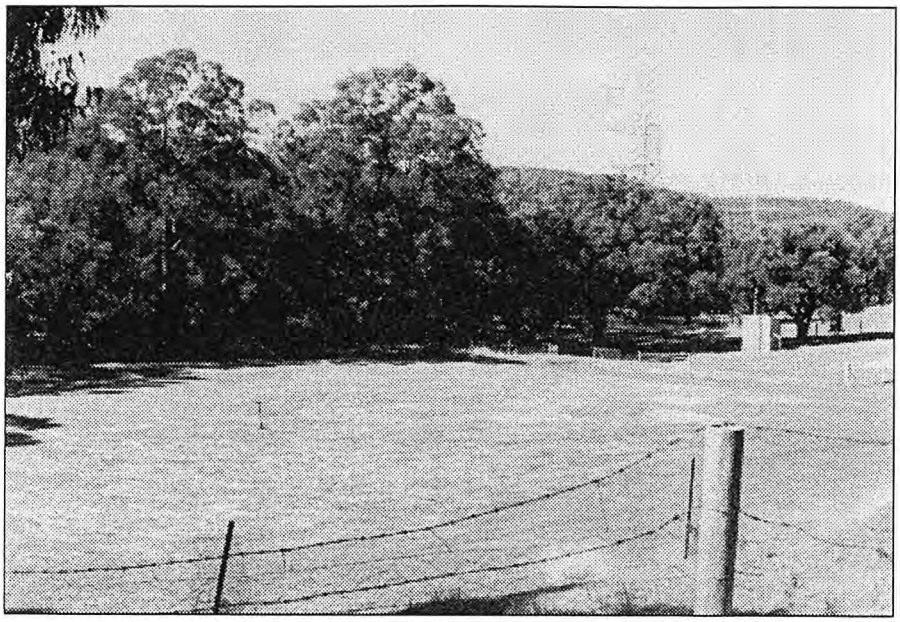
Rural

Suburban

Natural

Recreational

Significant Viewscapes



Canning River, Manning Ave. Gosnells. 1997.

Swan River Trust.

Canning River, Cockram Ave, Kelmscott Pony Club. 1997.

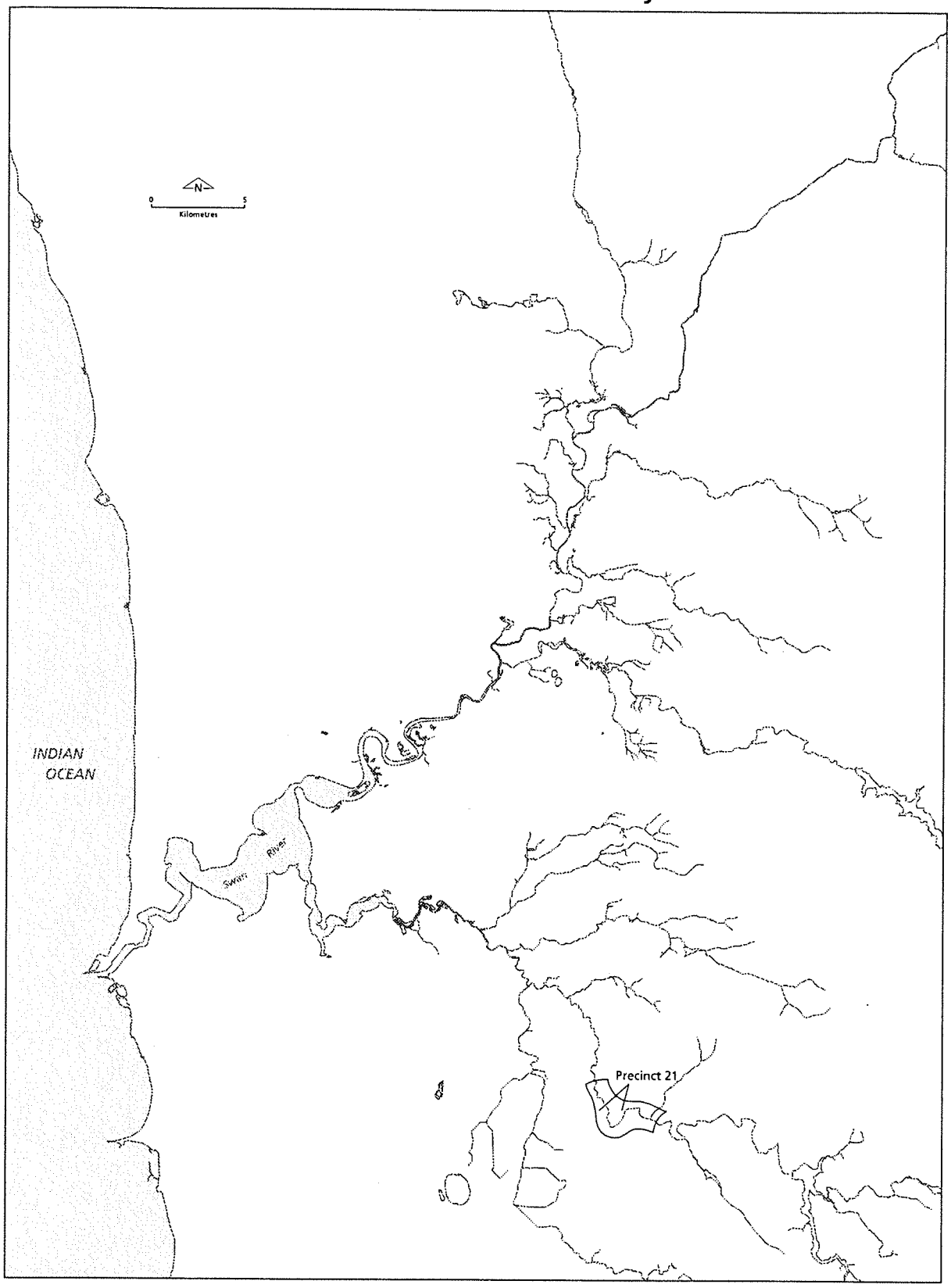
Swan River Trust.

Turner –Brookside footbridge, Canning River. Kelmscott.1996.

Swan River Trust.

Precinct 21

Canning River - Turner/Brookside Footbridge to Stony Brook Confluence



Summary

Canning River - Turner/Brookside Footbridge to Stony Brook Confluence

The Canning River irregularly meanders throughout the precinct. Upstream of Brookside crossing the river width becomes increasingly restricted by the surrounding bedrock. At most points along the river, the embankments are almost vertical before rounding off to a flat flood plain. The Darling Range provides a steep and dramatic backdrop to the riparian form, and is attractive for its steeply undulating topography and the sense of depth it evokes in the landscape.

Due to the narrowness of the river channel and embankment, the canopies of the trees often join over the waterform creating an enclosed river section. The riverine vegetation is dominated by flooded gum and paperbark. The understorey is made up of mainly weeds which in many places are so prolific that there is hardly any indigenous understorey species.

Several bridges within the area provide both vehicle and pedestrian river crossings. Most are low forms which are in line with the river valley embankments. The most unattractive crossing is the Bernard Street Footbridge which is covered in graffiti and surrounded by an abundance of weeds, including several bamboo stands. At Martin Road, there is an informal crossing constructed with two wooden logs. This is rather attractive due to its weathered form and the surrounding riparian vegetation which forms a canopy over the waterform.

The precinct is becoming increasingly residential as many rural properties are being redeveloped as suburban blocks. The remaining attractive small orchards and grazing paddocks give the river landscape a rural identity. There are several historical features along the river foreshore in the area including St Mary in the Valley Cemetery. Newer landscape features are the Kelmscott shopping precinct and the local primary schools.

Biophysical Processes

Geological Processes

The dominant geological formation at the downstream section of the precinct is the Guildford Formation. The formation was formed in the Quaternary and is identified as being of predominantly fluvial origin and consisting of sandy clays to clayey sands as well as including other alluvium and colluvium. The Yoganup Formation is the second Quaternary formation in the area. It is characterised as being pockets of conglomerate overlain by a unit of sand containing beds of clay. It occurs along ancient shorelines at the foot of the present Darling Scarp and is made of up sands and some heavy minerals.

The Proterozoic dated Cardup Group occurs sporadically south of Maddington and is present at Kelmscott. It is weakly metamorphosed and consists of conglomerate sandstone, siltstone and shale which was laid down in a continental shelf environment.

Archaean migmatites are present in the upstream section of this precinct. The geological unit consists of mixed rocks comprising an earlier gneissic or metasedimentary portion and the later granite component. In this section, the migmatite consists mainly of amphibolite streaks. The Darling Fault line cuts through the area in a north south direction.

The Swan Association soils occur on the downstream section of the scarp. They consist of red podsolic soils and undifferentiated alluvial soils. Part of the Darling Scarp shallow red and yellow earths and rock outcrop occur at Kelmscott and upstream. On either side of the Canning River banks, the soil is identified as being the Forrestfield Association which is the gravelly and sandy soils of the Ridge Hill Shelf.

Topography

The precinct is part of the Helena Valley geomorphic unit. It is characterised by deeply incised valleys with rocky steep slopes. East of the river, the topography increases quickly to the Roleystone hills and is identified as being the Ridge Hill Shelf geomorphic unit. The Ridge Hill Shelf is a narrow strip along the foothills of the Darling Scarp and its western line lies near the Darling Fault. It slopes gently westward and is dissected by the Canning River and tributary streams and forms a shallow river valley.

Hydrological Processes

Water features

The Canning River takes a relatively straight channel pattern as it cuts through the areas of low topography from Roleystone to Kelmscott. Downstream of Kelmscott, the river takes the form of irregular meanders and the channel width becomes increasingly irregular due to the lower gradient of the river channel. The river is located in a shallow channel and the flood plain is relatively narrow. The embankments are moderate to steep sloped and in parts the channel braids. Downstream of Bernard Street, an island has formed in the river due to the deposition of fine alluvial sediments. There are several shallow tributary creeks which drain from the surrounding land and confluence with the Canning River. The largest in the area is Stony Brook.

Bathymetry

The channel is on average less than one metre with an embankment of up to 2 metres. In most parts there is a flat flood plain before the topography increases in gradient.

Flooding

Seasonal inundation of the flood plain occurs during periods of high water, however the area is well drained and the land is rarely waterlogged for long periods. The floodway is quite narrow upstream, however from Brookton Highway to Orlando Street it broadens markedly, often to approximately 100 metres.

Erosion and Accretion

There are some points of minor bank erosion on the meander bends and as the river cuts around higher land. An example is the exposed roots of the exotic elm trees at Sereagio Park.

Vegetation Communities

Native

Darling Scarp Complex

The indigenous flora of this precinct is classified as being as part of the Darling Scarp Complex (DCE, 1980). The vegetation ranges from open woodland to lichens according to the depth of the soils. Woodland flora includes wandoo *(Eucalyptus wandoo)* with Darling Range ghost gum *(Eucalyptus laelia)* and

marri *(Eucalyptus calophylla)*. The various communities which make up this complex are described below.

***Eucalyptus-Melaleuca* community**

All the riverine vegetation is of the flooded gum *(Eucalyptus rudis)* and swamp paperbark *(Melaleuca rhaphiophylla)* low forest and occupies the entire floodway. The understorey mainly consists of weeds although some relic natives persist such as variable leafed grevillea *(Grevillea diversifolia)*. The exotic shrub *(Astartea fasicularis)* and the native coojong *(Acacia saligna)* which is not indigenous to the area are scattered throughout the area. As the river meanders near Roberts Road, the flooded gum-paperbark complex continues with *Astartea fasicularis* understorey.

***Eucalyptus* community**

On the higher banks, marri *(Eucalyptus calophylla)* is present in the complex with the occasional moonah *(Melaleuca priessiana)*. In the marri areas, the understorey includes prickly moses *(Acacia pullcella)* and blackboy *(Xanthorrhoea preissii)*. Upstream of Bernard St to Brookton Highway, native understorey species are quite common, however east of Brookton Highway, weeds are particularly prolific. Between the crossing of Brookton Highway and Stony Brook, jarrah *(Eucalyptus marginata)* and marri *(Eucalyptus calophylla)* cover the hillsides. The understorey is less disturbed compared with the river complex and there is an abundance of blackboy *(Xanthorrhoea preissii)* and buttercup *(Hibbertia* sp*)*. Wandoo *(Eucalyptus wandoo)* and the Darling Range ghost gum *(Eucalyptus laeliae)* are found on the shallower gravelly soils.

Exotic

Exotic species include the giant reed *(*Arundo donax)*, castor oil bush *(*Ricinus communis)*, edible fig *(*Ficus carica)*, blackberry *(*Rubus* sp*)*, blue periwinkle *(*Vinca major)*, Japanese honeysuckle *(*Lonicera japonica)*, bridal creeper *(*Myrsiphyllum asparagoides)* and fountain grass *(*Pennisetum setaceum)*. Also willow tree *(*Salix* sp*)*, pampas grass *(*Cortaderia selloana)*, cape lilac *(*Melia azedarach)*, morning glory creeper *(*Ipomea indica)*, poplar trees *(*Poplus* sp*)*, veldt grass *(*Ehrharta calycina)*, bamboo *(*Bambusa sp)* and coral tree *(*Erythrina caffra)* are present. Blackberry *(*Rubus* sp*)* is a serious problem and in places almost covers the entire river channel such as upstream of Brookton Highway crossing. Several trees such as jacaranda *(*Jacaranda minosifolia)* and sugar gum *(*Eucalyptus cadocalyx)* have been planted.

Historical Land use and Resulting Environmental Changes

The town site of Kelmscott was chosen by a party lead by Governor Sir James Stirling in November 1829 and on the 6 July 1829 the new town was proclaimed by the Governor. Kelmscott was built as a barracks for the 63rd Regiment and the first building was their wattle and daub barracks on the eastern bank of the river (Fletcher, 1994). The regiment was established in the town to allay the fears of the settlers of being attacked by the local Aboriginal people. The settlers along the Canning River had been attacked on several occasions by the Nyungar who were defending their traditional lands. The officer in charge was Captain Theophilus Ellis who later died in the Battle of Pinjarra.

The town site was on the road, or sandy track, which lead to the town of Albany. The first road passed through the town of Roleystone, however in 1836 a new road was surveyed from Kelmscott past Neerigen Brook and is now the path of Albany Highway (Fletcher, 1994).

By 1893 the railway line from Perth to Bunbury had been officially opened which encouraged the growth of the area. The products of the region such as fruit and timber were easily exported from the area. The Armadale town site quickly overtook Kelmscott as the regional centre due to the rapid development of residential, commercial and civic buildings around the Armadale town centre and the Fremantle and Armadale railway junction.

Early settlers in the area included Thomas Buckingham who established a farm adjacent to Stony Brook in the 1860s (McDonald and Cooper, 1988). Buckingham established a timber mill on the property in the 1890s and timber was cleared from the surrounding areas to meet the high demand for timber during this boom construction period.

Many areas of Kelmscott were cleared for orchards

PRECINCT 21

Significant Land Use Features

N

100 0 200 400

Metres

BROOKSIDE AVE

TURNER PL

CLIFTON

Clifton Hills Primary School

Kelmscott Plaza

Fancote Park

Frye Park

GILWELL AVE

ST

Kelmscott Village

MARTIN ST

CANNING MILLS RD

Canning River

Lloyd Hughes Park

St Marys

CHURCH ST

Kelmscott Primary School

ORLANDO ST

Rushton Park

MARMION ST

Kelmscott Aquatic Centre

Tennis Courts

Kelmscott Caravan Park

AVE

ALBANY HWY

RAILWAY

Good Shepherd Primary School

RD

ROBERTS ST

BERNARD ST

footbridge

ARMSTRONG RD

HWY

Recreation Reserve

Water Corporation

Pipeline Reserve

BUCKINGHAM RD

MOUNT ST

Sereagio Park

Stony Brook

HAMERSLEY ST

BROOKTON HWY

PRECINCT 21

Sites of Significance

N

100 0 200 400

Metres

Goolamrup Sites of Nyungar Significance

• Barracks Other Australian Community Significance

Canning

Site of Barracks

• Site of first house in Kelmscott

Original St Marys in the valley

Goolamrup area

• Site of Kelmscott "Swimming Pool"

Site of Kelmscott Showgrounds

• Site of Buckingham Water Mill "Poplars"

Stony Brook

River

• Site of the Nissen Hut camps

BROOKTON

AVE

RAILWAY

ALBANY HWY

HWY

after the 1840s. The rich soil and unlimited availability of water from the Canning River made this location attractive for growers. Since the construction of the Canning Dam water supplies have been reduced in this area. Roleystone was opened up by Peet and Co in 1904 and was promoted as a fertile valley, ideal for horticulture and market gardens (Fletcher, 1994). Fruits and vegetables produced were of high quality and these were exhibited at the Kelmscott Showgrounds which is now known as Rushton Park.

During and after World War II, thousands of immigrants arrived in Australia. Along the Canning River on River Road and Marmion Street two Nissen hut camps were constructed to house people from mainly middle and eastern Europe. In addition, from 1948 a large number of Dutch migrants settled in the area (Fletcher, 1994).

Present Land Use and Social Patterns

The land along the main highways has become increasingly residential particularly from the mid 1965s onwards. Subdivision of rural properties for small residential blocks has dramatically changed the landscape, however there are several properties particularly in the Buckingham Road area which are quite large and used for grazing while smaller rural properties occur down stream. The subdivisions from the 1970s include the Kingsley, Westfield Park and Clifton Hills estates.

Kelmscott Primary School is located on the river foreshore adjacent to the Orlando Street crossing. The school faces onto the river and the oval at Rushton Park is an attractive recreation area.

St Mary in the Valley church and cemetery were established 1871. The original church was demolished in the early 1960s, however the new church and the pioneer grave site are important features on the river banks, giving the area local identity and a link with its history.

There is a ribbon of commercial premises along Albany Highway and the main complexes are the Kelmscott Village Shopping Centre opened in 1969 and the newer Kelmscott Plaza Shopping Centre. Sereagio Park Reception Centre is a notable feature on the Canning River. Adjacent to the park, is the WAWA pipeline reserve which has a silver water pipe crossing the river at this point.

Recreation nodes

Fancote Park is located behind Kelmscott Plaza and a notable feature of the park is a small castle/folly which has been constructed out of red rocks and cement. There is also other play equipment in the park and there has been a scattering of trees planted on the flat lawn area.

Rushton Park was originally the Kelmscott Showground. The park is mainly used as an oval by the local primary schools. A wooden hall was built in 1892 to cater for the local agricultural society meetings, however this was demolished in the mid 1960s and replaced with a larger hall which is present today. Adjoining Rushton Park is Kelmscott Reserve which is a picnic spot on the river banks and it is located in front of the Kelmscott Pool. The reserve has several barbecues. The Kelmscott Pool was constructed in 1957. The one-third size Olympic pool was the first to be constructed by a metropolitan municipal authority.

Adjacent to the parkland is the Kelmscott Caravan Park which has mainly permanent residents. Frye Park has basketball courts and other formal sport facilities and is adjacent to the Clifton Hills Primary School. The Bernard St Reserve has a footbridge and a fringe of riparian vegetation.

Public access

The Canning River can be crossed at Brookside Avenue Footbridge, Gilwell Avenue, Orlando Street, Brookton Highway and Agostino Road. There are two pedestrian crossings which are the Brookside Avenue Footbridge and the Bernard St Footbridge.

Sites of Nyungar & Wider Australian Community Significance

Nyungar significance

The area of Kelmscott was known to Nyungars as *Goolamrup*. The Canning River is a significant element in the landscape for Nyungar, although there

are no specific sites of significance identified within this area (O'Conner, 1986).

Other significance

The name 'Kelmscott' was chosen by Stirling as a tribute to the birth place in England of Archdeacon Thomas Scott. Scott was an Anglican cleric who having been delayed for some months at Fremantle while his ship was being repaired spent his time establishing the Anglican Church in the Swan River Settlement (Fletcher, 1994).

There is a historic marker to indicate the site of the first house in Kelmscott (1830) occupied by Henry Martin. An old wooden bridge near Martin Road takes the form of two logs which have been weathered to smooth forms by the river constantly running over the wood.

Saint Mary's Church and graveyard 1871 is on River Road on the western bank of the river. The original St Mary in the Valley Anglican Church was built by Thomas Buckingham (Jnr) in 1871 and he was the first to be married in the church and is also buried in the graveyard.

On the corner of Clifton and Martin Streets the 63rd Regimental Barracks was established in 1831 on the eastern bank of the Canning River.

On Orlando Street, Kelmscott, there stood a turn of the century old goal building which was demolished in 1977.

The Rushton Reserve was the original Kelmscott Showgrounds. The Canning River was originally deep enough at this section to be used as the local pool and was refereed to as the 'Kelmscott Pool'.

The original Kelmscott School was opened in 1891 and the original building was demolished in the 1960s.

In the 1950s Nissen huts were located on River Road (now Brookton Highway, Kelmscott) for migrants. The huts were often home to north and middle European migrants for up to five years.

The power saw mill established by Thomas Buckingham in 1886 was located on the corner of the Brookton Highway and Mount Street. The mill was on the 'Poplars' property owned by Buckingham and a historic marker is present.

A contour channel was constructed between Kelmscott and Gosnells. The aqueduct carried water from the Canning Dam to the metropolitan area from the 1930s and continued to be used for about thirty years.

Conservation Areas

System 6

M75 Upper Canning and Southern Rivers

The recommended area comprises the Canning River and its fringes from Nicholson Road to the boundary of the State Forest, together with those parts of the Southern and Wungong Rivers within the City of Gosnells. Much of the area is reserved for Parks and Recreation under the Metropolitan Region Scheme. The river is well fringed with flooded gums and paperbark although the ground flora has been almost eliminated by grazing and clearing. The area is significant for its open space of regional significance and its proximity to Perth's residential areas. The recommendations include encouraging the growth and regeneration of flora and fauna and preventing vehicular access while allowing low impact access to the river.

Landscape Description

Precinct Description

Waterform and natural riparian zone

The Canning River irregularly meanders throughout the precinct. Upstream of Brookside crossing the river width becomes increasingly restricted by the surrounding bedrock. From Brookside Avenue to Orlando Street the embankments are quite vertical before rounding off to a flat flood plain and narrow river channel. The flood plain in places is quite wide and covered with riparian vegetation. Upstream of Orlando Street, the river takes a relatively straight channel pattern as it cuts through the areas of relatively low topography from Kelmscott to Roleystone. At this section, the embankments are moderate to steep sloped and the channel width is restricted by the surrounding geology. Downstream of Bernard Street, the river channel has braided forming a central island which is vegetated. Upstream near Stony Brook the river channel is relatively narrow and often blocked by weed species, such as pampas grass and bamboo. There are several tributaries that drain the surrounding landscape and one of the larger channels is Stony Brook. The brook is intermittent and is a shallow gully.

Due to the narrowness of the river channel, the canopies of the fringing trees meet over the river enclosing the channel. The understorey is mainly weeds and often the creepers smother the tree branches and river banks. From most sections of this precinct, the waterform viewscape is quite broad, due to the valley shaped topography and the limited fringing vegetation.

Landform

The downstream section of the precinct is relatively flat and gently undulating compared to the deeply incised valleys with rocky steep slopes of the upstream section of the river course. The Ridge Hill Shelf slopes westward and is dissected by the Canning River and tributary streams which form a shallow river valley. The landform is particularly attractive around Armstrong Road, where the Darling Scarp forms a high undulating hillside with the river valley at the base of the hills. The height and size of the hillsides give a sense of depth and provide an interesting complex form to the river landscape.

Vegetation

Flooded gum and paperbark low forest fringes the floodway of the Canning River. The understorey mainly consists of weeds although some relic natives persist. In areas, such as Orlando Street Bridge, the river is full of weeds and exotic trees such as jacaranda and giant reed. The river channel is often blocked by emergent weeds, such as bamboo. In several places, the floodway has been mowed to create a lawn for riverside parklands. The land around the river has mostly been cleared over time and some trees have been retained for aesthetic purposes around houses, while others remain in pasture land, such as along Roberts Road. On the topographically higher land marri and jarrah woodland remains uncleared. This provides a deep grey green background to the river valley. The pastured land and undulating hills are particularly reminiscent of a European landscape.

Riparian land use

Adjacent to Gilwell Avenue is Fancote Park, which acts as a barrier of open space between the river and the back of Kelmscott Plaza. The parkland is mainly cleared of its natural vegetation, however a few planted trees and a remnant fringing vegetation community make the flat parkland more aesthetically pleasing. One of the most attractive features of the park is the Darling Ranges which act as a backdrop to the park and provide an interesting landform against the flat lawned park.

There are two wooden logs across the river at Martin Street, which have become weathered by the water. They provide an informal crossing walkers and mountain bikers. They are a rather attractive feature as they cause ripples in the water and provide a visual link between the two banks.

Rushton Park and the adjoining Kelmscott Reserve are important public foreshore access spots within the town of Kelmscott. They provide pleasant recreational locations due to the remnant fringing vegetation and the valley form of the river flood plains. The park has several buildings including a pale brick simply designed hall, several sheds pool and change rooms. There are several old orchards within the park lawn. The river reserve is within the river valley. The reserve has several barbecue facilities beneath the shade of the flooded gums.

The Orlando Street Bridge is a low form bridge which is in line with the edge of the river valley embankments. It has metal balustrades and a narrow superstructure. Adjacent to the bridge is a silver water pipeline which has a mixture of wooden and cement struts and the structure has been graffitied. The bridge and pipeline give the river reserve an enclave effect by severing the river from downstream and emphasising the height of the river valley embankments.

The Bernard Street Footbridge is adjacent to a reserve of uncleared wandoo and marri open woodland. There are several native understorey species on the higher topographic ground, while adjacent to the river weeds flourish. The bridge is made of several steel plates and has a pipeline adjacent to the structure. The bridge and pipeline covered with graffiti and with the abundance of bamboo, the area is aesthetically unattractive.

Stony Brook Bridge allows Brookton Highway to cross the stream. It has a concrete superstructure with a white painted traffic barrier and vertical concrete abutments. The bridge allows access to private properties and is hidden by surrounding vegetation.

Land use

The precinct is becoming increasingly urban residential land. An example of the increase in urban development the Riverside Villas which have been constructed by a single developer for individual purchase. The houses are uniform in design and are constructed in pale limestone coloured brick. Along Clifton and Marmion Streets, the houses range from small single residential blocks to orchard properties. The homes are built mainly in the 1970s styles although several are older properties. South of Orlando Street, there are several very attractive orchards, due to their location on an undulating landform and abundance of fruit trees. They have several old weathered sheds and older style residential properties which give the landscape a rural and historical identity.

Kelmscott Village has a large carpark and the box shaped complex is painted red and white on the outside. The building is rather unattractive and there are several graffitied walls.

Kelmscott Primary School is in an attractive location with the play equipment adjacent to the river embankment. The school itself is constructed of red brick and has had several additions over the years resulting in different building styles. Further upstream there are a mixture of old and new houses. The recently constructed Good Shepherd Primary School is located on a hill at Marmion Street and is built in a 'Federation' style.

The properties become large along Roberts Road. Many front onto the river which makes pedestrian access difficult. Many properties have a few sheep or horses grazing within paddocks while others have small orchards. There is a plant nursery on Roberts Road.

Sereagio Park is an attractive two storey building which is a combination of the Victorian, Georgian and Regency styles. The garden is entirely transformist with the whole ground transformed into an English country estate by planting exotic flora in geometric patterns. The section of river which runs adjacent to the homestead has been converted to an English stream, with elm trees planted in two rows on the banks of the river. A wooden bridge crosses the river and has a creeper growing over the hand rails. The result is a picture scene straight from England. Surrounding the estate is a citrus orchard which is one of the few remaining orchards in the area. The orchard is an attractive rural land use which gives the area an attractive landscape identity.

PRECINCT 21

Dominant Landscape Characters and Significant Viewscapes

N

100 0 200 400

Metres

LANDSCAPE CHARACTERS

- Rural
- Suburban
- Natural
- Recreational
- Significant Viewscapes

PRECINCT 20

PRECINCT 22

Canning

River

Stony

Brook

ALBANY AVE

RAILWAY

HWY

HWY

BROOKTON

Dominant Landscape Character

The dominant landscape character along the downstream section of this precinct is suburban. The suburban area is made up a mixture of housing styles and ages. Increasingly, subdivisions are occurring and there are several single storey duplexes adjacent to the river. In addition many of the older houses are being replaced with more modern houses. In general, the house designs are modest and the gardens are eclectic. The Kelmscott retail area has a large carpark and the ribbon style shopping complex run parallel to Albany Highway. They are not particularly attractive elements in the suburban landscape due to conspicuous advertising and signs.

Along this section of the Canning River, there is a narrow but almost continuous ribbon of riparian vegetation. Soft weedy plants have invaded much of the understorey, however melaleucas and flooded gums form an attractive line of trees.

There are two pockets of recreational landscapes along this section of the river. These play an important part in linking the fringing riparian vegetation to the surrounding urban areas. They act as a section of open space which minimises the contrast between the two landscape elements.

For much of the upper section of the precinct, the landscape is predominantly rural. Remnant orchards and market gardens are mixed in with hobby farms and horse agistments. The rural properties are relatively small scale and they appear not to be supporting significant rural activities. The undulating landform, pastures and ribbon of natural vegetation, is indicative of an English rural landscape and what is considered attractive according to European landscape values.

Significant Viewscapes

From many locations of the upper section of this precinct there are several attractive viewscapes of the undulating hills and the Canning River running through the valleys. The indigenous vegetation has been restricted to a ribbon of riparian vegetation along the stream line. The rest of the land has been cleared for pasture and orchards, and residential buildings dot the landscape. The result is an attractive rural landscape on a complex landform.

Conforming and Non Conforming Elements in the Landscape

The orchards are a particularly attractive landscape feature as they are quite prominent in the rural landscape, due to their linear plantings and pruned forms. The wide open pastures are also attractive on the undulating landform.

The many abundant weeds dominate the understorey of the remnant riparian vegetation and detract from the naturalness of the vegetation corridor. Several bamboo stands block the river channel at the upper section of the precinct.

Several bridges and water pipes are graffitied which are localised detracting elements in the environment.

Recommendations for Maintenance and Enhancement of the Present Landscape Character

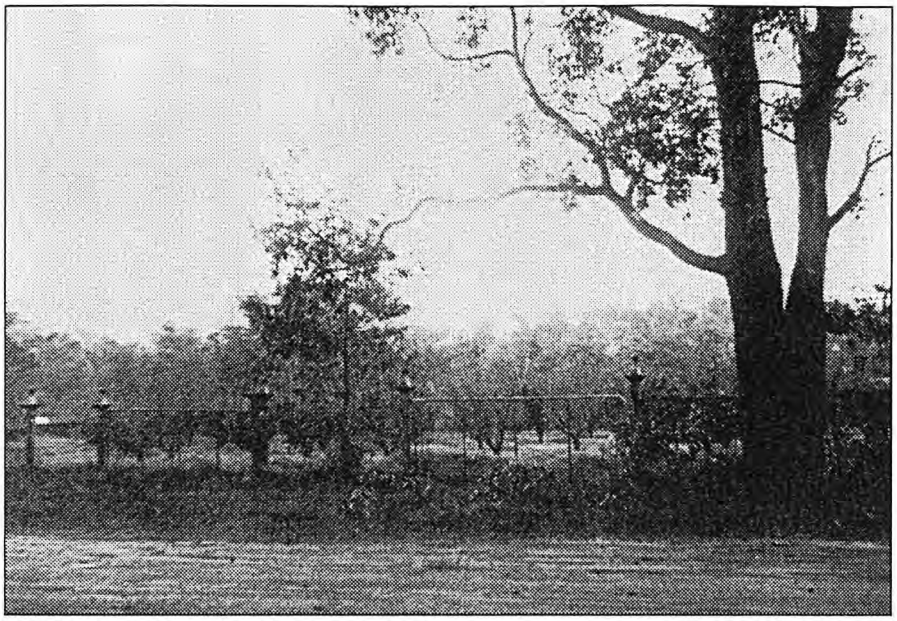
There is the opportunity to remove weeds from remnant riparian vegetation which detract from the natural landscape character. Several areas are overrun with weeds and replanting could enhance the environmental value and aesthetics.

Opportunity to consider the rural landscape value and ensure that that the elements such as large block sizes and open fields are retained.

It is also important that those developments built on the steep slopes take into consideration the landform and are appropriately designed to have minimal impact on the landscape.

Precinct Specific References

Fletcher, K. 1994. Spanning the Years 1894-1994. Celebrating 100 years of Local Government in Armadale-Kelmscott.

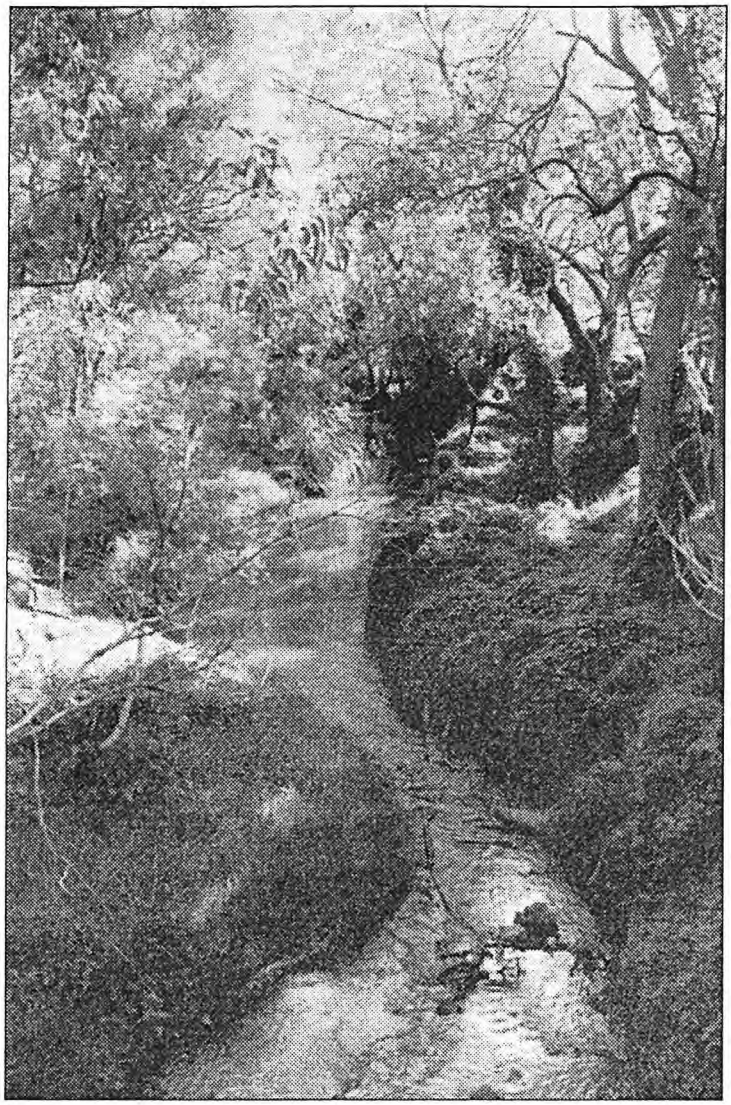


View from River Road, Kelmscott. 1930.

Swan River Trust.

View from Mount Street Footbridge, Kelmscott, 1997.

Swan River Trust.

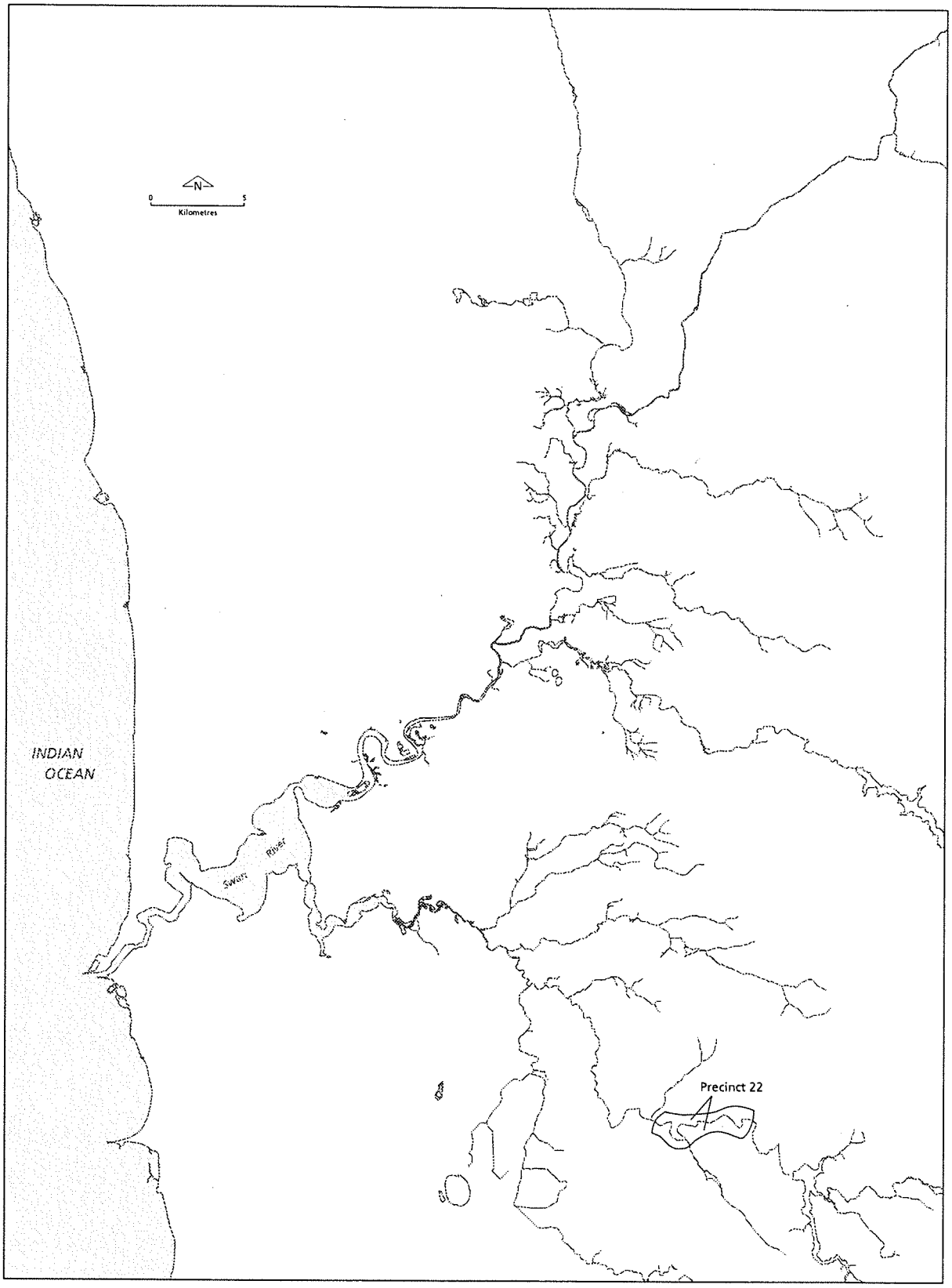


Canning River from Orlando Street Bridge, Kelmscott. 1997.

Swan River Trust.

Precinct 22

Canning River - Stony Brook Confluence to Stinton Creek Confluence



Summary

Canning River - Stony Brook Confluence to Stinton Creek Confluence

The Canning River takes a meandering form through the steeply sloping river valleys of the Darling Range. The river is quite narrow and shallow and in several places runs over exposed granite rocks. Several tributaries join the Canning River at this point.

They are typically narrow and intermittent. The riparian vegetation is a dense mixture of native and exotic understorey species. The fringing overstorey community consists of the attractive paperbark and flooded gum communities, while on the hillside the complex gives way to the marri and jarrah woodland. Much of the vegetation has been cleared for grazing and the vegetation is now considered as pastured woodland. The Darling Range forms a dramatic backdrop to the Canning River due to its height and steeply sloping hillsides.

There is little immediate riparian land use apart from service infrastructure and several bridges over the river. The precinct is a mixture of residential and rural land uses. There is a low density scattering of residential properties along the river. Many properties are used for rural land uses such as grazing, orchard growing and garden nurseries.

Biophysical Processes

Geological Processes

Archaean migmatites which are mixed rocks made up of gneissic and granite components are prominent geological formations in the precinct. In addition, sections of pure gneisses occur and are believed to have been made from sediments and deformed granite. The gneiss is made up of quartz, feldspar and biotite. Upstream of Churchman Brook the mixture of gneisses give way to granite which varies in composition and texture. Thin sheets of dolerite occur abundantly in the granite and gneiss sheets.

The soil along the Canning River channel is identified as being part of the Swan Soil Association and consists of red podsolic and undifferentiated alluvial soils. On either side of the strip of Swan Soil, the soil changes to Forrestfield Association which is gravelly and sandy.

Topography

The area is part of the Helena Valley landform which is deeply incised valleys with steep rocky slopes. The scarp ridge is evident adjacent to the river valley. The gradient of the river valley is quite steep and in many sections, such as east of Heritage Road, there is no significant decrease of gradient before the river channel. In contrast, at Wymond Road, the river valley takes a gentler gradient after the scarp ridge to the river channel and embankment.

Hydrological Processes

Water features

The Canning River channel takes a relatively sinuous meander form as it cuts through the river valley between the topographically high land. The river flows through a palaeo-terrace which is made of several shallow palaeo channels and some shallow contemporary overbank sections which are not regularly flooded. Between Butcher and Stocker Roads there are a few small pools and associated riffles caused by granite boulders outcropping in the stream. Upstream to Araluen, the river becomes narrow with wide pools. There are a number of small waterfalls as the river passes over exposed granite downstream of Thompson Road Bridge. In places, the granite/ dolerite bedrock obviously restricts the channel width and is the dominant reason for the series of pools and riffles in the area.

A number of steep freshwater seepage or creek lines entering the river become obvious on the southern side of the river between Thompson and Bristol Roads. These drainage lines arise from springs at the base of the scarp ridge adjacent to the river. The larger tributaries are Stinton Creek, Slab Gully, Churchman Brook and Stony Brook all of which are intermittent. At the mouths of these tributaries sediment bars have formed on which riparian vegetation has established itself. Older bars are more heavily vegetated.

Bathymetry

The river channel is mainly shallow and less than a metre in most places, however the river embankment is usually several metres deep and form a river valley. There are a few channel pools which are also very shallow mainly due to the additional sedimentary deposition since the construction of the Canning Weir. The pools are typically much broader than the main river channel.

Flooding

There is no area which has significant inundation due to the relatively steep topography and river embankment. Evidence of palaeo flood plains suggests that since the Canning Dam was constructed that the flood plain level has been reduced. New lower flood plains are evident in this precinct.

Erosion and accretion

There are no notable areas of erosion along this section of the river channel, however the surrounding steep topography is susceptible to erosion once the vegetation is disturbed or removed.

Vegetation Communities

Native

Helena Complex

Along the river valley for the most part of this precinct the Helena Complex dominates. The vegetation ranges from open forest of jarrah *(Eucalyptus marginata)*, marri *(Eucalyptus calophylla)* and Swan River blackbutt *(Eucalyptus patens)* through to heath and herbland to lichens on granite rock. Other species may include pincushions *(Borya*

nitida), fuchsia grevillea *(Grevillea bipinnatifida),* oval leafed hakea *(Hakea elliptica),* wavy leafed hakea *(Hakea undulata),* Swan River blackbutt *(Eucalyptus patens)* and rock sheoak *(Allocasuarina huegeliana).*

Murray Complex

The Murray Complex is found at Roleystone and also upstream of the Canning Weir. The vegetation ranges from open forest of jarrah *(Eucalyptus marginata),* marri *(Eucalyptus calophylla)* with Swan River blackbutt *(Eucalyptus patens)* on the slopes, to fringing woodland of low open forest of flooded gum *(Eucalyptus rudis)* and swamp paperbark *(Melaleuca rhaphiophylla)* on the valley floors. Other species found include winged wattle *(Acacia alata),* swamp peppermint *(Agonis linearfolia),* swamp banksia *(Banksia littoralis),* winged stem damperia *(Damperia alata),* variable leafed grevillea *(Grevillea diversifolia)* and semaphore sedge *(Mesomelaena tetragonia).*

Dwellingup Complex

The Dwellingup Complex occurs on the higher land behind the Helena Complex, in areas such as the land between Churchman Brook and the Canning River confluence. It consists of open forest of jarrah *(Eucalyptus marginata)* and marri *(Eucalyptus calophylla).* Other vegetation which occurs in this complex includes hairy gland flower *(Adenanthos barbigerus),* bull banksia *(Banksia grandis),* sheoak *(Casuarina fraseriana),* prickly bitter pea *(Daviesia horrida),* York Road poison *(Gastrolobium calycinum),* sword sedge *(Leptosperma angustatum),* and snottygobble *(Persoonia longifolia).*

Yarragil Complex

The Yarragil Complex occurs near Slab Gully in this precinct. It consists of open forest of jarrah *(Eucalyptus marginata)* and marri *(Eucalyptus calophylla).* There is some marri and banksias scattered throughout the jarrah. In moist areas, moonah *(Melaleuca preissiana)* and swamp banksia *(Banksia littoralis)* are found. Other species include camphor myrtle *(Baekea camphorosmae),* dwarf casuarina *(Allocasurina humilis),* winged stem damperia *(Damperia alata),* native fuchsia *(Grevillea bipinnatifida),* and semaphore sedge *(Mesomelaena tetragona).*

Exotic

The significant weed species include giant reed *(*Arundo donax),* blackberry *(*Rubus* sp*),* bulrush *(*Typha orientalis),* watsonia *(*Watsonia bulbilifera)* dock *(*Rumex crispus)* wild oats *(*Avena fatua),* beared oats *(*Avena barbata)* and couch grass *(*Cynodon dactylon).* There are several examples of exotic trees being planted adjacent to the river channel on residential properties. Araluen Country Club has recently planted many exotic trees along the roads.

Historical Land Use and Resulting Environmental Changes

In 1924, a pipehead dam was built near Araluen, approximately 6 km downstream from the present Canning Dam (Department of Geography UWA, 1989). The present day Canning Dam occurs upstream from this precinct and was built between 1933-1940 due to growing demand for a major water reservoir. The dam has significantly reduced the maximum discharge of the Canning River below the weir. There are several indications of the previous much higher flow with wide palaeo channels and several highly polished boulders indicating that they had once been subject to continuous water flow. The dam has resulting in infilling of many of the original pools and riffles and the deposition of fine sands and silts in the channel.

A substantial town site was established at the Canning Dam construction site between 1933 and 1940 (Fletcher, 1994). The town consisted of small wooden cottages and a school for over a hundred children, of which there is little evidence today.

Orcharding began in 1893 in the Roleystone and Araluen areas (Fletcher, 1994). These included the Hart's orchard at Urch Road, Roleystone, Reeds orchard at Soldiers Road, Brookton Highway, and Thomas Price's property south of the Canning River. The Derry na Suray (valley of the vine) vineyard was located at the East Armadale and was a major wine producer for the State at the turn of the century.

PRECINCT 22

Significant Land Use Features

N

150 0 300 600

Metres

Stony Brook

URCH RD

GULLY RD

HOLDEN RD

Slab Gully

BROOKTON HWY

Stinton Creek

Araluen Park

pool

CROYDEN RD

BROOKTON HWY

Roleystone Theatre

retail

church

Roleystone Pool

THOMPSON RD

STOCKER RD

SOLDIERS RD

Canning River

weir

Araluen Young Australian Leauge Outing Camp

Mc Ness Bridge

McNESS DR

BRISTOL RD

BUTCHER RD

HERITAGE DR

OLD ALBANY LA

HERITAGE DR

Churchman Brook

Araluen Country Club

PRECINCT 22

Sites of Significance

N

150 0 300 600

Metres

• Flat Rock — Other Australian Community Significance

Site of Hart's Orchard

Brook

Stony

HOLDEN RD

Gully

Slab

BROOKTON HWY

Creek

Stinton

pool

CROYDEN RD

McNESS DR

BROOKTON HWY

Roleystone Pool

Flat Rock

Site of Roleystone "Drive In"

Site of Reeds Orchard

Cascades

Possible site of the "Rolling Stones"

River

Canning

Possible site of Canning River Ford

Old Albany Road

Churchman Brook

Present Land Use and Social Patterns

There is a mixture of rural and residential properties along this section of the Canning River. The residential properties tend to be on large bushland blocks and the houses display quite a range of architecture including modern organic, reminiscent Federation, post modern, as well as the typical single storey bungalow. Several small retail outlets occur at the junction of Croyden Road and Brookton Highway. Opposite is the Roleystone Theatre and a local church is also at this intersection. Many properties are used for rural purposes such as cattle grazing near Butcher Road. There are several orchards and other horticultural properties within the area, such as Brenton Rose farm on Croydon Road. One of the most notable developments is the residential section of the Araluen Country Club. A substantial section of the hillside has been cleared of trees and planted and the new roads lined with exotic species. Although several blocks have been purchased, at present there has been no residential construction.

There are two weirs downstream of Stinton Creek. They have been constructed on bedrock features and restrict the flow downstream in the summer months.

Recreation nodes

In the 1920s at the corner of Soldiers Road and Brookton Road (Highway) there was a popular picnic spot called Flat Rock. This is close to the present day Roleystone Pool and picnic area at the corner of Thompson and Colins Road. The pool was used by the Roleystone Swimming Club since, however the construction of the Canning Dam it has silted up greatly.

Araluen Park was developed by the Young Australia League as a holiday camp. It is noted for its splendid display of tulips in spring which began as a tradition in the 1930s, however was discontinued after World War II. The tradition of tulips being planted was re-established in 1991. The streams are a feature within the area. There are walkways, kiosk, restaurant and barbecue areas. A feature of the park is the 'Grove of the Unforgotten' which was planted with 88 cypress pines so as to make the outline of a lyre. The rose pergola was constructed using local stone in 1939 by a local Italian stonemason. The Young Australia League's Camp Simons is on the southern bank of the Canning River and has several sports areas.

Araluen Country Club is a 18 hole golf course open to the public. It has function centres as well as a highly maintained green.

Public access

Public access to the river is difficult due to private ownership of much of the land adjacent to the river reserve. The private properties have mainly been fenced and access to the reserve is difficult without crossing private land. The river is predominantly reserved for local recreation as Crown Reserve. Public access to the river is possible at Araluen Park and Roleystone Pool.

Sites of Nyungar & Wider Australian Community Significance

Nyungar significance

The Canning River is recognised as being of significance to Nyungars. There are no specific sites of significance identified in the area. However south of the Canning Dam there are several significant sites. Turtle Pool is associated with the Waugal. In addition, there are two pools fed by springs adjacent to Canning Dam which are also associated with the Waugal (WAWA, 1987).

Other significance

The Old Albany Road is the site of the original track to Albany. It passes several large granite boulders and it is probable that these were the 'rolling stones' after which Roleystone was named (Fletcher, 1994).

Flat Rock at the junction of Croyden Road was a popular picnic site and later was the site of the first 'drive in' in Western Australia (1956).

Canning River ford was built in the 1830s to divert water to surrounding orchards and farm lands and is located off Albany Road (Department of Geography UWA, 1989).

Wall Rock, Roleystone, is reputed to be one of the hideaways of Western Australia's infamous bushranger, Moondyne Joe (Fletcher, 1994).

Conservation Areas

System 6

M75 Upper Canning and Southern Rivers

The recommended area comprises the Canning River and its fringes from Nicholson Road to the boundary of the State Forest, together with those parts of the Southern and Wungong Rivers within the City of Gosnells. Much of the area is reserved for Parks and Recreation under the Metropolitan Region Scheme. The river is well fringed with flooded gums and paperbark although the ground flora has been almost eliminated by grazing and clearing. The area is significant for is open space of regional significance and its proximity to Perth's residential areas. The recommendations include to encourage the growth and regeneration of flora and fauna and preventing vehicular access while allowing low impact access to the river.

Landscape Description

Precinct Description

Waterform and natural riparian zone

The Canning River takes a meandering path through the steeply sloping river valley. The river is at most points quite narrow only being one or two metres wide. In several places, the river runs over exposed granite rocks. The bedrock in places obviously restricts the channel width and depth and the result is pool and riffle formations. The granite rocks in these formations are smooth and polished by the water. Several form attractive waterfalls in high flow periods. At the bases of these waterfalls the channel is typically deeper having been gouged by the flowing water. Roleystone Pool is a shallow basin which is filled by the winter rains and becomes very shallow in the summer months. The pool is surrounded by a mixture of indigenous and exotic vegetation, and by the nature of the steeply sloping surrounding valley is a sheltered and enclosed water body.

There are several tributaries entering the Canning River as well as the seepage lines created as the water from the surrounding areas is drained into the river. The major tributaries are Stinton Creek, Stony Brook, Slab Gully and Churchman Brook. Most of the tributaries are intermittent and for the most part of the year remain as a dry gully. As a result, the riparian vegetation of these tributaries are the jarrah-marri woodland species rather than more dampland species.

The riparian vegetation of the Canning River is a mixture of native and exotic understorey species. There are several emergent reeds within the river channel and small shrubs and paperbark trees often spread their branches right over the river channel. However at the broader pool areas there are rarely overhanging tree branches, rather the melaleuca and other riparian shrubs surround the water bodies. The marri and jarrah trees edge the river and are rather stunted and narrow trunked compared with other similar communities along the Swan and Canning Rivers.

Landform

The Canning River channel passes through the valleys of the Darling Range. The surrounding topography is a relatively steep gradient and it is only at the river valley base that the gradient becomes more gentle. Along Croydon Road, the hillside is particularly steep and due to the removal of much of the vegetation the morphology of the hillside can clearly be seen as dramatic and undulating slopes. It is one of the few areas of the Canning River where the flat Swan Coastal Plain cannot be viewed due to the relatively high hillsides surrounding the river. Downstream of Butcher Road the landform is comparatively gentle as the Canning River valley broadens and flattens between two topographically lower hillsides.

Vegetation

The hillside vegetation consists of a marri and jarrah open woodland. The woodland is an attractive complex with the dull rough barks of the jarrah and marri trees contrasting against the native understorey species which are often light and feathery. The understorey of this woodland consists of a mixture of indigenous and exotic species. Bushes, such as variable leave grevillea, are typical on the shallow soils and granite rock areas and give a bushy spreading appearance. Unfortunately, many sections of this precinct have been significantly disturbed by weed invasions and fires. The privately owned land is most often pastured woodland areas where the understorey has been replaced with grasses for grazing. South of Brenton Rose Farm, the fringing bushland has been recently burnt and weed communities are flourishing in the understorey. Residential properties often have several exotic plants in the gardens, however most have retained the native bushland.

Riparian land use

Most of the precinct has uncleared riparian vegetation and therefore the pipelines are hidden within the vegetation such as adjacent to Camp Simons and also between Croydon Road and Bristol Roads. The pipelines are silver and have minimal intrusion on the river landscape due to the often dense nature of the understorey and the undulating landform. In addition, there are two weirs constructed across the bedrock just downstream of Stinton Creek. These create small pools upstream of the weirs and in the summer months the river channel is almost dry at these points.

There are several bridges which cross the Canning River in this section. The bridge at Araluen is made from pine balustrades and rock and cement piles and due to its low form and building materials is an attractive landscape element. The Mc Ness Bridge has an unpainted metal balustrade with wooden

abutment. Although the bridge is the only man-made feature in the area apart from a well hidden private residential property, it does not appear as an intrusive feature on the riparian landscape, rather it adds a visual feature to the riverscape and allows the public to view the river channel. Other low form road bridges occur at Thompson Road, Soldiers Road and Stocker Road.

The Roleystone Pool is an attractive enclave which can be accessed by rock steps to a grassy picnic area. Unfortunately, much of the riparian vegetation has been invaded by weeds which detracts from the picnic area. The nature of the surrounding topography is all enclosing giving the pool a secluded and private character.

Land use

The precinct has a mixture of residential and rural land uses. The centre of Roleystone town occurs to the north of Brookton Highway and is away from the riparian landscape. At the junction of Croydon Road and Brookton Highway, there are several small shops and the Roleystone Theatre. Part of this service node has been built into land quarried out for the construction of the road and therefore has reduced impact on the landscape. Remnant vegetation also helps to link this node to the surrounding landscape. The precinct is characterised by very low density housing with most homes near the river on large bushland blocks. The houses are attractive as many have retained some indigenous flora which helps reduce the impact of the houses and gives the residential areas a link with the natural landscape. The wide variety of architecture makes for an interesting landscape, in particular the houses which have been constructed to complement the steeply sloping topography and surrounding bushland are attractive landscape elements.

The rural properties are used for a variety of land uses including orchards, grazing and horse agistments. Many of these properties have remnant bushland which is attractive and helps give these rural activities some link with the natural landscape features. The orchards appear green and lush compared with the native flora and their presence is an important local landscape element.

The Araluen Country Club entrance is at the base of a steep hill. The entrance has two neatly maintained residential properties adjacent to the Canning River. At this point the river embankment has been walled using granite rocks, which has turned the river into a garden water feature. The residential gardens are entirely transformist and consist of brightly coloured exotic flowers and trees. The Canning River has been walled at these properties and several small walls have been built across the river to create waterfall features. These properties stand out from the other riparian features as the indigenous landscape elements have been removed and altered to form a European landscape.

Camp Simons is a neat dormitory site for the Young Australia League. The camp consists of several buildings built over a period of time and the majority are constructed from cream brick with tile roofs. Within the grounds are several grassed areas and bituminised basketball courts. The location of the camp is within the river valley and as a consequence can only be viewed from the immediate area.

Araluen Park is an attractive recreational site and provides an ideal picnic spot for families. The park has a restaurant and more informal picnic areas as well as several large parking bays. The main parking bay is in a prominent position being in a valley floor and adjacent to Stinton Creek. The park has formal gardens consisting of many exotic trees and flowering plants. The style is quite formal which provides a sharp contrast to the surrounding bushland which away from the main recreational area has some attractive native understorey species. A waterfall and man-made pool are some of the features which attract tourists to the area. Several old cottages built by the Young Australia League have not been maintained and provide opportunities for renovation by the group. An attractive rock cottage adjacent to Stinton Creek has recently been renovated and is now a tourist shop.

PRECINCT 22

Dominant Landscape Characters and Significant Viewscapes

Stony Brook
HOLDEN RD
Slab Gully
BROOKTON HWY
Creek
Stinton
pool
BROOKTON HWY
CROYDEN RD
River
McNESS DR
Canning
Churchman Brook

N

150 0 300 600

Metres

LANDSCAPE CHARACTERS

- Rural
- Suburban
- Natural
- Recreational
- Significant Viewscapes

Dominant Landscape Character

The dominant landscape character for this precinct is rural. The land has been cleared for grazing pasture, nurseries and orchards. These activities are on the decline, and the rural landscape is being converted into suburban developments. The best example of this is the Araluen Country Club, where pasture land was redeveloped as an exclusive residential area and golf course. The rural lots are often hobby farms and have a mixture of land uses on the single property.

There are narrow ribbons and blocks of uncleared eucalyptus woodland. In general, where natural vegetation is retained, the landform and soil structure have not been suitable for rural development due to gravelly outcrops and steep slopes. The woodland has a relatively thick overstorey, however along the river streams, leafy weeds have encroached on the understorey. Weeds have also encroached on the woodlands in areas which are adjacent to pasturelands, and on Araluen Park.

The Araluen Park is a large landscape feature which has an eclectic collection of plants, and has had numerous paths and water features created on the property. The landscaping style is European.

Significant Viewscapes

There are several significant viewscapes at this precinct. From many locations on the hills, there are attractive views of the valleys, surrounding undulating landscape and mixed land uses. This precinct has some significant landscape viewscapes, as the river flows through the deeply incised Darling Ranges, and compared to the other precincts further downstream, the landform is complex and interesting to the viewer.

Conforming and Non Conforming Elements in the Landscape

The Canning River has several attractive pools and riffles, in this precinct. Unfortunately, many of the pools have filled with sediment over time, providing a less diverse river landscape as the river form becomes uniformly shallow.

The dramatic topography and remnant woodlands are important landscape elements for local identity. There is the opportunity to encourage land use which will enhance rather than detract from the landform and remnant vegetation.

The Araluen Country Club is at present a rather barren feature on the landscape. Most of the residential blocks have not been developed and the unconsolidated soils have been subject to erosion by the winter rains.

There are several sections of the Canning River in this precinct which have been walled or have had small weirs constructed. These detract from the natural form of the river and instead create a drain like impression.

The orchards and other rural land uses are important landscape element which are important in creating local identity.

Many of the residential buildings in this area have been designed to complement the site and use timber and earthy coloured materials.

Recommendations for maintenance and enhancement of the present landscape character

- Encourage the continuation of designing houses to complement the steeply sloping landform.
- Encourage the restoration of riparian areas with native vegetation and weed removal.
- Ensure that exotic species from local gardens and Araluen do not spread into the natural areas.
- Consider the importance of the rural landscape elements to the Canning River landscape and how this landscape can be retained with increasing development pressure.

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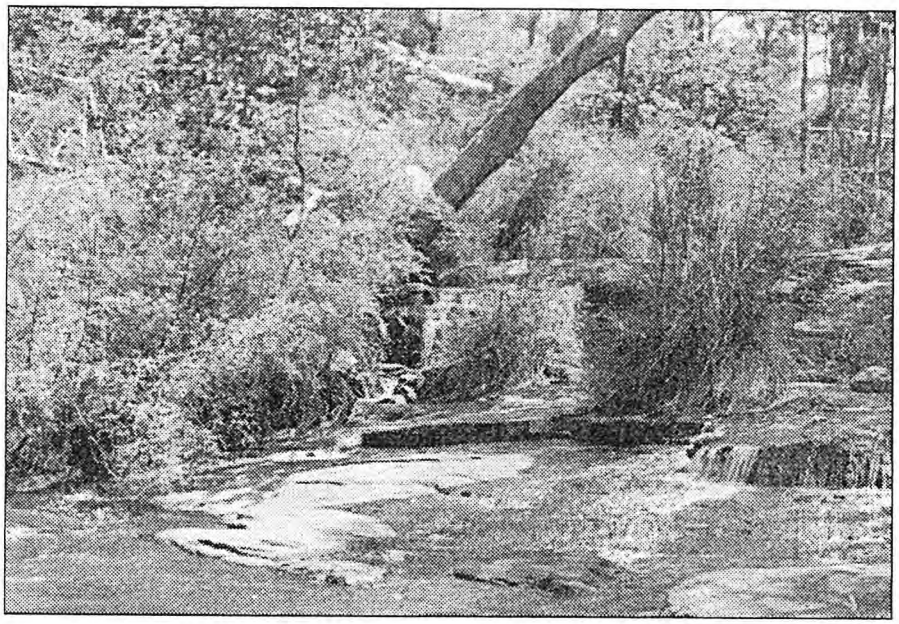

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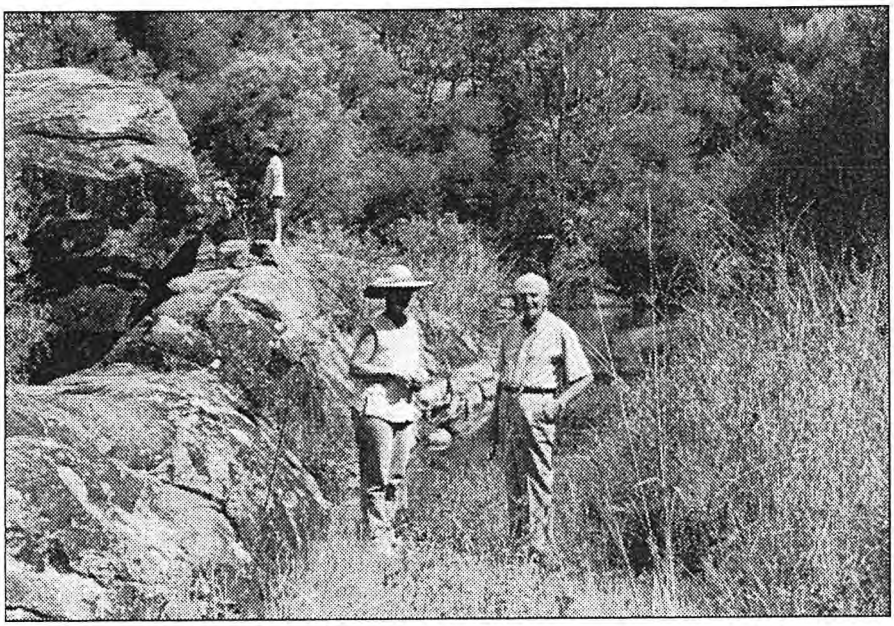

Canning River, Roleystone. 1995.

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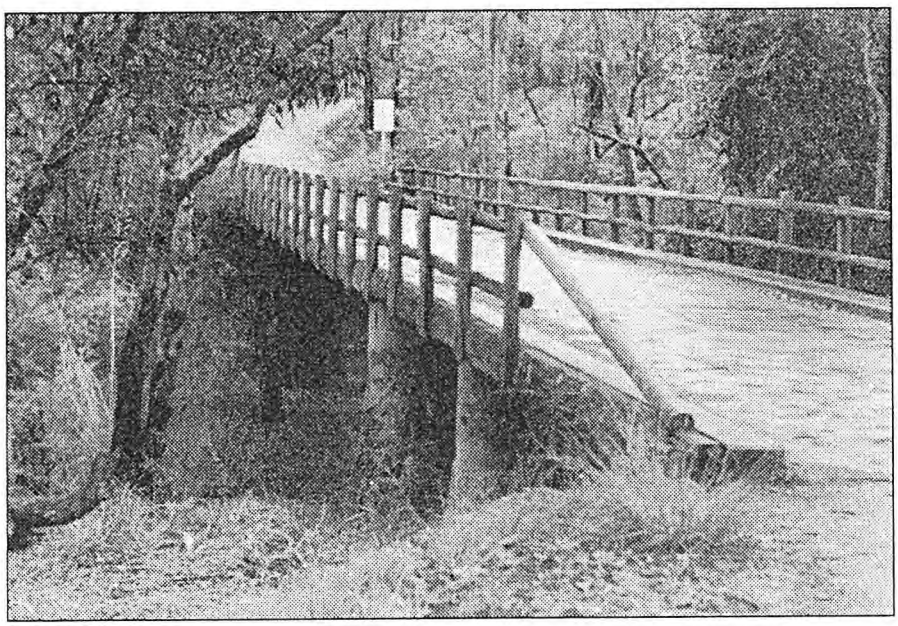

Stinton Creek near confluence with Canning River. 1995.

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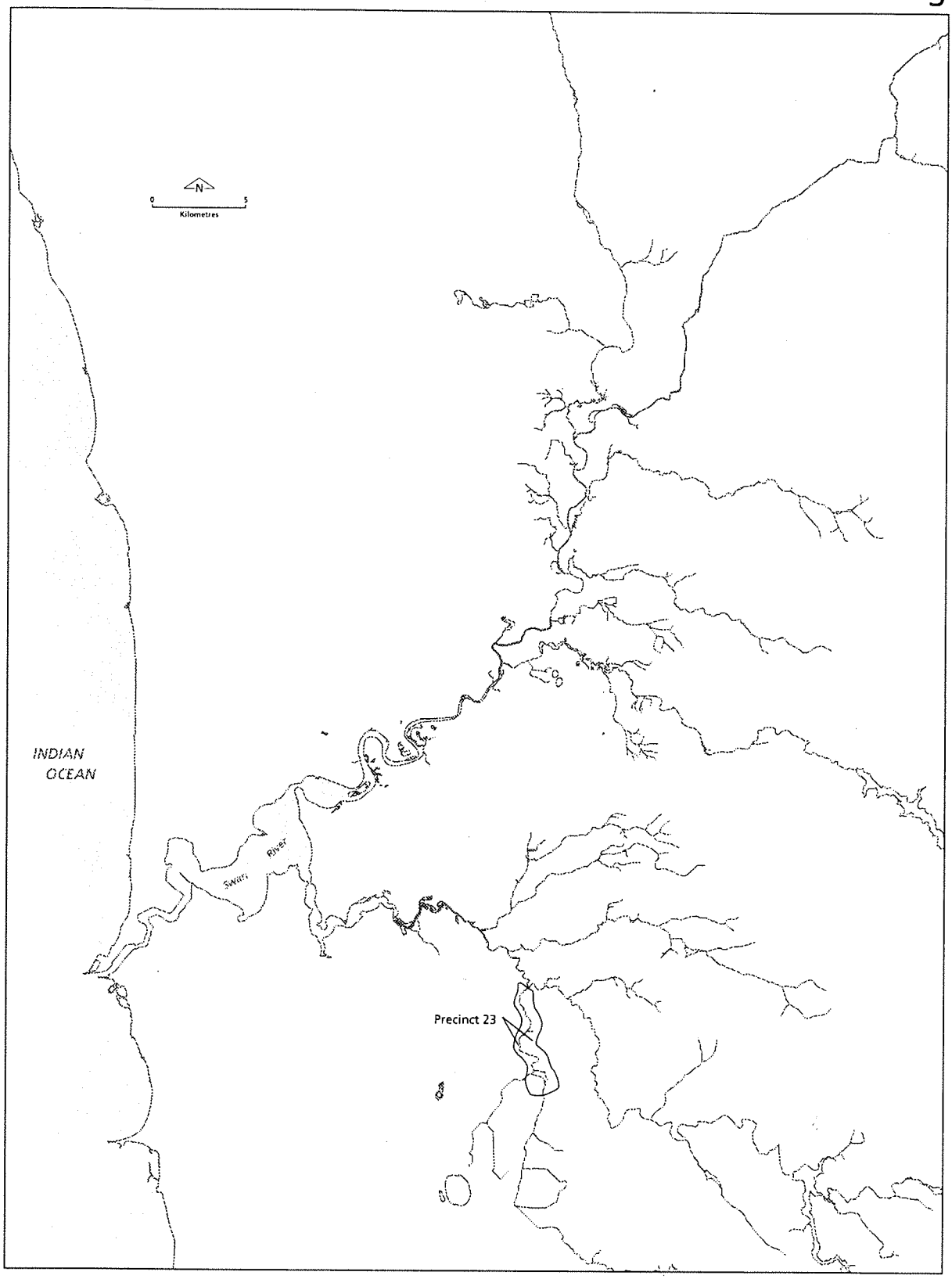
Precinct 23

Southern River - Canning-Southern River Confluence to Allen Road Crossing



Summary

Southern River -
Canning-Southern River Confluence to Allen Road Crossing

The Southern River channel takes a highly sinuous, meandering form towards its confluence with the Canning River. The river varies in width and tends to be narrower as it meanders though the sandy embankments, rather than the flatter land where it has a broader cross section.

The river is very shallow and has wide flood plains south of Verna Street. There are several areas subject to inundation and damplands form in the sandy swales. The riparian vegetation is mainly paperbark low forest and along the downstream sections jarrah and marri communities are also present. In uncleared upstream sections of the river, the sands have a remnant marri-jarrah-banksia complex which is an attractive landscape feature.

Residential subdivisions have occurred along the Southern River since the 1970s and the areas of Huntingdale and Gosnells are located adjacent to the downstream sections of the river. Most of the houses are quite modest in style and the newer homes have very neat eclectic gardens. Rural properties are located in the upstream section of the river and are mainly used for grazing and horse agistments. Other land uses in the area include plant nurseries, poultry farms and recreation areas. The land uses tend to have limited impact on the immediate Southern River landscape due to the relative flatness of the surrounding topography and the dense scrubby nature of the immediate riparian vegetation.

Biophysical Processes

Geological Processes

The Southern River runs over the Bassendean Sand geological formation which is made up of leached dunes of quartz sand. The sand is believed to be the remains of old coastal dunes that were formed during the last two Quaternary periods of high sea level. The soils have been leached of calcium carbonate and reduced in size possibly by aeolian processes.

At the confluence of the Southern River and the Canning River, the Swan Soil Association occurs and is described as being red podsolic and undifferentiated alluvial fan soils. The rest of the river is within the Southern River Soil Association and is characterised by being grey sand dunes with intervening clayey swamps. It is believed that the surrounding dune sand has been blown over the alluvial soils of the river and as a consequence the swamps have a clay base.

Topography

The precinct is part of the Pinjarra Plain which consists generally of unconsolidated fluviatile sediments. The surface is gently undulating to flat. Damplands, wetlands and areas of inundation form in the lower lying areas and swales. The topography is believed to have been formed by palaeo streams flowing from the Darling Scarp and creating the wide alluvial fans in front of the scarp. Much of the sediment has been reworked with palaeo sand dunes being moved by aeolian processes creating low lying dunes.

Hydrological Processes

Water features

The Southern River has a relatively shallow channel which varies in width. It has a highly irregular and sinuous meander form as it flows downstream towards the confluence with the Canning River. Upstream of Verna Street, the Southern River has a broad flood plain due to the highly erosive and low lying surrounding topography. Due to the low gradient the river is characterised by irregular meanders and has a shallow channel depth. The land is often damp and inundated adjacent to the river in winter months. Away from the river, various wetlands drain into the dune swales. The larger lakes in the area include Wright Lake, Harrisdale Swamp and Balannup Lake.

Bathymetry

The river channel is less than one metre in depth. The surrounding embankments range from very flat to 1-2 metres deep at Huntingdale. The river is entirely fluvial and has several small drainage lines entering the main water channel. Much of the surrounding land is poorly drained and water is retained in wetlands away from the Southern River.

Flooding

The area is subject to localised inundation and there are often water logged soils between Verna Street and Allen Road. The newer residential areas are set back from the hundred year flood line and as a result are in most places approximately 100 metres back from the river channel and build on landfill. There is evidence of the Southern River receiving higher than present volumes of water in the lower section of the river with palaeo flood plains being present and having established riparian vegetation.

Erosion and accretion

There is a severe point of erosion at the junction of the Southern River Road with the river itself. The loose sandy banks of the river make it particularly subject to erosion, especially during periods of high water level or in places where riparian vegetation has been removed.

Vegetation Communities

Native

Swan Complex

At the confluence of the Canning and Southern Rivers the Swan Complex is the dominant vegetation type. The complex consists of fringing woodland of flooded gum *(Eucalyptus rudis)* and swamp paperbark *(Melaleuca rhaphiophylla)* with localised occurrence of the swamp sheoak *(Casuarina obesa)*. Other plants include shore rush *(Juncus kraussii)* and lake club rush *(Schoenoplectus validus)*. In the wetter parts of this community the bracken fern *(Pteridium esculentum)* can be abundant, while the drier areas support green stinkwood *(Jacksonia sternbergiana)*.

Southern River Complex

Further upstream of the confluence, the Southern River Complex is the dominant vegetation type (DCE, 1980). The complex is made up of open woodland of jarrah *(Eucalyptus marginata)*, marri *(Eucalyptus calophylla)* and various banksia species. Adjacent to Burslem Drive there is also a narrow belt of open forest. Along the river and creek banks the flooded gum *(Eucalyptus rudis)* and swamp paperbark *(Melaleuca rhaphiophylla)* can be found. There are very small remnants of various banksias, sheoak *(Allocasurina fraseriana)* and coastal Swan River blackbutt *(Eucalyptus patens)* adjacent to Jenkinson Street. The community supports firewood banksia *(Banksia menziesii)*, holly leafed banksia (*Banksia ilicifoia)*, and woody pear *(Xylomelum occidentale)*. The lower storey has a few blackboy *(Xanthorrhoea preissii)* and zamia palms *(Macrozamia riedlei)*. In the damplands, moonah *(Melaleuca pressiana)* healthland is the dominant plant community.

Exotic

Several exotic flora species have invaded the paperbark woodlands. These include castor oil bush *(*Ricinis communis)*, pampas grass *(*Cortaderia selloana)*, bulrush *(*Typha* sp*)*, weeping willow *(*Salix* sp*)*, Japanese pepper *(*Shinus terebinthifolius)*, giant reed *(*Arundo donax)* Victorian tea tree *(*Leptospermum laevigatum)*, canna lily *(*Canna* x *orchiodes)* and blackberry *(*Rudus* sp*)*. Close to Jenkinson Street, there is a large stand of exotic bullrush *(*Typha orientalis)* adjacent to the banksia low open woodland. Within the Jenkinson Street remnant banksia community, there are lupins *(*Lupinus cosentinii)* and Veldt grass *(*Ehrharta* sp*)*.

Historical Land Use and Resulting Environmental Changes

The original land grants along the Southern River were allocated to John Okey Davis (Location 16) and D. Scott (Location 16A). Both properties stretched from the Canning River to south of the Southern River. Scottís land was taken up by T. Helms who was an absentee land owner for some time, however by 1870s Helms was farming the land. Helms' orchards and pastoral land was purchased by the developers Panton & Neubery who subdivided the land for residential purposes. John Okey Davis, property was farmed for many years and eventually purchased by the City of Gosnells for investment purposes (McDonald and Cooper, 1988).

At the turn of the century Location 16 was sold to the Gosnells Estate Company, which aimed to subdivide the property into individual titles of differing acreage (McDonald and Cooper, 1988). The company became associated with many financial problems and several unreliable managers. People who had paid for their land were often unable to obtain their titles because the company had no cash to arrange for the issue of the title deeds. Several of the properties were reserved for goldfields people and several auctions took place in Kalgoorlie with purchasers often unaware of the physical attributes of the land. One such man was Joseph Michel, who was attracted by the idea of owning a riverfront block of the Southern River (McDonald and Cooper, 1988). The land was shown on the map as being near infrastructure such as railways, tramways, streets as well as being good agricultural land. The Southernwood property proved to be a sandy swamp, however his wife and family struggled to establish an orchard, while Michel returned to the goldfields.

Much of the land around the Southern River has been used for small agricultural properties which included orchards, poultry and dairy goods. More recently, these properties have been subdivided or used for light industrial purposes.

Present Land Use and Social Patterns

The land adjacent to the Southern River in this precinct is mainly used for urban purposes. There are community facilities such as schools, health centres and recreational areas adjacent to the river and residential blocks. The houses are typically modest and the newer homes in particular have very neat eclectic gardens, almost all with a large expanse of lawn.

Towards the southern section of the precinct rural blocks are located right to the river reserve. Most are fenced paddocks with remnant bushland in places. The properties are mainly horse agistments, although a few remaining orchards do exist.

PRECINCT 23

Significant Land Use Features

N

500 0 500

Metres

Thornlie TAFE Campus

DR

BURSLEM

Canning River

ALBANY

HWY

Mabel-Davies Park

FREMANTLE RD

footbridge

The Richard Rushton Community Centre

CARDINGTON WY

Wirrabirra Primary School

RD

WARTON

HUNTINGDALE RD

TODD PL

SHIPBOURNE WY

Mary Carroll Park

Gosnells Senior High School

Swingler Park

RD

Robinson Park

RIVER

Southern River

SOUTHERN

ST

Seaforth Primary School

Southern River Association Hall

Huntingdale Community Centre

Sutherlands Park

Chicken Farm

VERNA

River

Wright Lake

RD

LAKE

drain

FURLEY RD

drain

Proposed Allen Rd crossing

Southern River

John Calvin Primary School

SPENCER RD
BURSLEM DR
Canning River
ALBANY HWY
FREMANTLE RD
RD
WARTON
Site of John Okey Davis's property and later C.Gosnells
Mary Carroll Park
Southern River
Wright Lake
RD
LAKE
Site of D.Scott's property, later T.Helms's property
drain
drain

PRECINCT 23

Sites of Significance

N

500 0 500

Metres

D.Scott's property

Other Australian Community Significance

Other land uses include the growing and distribution of plants for metropolitan nurseries. Many of these nurseries have diverted water from the Southern River and the used water is returned to the river through a series of drains.

There are at least five poultry and egg farms in the area. A dog kennel is another non residential land use in the area.

During the mid 1970s subdivisions for residential areas occurred creating the suburbs of Gosnells and Huntingdale. However east of the Huntingdale residential area a poultry farm and a few orchard areas remained.

A property on the corner of Southern River Road and Furley Road was owned by the City of Gosnells and was used as a liquid waste disposal site between 1969 and 1981. Known wastes included brewery effluent, septic sludge and night soil, oils and other industrial waste.

Many of the original wetlands around Southern River have been subject to infilling and clearing of their fringing vegetation. Balannup Lake has been partly infilled and excavated and its fringing vegetation on the southern section has been cleared.

Many of the roads in the upstream section of the river are unsealed and several are sandy tracks while in contrast the Gosnells and Huntingdale areas are entirely urbanised. There are several river crossings in the area the most major being the Spencer Road Bridge which is part of an important traffic intersection. The second major crossing is at Southern River Road which is a low form wooden piled traffic bridge.

The Wungong Dam was completed in November 1979 and has altered the stream flow in the Southern River catchment area. Flooding regimes and flow volumes have changed and there is less water than previously in the Southern River section.

Recreation nodes

Mabel Davis Park is maintained by local residents. The park has a play equipment area, shade trees and lawn as well as a commemorative plaque.

Sutherlands Park was established in the 1970s by the Gosnells Council as a formal sporting complex. It is located on Southern River Road, and has several ovals and club houses.

The Southern River Association Hall provides a meeting place for several local groups. It is an old wooden hall which has been recently renovated and the carpark area expanded. It is immediately adjacent to Southern River Road and the riverbank.

Cardington Way Reserve is situated on the banks of the Southern River in Huntingdale and has two tennis courts and a barbecue area. It is linked with the Richard Rushton Community Centre on the Gosnells bank.

Public access

The southern section of the river in this precinct is difficult to access due to properties being fenced to the edge of the embankment. Those sections where the pedestrian can walk down to the river have dense scrub and the area is very sandy. Informal horse riding paths are present along the boundaries of the agistment properties. Around the older residential areas near Todd Street and the Richard Rushton Community Centre, there are dual use pathways and a pedestrian bridge across the river.

Sites of Nyungar & Wider Australian Community Significance

Nyungar significance

There are no recorded sites of significance along the Southern River itself, however to the west of the river, outside this study area, there are several sites of significance including a swamp at Gosnells Golf Club Site, Lake Forrestdale, Bartram Swamp and Mather Reserve (O'Connor et al, 1989). These sites have strong associations with the Waugal which is believed to inhabit the swamps and water bodies. It is believed that at Lake Forrestdale, disturbance of the reeds could unleash the powerful Waugal associated with rain and destruction. The swamps were an important food source and camping grounds to the local Nyungar.

Other significance

The early farming families of Okey Davis and Scott lived in this precinct, however there is little evidence

of their farming properties as these have since been subdivided (McDonald and Cooper, 1988).

Conservation Areas

Wetlands

The Southern River has been identified by WAWA (1993) as being a Multiple Use wetland which provides a significant number of ecological, hydrological and social functions which need to be considered 'in the context of sustainable catchment and land use planning'.

There are many wetlands and damplands in this precinct. The wetland near the corner of Holmes and Balfour Streets has been identified as significant for waterbird usage and is one of only three sites where the freckled duck *(Stictonetta naevosa)* is known to breed (EPA, 1993). Balannup Lake has been identified as being in the Conservation, Recreation and Resource enhancement categories of the Environmental Protection Authority wetland management categories (Storey et al, 1993). The other wetlands in the area have been classified as resource enhancement and multiple use categories.

System 6

M75 Upper Canning and Southern Rivers

The recommended area comprises the Canning River and its fringes from Nicholson Road Bridge to the boundary of State Forest, together with those parts of the Southern and Wungong Rivers within the City of Gosnells. At the river's confluences with Bickley Brook and the Southern River both banks are well covered mainly with flooded gum and paperbarks. Grasses and weeds abound. The Southern River from its confluence with the Canning River to its continuation as the Wungong River is fairly well wooded with flooded gum on both banks, although the ground flora has been mostly lost. Along the lower reaches there are paperbark and *Acacia saligna* and patches of *Juncus* and *Baumea* species. Along the Wungong River remnants of woodland of jarrah and marri occur in places on the slopes above the banks with an understorey which includes large clumps of *Cyperus vaginatus* and occasional *Lobelia olata* and *Acacia saligna*. Grasses and weeds abound. The area constitutes open space of regional significance because of its high conservation and recreational values, its proximity to Perth's residential areas and regional roads passing though the area.

Landscape Description

Precinct Description

Waterform & natural riparian zone

The Southern River takes a highly sinuous, meandering channel form towards its confluence with the Canning River. The river varies in width and tends to be narrower as it meanders through the sandy embankments, compared with the flatter land where it has a broader cross section. The river is very shallow and the sand's ripple forms of the channel floor can be easily viewed. The banks being formed from loose sand are highly erosive once retaining vegetation has been removed by natural or degrading processes. The banks therefore often take clumpy forms where sand has given way and slid down the embankment. On other river sections, such as near Matison Street, the embankment is an almost vertical cut and highly susceptible to erosion. Adjacent to Cardington Drive, the river cuts into the sandy embankment and where there is no understorey growing, the banks are quite rapidly eroding. Several marri roots are exposed and the water swirls around their root forms in winter months. South of Verna Street, the flood plain is relatively broad and extends up to 200 metres in places on the curve of the meander bend. The waterform and riparian zone has a restricted viewscape due to the dense low formed vegetation and the low topography.

Landform

The landform around the river is flat and sandy, particularly in the residential areas where the gentle undulations of the Bassendean Sand have been levelled for building. The upstream section of the precinct is flat to gently undulating and is more indicative of the original landform. The slope declines towards the channel which is usually an abrupt cut in the sandy plain. Much of the land south of Verna Street is subject to inundation and is seasonally waterlogged adjacent to the river channel.

Vegetation

Along Burslem Drive, the fringing vegetation is very attractive as large flooded gums rise majestically over the small paperbarks. Mature jarrah trees edge the flooded gum complex and provide an interesting contrast in bark texture and foliage to the flooded gum. Along the edge of the natural complex is a mowed lawn, which gives the effect of a parkland. The vegetation occurs within the river embankment area which is relatively deep compared with the lawned area which is several metres above the embankment.

Along Cardington Drive, there is a similar attractive belt of vegetation. Here marri and a few younger jarrah tree, edge the river embankment and channel. The middle storey consists of sheoak and banksia, and there is an understorey of weed species which slightly detracts from the riparian vegetation. Further upstream, the paperbark complex dominates the river landscape. This gives the river a more scrubby effect as the tallest trees are less than 10 metres high and the canopy is quite dense.

Well away from the river paperbark complex remnant marri-jarrah-banksia open woodland is an important landscape feature. Uncleared blocks of this vegetation community remain, and due to the inaccessibility of much of the river area, many of the users must go through these communities before approaching the river. The dominant trees are the slender and holly leafed banksias. The damplands are dominated by the spectacular moonah which have an attractive white bark and clumped dense green foliage. The understorey is typically low lying sedge land although much of this has been replaced by grazing grasses.

Riparian land use

At Spencer Road Bridge, a new intersection and bridge is being constructed at the confluence of the Canning and the Southern Rivers. This has temporally disturbed the embankment and fringing vegetation. A second traffic bridge occurs at Southern River Road. This is low formed and has wooden piles and has less impact on the landscape than the new Spencer Road Bridge. There is a footbridge leading to the Richard Rushton Community Centre which is constructed using steel 'H'girders. The bridge has been made as a feature point and has two 'A'frame arches above the superstructure. The orange/brown paint stands out against the riparian vegetation and the structure gives a vertical element to the surrounding landscape. The result is an interesting element in the riparian landscape which also provides easy public access across the river.

At Carrington Drive, there are some tennis courts and play equipment located adjacent to the river embankment. Several mature marri and jarrah trees have been left to provide shade in the barbecue area, and a few native species have been recently planted on the undulating sandy banks of the river and parkland. There are many informal 'rabbit' paths on the embankment which contribute to the collapsing sandy banks, due to the removal of the vegetation. The river channel banks are a popular play area for children as there are several meander banks and logs on which to play.

Along Shipbourne Way there are remnant orchard trees in the grassed parkland. There is a small concrete pedestrian crossing at the end of Todd Road which provides important access for the local children to Gosnells Senior High School from the Huntingdale area. The crossing area is devoid of vegetation and there are several exotic trees planted adjacent to the river channel. The adjacent houses have their back fences along the river bank.

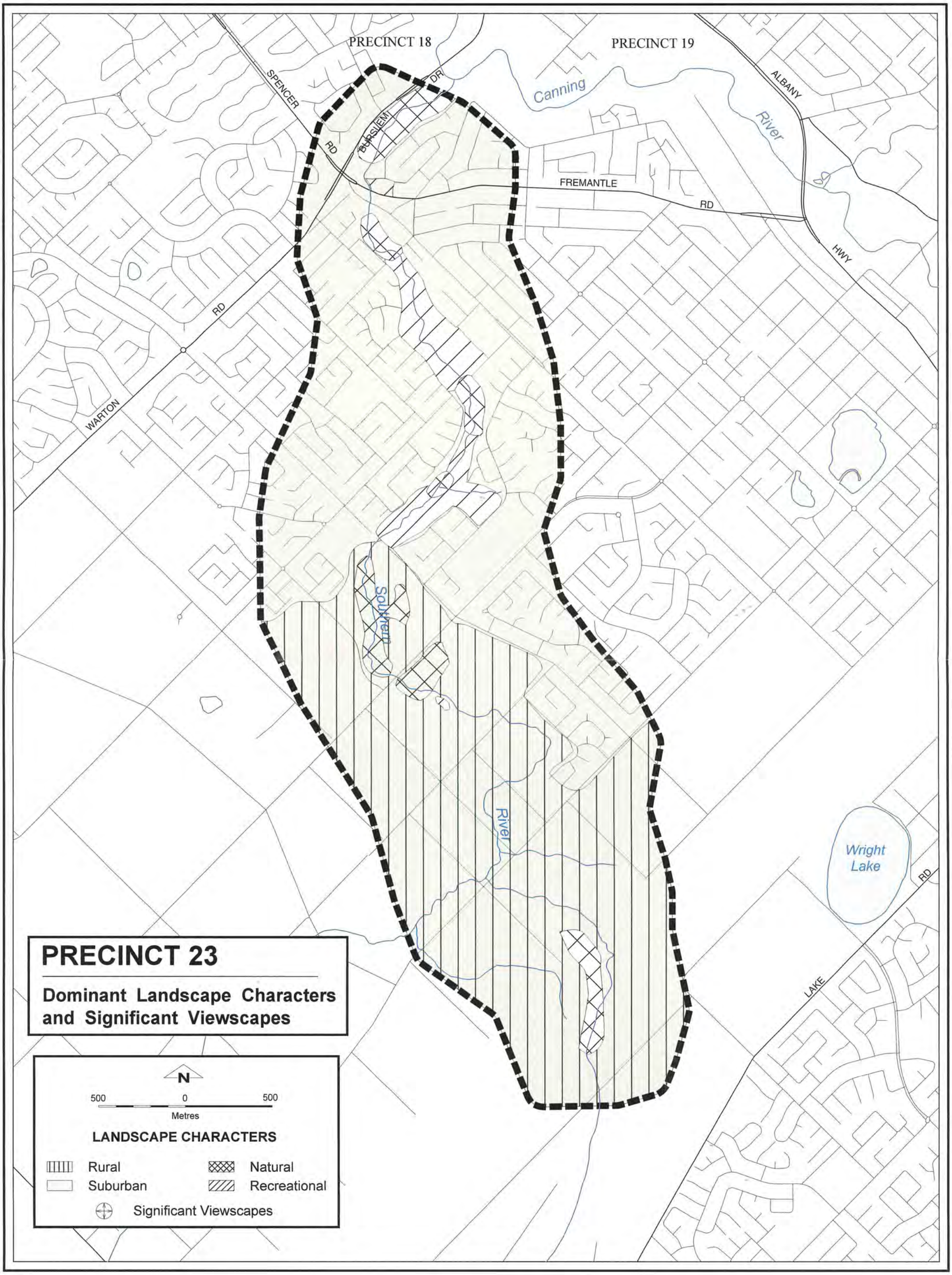
Land use

The Thornlie built up area is separated from the western bank of the river by Burslem Drive. The Thornlie TAFE campus is located on the western bank along with a number of residential blocks. The campus has been mainly planted with Australian flora which is complementary to the fringing vegetation. On the opposite bank, the Gosnells residential area is set back away from the river embankment and the Mabel Davis Park is a small block in between the houses and Fremantle Road. The park has a neat lawn and sand pit area and overlooks the river embankment. The park and residential area are separated by Windsor Drive and therefore the distinct land use change separates the riparian and residential landscapes.

The Richard Rushton Community Centre is located adjacent to the river reserve and is constructed with a dark brick. The area is lawned with remnant marri and jarrah surrounding the building. The Wirrabirra Primary School is adjacent to the Community Centre and its oval area joins to the community centre lawn and the river fringing vegetation. Both buildings are low formed and due to the flat nature of the landform have minimal intrusion on the landform.

Most of the Huntingdale residential blocks are separated from the river reserve by a road, however earlier properties are located on the river banks, including a 1950s style home adjacent to Shipbourne Way. The new houses on Todd Avenue are well set back from the river and the slightly lower adjoining land. New smaller block housing developments have recently been built on the Gosnells side downstream to Verna Street. These are modest homes and all have very new gardens with few mature trees. Much of the land has been cleared in the past for rural land uses, however the low fertility of the soils, makes it suitable mainly horse agistments and other land uses which do not require rich soils. A few large rural private properties extend from south of Chamberlain Street, Gosnells, and south of Huntingdale Road, Huntingdale. These properties are have mostly been cleared with a few shade trees remaining. They are mainly private residential properties with several paddocks for agistment purposes. There are two plant nursery distributor points at Huntingdale and Sunnyvale Nurseries. Orchards are being converted into residential blocks, however a few orchards still exist at Ball Road, Huntingdale. In general, the low lying topography and the vegetation limit the view of the residential areas on the riparian section.

One of the prominent skyscape features is the distributor powerlines which cross the Southern River. Due to the flatness of the topography, these powerlines are visible from most parts of the riverscape.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SPENCER RD
BURSLEM DR
Canning River
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Dominant Landscape Characters and Significant Viewscapes
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LANDSCAPE CHARACTERS
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Suburban
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Significant Viewscapes

Dominant Landscape Character

The suburban landscape is the dominant landscape character for the northern section of this precinct. The houses are generally modest styles with eclectic gardens. Only the older areas have mature trees, and due to the flatness of the landform, the depth of view is limited.

The natural landscape is very limited, as most of the native woodland community has been cleared. Along much of the Southern River, only grasses are present on the sandy river banks, and as a result these sites are quite degraded and are visually unattractive.

Along the Southern River, adjacent to the suburban areas, the riparian vegetation only remains in small segments. Much of the riparian area has been cleared and lawned for recreational purposes. The result is a parkland landscape which has little indigenous vegetation and as a result very little local character or identity.

At the southern section of the precinct there is quite a sharp change between suburban and rural land uses. At this section, the views are restricted by the flatness of the land and as a consequence, the landscape character is restricted to limited areas. Much of the land has been cleared in the past for rural land uses, such as orchards, however these are being replaced by housing developments. The remaining rural landscape is made up of horse agistment and pasture. There are some intensive production sites, including poultry farms and domestic plant nurseries. The rural landscape in this area is characterised by much of the land being cleared and very little indigenous vegetation remaining. The sandy soil results in a barren appearance.

Significant Viewscapes

As the landform is very flat, the viewscapes are very limited. What remains of the riparian vegetation is very dense and scrubby so that the shallow channel of the Southern River can only be viewed in places where it has been cleared. As most of the original vegetation has been cleared, the small patches of indigenous vegetation which remain are important if small elements in the landscape. They give local identity to a landscape which has few distinguishing characters.

Conforming and Non Conforming Elements in the Landscape

The footbridge adjacent to the Richard Rushton Community Centre provides an example of a structure which adds interest to a suburban landscape. The bold form and colours contrast with the riparian vegetation and surrounding suburban buildings.

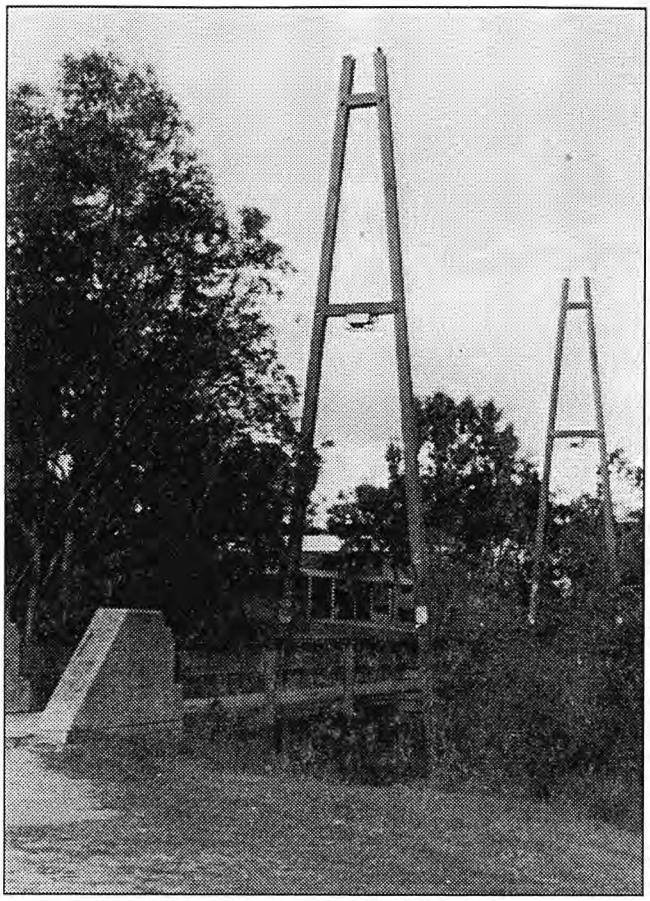
Soft leafy weeds are commonplace along the Southern River. There is opportunity to enhance the present landscape character by restoring the indigenous flora.

Recommendations for Maintenance and Enhancement of the Present Landscape Character

- Rehabilitation of the remnant vegetation. There is particular need to ensure that the Southern River Complex is adequately represented in this precinct. It is under increasing pressure from development and weed invasion.
- Planting indigenous species in parkland and riparian reserves which are presently mainly lawn.
- Ensure that riparian structures and developments are complementary to the landscape characters in this precinct.

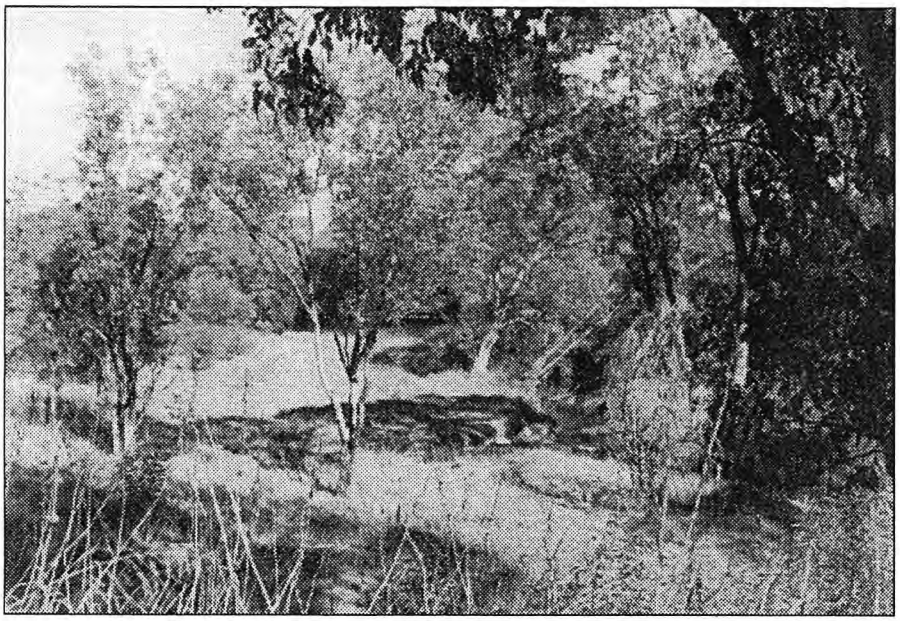
Precinct Specific References

McDonald, G. and Cooper, W.S. 1988.
The Gosnells Story. City of Gosnells, Perth.



Footbridge near Cardington Way, Southern River. 1996.

Swan River Trust.



Jenkinson St, Gosnells, Southern River. 1997.

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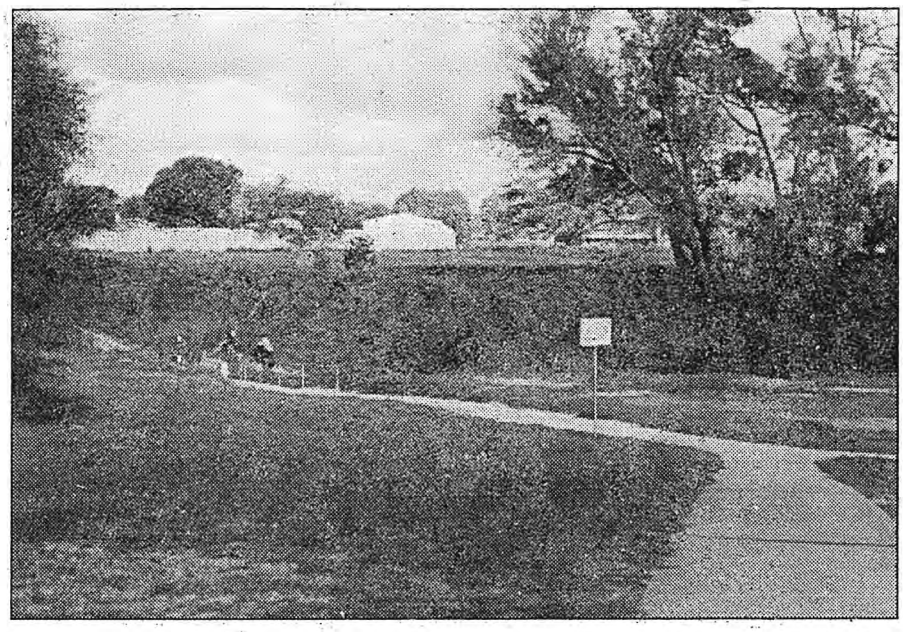

Footbridge near Todd Avenue, Southern River. 1996.

Swan River Trust.