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Bulletins 4513: Scott Coastal Plain a strategy for a sustainable future

Bulletin 4513

June 2001

Scott Coastal Plain Steering Committee

November 2000

This report has been prepared in good faith by the Scott Coastal Plain Steering Committee. It contains recommendations and strategies developed in partnership with local farmers, community and government agencies.

NOTE: The information contained in this section was current at the time of writing (1998-2000).

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Strategy documents

1. Draft Land Use Strategy for Scott Coastal Plain (1999)
2. Draft Water Management Strategy for Scott Coastal Plain (1999)
3. Draft Vegetation Strategy for Scott Coastal Plain (1999)

Water Strategy supporting documents

4. Conceptual Surface Water Management within the Scott River Catchment
5. Draft policy on Drainage Management for the Scott Coastal Plain
6. Groundwater Well Licence Management Strategy - Draft guidelines for Scott Coastal Plain
7. Proposed Water Quality Monitoring Program for Scott River (1998)
8. Proposed Pilot Water Quality Monitoring Program for Hardy Inlet (1998)
9. Developing water quality targets for Hardy Inlet
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18. Information package for land clearing proposals on land zoned rural

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19. Land capability assessments for horticulture in the Scott River Catchment
20. Economic potential of the Scott Coastal Plain
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Nutrient management documents

22. Management of diffuse nutrients of pasture land Scott River Catchment - Lower Blackwood LCDC Scott River Nutrient Management Project Review June (1999)

Implementation documents

23. Assessment and approval process for new irrigated agriculture proposals Scott Coastal Plain (1998)
24. Preliminary guidelines for assessing the environmental risk of irrigated agriculture on the Scott Coastal Plain (1999)
25. Summary of references for recommended buffers and setback distances - Scott Coastal Plain
26. Protection of remnant vegetation on private land in the agricultural region of Western Australia (1997)

Best practice guidelines and supporting documents

27. Best management practice for vegetable production at Scott River [DRAFT]
28. Best practice for nutrient management of livestock grazing systems at Scott River [DRAFT]
29. Dairy effluent management guidelines
30. Code of practice for timber plantations in Western Australia [DRAFT]
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Acknowledgments

The Steering Committee acknowledge the assistance and input of agency staff from various State agencies, and landholders and local people from the Scott River area in preparing this draft Strategy.

Mr Peter Iley and Cr Barbara Dunnet provided considerable local knowledge of agricultural land uses and history and assisted with preparation of the strategies and recommendations.

The Water Management Strategy was prepared by Water and Rivers Commission staff including the initial targets for water quality in Scott River and Hardy Inlet. The Vegetation Management Strategy was prepared by staff from Department of Conservation and Land Management and the Land Use Strategy was prepared by staff from the Ministry for Planning. The final maps were prepared and printed by the Ministry for Planning. The sub-catchment planning and drainage management section, the agricultural development potential section and the report card on sustainability indicators were prepared by staff from Department of Agriculture.

Mr David Galloway from Chambers and Galloway and Associates compiled the preliminary draft Strategy report and prepared the draft implementation section.

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Members of the Scott Coastal Plain Steering Committee

The members of the Scott Coastal Plain Steering Committee who prepared the *Scott Coastal Plain - A Strategy for a Sustainable Future* are:

Hon Barry House MLC	Chairman
Mr James Dee	Executive Officer, Department of Agriculture
Mr Eric Wright	Project Manager, Department of Agriculture
Cr Barbara Dunnet	Shire of Nannup
Cr Barry Godley	Shire of Augusta-Margaret River
Mr Tom Fox	Western Australian Farmers Federation

Mr Robert Dunnet	Scott River Horticultural Growers Group
Mr Peter Iley	Lower Blackwood Catchment Land Conservation District Committee
Mr John Brown	Simplot (Australia) Pty Ltd
Mr Max Churchward	Conservation Council of Western Australia
Mr Ross George	Department of Agriculture
Mr Robert Paulin	Department of Agriculture
Ms Kerry Dunn	Department of Agriculture (<i>Department of Agriculture</i> Farm Business Development)
Mr Wayne Tingey	Water and Rivers Commission
Mr Jeff Kite	Water and Rivers Commission
Mr Kevin Martin	Ministry for Planning
Mr Murray Carter	Department of Conservation and Land Management
Mr Nick Woolfrey	Department of Environmental Protection
Mr Mike Freeman	Department of Minerals and Energy

Previous members of the Steering Committee include:

Mr Geoff Klem	Department of Commerce and Trade
Cr Lester Dickson	Shire of Nannup
Mr David Reid	Blackwood Basin Group
Ms Jane Taylor	Department of Environmental Protection

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Foreword

The *Scott Coastal Plain - A Strategy for a Sustainable Future* presents a broad Strategy and vision for the future use and development of the area.

The Strategy represents the objectives of landholders, farmers, government agencies, industry groups, conservation groups and the general community. In exploring the region's potential, it recognises that the environmental values of the area and receiving water bodies such as Hardy Inlet, are important and susceptible to impacts from pollutants such as nutrients. In this spirit of careful stewardship for land and water management, the Strategy sets out a vision for the future for agricultural land use, as well as other land uses.

The Scott Coastal Plain has significant attributes that make it an area of State and regional significance for agricultural production. The climate, availability of good quality groundwater for irrigation, and large lot sizes provide opportunities for mechanised horticultural production which other parts of the State may not have. The nature of the soils, which range from excellent loams and clays to sandy soils with poor nutrient retention capacity and high winter groundwater levels, combined with the significance of receiving water bodies means land use and

management practices are an important part of this Plan.

The Steering Committee has developed land and water management strategies based on the best available information and data, recognising that there is insufficient scientific data to be certain about impacts from current levels of development. The process is therefore adaptive and the Strategy will be reviewed in future years and possibly amended in light of subsequent changes in land use, monitoring of catchment and waterways and development of new techniques and technologies for agriculture.

While accommodating growth and diversification in agriculture, the Scott Coastal Plain has potential for diversification of its economic base through tourism, agroforestry and mining. The potential for tourism in the area is significant, with unique vegetation communities, national parks and nature reserves and the increasingly popular south coast. The Strategy establishes principles for sensitive development of the coastal zone, by protecting the fragile areas and identifying access, accommodation and service opportunities.

Many of the ideas contained in this Strategy have started locally. The development of the Strategy has in itself been important in establishing better relationships and communication between government agencies and landholders and providing an opportunity for local people to have a say in how their area develops in the future. I am grateful for the advice and continuing interest of local residents, as well as the work of those who have contributed directly to its preparation, members of the Steering Committee and the technical officers from government agencies.

Barry House MLC
CHAIRMAN
SCOTT COASTAL PLAIN STEERING COMMITTEE

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Background

In response to the interest in the Scott Coastal Plain for a range of development including irrigated agriculture, the Scott Coastal Plain Steering Committee was established by the Minister for Primary Industry, the Hon Monty House MLA, in 1996, to prepare an integrated land and water management plan for the Scott Coastal Plain area. The Steering Committee was established to:

- report on the agricultural potential of the Scott Coastal Plain;
- report on the impacts on the environment of current and any future developments;
- develop the formal planning and coordination process for the future management of the Scott Coastal Plain.

The Scott Coastal Plain - A Strategy for a Sustainable Future integrates the land and water management solutions with the future development potential for the Scott Coastal Plain. The Strategy provides a vision for the future developed by the local community and through the Land Use Strategy (LUS), a framework for development and implementation of the Strategy. The Strategy offers an opportunity to better coordinate activities of government in the region and will guide the future use and management of land and water on the Scott Coastal Plain.

Vision

The vision for sustainable development on the Scott Coastal Plain was developed by the Steering Committee in consultation with the community:

A vital sustainable agricultural community living in balance with economic development and the unique environmental values of waterway and vegetation systems of the region.

Figure 1. Location of Scott Coastal Plain.

The Strategy for a Sustainable Future is about balancing the economic, environmental and social factors to achieve sustainable development for the Scott Coastal Plain. This is explained in greater detail in Section 6 - 'Sustainable development'. This strategy recognises the importance of continuity and replenishment of the environment as opposed to rapid exploitation and collapse, which is a key aspect of the World Commission on Environment and Development (WCED) approach to Ecologically Sustainable Development (ESD).

General approach

The approach the Steering Committee took included a number of assumptions in preparing this Strategy to address the issues for land and water management, and development, on the Scott Coastal Plain. It has been assumed that an integrated strategy will produce a balance between land use and environmental maintenance and protection; stakeholder participation will provide ownership of outcomes and strategies, resolve conflicts and ensure commitment; and the resources required to monitor the sustainability criteria and to provide feedback to stakeholders will be available.

While this project had been triggered by the arrival of more irrigated agriculture, the Strategy has had to consider other land uses that have the potential to impact on the environment, to ensure fairness and equity between landholders and to properly integrate land and water management.

Emphasis is on developing a regional or catchment area approach within the context of sustainable development. A Land Use Strategy has been prepared to guide future development of the area. There are a number of infrastructure issues to be addressed, such as provision of suitable power, roads and telecommunications, if the economic potential of the area is to be recognised.

The environmental condition of the Scott River and Hardy Inlet was a major determinant for the future of agricultural activities in the region. While the Scott River appears to be in reasonable ecological condition, particularly when compared with other rivers on the Swan Coastal Plain, it is showing elevated levels of nitrogen, which points towards a need for vigilance and good management.

There is insufficient monitoring information available on the Scott River and Hardy Inlet to determine the linkages between land management practices, water quality and river ecology. In this context it is important that development proceeds with caution so that irreversible damage does not occur and that the approach taken in the Strategy is flexible and able to adapt to take account of better information and improvements in technologies and practice.

Specific management strategies for water and drainage, vegetation and land use have been developed and the Steering Committee recommends that these be adopted by all decision-making authorities and practised by landholders and the general community as the best practice approach to land and water management. Regular monitoring will be carried out to determine how well the Strategy is progressing towards sustainable land use and land and water management.

Agricultural development potential

The Scott Coastal Plain has significant attributes that make it an area of State and regional significance for agricultural production. The climate, availability of good quality groundwater for irrigation, and large lot sizes provide opportunities for mechanised horticultural production which other parts of the State may not have.

An estimate of the area that could be used for each agricultural land use has been developed, at a broad study area level. The figures presented in this report show that diversified production combining tree plantation and/or irrigation (cropping or hay/silage) with grazing enterprises provides for potential increases in gross margins and buffers against movements on commodity prices in any one industry.

This report calculates gross margins for existing enterprises that operate in the Scott Coastal Plain and potential enterprises that could operate in this area. These gross margins are then used as the basis for calculating the existing and potential gross value of agriculture able to be generated from the Scott Coastal Plain area. The existing and potential gross value of agriculture figures are then used in conjunction with total value adding ratios to calculate the existing and potential total value added to the overall State by agriculture on the Scott Coastal Plain.

Further information

Water Management Strategy

Guidelines for managing surface water flows and the impacts on waterways from a range of land uses have been developed. These guidelines cover irrigated agriculture, timber plantations, grazing and dairy production, road construction and maintenance, conservation areas and mining operations.

Water quality targets for Scott River and Hardy Inlet have been prepared, to provide a guide to future monitoring and management. These targets are 'interim' and will be updated based on additional monitoring over the next two years. Water quality monitoring programs have been prepared by Water and Rivers Commission (WRC) to provide the data and information required to analyse water quality against the interim targets.

General water quality standards, such as Australian and New Zealand Environment and Conservation Council (ANZECC) National Water Quality Guidelines, have set a national 'number' on parameters to determine how to judge the quality of water. However, a slightly different approach has been taken for setting the adaptive water quality targets for Scott River and Hardy Inlet.

The Scott River and Hardy Inlet are generally in reasonable health (after comparing them to other rivers and estuaries and National Standards). The Steering Committee decided that in the absence of baseline information on the health of Hardy Inlet and Scott River, that the current condition would be a reasonable basis for our targets, except where they might be above National Standards as is the case for Dissolved Inorganic Nitrogen levels for Scott River.

A sub-catchment planning approach is recommended to manage changes to and maintenance of drainage systems and streamlines and to avoid flooding and sedimentation problems on downstream properties. Sub-catchment plans are to be prepared, involving all landholders and stakeholders within each sub-catchment, identifying key streams and routing for safe disposal of surface waters and incorporating stream stabilisation works. A coordinating body will be required for this work and the Steering Committee has recommended that the Lower Blackwood Land Conservation District Committee (LCDC) take on this role, with technical support from WRC and Department of Agriculture (Department of Agriculture).

Further information

Vegetation Management Strategy

For its vegetation, the Scott Coastal Plain area has been identified as one of two main areas having national estate significance for high species richness; unusually high diversity of vegetation complexes; a concentration of rare, restricted and threatened communities; narrowly endemic plants; relict (primitive or Gondwanic) plants; plants with disjunct populations; wetlands of national importance; and natural landscapes. (National Estate Identification and Assessment in the South West Region of WA 1998 as part of the Regional Forest Agreement process.)

In the Scott Coastal Plain Strategy Area, 70 per cent of the area has natural vegetation cover and 14 per cent of the natural vegetation is on private property.

The Vegetation Management Strategy identifies vegetation types and complexes that should be preserved across the study area. It identifies and sets management objectives for:

- Threatened flora - flora listed on the rare and endangered species and Priority Species list.
- Threatened ecological communities (TECs) - A naturally occurring assemblage that occurs in a particular habitat that is either vulnerable, endangered or presumed destroyed.
- Vegetation management - vegetation poorly represented in the study area.
- Adequately represented vegetation.
- Other vegetation of importance.
- Well represented vegetation.

The assessment of vegetation within the study area has determined there are vegetation complexes that are of sufficient size to withstand a reduction in area without compromising their status as being adequately reserved.

To comply with government policy and regulations, any proposal for clearing vegetation must be examined in the manner outlined in the Memorandum of Understanding governing the protection of remnant vegetation on private land within the agriculture region of Western Australia.

Further information

The Land Use Strategy

The Land Use Strategy recognises existing land uses and the need to consider a more diversified approach to agriculture in the catchment.

Assessment of land capability suggests that, subject to appropriate land management practices being undertaken, seasonal irrigated agriculture and other intensive agricultural activities could be undertaken on the Scott Coastal Plain, depending on soil types, depth to watertable and other factors including proximity to watercourses. The key factors for sustainability are implementation of best management practice (BMP), ongoing monitoring aimed at detecting undesirable impacts off-site and subsequent changes to land management if required.

The broad land use concept for the study area is for continued and enhanced agricultural uses on private land to the north of the Scott River and for a range of rural-type land uses and landscape conservation on the private lands to the south.

The Strategy proposes that all the freehold land within the study area to the north of the Scott River be zoned 'Rural Agriculture'. This will enable the continued development of a wide range of intensive and extensive agricultural land uses in conjunction with appropriate land management practices.

The principal objective of the Rural Agriculture zone is to provide for the sustainable use of land for crop growing (including horticulture and timber production) and extensive animal husbandry (including dairying and grazing) and to protect the long-term productive capacity of agricultural land from incompatible land uses (including subdivision).

The freehold land areas to the south of the Scott River are characterised mainly by steep coastal dunes with relatively fragile coastal heath vegetation. The coastal belt is at risk of wind erosion and dunal blowouts and at the same time the coastal area has high and varied visual landscape values. In consideration of those factors, it is proposed that the freehold land south of the Scott River be zoned 'Rural Landscape and Conservation'.

The principal objective of the Rural Landscape and Conservation zone is to protect significant landscapes and environmental features and provide for development which is compatible with and will enhance the landscape and environmental qualities of the locality.

In recognition of the fragile coastal landscape, it is recommended that a coastal management strategy be prepared for the whole coastal strip extending from the western boundary of the D'Entrecasteaux National Park through to Hardy Inlet. Subdivision of land and increasing development potential will not be supported by the Western Australian Planning Commission (WAPC) until the issue of the vesting of the vacant Crown land coastal strip is resolved and a suitable coastal management strategy is approved and adopted.

The agricultural development potential of the Scott Coastal Plain has been assessed by Department of Agriculture and the projections for agricultural land use includes three scenarios for various levels of agricultural diversification. From these projections the likely employment generation, resultant population increases, accommodation requirements and demands for additional infrastructure and community services and facilities have been estimated.

Vehicle movement on roads is estimated to increase significantly with expansion of both tree plantations and irrigated agriculture, requiring an urgent upgrading of principal roads within the Scott Coastal Plain. This development will also increase levels of demand for improved power supplies across the study area. This will come mainly from additional horticultural and dairying developments, the vast majority of which would be located to the north of the Scott River. To this should be added the potential for one or two townsites, the principal one which would more than likely be located to the south of the Scott River, in the vicinity of Milyeannup Coast Road, plus a range of low key tourist development along the south coast.

The extension and improvement of the power supply grid within the study area needs to be discussed with Western Power to provide for current levels of power consumptions and potential increases in irrigation and dairying and the potential for new townsites and/or tourist facilities.

Further information

Implementation

The implementation of the Strategy is based on the following principles:

- Appropriate effort for the appropriate level - this Strategy must work at both the farm and the regional level.
- Agreed ground rules - when implementing the Strategy what are commonly agreed information and approaches are important.
- Quality planning - planning should produce viable economic outcomes, agreement on acceptable environmental impacts and should enhance community well-being.
- A management group - is needed at the catchment or study area level to plan and respond to feedback on performance.
- Feedback/reporting mechanism - monitoring the success of the activity in meeting the objectives of the Strategy for land and water management on the Scott Coastal Plain.

At a catchment and study area level the Land Use Strategy defines recommended land use zones and land uses which are appropriate in different zones. At a local level the individual landowner is responsible for land use within the context of the Land Use Strategy.

Control over activities at the catchment level will be provided through the Town Planning Scheme of the Shire of Nannup and the Shire of Augusta-Margaret River, by incorporating this Strategy into the Schemes and also through the Warren Blackwood Regional Planning Strategy.

At a farm level control over land use activities is provided through:

- economic viability;
- a formal assessment and approval process for irrigated agriculture;
- assessment of vegetation clearing proposals through the Commissioner for Soil Conservation;
- drainage coordination through the sub-catchment planning process.

Planning and management at the farm or local level is the responsibility of the individual land owner using a combination of BMP and feedback from monitoring.

A Management Group is needed to oversee the implementation of this Strategy and to coordinate the report card on catchment performance and promote the results to landholders and the general community. The Steering Committee recommends that a new Zone Steering Committee of the Blackwood Basin Group be created within the Blackwood Basin Group to cover the Scott Coastal Plain.

The advantages of this include providing the local community with access to an established administrative group that has both State and Federal Government recognition and an existing infrastructure within which to progress the initiatives that have been developed in the Strategy for a Sustainable Future. Developing the Scott Coastal Plain area as its own catchment Zone ensures that local issues are dealt with by a local management group.

Level	Mechanism
Formal	<ul style="list-style-type: none"> ● Land Use Strategy incorporated into the Town Planning Scheme <ul style="list-style-type: none"> ○ Town Planning Scheme provisions for land use ○ Town Planning and Development Act 1928 ● Assessment and approval process for new irrigation proposals <ul style="list-style-type: none"> ○ Groundwater well licensing for irrigation (Rights in Water and Irrigation Act 1914) ○ Vegetation clearing controls (Soil and Land Conservation Act 1945, and Memorandum of Understanding between government agencies on clearing) ● Protection of Rare and Priority Species (Wildlife Conservation Act)

	<ul style="list-style-type: none"> ● Environmental Protection Act 1986, referral process
Informal	<ul style="list-style-type: none"> ● Integrated catchment management - the <i>Scott Coastal Plain - A Strategy for a Sustainable Future</i> guidelines for land and water management ● Groundwater well licensing guidelines (Water and Rivers Commission) ● Sub-catchment planning and drainage management ● Best practice guidelines for irrigated agriculture, grazing and dairy effluent management ● Shire Rural Strategies ● Monitoring and reporting against targets for water quality ● The Report Card on catchment performance ● Farm development plans

Further information

Reporting on sustainability

To ensure that the activities at both a regional and local level are moving towards sustainability, a report card of sustainability indicators will be prepared every three years. These indicators measure economic, social and environmental conditions at both the farm and catchment area level. Section 11 details indicators that will be measured to evaluate the sustainability of agricultural land use and the condition of land and water resources and report on trends over time.

Condition indicators for the catchment will be measured in monitoring programs carried out by WRC and soil condition surveys done by farmers. The condition data will be evaluated against agreed standards (targets for Scott River and Hardy Inlet, water quality standards from ANZECC etc.) and then interpreted in terms of local threshold values or circumstances. The condition report card gives a view of the long-term health status of the catchment.

Trend indicators capture short-term changes in catchment health. Trend indicators relate to attributes of the catchment that can be modified in the short term by changes in land use and land management. Reporting on trend indicators will provide the first indications of how effective the management strategies are in addressing the needs of sustainable development on the Scott Coastal Plain.

The information from the report card will be used by the individual landowners and the regional Management Group and will provide useful land management information to a range of other stakeholders and local government. Where the report card shows ongoing problems, the Management Group will be able to modify the Strategy in consultation with the community.

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Agricultural development potential

Recommendation 1

It is recommended that the Water and Rivers Commission investigate and map the groundwater recharge areas associated with the wetlands of conservation significance. This information should be made available to the Zone Management Committee.

Further information

Recommendation 2

It is recommended that additional investigation and research on agricultural production and farming systems development for irrigation on the Scott Coastal Plain be carried out jointly by Department of Agriculture and local grower groups.

Recommendation 3

It is recommended that Department of Agriculture, Department of Minerals and Energy and local government investigate mechanisms to ensure access to accessible lime resources for the region.

Recommendation 4

It is recommended that CALM, Department of Minerals and Energy, Main Roads and local government investigate mechanisms to ensure access to accessible gravel resources for the region.

Recommendation 5

It is recommended that an economic development and marketing plan for agricultural production of the Scott Coastal Plain be prepared. The plan should identify production and marketing opportunities and include funding options for, horticulture research and marketing.

See also: Section 5 Agricultural development potential

Water Management Strategy

Recommendation 6

It is recommended that investigation and research be conducted by CALM, Forest Products Commission, Department of Agriculture and landholders to minimise and improve the use of fertilisers and biocides as well as control the run-off during the establishment and ongoing maintenance of timber plantations.

Recommendation 7

It is recommended that local governments make compliance with the Code of Practice for tree plantations and this

Strategy a scheme provision for new tree plantation proposals.

Recommendation 8

It is recommended that the Water and Rivers Commission initiate a research project to determine the sources of the colour in the Scott River and their contribution to the river's quality and ecology.

Recommendation 9

It is recommended that CALM participate as a stakeholder in all sub-catchment planning for the Scott Coastal Plain. This process plans and negotiates drainage options for each sub-catchment and is outlined in Section 7.11.

Recommendation 10

It is recommended that the Shires in association with Main Roads Western Australia, the plantation industries and local landholders investigate how their road building activities can be incorporated into sub-catchment drainage planning (Section 7.11.). This investigation should particularly address improving road planning and construction so that the impacts of road construction and maintenance on the regional and local drainage regimes are minimised. This needs to be completed before the end of the year 2001.

Recommendation 11

It is recommended that the Water and Rivers Commission coordinate the water monitoring programs as detailed in Appendix 7 and Appendix 8 and collates and reports on the data as required by the report card described in Section 11.

Recommendation 12

It is recommended that the Lower Blackwood LCDC coordinate the sub-catchment planning for drainage management in the Scott Coastal Plain area with technical assistance and support from Water and Rivers Commission, Department of Agriculture and local landholders.

See also: Section 7 Water management strategy

Vegetation Management Strategy

Recommendation 13

It is recommended that no disturbance at all occur on any area containing Threatened Ecological Communities.

Recommendation 14

It is recommended that the feasibility of acquiring remnants for conservation reserves within vulnerable or poorly represented vegetation complexes through appropriate mechanisms, such as subdivision for conservation, boundary realignment, direct purchases and other processes suggested by the Native Vegetation Working Group, be examined. Any formal proposal to acquire land for the conservation estate should be extensively examined in the field with relevant landholders. CALM should liaise with Ministry for Planning and Department of Land Administration and relevant landholders to identify appropriate locations and determine an approach to be taken for implementing this initiative.

Recommendation 15

It is recommended that the Government needs to recognise the public good of retaining remnant vegetation on private property. This recognition should include financial assistance to support the viability of the whole farm business.

Recommendation 16

It is recommended that as more consistent data relating to the viability of certain corridors for specific species becomes available, vegetation corridor assessment be undertaken with the full knowledge and involvement of the relevant landholders.

Recommendation 17

It is recommended that any proposal which impacts on wetlands including clearing needs to be assessed through the multi-agency assessment and approval process as detailed in the Strategy.

Recommendation 18

It is recommended that a high degree of protection be given to coastal areas. In addition, a separate management strategy for the coastal zone should be developed to address the unique issues associated with the area. Ministry for Planning, as the lead agency, in conjunction with CALM, Shire of Nannup, Shire of Augusta-Margaret River and the relevant landholders, should develop this strategy and management plan as a matter of urgency, before pressures to develop this area increase.

Recommendation 19

It is recommended that any potential future development involving clearing be examined in the appropriate manner outlined in the land clearing Memorandum of Understanding (Department of Agriculture 1997).

See also: Section 8 Vegetation management strategy

Land Use Strategy**Recommendation 20**

It is recommended that an urgent upgrading of roads to cater for the existing industries and to service the future horticultural and plantation industries as identified in the TIRES study commence before haulage operations commence for these industries.

Recommendation 21

It is recommended that the Shires of Nannup and Augusta-Margaret River amend their district planning schemes after extensive consultation with landholders to incorporate the zonings, zoning table and scheme provision recommendations set out in the Land Use Strategy.

Recommendation 22

It is recommended that as a pre-requisite to increased development along the coast and access to the foreshore area, the vesting of the coastal strip should be resolved as part of the Regional Coastal Management Strategy and Local Coastal Management Plan mentioned in Recommendation 18.

Recommendation 23

It is recommended that the accommodation growth demands within the study area be monitored and, as appropriate, detailed investigations be carried out into the preferred siting of a settlement/townsite and the associated infrastructure and community services and facilities requirements.

Recommendation 24

It is recommended that emerging product source locations and processing/transfer destinations be monitored to determine the routes, standards and timings of future road upgrading requirements.

Recommendation 25

It is recommended that a combined approach by landowners and producers within the study area be made to Western Power to determine the preferred option, connection points, grid layout, staging and associated cost contributions for three-phase power supplies to properties.

See also: Section 9 Land use strategy

Implementation

Recommendation 26

It is recommended that the Best Management Practices (BMPs) developed for this strategy be reviewed by the appropriate agencies and landholders on a regular basis. This is to ensure local knowledge and experience is incorporated into the BMPs.

Recommendation 27

It is recommended that the Lower Blackwood LCDC become the core of the Zone Management Committee. This Zone Management Committee would be responsible for coordinating the implementation of the Strategy for a Sustainable Future.

Recommendation 28

It is recommended that the role of the Zone Management Committee should principally be one of review of the Strategy, coordination of activities and reporting to the community on the Strategy and the results of the Triennial report card. The Zone Management Committee should not have the role of granting approvals or enforcing regulations. This function should remain with government agencies.

See also: Section 10 Implementation

Report card - Using sustainability indicators

Recommendation 29

It is recommended that landholders provide farm level soil survey and business information, on a confidential basis, to assist with the preparation of the sustainability report card.

Recommendation 30

It is recommended that the Zone Management Committee coordinate the preparation of the report card on sustainability for the Scott Coastal Plain with technical assistance from Department of Agriculture and Water and Rivers Commission, to be prepared every three years. The report card will include analysis of monitoring information gathered by Water and Rivers Commission and the Lower Blackwood LCDC and farm level information provided by landholders.

See also: Section 11 Report card : using sustainability indicators

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1.1 Background

The Scott Coastal Plain Steering Committee was established by the Minister for Primary Industry, the Hon Monty House MLA, in 1996, to prepare a land use plan or catchment Strategy for the Scott Coastal Plain area. The Committee members are representatives of farmer organisations, producer groups, the Lower Blackwood Catchment LCDC, local government and State government agencies.

The formal terms of reference are to:

- report on the agricultural potential of the Scott Coastal Plain;
- report on the impacts on the environment of current and any future developments;
- develop the formal planning and coordination process for the future management of the Scott Coastal Plain.

The study area is referred to as the Scott Coastal Plain (SCP) and consists of the area bordered by Brockman Highway, Stewart Road, Barlee Brook, Donnelly River, the Southern Ocean coastline and the Blackwood River. Roughly rectangular in shape, it extends about 70 km along the coast and about 20 km inland, covering a total area of about 105,000 hectares. Private freehold land covers about 42,900 ha, with the remainder being State forest, national parks/nature reserves, Crown land and other minor uses.

Europeans first moved into the area in the 1860s when the Bussells, Brockmans and Longbottoms developed coastal cattle runs in the area. In the 1920s more permanent European settlement occurred with the Group Settlement in the west of the project area. Other lands were also opened up about this time around Milyeannup in the east.

The next major development occurred in the 1960s when a number of conditional purchase blocks were cleared. The land was mainly used for dairy in the west and grazing in the east. In the 1990s, as returns from grazing diminished, farmers in the area began to diversify to other agricultural opportunities. This saw the eastward spread of dairying and the emergence of substantial blue gum (*Eucalyptus globulus*) plantations. With the availability of large quantities of high quality water from the underlying Yarragadee Aquifer, some farmers sank bores capable of drawing up to 1,000,000 m³ per annum and developed 40 ha centre pivot irrigation systems, principally for growing potatoes in a three-year rotation with grazing and other agricultural uses.

The emergence of substantial irrigated horticultural developments drew attention to the potential for environmental impacts arising from nutrient export and the longer term sustainability of the industry. In addition the high nutrient and biocide use in the early stages of tree plantation establishment was also of environmental concern.

If suitable land management practices and bore licensing conditions can be utilised to overcome those potential impacts, the opportunities for future development and production on the SCP is very substantial. The purpose of this Strategy is to address the land use planning aspects of an overall catchment management Strategy for the area.

The arrival of mining, tree plantations and the upgrading of agricultural and horticultural activities means that there are significant changes occurring on the SCP. There are greater demands for infrastructure to support these activities and the potential to change the social structure of the community.

To address the terms of reference set for the Steering Committee, this Strategy for a Sustainable Future has been prepared. This will incorporate management strategies for water and drainage, vegetation and land use. As a first stage of the overall study, the Steering Committee commissioned a Background and Issues Paper to form the basis for all the subsequent work.

The Background and Issues paper contains detailed information on climate, geology, soils, current land use, vegetation and an assessment of nutrient loads into the Hardy Inlet. It also contains opinions and recommendations that are not necessarily shared by the Steering Committee. The Background and Issues paper was current in 1997. However, some land uses have changed since then, and the pressures on the environment are better understood.

1.2 Current and future land use

There is a significant future in the SCP for a variety of land uses. Currently there is between 400 and 600 ha of land developed for irrigated agriculture in the SCP area. The main crop has been potatoes; other potential crops are carrots, sweet corn and onions. Despite the high cost of establishing irrigation systems, vagaries in the market and uncertainty over crop production and yields, this represents an area of significant potential for growth, provided best management practices for irrigation is followed, and approval conditions on the water licence are complied with.

Plantation timbers are also becoming a significant land use presenting land owners with a confirmed income. However, the use of land for this purpose is seen in some sectors as taking up land that could be put to higher value agricultural production. There is also the perception in the local community that plantations pose a potential environmental threat through use of biocides and the creation of silt-laden run-off during their establishment phase.

Grazing and dairying have been the most common form of land use on the SCP in the past, however, these are being displaced by other land uses including tree plantations and irrigated agriculture. Despite this there is opportunity for these industries to continue to grow and operate in the region.

Mining also has been established in the last 10 years with a big increase in infrastructure (roads and electricity) as a result. While the Beenup Mine has been shut down, Jangardup mine is still operating and there are still potential mineral sand reserves that may be developed in the future. Similarly the potential of the south coast for tourism still has to be developed. The study area includes the Scott National Park and various nature reserves and provides a westerly access to the D'Entrecasteaux National Park.

A key characteristic of the future development of the SCP is increased integration of a variety of land uses. Using timber plantations in combination with irrigated agriculture, grazing and dairying can assist to diversify the economic potential of the region and to address a range of social and environmental issues.

1.3 Why have a Strategy

What is a Strategy?

A strategy is a management plan, which describes a given situation, and then suggests a preferred series of recommendations and activities to achieve a future goal or objective. It is a process that allows people to identify key issues and develop preferred responses to a complex situation. It is a non-regulatory process, which needs to be reviewed on a regular basis.

In the past the SCP has been used predominantly for grazing and dairying. In the 1990s the area began to be investigated and developed for intensive horticulture, tree plantations and mining with potentially significant economic benefit. Each of these developments focussed more attention on environmental quality, provided an impetus to ensure good management of land resources in the region and to ensure that the development is sustainable.

In 1996 a proposal to develop 200 ha of land for horticulture was referred to the Environmental Protection Authority (EPA) for assessment. This referral was made primarily because of possible substantial and long-term off-site environmental impacts through nutrients leaching from sandy soils into the Scott River.

Following consideration of the project the EPA made a series of recommendations including: that the Minister for Primary Industry be requested to consider the preparation of a catchment management Strategy or land use plan for the area through the Scott Coastal Plain Steering Committee.

For any agricultural development to be sustainable it is important that the community well-being and the ecology of the area is improved, or at the minimum is not decreased, as a result of the development. The purpose of this Strategy is to place the future development of the SCP in the framework of sustainable development and to provide a vision for the future for agriculture.

1.4 Process description - How it was done

To initiate the project the Government, through Department of Agriculture, established a Steering Committee. The Steering Committee contracted John Monaghan and Associates to prepare a background and issues report on land use, development and the environment on the SCP. This work provided the introduction to the project and is contained in Part 1 of this Strategy. The Steering Committee developed a project plan to direct activities and appointed a Project Manager to coordinate the development of the Strategy.

The Steering Committee delegated the responsibility of implementing the project plan to an Executive Committee comprising the Chairman, two landholders (one of which also represented local government being a Nannup Shire Councillor), WRC, Department of Agriculture and the Project Manager. The major stages of the process in developing the Strategy are shown in Figure 2.

In late 1997, an agency Technical Advisory Group (TAG) was formed with representatives from Department of Agriculture, WRC, CALM, Department of Environmental Protection (DEP) and Ministry for Planning. The TAG role was to develop the assessment and approval process to integrate government agency assessment for new irrigation proposals and oversee the technical and scientific aspects of work being done by agencies on project activities.

The CSIRO Australian Research Centre for Water in Society (ARCWIS) was contracted to determine the community's visions and requirements for input into the Strategy. The consultation was undertaken during August and September 1998 and identified issues relating to land use, the role of the Steering Committee, resolution of problems and conflicts, how people value the wetlands and Scott River, the future of Hardy Inlet and other matters.

Following the development of the project plan, the Executive Committee established several working groups to develop management strategies for vegetation, water and drainage and land use in the study area.

The vegetation management Strategy was developed by CALM with DEP advising during the data acquisition and analysis stage of this work.

The Water Management Strategy group was led by WRC; members included Augusta Margaret River and Nannup Shires' engineering staff, WRC, Department of Agriculture and the Lower Blackwood LCDC Catchment Landcare Coordinator. A number of landholders and a drainage contractor were also invited to join the working group, but declined.

The Land Use Strategy working group was led by the Ministry for Planning; its members coming from the Shires of Nannup and Augusta-Margaret River, landholders, Ministry for Planning, DEP, WRC and Department of Agriculture.

The working groups documented and prepared natural resource data, guidelines for best practice, draft management strategies and draft policies on land use, for the Water Management Strategy and the Land Use Strategy. At various times, the community was consulted on the direction the strategies were taking, either at a full public workshop or at smaller targeted landholder meetings.

The Executive Committee supervised the project through each stage of the process and managed the budget for each task in the project plan. Despite delays in the preparation of individual management strategies the first draft of the complete Strategy was submitted to the Executive Committee prior to the end of June 1999.

Based on the comments of the Executive Committee, amendments and alterations were made to the Draft. This was then reviewed by the Steering Committee in July 1999 and then referral to the State government agencies for endorsement to advertise as a draft management Strategy for public comment. This last phase will be completed by the end of 1999.

Figure 2. Major stages of the study.

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Contents

- 2.1 Introduction
- 2.2 The AWCWIS Project
- 2.3 Vision for the future workshop
- 2.4 General issue identification

2.1 Introduction

Community consultation and communication on the preparation of the draft Strategy for a Sustainable Future has been coordinated by the Executive Committee. This work has involved a number of public workshops, discussions and briefings on-site in Scott River for landholders and farmers and (initially) a comprehensive newsletter explaining the role of the Steering Committee and the process for preparation of the Strategy.

The consultation and communication activities carried out between June 1998 and June 1999 are shown in the following table.

Table 1. Community consultation activities

Date	Action
July 1998	Newsletter on Steering Committee activities and process sent to stakeholders (>140)
September 1998	ARCWIS community consultation project (stakeholder consultation)
October 1998	Meeting with irrigation farmers to review BMP for irrigation, and the draft assessment criteria for new irrigation proposals
December 1998	Public Workshop (Vision for the Future)
February 1999	Meeting with irrigation farmers to review groundwater licensing guidelines (Water and Rivers Commission)
February 1999	Public Workshop (Prelim Draft Water Management Strategy, catchment characteristics, nature and importance of aquatic ecosystems, Lower Blackwood LCDC)
May 1999	Public Workshop and Briefing (Scott Steering Committee process, direction of overall plan, draft management strategies, LUS directions)

The two principal consultation actions in obtaining input from the community on the preparation of the Strategy

for a Sustainable Future were the ARCWIS project and the December 1998 'Vision for the Future' public workshop.

2.2 The ARCWIS Project

The Steering Committee commissioned ARCWIS to consult with the community on issues for land use, the role of the Steering Committee, resolution of problems and conflicts, how people value the wetlands and Scott River, the future of Hardy Inlet and other matters.

The consultation was carried out by interviewing a large number of stakeholders (> 80) including landholders, community groups and conservation groups, business and people in local government. Priority was given to community and other stakeholders in the interview process. State government stakeholders represented on the Steering Committee were not interviewed.

At the beginning of each interview, a broad explanation was given of the Steering Committee's role and objectives, its members and their work on the preparation of the Strategy. It was explained that the Steering Committee wanted to gain input on community issues, were wanting advice on whether people thought the Committee was addressing the right issues and the ongoing community participation process.

Almost everyone interviewed mentioned something positive about the SCP, whether it was the unique aspects of the land or climate that made it good farming country, the potential for further development of agriculture, the diversity, health or beauty of the environment, or the unique cultural aspects. People who lived in the area loved living there and enjoyed the lifestyle.

At the same time, it was evident that there were certain challenges facing the area, partly associated with its isolation. There was a lot of concern about relationships with government departments, resulting in uncertainty about the future of the SCP. In addition, low incomes, rising costs, international markets, lack of political support, lack of resources, diversification, conflict and infrastructure were all mentioned as issues which were impacting on the area and at times limiting progress.

Many individuals interviewed discussed decision making on water allocation and various aspects of vegetation. Also discussed was the degree of consultation by government departments in general. Issues regarding land and water management included water quality (of rivers, Hardy Inlet) monitoring, management of fertilisers, waterlogging, drainage and groundwater. Discussions of the impacts of different activities on the area covered blue gums, urban and agricultural development, tourism, mining and horticulture. Generally, the view was that both the environment needed to be protected and agriculture needed to be economically sustainable.

2.3 Vision for the future workshop

A facilitated workshop was conducted at the Alexandra Bridge hall in December 1998, to develop a vision for the future for agriculture and the SCP generally. The workshop provided an opportunity for landowners and the general community to have input into the preparation of the draft Strategy. The workshop was also successful in identifying a number of criteria for sustainability for land use in the SCP and these are documented in Section 11.

A large number of landholders and stakeholders from the study area worked through a set program to determine values for the area generally, for water management and vegetation and for land use. Many of the issues identified in the ARCWIS project were confirmed, however, the workshop also provided a mechanism to exchange views between government agency staff, and landholders and farmers.

The workshop results have provided valuable input into the preparation of management strategies for the SCP and ideas suggested by participants have enabled the Steering Committee to develop guiding principles for the Strategy for a Sustainable Future.

The participants generally believed that diversified agriculture has a future in the SCP area. It was generally considered that agriculture was an important land use in this area and its value to the State should be identified and promoted to the general community.

2.4 General issue identification

- 2.4.1 Issues : Economic and Infrastructure
- 2.4.2 Issues : Environmental
- 2.4.3 Issues : Community

Based on the community consultation, the background and issues report and other work from the agencies, a number of issues were identified relating to the SCP. These are presented below.

2.4.1 Issues - Economic and infrastructure

The SCP has considerable potential for diversified agricultural land uses, particularly centre pivot irrigation for horticulture, continued beef and dairy farming, and timber plantations. This potential is discussed further in Section 5.

Key issues identified are:

- There is a demand from the industry to expand horticultural operations into the region.
- The capital investment required for irrigated agriculture is such that year-round operation is more economically attractive than summer-only production.
- To service these industries it is likely that certain infrastructure improvements such as power, roads and telecommunications will be needed in the region.
- Blue gum plantations are already present in the region and are expanding. In addition these plantations are occurring on productive agricultural land.
- There are best practice guidelines that can and are being employed to reduce nutrient loads entering rivers.
- The identification and development of suitable markets to support ongoing agricultural industry.

2.4.2 Issues - Environmental

The Steering Committee has set the objective that until more is known about the impacts on the ecology of the Scott River and Hardy Inlet from land use activities there should be no increase in the levels of nutrients in these waterways that are sourced from the Scott River Catchment.

Much of the landscape of the SCP is subject to high watertables and waterlogging in winter. There is significant drainage from the SCP to the Scott River and the Hardy Inlet. The drainage system of the SCP is complex and it is difficult to identify specific sources of nutrients across the catchment. The drainage pattern of the plain has been significantly modified increasing the likelihood of nutrients and sediment reaching the Scott River and Hardy Inlet.

Other issues include:

- While the land capability has been determined based upon summer cultivation, the horticultural industry is of the opinion that there are technical options that will allow it to operate all year.
- There is insufficient data to develop an accurate picture of the nutrient status of the water bodies in the region, however, it appears that there are already elevated levels of nutrients, particularly nitrogen, present.
- The SCP contains native vegetation that is endemic and some that is poorly represented elsewhere and includes some rare and Priority Species. This is discussed in Section 8.
- There are opportunities for protecting and repairing native vegetation, e.g. along roads and streamlines, and thereby increasing the ecological value of the region.
- There are a range of land uses that can be used for economic production that also have an environmental repair function, e.g. growing plantation timbers adjacent to degraded stream lines.

2.4.3 Issues - Community

Key issues include:

- It is important that improvements to the ecological and social qualities of the region are not to the detriment of the economic activity in the region.
 - The community feels threatened by the changes in rural activities that have occurred over recent years. The introduction of blue gum plantations has potential to result in people moving out of the region.
 - With changing mining activity, the size and composition of the population living in the SCP will change with the ensuing changes in the community structure.
 - There has been no review or assessment of changes in community structure as a result of changing land use.
-

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This section describes selected State Government policy in relation to general natural resource management issues such as clearing, drainage and wetlands and describes landholder responsibilities under State Legislation and government policy.

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- 3.1 Clearing of remnant vegetation
- 3.2 Drainage
- 3.3 Declared plants and weed pests
- 3.4 Wetlands
 - 3.4.1 South West Agricultural Zone Wetlands Policy
- 3.5 State water quality management strategy
- 3.6 Native title and aboriginal heritage
 - 3.6.1 Native title and water allocation

3.1 Clearing of remnant vegetation

The protection of remnant vegetation on rural land in Western Australia is provided for by the Soil and Land Conservation Act 1945 and Regulations (1992) and managed according to the Memorandum of Understanding for the protection of remnant vegetation in Western Australia published in April 1997.

The Memorandum of Understanding between State agencies is aimed at ensuring that broader nature conservation and biodiversity values are not threatened by a proposal for clearing, as well as addressing land degradation issues. Where the Commissioner for Soil Conservation does not object to a proposal (or part thereof) on land degradation grounds, he will consider advice from other State agencies and may refer proposals on to those authorities for appropriate action under other legislation, e.g. the Commissioner may refer a proposal for clearing to the EPA if it is considered that the protection of biodiversity is an issue.

Under new procedures announced by the Minister for Primary Industry on 5 March 1999, landholders wishing to clear vegetation will have to prove that any proposed land clearing will not cause land degradation. The collection of detailed information to assist

the assessment of clearing proposals will no longer be undertaken by Department of Agriculture staff. The Commissioner will request landholders to document and present their case for assessment. The new arrangements ensure that further clearing does not add to the severity of land degradation that already affects significant areas of rural Western Australia.

Notification to the Commissioner is required for clearing that will result in a change in the use of that land and the area is greater than 1 hectare.

Other provisions exist in:

- a controlled catchment or water reserve proclaimed under the Country Area Water Supply Act (1947); or

- a special policy area such as the Peel-Harvey Catchment, or the Leeuwin-Naturaliste Ridge Statement of Planning Policy area.

The SCP lies within the Shires of Augusta-Margaret River and Nannup. Landholders wishing to clear remnant vegetation on their properties will need to address land degradation issues such as erosion and possibly eutrophication (or loss of nutrients) and ensure the nature conservation and biodiversity issues are addressed in their proposals.

More detailed information to assist with assessing the likely outcome of a clearing proposal and how to prepare a detailed proposal, is available from Department of Agriculture in the Information Package for Land Clearing Proposals on Land Zoned Rural, see Appendix 18. In addition, the Vegetation Strategy in Section 8 of this report, with additional details in Appendices 12 to 18, contains descriptions of vegetation complexes that are well represented and those poorly represented in the SCP area.

3.2 Drainage

The principal control mechanism related to drainage in Western Australia is the Soil and Land Conservation Act 1945 (SLC Act) and this is mainly for saline drainage. In addition, provisions exist within the Rights in Water and Irrigation Act 1914 (RIWI Act). The Environmental Protection Act 1986 (EP Act) may be invoked if there is likely to be a significant effect on the environment.

The RIWI Act provides protection for any watercourse, race or drain flowing through or over the land, however, these are mostly used in gazetted catchments for the management and allocation of surface water flows. The EP Act may be invoked where it can be demonstrated that there is potential for any drainage activities to result in environmental damage.

The SLC Act deals with all aspects of land related degradation including that which results from drainage works. This may include the adverse affects of erosion, flooding and eutrophication.

The Soil and Land Conservation Regulations are those most often applied to the management of degradation issues on private land. These regulations require that landholders intending to drain or pump saline groundwater, principally for the purpose of reducing land salinisation, notify the Commissioner of Soil and Land Conservation of their intentions. The aim of the notification is to ensure that neighbouring landholders are given an opportunity to comment on the proposal and for an assessment to be carried out. The assessment would include aspects relevant to the other Acts as well as the Soil and Land Conservation Act.

Drainage works on the SCP are undertaken principally for the management of fresh surface and shallow groundwater to reduce the impacts of waterlogging and inundation. Where they are not for the purpose of lowering saline groundwater or mitigating land salinisation, these works are considered to not require notification, by the proponent, under the Act.

Notwithstanding, the Commissioner for Soil and Land Conservation is charged with the responsibility of preventing land degradation. Therefore, there is a requirement to assess any proposal or existing activity brought to the Commissioner's attention, on the basis of potential land degradation. As an outcome of any such assessment, conditions may be imposed.

In order to reduce the potential for land degradation and community conflict, landholders are encouraged to work cooperatively in drainage activities. In support of this, the Commissioner may provide comment and assistance to landowners developing water management and drainage plans, if they are referred to Department of Agriculture. In addition, a draft policy on drainage for the SCP has been endorsed by the Commissioner to advertise for public comment in this Strategy. See Section 7.11 on catchment planning and Appendix 5 for more information.

3.3 Declared plants and weed pests

Department of Agriculture and the Agriculture Protection Board have recently announced a major initiative to control plant pests and weeds that threaten agricultural industry in the South West. Across the whole State and within each shire certain species of plants have been declared and landholders and occupiers will be required to carry out weed control works on their properties where the weeds occur. Details of the weeds requiring control

and eradication works by landholders in the Shires of Nannup and Augusta-Margaret River are shown in Appendix 32.

3.4 Wetlands

Wetlands on the SCP have been classified by Semeniuk (1996) and published in the WRC report Mapping and Classification of Wetlands from Augusta to Walpole in the South West of Western Australia (1997).

In this report, wetlands are defined as 'areas of seasonally, intermittently or permanently waterlogged soils or inundated land, whether natural or otherwise, fresh or saline, e.g. waterlogged soils, ponds, billabongs, lakes, swamps, tidal flats, estuaries, rivers and their tributaries'.

One of the implications for landholders is that areas of pasture considered by farmers to be of little or no environmental value can be included in the list of wetlands, or appear on wetland mapping for their area, simply because it is waterlogged or inundated at some time during the year. The values assigned to this sort of wetland are usually low, however, most biologists recognise that waterlogged and flooded pasture areas do present certain values for wildlife (grazing, feeding on invertebrates and possibly nesting by some waterbirds).

A summary of selected formal controls and protection mechanisms such as Legislation, Regulations and Policies covering wetlands and how they apply to the Scott Coastal Plain are shown in Table 2.

Table 2. Summary of legislative and policy controls relating to wetlands

Legislation or Policy	Provisions for Wetlands	Applies to SCP
Rights in Water and Irrigation Act	Controls surface water diversions in gazetted catchments; licensing and control of groundwater abstraction in gazetted groundwater areas.	Yes Limited to groundwater licensing.
Country Areas Water Supply Act	Controls clearing in gazetted catchments.	No None in SCP.
Soil and Land Conservation Act	Controls clearing Statewide, applies to the SCP for clearing all vegetation for areas > 1 ha, including wetland vegetation. Controls drainage Statewide. Draft policy developed for SCP involves sub-catchment planning approach, however, no formal controls on drainage unless land degradation occurs.	Yes Yes See section 7.12 and Appendix 5.
The Environmental Protection Act 1986	Part 3 Environmental Protection Policies Part 4 Environmental Impact Assessment Part 5 has the objective of the prevention, control and abatement of environmental pollution, for the conservation, preservation, protection, enhancement and management of the environment.	Yes
Water and Rivers Commission Act	The Commission has water resources conservation, protection and management functions vested in it by various written laws. This Act also gives the WRC functions which relate to the conservation, management and assessment of water resources and planning for their use (water resources is broadly	Yes No clear provisions for protection of wetlands.

	defined to include wetlands).	
Waterways Conservation Act	Within certain gazetted management areas, a management authority will protect waterway systems. None occur in the SCP area.	No
Wildlife Conservation Act	Protection of Declared Rare Flora	Yes Some occur in SCP area, landowners are notified. May involve wetlands.
South West Agricultural Zone Wetlands Policy (EPP)	Protection for nominated and registered wetlands in South West Agricultural Zone only. See detailed note below.	Yes None occur in the SCP yet.
Swan Coastal Plain Lakes Policy 1992 (EPP)	Protection for wetlands on the Swan Coastal Plain. Does not apply to the SCP.	No
State Wetlands Conservation Policy	Principles for identification and protection of wetlands in Western Australia.	Yes But at a high level, non-statutory.
International Treaty to which Australian and State Governments are responsible	Western Australian Ramsar wetlands, none occur in SCP.	No
Department of Environmental Protection - Guidelines for environment and planning	Non statutory guidelines, provides advice on wetlands generally as well as those that are important such as Ramsar, current legislation and policies, classification of wetlands, and guidelines on protection mechanisms including buffers. EPA position statement on wetland protection.	Yes

Generally, most provisions within the above statutes and policies apply to areas outside the SCP. There are no Ramsar wetlands in the SCP and the provisions within the RIWI Act for surface water management generally are not applied in this area.

Lake Jasper is listed under the convention on Wetlands of International Importance.

The State Wetlands Conservation Policy is a non-statutory policy of Government, aimed at identifying and protecting wetlands within Western Australia. The Policy outlines principles for protection of wetlands and identifies the need to protect wetlands. There are no specific provisions that impact on SCP landholders, however, most of the principles for protection of wetlands are incorporated into decision making by State agencies and local government.

The drainage regulations apply State-wide, however, are not applied to the SCP area, unless land degradation occurs, because drainage of saline groundwater is not an issue for this area. A draft policy for drainage management has been endorsed by the Commissioner to advertise for public comment as part of this Strategy. See Section 7.11 and Appendix 5 for more information on drainage approaches for the SCP.

3.4.1 South West Agricultural Zone Wetlands Policy

In 1998 the Government of Western Australia proclaimed an Environmental Protection Policy (EPP), called the Environmental Protection (South West Agricultural Zone Wetlands) Policy.

This EPP creates a register of protected wetlands; sets up a program for protection of wetlands; and prescribes a

number of controls on activities that might have a detrimental environmental impact on protected wetlands.

A wetland becomes protected when it is nominated to and entered on the Register of Wetlands, which requires the agreement of the landowner. The policy provides for offences that result from damage or degradation of registered wetlands and the development of BMP between government and landowners to encourage voluntary adoption of environmentally sensitive practices.

3.5 State Water Quality Management Strategy

A State Water Quality Management Strategy (SWQMS) has been developed containing a water quality management objective, principles, strategies, action plan and implementation framework. This Strategy recognises that water quality management is a responsibility shared by government (at all levels), industry and the community.

The State Government is signatory to National Agreements and Strategies which require government and agencies to apply certain principles and implement reforms and strategies related to natural resource management, water resources management and sustainable development. This includes a requirement to develop the SWQMS, in line with the principles and objectives of the National Water Quality Management Strategy.

The water quality management strategies (summarised) are to:

- use an integrated resource management approach;
- involve and inform community and key stakeholders;
- determine environmental values or beneficial uses;
- prepare water quality management guidelines;
- adopt a precautionary approach and encourage continuous improvement;
- use a mixture of regulatory and market measures;
- require the polluter to avoid pollution and pay for clean-up.

The implementation of the SWQMS involves a number of actions including the preparation of a State Water Quality Implementation Strategy and assessing existing plans, policies and guidelines and processes for consistency with the principles and strategies. In addition, interagency agreements, central compilation of policies and guidelines and coordination mechanisms are required to ensure effective integration of water quality management.

This SWQMS does not impact on landholders in the SCP area directly. The State Government has the prime responsibility for water quality management in Western Australia and the SWQMS is implemented through agencies in the first instance and through cooperative projects and committees and catchment management groups supported by agencies throughout the State.

3.6 Native Title and Aboriginal heritage

The Native Title Act (1993) was introduced by the Federal Government to give statutory effect to the principles handed down by the High Court Mabo Decision in June 1992. This Act is not directly related to heritage issues yet affects the ownership and management of land by determining whether Native Title exists over particular land.

The operation of Native Title legislation within Western Australia continues to be debated by sections within the community, including State Government. Due to the complicated nature of the situation and the intricacy of the legislation, the reader is advised to seek any further advice from the Native Title Tribunal.

A number of Native Title claims have been lodged with the National Native Title Tribunal in relation to land covering parts or all of the study area. The applications do not include claims involving freehold land.

The Aboriginal Heritage Act (1972) establishes protection for areas of Aboriginal heritage, identifies the characteristics of Aboriginal heritage and provides for offences for actions which degrade or destroy values of Aboriginal sites. Not all sites of Aboriginal heritage are registered and landholders may be unaware that their property has sites possessing Aboriginal heritage values. The Department of Aboriginal Affairs recommend that

landholders and developers consult with the Sites Register and with local Aboriginal groups to determine whether any heritage values exist on their property before commencing development.

3.6.1 Native Title and water allocation

The WRC has recently included the consideration of Native Title when assessing applications for surface water or groundwater use and allocation.

The impacts of Native Title on water allocation and statutory licensing under the RIWI Act are still being determined by the WRC. The reader is advised to seek further advice from the Commission on how an application for surface or groundwater would be processed.

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The health of the Hardy Inlet must be considered in relation to the health of the Scott and Blackwood Rivers. While numerous investigations have been carried out over the last decade, they have been done in isolation and making comparisons is difficult. Following is a brief discussion of monitoring and studies to date, current assumptions and comments on future monitoring.

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4.1 Scott River

The Scott River is much smaller than the Blackwood in respect to both catchment and flow. It is tidal for approximately 8 km and upstream of this point is fresh with average salinity in the region of 0.25 parts per thousand. Recent studies have indicated that nutrient concentrations often exceed ANZECC guideline levels for ecosystem protection. It is worth mentioning that the same is true for many systems in this region and may be seen as an indicator of declining waterway health. Despite high nutrient concentrations the Scott River shows only few and occasional physical symptoms of eutrophication. A possible reason for this is the dark colour of the water which has high levels of tannins, which limits light penetration and affects plant growth.

The Scott Catchment has much greater water yield per unit area than the Blackwood and this combined with soil types in the catchment means that the Scott releases a disproportionately large proportion of phosphorus when compared with the Blackwood. The high nitrogen (most of which is organic) loads carried by the Scott are believed to be largely natural due to high background levels in the catchment (Gerritse 1996).

Sampling in 1995 revealed that both total nitrogen and total phosphorus levels were high and that particulate nutrients represented the greatest proportion (Gerritse 1996). Both researchers do state the possibility of sampling error in the data used to draw these conclusions. Monitoring in the last four years by the Water and Rivers Commission does not concur with the 1995 results. Sampling between 1996 and 2000 shows that little suspended material is carried in the Scott River and that the greatest proportion of the nutrients present are in solution.

Figures from 1997 indicated that the Scott contributed 40 per cent of the total phosphorus load to the Hardy Inlet and 30 per cent of the nitrogen, these figures were somewhat lower in 1996 (38 per cent of phosphorus and 6 per cent of nitrogen). However, 1996 was not a typical year in terms of flow. Data supports the assumption that the Scott River has a greater impact on the trophic status of Hardy Inlet in years of low flow rather than average years due to reduced flushing of the estuary basin (WRC 1996). Based on recent data the assumption is that the situation with regards to proportional loads has not changed in recent years. Recognising the limitations in estimating loads

the Water and Rivers Commission is developing a Statewide approach which focuses on concentrations. For this reason no loads have been estimated for the last four years. Based on recent data the assumption is, that the situation with regard to proportional loads has not changed in recent years.

Despite any uncertainty with regard to the current status of the Scott River it is important to recognise that the ecosystems of the area are naturally adapted to nutrient poor conditions and any increase in concentrations in the catchment is risky. Regardless of its form, high levels of phosphorus are harmful to ecosystem health contributing to excess algal growth, consequences of which may include toxicity to humans and of shellfish, overall decline in species diversity in a system and fish deaths. In addition to the risks from nutrient enrichment in the catchment an additional risk to ecosystem health is changing water regimes, information on which has yet to be collected.

4.2 Blackwood River

The Blackwood catchment is 66 times greater in area than the Scott with five to six times average annual flow (Monaghan 1997). The river is salty in its upper reaches becoming less so moving downstream. It is estuarine for approximately 50 km and is subject to stratification over most of this length during summer months when a salt wedge establishes below the fresher surface water.

ANZECC guideline levels for Total Nitrogen and Total Phosphorus have only been exceeded during winter flows in the last three years. However available nitrogen and phosphorus concentrations remain above guideline levels for most of the year and this is reflected by an increased presence of micro-algae cells along the length of the river. Cyanobacteria (blue-green algae) blooms have occurred with increasing frequency and severity in the middle reaches of the Blackwood over the last five years. These blooms are symptomatic of a system under pressure and in decline. Not only are they unsightly, there may be toxicity concerns with some species seriously limiting the beneficial use of the waterway.

The Blackwood carries a larger sediment load than the Scott River, reflected not only by high turbidity and suspended solids results but also in the physical appearance of the water. Given the comments made above about the potential impacts of particulate nutrients on the inlet this is an issue that requires attention.

4.3 Hardy Inlet

The Hardy Inlet has an area of 12.7 km² with an average depth of 1.3 m. It is well flushed in winter by river flows and has good tidal exchange during warmer months. The upper estuary however is less well flushed in summer and is placed under additional pressure by the presence of a salt wedge influencing water chemistry. The flushing may mean that the bulk of sediment and nutrient loads delivered to the estuary are flushed to the ocean, however, this is yet to be determined. Some particulate and organic material may be retained through sedimentation during low flow periods. Leading to problems in warmer months especially in those areas where the salt wedge is established and de-oxygenation conditions occur.

When first observed the Hardy Inlet appears healthy. Fringing vegetation is good and there is little evidence of eutrophication. Data from the first year of the WRC monitoring program show that nutrient levels are generally below ANZECC guideline levels with some excursions during high flow periods. However, data clearly identifies areas of the inlet that are under pressure and where further increases in nutrient concentrations may lead to increased algae blooms and changes in species composition favouring potentially toxic types such as cyanophyta and dinoflagellates.

Additional impacts on the Hardy Inlet of elevated nutrient levels are not yet known and will be dictated by the form in which the nutrients occur. Soluble nutrients are unlikely to be retained in the inlet due to the level of flushing, while particulate nutrients have the capacity to accumulate, increasing the internal loading and significantly impacting on the trophic status of the inlet. Problems evident in other similar South West systems serve as a solid basis to employ a cautionary approach when determining target concentrations for the Hardy Inlet and the Scott and Blackwood rivers.

A full report on the first year's results is being compiled and should be available by the end of November 2000.

Figure 3. A comparison of total nitrogen and phosphorus concentrations in the Scott, Blackwood and Serpentine rivers between July 1996 and October 1998. (The red line indicates ANZECC (1992) guideline values for fresh water.)

Figure 3a. The Scott River

Figure 3b. The Blackwood River

Figure 3c. The Serpentine River

Figure 4. A record of nutrients and chlorophyll 'a' concentrations in Hardy Inlet collected between December 1998 and September 2000 with those collected historically. (The solid line indicates ANZECC (1992) guideline values for estuarine and fresh water.)

Figure 4a. Total nutrients (mg/L)

Figure 4b. NOX (mg/L)

Figure 4c. Ammonia (mg/L)

Figure 4d. Chlorophyll A (mg/L)

Figure 4e. Total Phosphorus (mg/L)

Figure 4f. Filterable Relative Phosphate (mg/L)

4.4 Possible consequences of elevated nutrient levels

There are two major consequences of elevated nutrient levels: the effect of nitrogen and phosphorus on algal growth and the toxic effect of ammonia.

High nitrogen and phosphorus concentrations can lead to an increase in growth in both macroscopic (large enough to view with the naked eye) and microscopic (smaller than can be seen with the naked eye) algae.

Description of Hardy Inlet sampling sites

Site	Region	Northing	Easting
HIF01	Entrance	6 200 386	331 512
HIF02	Entrance	6 201 883	330 922
HIF03	Basin	6 203 358	330 945
HIF04	West Bay	6 203 403	329 810
HIF05	North Bay	6 205 218	330 672
HIF06	Channel	6 204 220	332 374
MIF01	Molloy Island SW	6 205 672	334 256
MIF02	Molloy Island W	6 206 715	334 279

MIF03	Molloy Island NE	6 207 106	335 493
SRF01	Scott River	6 207 231	336 389
BRF01	Blackwood River	6 207 861	335 101
BRF02	Blackwood River	6 218 080	333 411

Problems that can result from large growths (blooms) of algae:

- **Habitat degradation** - Algae can smother existing habitats of fish and invertebrates.
- **Physical barrier** - Macroalgae blooms can form physical barriers to fish migration.
- **pH and oxygen changes** - Blooms can lead to local, but marked, diurnal (day/night) changes in both pH and oxygen. This can be deadly to sensitive species of aquatic plants and animals.
- **Odour and nuisance** - The decomposition of an algal bloom, can lead to major odour problems for local residents and users of the estuary. Algal blooms can often spoil beaches and shorelines and are an obvious nuisance to recreational users (e.g. swimmers, boating and fishing).
- **Bloom crash** - If a bloom crashes (often caused by seasonal changes in water conditions) its decomposition leads to a rapid drop in oxygen levels. A lack of dissolved oxygen within surrounding waters is deadly to other aquatic life.
- **Toxicity** - Some forms of algae, especially blue-green algae (Cynobacteria), can be toxic to both aquatic life, as well as humans.
- **Seagrass decline** - Microalgae, growing on the leaves, can eventually smother seagrass, causing the death of large meadows. Seagrass (which is not an algae, but an aquatic flowering plant) meadows are an important habitat, a major food source for aquatic animals and their roots stabilise the estuary floor.

High concentrations of ammonia are of concern as they can have acute toxicity to aquatic life. Elevated levels of ammonia can also have chronic effects including reduction in fish hatchings and growth rates.

4.5 Current and proposed research

The high level of agricultural and general development activity in the Blackwood and Scott catchment and the increased nutrient concentrations recorded have prompted the WRC to assess the health of the Hardy Inlet in more detail. Currently a fortnightly water quality program is being conducted to collect seasonal data, which will give a better indication of nutrient concentrations.

It is also envisaged that the following work will be conducted over the next two years:

- A hydrographic survey.
- A water circulation survey which includes the mapping of the Scott River/Hardy Inlet interface.
- Fish and bird surveys.
- A shoreline vegetation survey.
- An invertebrate study.
- Investigation into sedimentation rates in the lower river reaches and the inlet, and sediment export to the ocean to provide clarification of the inlet's ability to deal with sediment and nutrient loads from the Scott and Blackwood rivers.
- Analysis of sediments for nutrient concentrations and fluxes to establish the internal loading and the ability of the inlet to process nutrients to assess future risk of eutrophication.
- Development of ecological water requirements for the Scott Coastal Plain wetlands and their associated endangered species communities.
- Ongoing monitoring in the Hardy Inlet and Scott and Blackwood rivers with the aim of developing water quality targets for the area and an appropriate compliance monitoring program.

The results from these studies will give a better indication of the health of the Hardy Inlet and problems that are likely to occur in the short to longer term. In the meantime it is strongly advised that nutrient input in to the Blackwood and Scott rivers should not be increased and that instead, effort is made to decrease the nutrients entering these rivers.

4.6 State of the wetlands

The SCP consists of predominantly undulating to near flat land. It is an area of deep sediments, with varied soils including coloured deep sands, some deep sandy duplex soils, sandy loams and loams. The SCP contains a large diversity of wetland types ranging both in size and condition.

A significant proportion of the SCP has been classified as being wetland. This includes extensive seasonally waterlogged or inundated areas such as swamps, damplands, palusplain and areas of permanent water such as lakes and rivers. A number of these wetlands have been recognised as having significant conservation areas.

Wetlands found on the SCP are highly valued for the diversity of functions and values that they provide including the provision of habitat for flora and fauna, biofiltering of sediments and nutrients, flood mitigation, groundwater discharge and erosion control. Wetlands are diverse and productive areas that perform a range of ecological functions, in some cases supporting large faunal populations, functioning as sanctuaries for native species and forming corridors that link areas of native vegetation with conservation values.

Mapping, classification and evaluation of wetlands from Busselton to Walpole has been undertaken by the WRC (Semeniuk Research Group 1997; Pen 1997). A condition assessment (the degree to which a wetland has departed from its natural state) was also completed at this time. There are two levels of wetland evaluation, first and second tier. First tier assessment is based on existing evaluations of important values at the local, regional, national and international level. Second tier evaluation is undertaken where there is limited comprehensive information available and evaluation of a large number of wetlands is proposed. This is discussed further in Appendix 11.

4.7 Wetlands of conservation significance

A number of the wetlands on the SCP have been identified as having significant conservation values and have been incorporated into national parks or nature reserves. Lake Jasper is the largest freshwater lake in the south-west of the State consisting of 440 ha of open water that is up to 10 m deep in places. Lake Jasper and the surrounding swampland represent some of the most pristine wetland habitat found in the South West. Lakes Jasper, Quitjup, Smith and Wilson are all found within the D'Entrecasteaux National Park.

Lake Jasper and Lake Quitjup have been identified as having significant floristic values both supporting extensive areas of very tall sedgeland. Water quality in each of the lakes is good with Lake Jasper in particular providing important habitat for freshwater fish, waterbirds, aquatic invertebrates and frogs.

Gingilup Swamp Reserve includes a complex network of wetlands including Gingilup Swamp, which is a very large area of swampland of approximately 2000 ha. Native vegetation in the Nature Reserve is in excellent condition providing habitat for a diversity of fauna and supporting a number of species of Declared Rare Flora (DRF). Gingilup Swamp and Lake Jasper have been identified as nationally significant wetlands by the Australian Nature Conservation Agency and the Australian Heritage Commission.

The boundary of the Scott River National Park commences at the eastern boundary of the Blackwood River and includes both sides of the lower reaches of the Scott River. It includes a large number of Priority Species and DRF. A large proportion of the area is considered to be in pristine condition with little evidence of past disturbance.

The Hardy Inlet is the broad shallow estuarine component of the Blackwood and Scott River Systems. It is up to 2 km wide and has significant areas of reserves and national park adjacent to it. The estuary functions as a nursery for a number of fish species and provides habitat for a number of waterbirds including migratory species.

4.8 Threats to wetlands

Given the generally sandy soils and high watertable within the catchment, careful land management practices are required to ensure that unacceptable environmental impacts do not occur. Threatening processes which may adversely impact upon wetlands on the SCP include:

- Increased nutrient loads from both surface and groundwater being discharged into wetlands and

waterways resulting in a decline in water quality and potentially eutrophication, adversely impact upon wetland ecology. Best management practices in management of irrigation and fertiliser must be implemented to ensure the conservation values of downgradient wetlands are not compromised.

- Alteration to wetland water regimes through clearing, drainage of waterlogged areas and discharge of drainage water into receiving waterbodies has the potential to adversely impact upon wetlands. These processes contribute to the loss of wetlands through either lowering the watertable or the alteration of wetland water regimes through flooding and increased waterlogging adversely impacting upon wetland ecology.
- Clearing of wetland buffer zones removes habitat for flora and fauna and diminishes the capacity of the buffer to reduce the export of sediment and nutrient into the wetland from surface run-off. Adequate buffers must be maintained to ensure wetland functions and values are protected.
- The establishment of intensive agriculture industries and tree plantations in the groundwater recharge areas associated with these wetlands. These developments could potentially impact on the nutrient and water balance of these wetlands. Any new developments need to be assessed using the multi-agency assessment and approval process that is used for other developments on the Scott Coastal Plain. There is a need to accurately map the groundwater recharge areas associated with these wetlands.



The status of individual wetlands is discussed in Appendix 11.

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5.1 Introduction

This section of the Strategy provides an assessment of the economic potential of agriculture on the Scott Coastal Plain. It estimates the potential for agricultural land use, production levels and presents a vision for the future for agriculture. Economic activity is only one component of land use on the SCP.

This study starts with identifying potential agricultural industries and the constraints on their development including infrastructure, environment and production requirements. The resulting estimate of the productive agricultural land available for each activity has then been adjusted downwards based on these constraints. There are still a number of uncertainties in these estimates. These include sufficient market demand for increased horticulture produce from Scott River and the ability of identified management strategies and best practice guidelines to achieve environmental sustainability targets. In addition, further work needs to be done to demonstrate that best practice and agronomic techniques will sustain viable levels of production for cropping in the SCP area, given the natural constraints, e.g. nature of the soils and potential for waterlogging.

It is acknowledged that the figures estimated here may be amended over time and adapted, based on reviews of the overall Strategy and in light of more detailed knowledge of the impacts of land use and land management practices.

This report calculates gross margins for existing enterprises that operate in the SCP and potential enterprises that could operate in this area. These gross margins are then used as the basis for calculating the existing and potential gross value of agriculture able to be generated from the SCP. The existing and potential gross value of agriculture figures are then used in conjunction with total value adding ratios to calculate the existing and potential total value added by agriculture in the SCP.

The Land Use Strategy in Section 9 relies on these figures in estimating the growth in development and identifying potential infrastructure needs.

5.2 Vision for the future of agriculture

The vision for the future of agriculture in the SCP area is one of profitable and diversified agricultural land use, in balance with the environmental and social values of the region. The figures presented in this report show that diversified production combining tree plantation and/or irrigated cropping with grazing enterprises provides for potential increases in gross margins and buffers against movements on commodity prices in any one industry.

The vision for agriculture is also one of a long-term investment. The high cost of equipment and land management infrastructure (drainage and nutrient stripping systems) and rising values of land, combined with the long-term returns on tree plantations, mean that landholders need to plan and manage their business enterprise on a long-term basis.

5.3 Available land for agricultural production

The total area of the SCP study area is 107,000 ha. Within this study area 57,384 ha is State forests, national parks, nature reserves and other reserves. The area of private farmland is estimated to be 49,616 ha, of which 18,060 ha is remnant vegetation. This leaves 31,556 ha of cleared land that is currently used for agricultural purposes and potentially available for further agricultural development.

Department of Agriculture has prepared maps showing land with very high to high capability (rating classes 1 and 2) for summer vegetable cropping, the distribution of land with very high to fair capability (rating classes 1, 2 and 3) for summer vegetable cropping (Tille 1999).

Using GIS data, the total area that has Class 1, 2 and 3 capability is estimated to be 23,713 ha. Land that has a land use capability of 1, 2 and 3 is considered to be capable for summer horticulture with appropriate management practices.

It includes extensive areas of the catchment that have been assigned a capability rating of Class 3 due to drainage requirements. Though capable of producing reasonable crops most years, the land can be expected to experience waterlogging problems in some seasons and major crop losses could be expected once in every four years or five years (Tille 1999).

Approximately 36 per cent of the Class 1, 2 and 3 area would have remnant vegetation on it, resulting in 15,082 ha cleared land that is capable of being developed for summer horticulture. It is estimated by the Scott Coastal Plain Steering Committee that within the next 10-15 years up to 5000 ha of horticulture could potentially be developed. This smaller figure estimate is due to:

- environmental constraints;
- uncertainty about market development;
- site and infrastructure constraints;
- potential available water use constraints;
- some rotational cropping with fallow years.

It is likely that the area suitable for summer horticulture will be revised, as more information becomes available on suitable crops, market development, environmental impacts buffer and setback distances, approvals for clearing remnant vegetation and the development of sub-catchment plans.

5.4 Current agricultural development

Traditional beef grazing enterprises dominate current land use in the SCP area. But in addition to beef production approximately 450 ha of horticulture have been developed, 1750 ha of the cleared land is devoted to dairy enterprises and approximately 5000 ha has been planted to farm forestry.

The total value-adding ratio is a ratio that relates the gross value of agricultural production to the total value added by that industry to the economy. The total value added to the economy is the sum of profits created in each sector of the economy including the farming sector.

Agriculture on the Scott Coastal Plain is roughly categorised into broad acre grazing or intensive agriculture.

Broad acre grazing encompasses dairying, beef and sheep enterprises. Dairying is the most resource and labour intensive system, followed by sheep then beef production. The major activity period for broad acre grazing occurs over autumn, winter and spring. Best management practices are being developed for these industries. Best management practices for fertiliser usage on the Scott Coastal Plain have already been produced.

Intensive agriculture encompasses irrigated and cropping, examples of this are potato crops, carrot crops, summer fodder crops. There is potential for many other crops. The major period of activity for these industries is in late spring and summer. Best management practices are being developed for these industries.

Table 3. Current area, potential area, total value adding ratio, assumed gross value and assumed gross margins of enterprises operating in the Scott Coastal Plain study area

Enterprise	Current area (ha)	Potential area (ha)	Total value adding ratio	Gross value of agriculture enterprise (\$/ha)	Gross margin of enterprise (\$/ha)
Beef grazing	21,920(1)	31,556	1.47	269	142
Wool sheep grazing	1,218 (2)	31,556	1.41	252	90
Sheep meat grazing	1,218 (3)	31,556	2.14	340	147
Dairy	1,750	Subject to market development	1.78	1,452	769
Horticulture	450	5,000	1.11(5)	12,510 (4)	3,348 (4)
Forestry	5,000	9,500	Not available	901	147

(1) 90% of general grazing area (Cleared land - (area devoted to dairy enterprise + horticulture + farm forestry) = 24,356 ha).

(2) 5% of general grazing area (Cleared land - (area devoted to dairy enterprise + horticulture + farm forestry) = 24,356 ha).

(3) 5% of general grazing area (Cleared land - (area devoted to dairy enterprise + horticulture + farm forestry) = 24,356 ha).

(4) Average of potatoes, carrots, onions, sweetcorn enterprises.

(5) Assumes Total Value added of onions and sweetcorn is the same as carrots. Average of the four crops value added contribution.

Source: Department of Agriculture.

5.5 Short-term agricultural development potential

The table below shows the current and potential value of agriculture that can be produced from the SCP area, given different areas of land devoted to different enterprises. Scenarios 1, 2 and 3 represent possible enterprise mixes that could operate in the study area.

Table 4 clearly shows that potentially the SCP can increase significantly the volume and value of agricultural products. The total value added figures represent the potential contribution that the SCP can have on the Western Australian economy given the different enterprise mixes. The gross values and gross margins used in the calculations of the total value added represent the best bet assumptions about the income and input costs likely to be incurred in this area. In reality, individual gross margins are likely to vary considerably from season to season and between individual farmers.

Table 4. Gross value of current agricultural industries and total value added contribution of agriculture for the area under different land use scenarios

Enterprise	Cleared land	Current area	Scenario 1	Scenario 2	Scenario 3
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	available for development (%)	(ha)	(ha)	(ha)	(ha)
Beef grazing	100	21,920	11,100	10,500	7,600
Wool sheep grazing	100	1,218	1,262	631	0
Sheep meat grazing	100	1,218	10,300	7,900	6,300
Dairy	10 (1)	1,750	1,893	2,524	3,156
Horticulture	16	450	1,000	3,000	5,000
Forestry	30 (2)	5,000	6,000	7,000	9,500
Total gross value of agriculture		\$19.2 million	\$27.5 million	\$53.1 million	\$80 million
Total value added		\$28 million (3)	\$44 million (3)	\$81 million (3)	\$115 million (3)

- (1) Currently dairy enterprises occupy 6% of cleared land, this assumes it is possible to increase this area to 10% given suitable market conditions.
- (2) Estimate of potential area, assume 25% overlap with the area suitable for horticulture.
- (3) Assumption that the total value added ratio is 1 for farm forestry.

Source: Department of Agriculture.

The three scenarios also demonstrate that a diversified agricultural enterprise, with possibly a mix of grazing, irrigation and tree plantations, will provide most landholders with better overall returns in the long term, although the potential for diversification will vary from property to property.

5.6 Constraints to agricultural development

The constraints upon agricultural development can be grouped into three areas: structural, agronomic and environmental. These are listed below.

5.6.1 Structural constraints

- Growers do not have access to three-phase power supply.
- Poor condition of road network.
- Limited availability of gravel for construction of roads and farm access.
- Prescribed assessment and approval processes established through the Strategy for a Sustainable Future.
- Lack of agricultural workforce means focus will be on crops and other agricultural activity with high mechanisation requirement.

5.6.2 Agronomic constraints

- Lack of experience in growing horticultural crops other than potatoes.
- Necessary to test the practical suitability of other horticultural crops.
- Waterlogging is a significant constraint in some parts of the SCP. Use of large centre pivot irrigation systems may not enable suitable siting to avoid waterlogged areas. Growers could consider semi-permanent irrigation systems sited on soils that are not affected by high watertables.
- Crops and varieties with shorter growing seasons may provide better returns from irrigation sites.
- Necessary to overcome weed, disease and pest issues as they arise on individual properties and in the region.
- Necessary to ensure a reliable source of affordable A grade Agricultural Lime for the region
- Necessary to ensure a reliable source of affordable gravel resources for the region
- Necessary to manage for price and marketing variances.

5.6.3 Environmental constraints

- Necessary to adopt best practice techniques to minimise the off-site effects of horticulture.
- The location of larger streamlines (4th and 5th order streams) which cannot practically be re-directed due to their flow volumes may constrain siting and design of irrigation areas.
- Use of buffers setbacks around streams and setbacks from other environmental features to prevent nutrients leaching into waterways.
- Protection of remnant vegetation.
- Availability of land with suitable soils and depth to summer watertable.

To address these issues the Steering Committee considers that emphasis is needed in two specific areas, these are described below in the following recommendations.

Recommendation 2

It is recommended that additional investigation and research on agricultural production and farming systems development for irrigation on the Scott Coastal Plain be carried out jointly by Department of Agriculture and local grower groups.

Recommendation 3

It is recommended that Department of Agriculture, Department of Minerals and Energy and local government investigate mechanisms to ensure access to accessible lime resources for the region.

Recommendation 4

It is recommended that CALM, Department of Minerals and Energy, Main Roads and local government investigate mechanisms to ensure access to accessible gravel resources for the region.

Recommendation 5

It is recommended that an economic development and marketing plan for agricultural production of the Scott Coastal Plain be prepared. The plan should identify production and marketing opportunities and include funding options for horticulture research and marketing.

5.7 Flow-on effects

Multipliers are used to give an indication of the flow-on effects of an expansion in any sector of the economy. Multipliers give an insight into the importance of each sector to the economy by giving an indication of the flow-on effects of a change in either output, income or employment of one particular sector of the economy. The potential effects of these multipliers on the State economy and employment are discussed in Appendix 20.

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Focus topic

Changes to French fry processing industry

Background

On 31 August 1999, Simplot Australia closed the French fry processing factory at Manjimup. The closure of the factory presents the local vegetable industry and the community with a challenge. Substantial debts are held by growers and contractors that relate to potato production for the Simplot factory. Potatoes are also an important rotational option contributing to the economic viability of enterprises producing other crops, such as export cauliflower.

Issues and actions

New horticultural opportunities have been identified for development in the Manjimup and Scott River areas, which may progress to commercial scale over the next two to five years. Export opportunities exist for ware, crisp and seed potatoes in SE Asia. Work to realise these opportunities is a high priority for the Department of Agriculture potato project, and \$180,000 has been allocated to a new activity to promote an export potato industry for Western Australia. This work aims to assist with the development of new potato varieties suitable for export markets in SE Asia, to provide agronomic advice to growers and to assist with export market analysis, and development of the potato market in SE Asia. In addition a submission has been submitted to the Horticultural Research and Development Corporation (HRDC) to develop agronomy profiles for new potato varieties for export markets. A further HRDC funding submission is being developed to assist with the long-term development of an export seed tuber trade.

Other opportunities being considered include; expanding markets for cauliflower, sweet corn and other export vegetables by innovations in post-harvest to extend sea freight life, locally based value adding for vegetable products and the examination of new crops for the area.

A group has been formed to investigate opportunities for growers in the Manjimup and Scott River areas. The Manjimup Horticultural Industry Advisory Group, was elected at a meeting in Manjimup called by the Potato Growers Association to discuss the Simplot closure. This group includes potato growers (Mr G. Ipsen, Mr E. Rose, Mr T. Fox), a vegetable exporter (Mr D. Geare), and Officers from Department of Agriculture (Mr M. Heap) and South West Development Commission (Mr J. Threlfall). The group has set its terms of reference as 'to examine horticultural industries with potential for the region and undertake the necessary activities, including accessing funds, to develop those industries with potential'.

Another farmer group, the Scott River Growers Group - Margaret River Region is now investigating the possibility of using the closed Beenup Mine buildings as a processing facility for horticultural crops in the region. This group is now in the preliminary negotiation phase with agencies and local government. Developing this facility would allow farmers in the Scott Coastal Plain area to value add to potentially new horticultural crops.

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- 6.2 Key directions of the project
- 6.3 Guiding principles
- 6.4 Local and catchment area approaches

The Scott Coastal Plain Steering Committee has defined the principle of sustainable development as using a value framework through which the Strategy has been developed. The guiding principles used to develop this value framework are detailed in Section 6.3.

The Steering Committee approach to sustainable development is based on a multi-objective criteria approach to sustainability that requires a balance between the economic, social and environmental factors.

The Steering Committee has made a commitment to facilitating sustainable agricultural development on the Scott Coastal Plain with minimal risk to the environment, and to develop a management strategy to ensure ongoing sustainability for development. The World Commission on Environment and Development (WCED) has defined Ecologically Sustainable Development (ESD) in formal terms based on a number of principles including improving the quality of all life, appropriate valuing of the natural environment, inter-generational equity and the precautionary principle.

While the Steering Committee has not strongly championed the WCED position on ESD, the approach taken by the Steering Committee is very similar and includes many of the same principles including, community participation in decision making, and integration of economic and environmental policies and activities. A key approach to ESD is a commitment to continually adopting 'best practice' management and planning options. As a process, it is dependent on the commitment to a value framework, which recognises the importance of continuity and replenishment as opposed to rapid exploitation and collapse.

The guiding principles detailed in Section 6.3 set out such a value framework, and are a clear commitment to a sustainable approach to development that recognises the need to balance the economic, social and environmental factors in preparing this Strategy for a Sustainable Future.

6.1 Vision for the future

The Strategy for a Sustainable Future is based in a vision for the future of the Scott Coastal Plain that was worked out by the community in consultation with the State agencies and local government. The Executive Committee has developed this vision into a Vision Statement for this Strategy.

To achieve the vision, the overall objectives of the Strategy for a Sustainable Future are as follows:

Objective 1 - Involve all the stakeholders

To encourage all stakeholders to work together to develop a sustainable future for land use and the environment.

Objective 2 - Produce a framework for sustainable land use

To develop a framework for sustainable land use which protects and maintains the natural environment.

Objective 3 - Preserving ecological integrity

To identify and protect the ecological values of bushland, waterways and wetland systems, report on their state of health.

Objective 4 - Produce sustainable agriculture

To identify sustainable agricultural development opportunities and develop processes for the future management of the region.

Objective 5 - Proper management of change

To develop formal planning and coordination processes to manage development and changes in land use in the region.

Objective 6 - Monitor performance

To develop a process for monitoring and reporting on catchment performance, including sustainability of land use and land and water management.

Objective 7 - Promote the region

To promote the value of agricultural enterprise in the region to the community of Western Australia.

6.2 Key directions of the project

With advice from scientists and State agencies, the Steering Committee decided that the Scott River and Hardy Inlet were in reasonable ecological condition and that the community had stated its intent and commitment to proper environmental management. Based on this the Steering Committee favoured a management approach that used a regional or catchment area framework to identify appropriate areas for future development, sought to monitor catchment-wide ecological changes around established benchmarks and used an adaptive approach to land use by encouraging use of BMP and local monitoring.

With this in mind the Committee recommends the following approaches:

- An integrated approach to planning at the catchment level but emphasise local management using best practice guidelines at the farm, industry and local level.
- Recognise that it is possible to develop a catchment/study area Land Use Strategy, however, localised differences in production and landscape mean that local planning and management cannot be adequately prescribed at the level of this strategy. It requires a farm by farm and industry by industry approach, within appropriate guidelines.
- Minimise the regulatory approach by focussing on outcomes.
- Take a management approach that uses feedback from monitoring to determine how to adapt land use strategies and land management practices. Where better information shows that improvement is needed, the Strategy will be updated or amended.
- There is a need for a feedback mechanism (or report card) that will indicate how well the use and management of land and water is meeting the goal of being sustainable.

Some assumptions that have been made about the process and for the future:

- An integrated plan will produce a balance between land use and environmental maintenance and protection.
- Stakeholder participation will provide ownership of outcomes and strategies, resolve conflicts and ensure commitment.
- The resources required to monitor the sustainability criteria and to provide feedback to stakeholders, will be available.
- An integrated plan can provide the environmental foundation on which social and economic development can occur.
- Local government will support the Strategy and recognise it is a valid and useful mechanism for resolving land use issues for the SCP area.
- The formal requirements for changes in land use can be streamlined by implementing the Strategy through the Town Planning Schemes of local government.
- The integrity of the Strategy will be maintained with future changes in management structures at local authority and State agency levels.
- The Strategy and guidelines will be understood and applied consistent with the statutory obligations of decision-making authorities and future influential stakeholders.
- The strategy will enable decisions on land use and land and water management to be consistent throughout all decision-making authorities.

6.3 Guiding principles

- 6.3.1 Statutory requirements
- 6.3.2 Multiobjective criteria for sustainability : economic, social and environmental
- 6.3.3 Recognising existing land values
- 6.3.4 Adheres to precautionary principle
- 6.3.5 Open decision making
- 6.3.6 Involvement
- 6.3.7 Evaluation
- 6.3.8 Presentation and understanding
- 6.3.9 Flexibility
- 6.3.10 Regional dimension
- 6.3.11 Infrastructure requirements

Guiding principles are used to direct Strategy development to ensure the objectives are met and achieve the vision and aims of the project. The guiding principles also help achieve consistent management strategies across a number of different subject areas.

The following guiding principles have been used to guide preparation of the draft Strategy:

- Compliance with existing legislation, regulations and government policy.
- Multi objective criteria for sustainability - economic, social and environmental.
- Recognising existing land uses.
- Adheres to precautionary principle.
- Open decision making.
- Involvement.
- Evaluation.
- Presentation and understanding.
- Flexibility.
- Regional dimension.
- Infrastructure requirements.

6.3.1 Statutory requirements

The Strategy should recognise existing State Government policy, legislation and regulations for the environment, natural resource management and land use planning. It is possible that through discussion of issues specific to the SCP, that recommendations could be formulated to enhance, add to or amend existing policy and regulations.

These recommendations will need to be taken to government, however, it must be recognised that recommendations take time to work through government and may or may not be acceptable to government.

6.3.2 Multi objective criteria for sustainability - economic, social and environmental

A combination of economic, social and environmental criteria are needed to enable the sustainability of land and water use to be measured and reported to the community and government.

Social sustainability underlies the community's vision for the future of the SCP area, ensuring that land use and development protects and enhances the social structure and quality of life for all residents.

Ecological sustainability is important because it underpins the objective of a sustainable agricultural industry with a long-term future in the SCP. Unsustainable land uses which result in significant impacts will lead to increased government regulation and restrictions on agricultural practice. The Scott River and Hardy Inlet are both receiving waters for nutrients from the catchment and all land uses and land users should recognise that water quality in these systems needs to be maintained at a level which ensures the long-term viability of ecological systems and processes.

While this Strategy was developed in response to the moves to increase horticulture on the Scott Coastal Plain it must be recognised that there are many land uses developing in the catchment. Each of these presents its own particular environmental issues. The Strategy has been written with the idea that all land users should all be treated as being equally responsible for their contribution to maintaining ecological quality for the catchment.

6.3.3 Recognising existing land uses

Any retrospective changes to policy on land use should include appropriate compensation mechanisms to ensure fairness and equity to those affected. The strategies for land use should take into account equity issues in relation to management of individual properties, water allocation and licensing and identifying appropriate levels of development that provide a future for agriculture in the area.

6.3.4 Adheres to precautionary principle

The strategies for land use should recognise the limitations of current understanding of environmental and social impacts and plan accordingly to minimise risk in the face of scientific uncertainty.

6.3.5 Open decision making

Decision making for policy, regulations and strategic and land use planning should be an open process, transparent and in partnership with community and government and should make use of the best available information. Decisions by agencies and shires should be communicated to the general community.

6.3.6 Involvement

The policy on agricultural land use should include significant community consultation and participation and involve all stakeholders. The development of policy, BMP, plans and strategies should be an efficient and transparent process with community participation at its core. The Strategy should recognise opportunities for resolving issues which develop over conflicts between public good and private rights.

At the end of the consultation process the community should feel that their issues have been addressed and the policies are accepted and 'owned' by all the stakeholders involved in the process.

6.3.7 Evaluation

The management Strategy should be structured in a way that it can be evaluated against performance and adoption criteria and should include a framework for evaluation and the impacts of these developments on the environmental values.

6.3.8 Presentation and understanding

The Strategy should be presented in a simple and logical manner that is intelligible to all potential users.

6.3.9 Flexibility

The strategies for land use need to be flexible and dynamic and be able to respond to new information and scientific data as it becomes available. There is a significant gap in scientific knowledge about the impacts of nutrients on Hardy Inlet and Scott River and current and ongoing studies will attempt to fill this gap over the next few years.

6.3.10 Regional dimension

Developing sustainable land uses on the SCP should recognise the regional catchment of Hardy Inlet. While higher than expected levels of nutrients have been measured from the Scott River catchment, it is only a proportion of that sourced from the Blackwood catchment. Recognising the regional dimension means understanding that there are other impacts on Hardy Inlet from the catchment of the Blackwood River and the catchment area surrounding the Inlet including Augusta townsite.

In addition, Hardy Inlet also experiences tidal flushing from Flinders Bay and the Southern Ocean. Understanding the nutrient and sediment dynamics of Hardy Inlet is important to understanding the impacts of changes in land use within the Scott River catchment.

6.3.11 Infrastructure requirements

Any proposed increase in development in the SCP area will require consideration of infrastructure for servicing the development. Roads are provided by the Shires of Nannup and Augusta-Margaret River for access to properties, whereas increased plantation development, irrigated agriculture or mining will require road upgrading works in order to support the trucking programs usually associated with these industries to transport logs, produce and minerals to markets or ports. The Strategy should recognise the needs and requirements of local government in planning for infrastructure to support increased development.

6.4 Local and catchment area approaches

This Strategy has developed an approach that recognises that the landscape, economic activity and communities cross the sectors that government agencies manage. Similarly it recognises that there are different managers and legal implications for different geographic scales in the landscape.

The development of a Strategy for sustainability of a catchment area will inevitably have to work within the sectors of government agencies. For example water issues tend to be managed by the WRC, land planning and allocation by the Ministry for Planning and local government.

Similarly the agency or individual that manages the landscape is determined by the size of area being considered. For example the Ministry for Planning and the Shires are concerned with the regional allocation of land to different uses and the preparation and administration of town planning schemes and region plans. The individual landowners are responsible for the management of their properties and farms. In contrast to this the WRC are the managers of water resources within the catchment but also have legislative powers to license bore use at the farm level.

These ideas are discussed further in the implementation section.

Bulletins 4513: Scott Coastal Plain a strategy for a sustainable future

Bulletin 4513 : Scott Coastal Plain : a strategy for a sustainable future

June 2001

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7.1 Introduction

The Water Management Strategy (WMS) aims to assist land managers to manage the water resources of the Scott Coastal Plain. Guidelines aim to minimise the off-site effects to agreed environmentally acceptable levels whilst allowing for diversified sustainable land use. The WMS is focused at an 'on-farm' scale of water management.

The following land uses have had individual WMSs described:

- Irrigated agriculture
- Timber plantations
- Grazing/dairy
- Roads
- Conservation
- Mining

The above land uses have been identified through public consultation as relevant to the SCP. The strategies for water management have been partly based on accepted BMP and the remainder have been developed by the Steering Committee as draft guidelines for managing water flows, water quality and impacts from land uses.

Limited data is available for the Hardy Inlet, but what is available indicates that nutrient concentrations are of concern. Elevated total nitrogen, nitrate/nitrite and filterable reactive phosphate concentrations were recorded in August 1995. In addition, consistently elevated ammonium concentrations have been recorded on five separate occasions between December 1994 and December 1998 throughout the estuary. There are a number of sources of nutrients into the Hardy Inlet (the townsite of Augusta, the Scott River, the Blackwood River and Molloy Island). Monitoring has given us comparisons of inputs from the two main tributaries but has not conclusively identified the proportion and origin of nutrient inputs.

The Scott River is tidal for approximately 8 km upstream and above this point is classified as fresh. In recent years WRC monitoring has, on numerous occasions, found nitrogen and phosphorus concentrations to be above ANZECC National Water Quality Guidelines.

Sediment build-up in creeks and streams of the Scott River presents an important issue. Once sediment is in drains and creeks there is a great risk of movement into the Scott River and further down into the Hardy Inlet. Sedimentation of the Scott would have an effect on the biodiversity of the system as it would cover natural riverbed habitats, remove pools from the system and may have high nutrient levels associated with it.

A key issue relevant to the Scott River is the level of tannins in the water, which appears as brown staining. The colour of the Scott River water is thought to play a key role in preventing algal blooms by limiting light penetration and binding phosphorus. Tannins originate from native vegetation and as such the protection of native vegetation is a key issue for this Water Management Strategy. Cleared sub-catchments have continued to have high levels of tannins. This is probably due to detritus build-up in soil. Initial monitoring by the WRC has identified a link between tannins and total phosphorus in the Scott River and further investigation into the source and the interaction of the colour in Scott River water will be necessary.

7.2 Statement of intent for water management on the Scott Coastal Plain

To ensure that all land use on the Scott Coastal Plain is conducted to minimise the off-site impacts and meet identified water quality targets.

Aims of water management:

- Protect water quality (physical, chemical or biological).
- Maintenance of water levels to protect wetland systems.
- Protect and enhance soil stability to minimise soil erosion.
- Protect the biodiversity of significant wetlands and waterways including the Scott River and Hardy Inlet.
- Protect native vegetation to maintain the colour of Scott River water.

Development in the SCP may introduce new land use with specific water management considerations that have not been covered here. The general principles of water management for the SCP (Section 7.3) should be considered for all further development or intensification of land use.

7.3 General water management principles for all land use

- Limit the risk of pollution by applying fertilisers, herbicides, pesticides and irrigation according to best practice guidelines.
- Limit off-site impacts by maintaining run-off on-site to allow for short-term storage and/or treatment of pollutants.
- Maintain native vegetation so as to maintain the colour of the Scott River to reduce the risk of algal blooms in both Scott River and Hardy Inlet.
- Maintain the sub-catchment water balance with particular emphasis on the effects of changes in water levels and flow regimes to conservation areas (wetlands).
- To develop water quality targets by land use. These targets need to be developed as interim targets initially and reviewed regularly in the light of new monitoring data for each sub-catchment. The continued improvement of BMP within any land use will be tied to meeting these targets.
- Address community concerns about a given land use.

7.4 Irrigated agriculture

- 7.4.1 Strategy rationale for irrigated agriculture
- 7.4.2 Water management guidelines for irrigated agriculture

7.4.1 Strategy rationale for irrigated agriculture

The Guidelines for Groundwater Well Licences, being prepared by the WRC, will work in conjunction with and consider the guidelines for water management outlined in this Strategy. The draft BMP guidelines for irrigated agriculture have been prepared by the Scott River Horticultural Growers Group and Department of Agriculture (Appendix 28).

Proposed water management practices will need to be monitored and evaluated to ensure they are effective in protecting environmental values. Water management practices may prove effective in minimising any adverse effects of irrigated agriculture.

Issues have been identified for soils with low phosphate retention index (PRI) which are irrigated in summer and have high watertables within a flat landscape. This does not represent the whole of the SCP, merely the highest risk situation that is encountered there. These issues include the potential for surface run-off of nutrients and chemicals and from possible leaching once the pollutants are in contact with the groundwater. Risks of nutrient impact off-site are influenced by soil type, separation distance from environmental features and surface water flow management. Management therefore needs to minimise the use of nutrients and chemicals and minimise the opportunities for export of these nutrients and chemicals off-site.

7.4.2 Water management guidelines for irrigated agriculture

- All new proposals for irrigated agriculture and proposals to increase area for existing operators, will be assessed by the joint agency working group using the draft Assessment and Approval Process for New Irrigated Agriculture Proposals Scott Coastal Plain (Appendix 24). The assessment criteria for assessing the risk of phosphorus export from irrigation proposals include risk assessment based on soil type, depth to groundwater, on-site management practices and separation distance from environmental features such as rivers, wetlands and nature reserves.
- In siting and planning irrigation sites, farmers and consultants should consider the benefits from using semi-permanent irrigation systems over centre pivot systems where waterlogged land or high watertables cannot be avoided.
- Site selection and layout of irrigation areas is critical to minimising the potential for nutrients to move off-site and land managers should discuss options for siting and design with both professional consultants and agency staff before commencing site establishment work (WRC, Department of Agriculture).
- Landholders will need to continuously investigate new technologies and practices in order to minimise the loss of nutrient from the site.
- Irrigation sites should be established with an appropriate separation distance from features such as rivers, wetlands and conservation areas. The following table, taken from the guidelines for assessing the environmental risk of irrigated agriculture (Appendix 25), is the recommended guide to separation distances.

Table 5. Separation distance from irrigation sites: Guidelines

Feature	m
Conservation area (national parks and nature reserves)	200
Inlet or river (the Scott and the Hardy)	100
Wetland (as defined earlier in the document)	50
Creek or stream (fourth order and above only)	30
Bushland down slope	30
<i>Source: Water and Rivers Commission.</i>	

- Irrigation areas should be established on sites where surface water streams and drains do not flow across the site during winter. Minor streams and drains may be diverted where flow volumes during winter are low, it is not recommended that larger volume streams and drains be diverted due to high risk of erosion, and high cost of earthworks and rehabilitation/stabilisation works. Diversions should not be at a greater slope than the original stream or drain and professional advice is recommended for planning and constructing drainage works.
- Sub-surface drainage should not be installed without referring to Department of Agriculture Guidelines for Water Management (refer Appendix 24), conformance with these guidelines for water management and inclusion of nutrient stripping systems for drainage discharge water is recommended. It is also recommended that professional advice be obtained for planning and constructing sub-surface drainage systems to include nutrient stripping functions.
- It is recommended that consideration is given to relocating established pivot sites where a stream flows across pivot site during winter and the stream is difficult or costly to divert.
- Whole of property and whole of catchment nutrient generation should be considered when assessing proposals for irrigated agriculture.
- Land managers, using data they have collected locally, will develop water quality targets. Targets will consider the environment of individual sub-catchments and will be adapted with the goal of continuous improvement.
- Irrigation sites should operate in accordance with the BMP for the SCP and as such should direct run-off from irrigation areas through nutrient and sediment stripping systems and should maintain soil moisture to the root zone but not flush beneath the irrigation area during a cropping season.
- During the summer cropping season, any sub-surface drainage of irrigation plots should be collected and, where practical, reused on the site during a crop season. Winter run-off from irrigation sites should be directed into detention systems, vegetated streamlines or wetlands on the property which will perform nutrient and sediment stripping functions, before leaving the property to enter identified Key Streams (refer to Appendix 4 on Surface Water Management).
- Fertiliser regimes should follow BMP for fertiliser application and soil amendment. Timing and placement of fertilisers should be such as to maximise the return from investment and minimise off-site effects. Fertiliser application strategies should not exceed crop requirements and should be determined by soil and plant tissue testing.
- Pest and weed eradication chemical applications should be operated in accordance with BMP.
- Works to retain and treat all pollutants on the property during the cropping season should be employed on all irrigation sites and may be required as a condition of approval for groundwater well licences issued through WRC.
- Cover crops should be established on irrigation sites immediately following harvesting of horticultural crops, to prevent erosion and use residual nutrients. Stock should be excluded from the sites until the cover crop has established and hardened off.
- Monitoring of groundwater or surface water adjacent to or downstream from irrigation sites may be required as a condition of approval for groundwater well licences issued through WRC. This monitoring will help to determine off-site environmental effects and to set water quality targets.
- Remaining native vegetation should be protected with fencing from stock. Commercial eucalypts or native vegetation should be used in buffers and windbreaks to help reduce nutrient losses from the site and to help maintain tannin levels on the Scott. It is thought that the brown colour of the tannins inhibits algae growth in the Scott River.

7.5 Grazing and dairy

- 7.5.1 Strategy rationale for grazing/dairy
- 7.5.2 Water management guidelines for grazing/dairy

7.5.1 Strategy rationale for grazing/dairying

Water and nutrient management are issues because the land cleared for pasture has been shown to have higher run-off of water and nutrients and the increased nutrient loads pose a eutrophication risk to downstream water bodies. Constructed drainage has in some cases caused erosion and increased nutrient export during winter.

Grazing conducted in rotation with horticulture presents another issue as the surface water management for horticulture may require compromise with the requirements for grazing. The main sources of nutrient run-off from sheep and cattle production are fertilisers, dung and nitrate nitrogen produced by leguminous pastures, mainly

clover. A portion (less than 10 per cent) of phosphorus fertiliser applied to pastures is leached from the soil into streams, mainly within several weeks of application. Sources of nutrients from grazing land include manure and fertiliser deposited directly into streams.

To minimise pollution of streams, paddock management practice is the first line of defence. The type, application rate and time of application of fertilisers should be determined by soil testing. For dairying, the same paddock drainage management guidelines should apply as for grazing. If pasture is to be irrigated in summer, the guidelines for irrigated agriculture should be applied.

With dairying there is the additional risk of stream and groundwater pollution from dairy shed, yard and laneway effluent. The risk from dairy effluent to the Scott River can be minimised if the Dairy Effluent Management Guidelines (see Appendix 30) are followed.

7.5.2 Water management guidelines for grazing/dairying

- Timing and placement of fertilisers should be such as to maximise the return from investment in fertilisers and minimise off-site effect. Fertiliser regimes should be operated in accordance with BMP and application rates should be guided by soil testing.
- Wherever possible, timing of fertiliser application should aim to avoid periods and areas of intense run-off. Fertiliser regimes should avoid application in waterways, drains or inundated areas.
- Initial planning should incorporate appropriate separation distances from waterways and wetlands, by establishing streamlining (revegetation of streamlines) and fencing off these areas from stock access.
- Measures should be taken to decrease the risk of nutrient pollution of waterways. Any stock access to streams should be managed and this may include managing stock access to streams, or possible stock exclusion. 'Stream lining', fencing and revegetation of major streams is effective and is recommended for the larger 'key streams' (Appendix 4). Community funding assistance may be necessary for this to happen. Stream lining also reduces the risk of pollution from chemicals that may be applied to pastures.
- Where streams and drains are to be fenced, stock crossings and water access points should be sited and constructed to ensure the efficient management of stock and the protection of stream and drain banks from disturbance and subsequent erosion.
- Dairies should follow the Dairy Effluent Management Guidelines for the management of dairy effluent. Particular care should be taken to site dairy sheds and effluent ponds on higher ground away from streams. Effluent ponds should be excavated into clay subsoils, as trials have shown that groundwater pollution occurs near ponds excavated into sandy soils. The treated liquid effluent should be irrigated or spread onto pastures on higher ground that is not inundated in winter.
- If drainage is to be constructed in the paddock, it should be properly designed and surveyed according to drainage best practice, i.e. be broad, shallow, vegetated and of very low gradient. Construction of drains on higher order streamlines with large catchments should not be attempted. It is recommended that individual drainage works be incorporated into a sub-catchment plan, developed through the LCDC.

7.6 Timber

- 7.6.1 Strategy rationale for timber plantations
- 7.6.2 Water management guidelines for plantations

7.6.1 Strategy rationale for the timber plantations

The timber plantations have adopted a comprehensive code of practice that presents guidelines for many of the industry's issues. The Draft Code of Practice for Timber Plantations in Western Australia (Appendix 30) will be used as the source document for the recommendations in this Water Management Strategy.

The issues for surface water management that arise from the timber plantations centre around the risks of erosion and run-off of fertilisers and pest and weed control chemicals. Establishment and harvest are seen to be high-risk times, as vegetation cover does not protect the soil during these times. Previous to mound ploughing the area is heavily treated with herbicides.

Farm forestry has potential for improved economic returns over grazing and also has landcare benefits. Plantations can be used as windbreaks, can lower the superficial watertable, can provide nutrient stripping and soil

stabilisation. Community consultation has also highlighted possible negative and social effects of increased timber production.

There are mixed community reactions to the possibility of increased timber production, leading to a decrease in the groundwater level in the area. It is felt that a decrease in the watertable may result in community change in the remaining native vegetation of the SCP. Others see the possible decrease in the watertable as a means to alleviate seasonal inundation of land.

Community concerns relating to plantation timber production include the impacts of fertilisers and biocides, water use and potential for impact on wetlands. Monitoring will need to be carried out to determine the validity of some of the concerns. Retention basins will be the main tool used to control all water on individual properties. These systems will allow a degree of nutrient stripping and trapping of other chemicals that may run off.

Roads and firebreaks that service plantations also raise water management issues as they can generate large amounts of run-off.

7.6.2 Water management guidelines for plantations

- Plantation design and operation will be guided by the established Draft Code of Practice for Timber Plantations in Western Australia and by this Strategy for management of drainage in establishment of tree plantations.
- The relevant agencies (primarily CALM and Department of Agriculture) and industry bodies support the formation of a 'Timber Plantations - Code of Practice Advisory Committee'.
- Nutrient stripping basins and retention basins will be used to control run-off from plantations during high risk times for erosion and pollution. Specifically nutrient stripping and retention basin should be designed to manage run-off during the first two years of plantation establishment. An attempt should be made to make such structures multiple use water points, as required under the plantation Fire Protection Guidelines 1991.
- Every effort should be made to maintain vegetation between rows of planted trees for soil stabilisation purposes.
- Monitoring programs for surface water should be implemented to determine the effectiveness of the site works in controlling pollutant run-off.
- A quadrant of piezometers should be established in and around plantations to determine the draw down effect on groundwater over the life of the plantation. Careful attention should be given to minimise localised draw down effects on groundwater levels around wetlands of conservation value.
- Chemical spraying and drainage works, for timber plantations, need to take account of potential for impacts on adjacent landowners, streams and wetlands.
- Surface water management needs to be incorporated into the plantation design and designed to minimise erosion and sedimentation. These works should be designed to fit with a sub-catchment surface water management plan developed by landholders in conjunction with the LCDC.

Recommendation 6

It is recommended that investigation and research be conducted by CALM, Forest Products Commission, Department of Agriculture and landholders to minimise and improve the use of fertilisers and biocides as well as control of the run-off during the establishment and ongoing maintenance of timber plantations.

Recommendation 7

It is recommended that local governments make compliance with the Code of Practice for tree plantations and this Strategy a scheme provision for new tree plantation proposals.

7.7 Mining

- 7.7.1 Strategy rationale for mining
- 7.7.2 Community concerns regarding mining
- 7.7.3 Management guidelines for mining

7.7.1 Strategy rationale for mining

Mining operations usually are established under State agreements, with a small number of very large operations under State agreements. Basic raw materials are extracted from Crown land under the Mining Act and from private land under local government extractive industries licences. Mining must also be established where mineral deposits occur. There is, therefore limited scope for input by this type of strategic planning document for guiding land management.

Any mining proposal that has the potential to cause significant environmental impact must be referred by the State Mining Engineer or the local government for consideration of the EPA. However, guidelines adopted here are intended to guide agencies and mining companies.

It is recognised that significant direct community benefits flow from mining, such as improvements to roads, power and communications infrastructure. The supplies of construction materials from mining are essential to construct and maintain community infrastructure needed to support all activities.

7.7.2 Community concerns regarding mining

Concerns have been raised by the community, relating specifically to the Beenup operation, with regard to use of groundwater, the exposure of pyritic sediments (that weather to generate sulphuric acid) and fears for some perceived environmental impacts. With the close of the Beenup mine, these concerns are now focused on the rehabilitation of the site. The rehabilitation plan was assessed by the EPA, and takes into account public comments.

All mining, as with most significant human development, invokes some degree of environmental impact. It is essential that the company developing a mining proposal take community concerns regarding perceived environmental impacts into consideration at an early time.

7.7.3 Management guidelines for mining

Guidelines adopted here are intended to guide agencies and mining companies.

- Mining proposals, while generating large economic benefits, are recognised as having limited lifetimes. The end of mining land use must be conceived in collaboration with the landholder and appropriate agencies. Planning to implement this agreed land use to be undertaken at the earliest convenience.
- Mining companies and decision-making authorities should consider the availability of natural resources, such as groundwater, lime and gravel, to traditional users when new mining activities are developed.
- Mining activities not covered under the Mining Act or Environmental Protection Act (e.g. gravel and lime extraction) should adopt BMP to minimise soil erosion.
- Most mining that affects native vegetation should be seen as an interim land use, with due consideration being given to post-mining restoration of the native vegetation

7.8 Conservation

- 7.8.1 Strategy rationale for conservation
- 7.8.2 Water management guidelines for conservation

7.8.1 Strategy rationale for conservation

Issues have arisen from the community with regards to drainage of conservation areas. These issues are site specific and have arisen due to inconsistent drainage approaches within sub-catchments. While conservation areas

are managed to preserve biodiversity other aspects of their management related to water such as the water balance, soil stabilisation and tannins need to be looked at.

The level of tannins in the water of the Scott River is seen as being a key buffer in preventing the high nutrient levels resulting in algal blooms. Tannins originate from plant material, specifically native vegetation, they colour the water limiting light penetration and also bind phosphorus allowing it to be flushed from the system and decreasing nutrient availability.

The need for preservation of biodiversity is widely accepted as being the guiding principle for the management of conservation areas. The value of conservation areas does extend beyond biodiversity, especially on the SCP.

7.8.2 Water management guidelines for conservation

- It is recommended that consideration be given to the effects, on a sub-catchment level, of vegetation change with respect to tannin input to the Scott River, erosion risk and the water balance of the sub-catchment.

Recommendation 8

It is recommended that the Water and Rivers Commission initiate a research project to determine the sources of the colour in the Scott River and their contribution to the river's quality and ecology.

Recommendation 9

It is recommended that CALM participate as a stakeholder in all sub-catchment planning for the Scott Coastal Plain. This process plans and negotiates drainage options for each sub-catchment and is outlined in Section 7.11.

7.9 Roads

- 7.9.1 Strategy rationale for roads
- 7.9.2 Water management guidelines for roads

7.9.1 Strategy rationale for roads

The principle of limiting both on-site and off-site impacts should also be applied to road construction. The community has highlighted flooding and drainage problems that drainage with present roads is causing. The small rate base in the SCP limits council's ability to upgrade roads. Purpose built roads are being constructed for the mining industry and timber plantations - and are consequently affecting tourism and agriculture.

Poor sand sub-grades combined with minimal gravel depth result in the roads not being able to sustain heavy haulage traffic. Ongoing developments including mining, intensive agriculture and plantation timbers will result in increased use, particularly heavy vehicular traffic.

Many sections of road are too low and are subject to frequent flooding. Some sections have no drainage culverts at all which results in localised flooding. Increased peak run-off from upstream clearing and site drainage works also puts increased pressure on the road drainage system. Some of the downstream drains and creeks have become overgrown and silted up, further restricting drainage.

7.9.2 Water management guidelines for roads

- Upgrade and maintain all-weather road access for all existing and future road usage.
- Reduce the sections of road subject to localised flooding.
- Pursue funding options to assist in the upgrade of the road network.
- In conjunction with upstream and downstream land users, develop road drainage design parameters that complement whole of catchment drainage plans.
- Determine road width and construction standards for the anticipated road usage.
- Maintain roadside vegetation and minimise the impact from construction equipment when maintaining roadside drains.
- Adopt BMP for erosion control during construction and maintenance of roadways.
- To develop water quality targets for roads. These targets need to be developed as interim targets initially and reviewed regularly in the light of new monitoring data for each sub-catchment. The continued improvement of BMP for roads will be linked to meeting these targets.

Recommendation 10

It is recommended that the Shires in association with Main Roads Western Australia, the plantation industries and local land holders investigate how their road building activities can be incorporated into sub-catchment drainage planning (Section 7.11). This investigation should particularly address improving road planning and construction so that the impacts of road construction and maintenance on the regional and local drainage regimes are minimised. This needs to be completed before the end of the year 2001.

7.10 Water quality targets: our first attempt

- 7.10.1 Overview
- 7.10.2 Water quality targets for the Hardy Inlet
- 7.10.3 Environmental water quality targets for the Scott River
- 7.10.4 Reporting on targets

7.10.1 Overview

Environmental water quality targets for general water quality in Hardy Inlet and Scott River will be set to provide a guideline for future monitoring and management.

General water quality standards such as ANZECC National Water Quality Guidelines have set a national 'number' on parameters to determine how good your water is. However, a slightly different approach will be taken for setting the adaptive water quality targets for Scott River and Hardy Inlet.

There are two principles that need to be followed in order to have confidence in any targets that are set:

1. The targets should be based on an agreed standard or measure of quality.
2. Clearly identifying a pass or fail to meet the targets.

The Steering Committee has made a judgment that both the river and the inlet are generally in reasonable health (after comparing them to other rivers and estuaries and National Standards) and in the absence of conclusive evidence to the contrary.

The Steering Committee has resolved to make the water quality targets at or above the current water quality in Scott River and Hardy Inlet, except where they might be above National Standards.

If the water quality fails to meet these targets then there is a problem that needs attention. As more information becomes available, these targets will be reviewed.

Passing and failing targets

A random sampling system for water sampling is being used in monitoring programs, because sampling of waterways cannot be done on a continuous (24 hours around the clock) basis. Because it is random, there is a degree of 'natural' variability in the samples that are collected, i.e. there are natural high and low points. However, when a decision is made on passing or failing the set targets, the occasional high sample should not automatically lead to failure. It is a better approach to decide on how many samples will be allowed to be higher than the target before it is deemed to have failed.

Once targets are set, if a sample is above the target the sample won't necessarily fail the target. A method called compliance monitoring is used here. It is generally accepted that if more than half (> 50 per cent) of the entire samples in a given sample period (usually a year) are higher than the target then there is confidence that the system being sampled has failed. Less than half (< 50 per cent) and the system being sampled will have passed. It is important to remember to review the overall data for several years, to ensure the targets are appropriate.

This 50 per cent compliance rule is applicable to Scott River and it is the one that has been used to determine the initial targets (see Table 7). However, because the Hardy Inlet is a much more complex system (due to the influence of the Blackwood River and marine flushing) it is harder to know if the random samples really reflect the true water quality situation. To reflect this uncertainty the ANZECC guidelines suggest that a 20 per cent rule is used instead, i.e. if one-fifth of the samples are higher than the target then there is confidence that the system being sampled has failed. This is the compliance rule that has been used for the Hardy Inlet (Table 6).

Table 6. Water quality target levels for Hardy Inlet

Parameters	Target	Units	Excursion rate	No. of samples	≤ No. οφ σαμπλεσ φαιλ
NH ₃	≤ 0.023	mg/L	0.20	144	38
DIN	≤ 0.043	mg/L	0.20	144	38
FRP	≤ 0.007	mg/L	0.20	144	
Chla	≤ 0.002	mg/L	0.20	144	38
DO	≤ 87.3	% Sat	0.10	144	22

Source: Water and Rivers Commission.

7.10.2 Water quality targets for the Hardy Inlet

This is an example of how targets are set.

The inputs are:

- All existing historical data from the Hardy. The sampling program has been running for a year so targets will be based on this data. It is usual to base targets on three years of data. This means that the targets will need to be updated when three years worth of 'start up' data has been collected.
- Data from similar environments. None was used in the first attempt but since it has been suggested that data from the Wilson Inlet be examined.
- Established water quality guidelines. The ANZECC National Water Quality Guidelines. Hardy Inlet has been shown to frequently exceed the ANZECC National Water Quality Guidelines targets for nutrients, yet the Inlet has not experienced severe algal blooms. The guidelines may not be relevant for this environment.
- The perception of the status or health of the Hardy Inlet. This is a value judgement and is perhaps the most important factor in setting the targets. The general perception has been that Hardy Inlet is healthy, despite some 'high' nutrient levels.

The decisions made were:

- Hardy Inlet appears healthy so targets are set at present levels with the 'fail' or compliance component designed to report on a significant change from the present status.
- There are 12 sites in the Hardy Inlet sampling program; they measure different areas of the Inlet. The

strength of the target setting comes from data relevant to the specific environment, that is, the input from existing data. With limited 'start up' data, targets will not be established for the different areas of Hardy Inlet. One target will be set for the Inlet as a whole. As the three years start up data is collected, targets for the different areas of the Inlet can be set.

Compliance with targets is tested by analysing the compliance data set to determine if more than 20 per cent of the data points are greater than the target. Such a small sample makes it hard to say with certainty that there are more than 20 per cent of the data points over the target. So in this example, with once-monthly sampling for 12 sites, 39 (26 per cent) of the 144 samples need to be above the target before the system being sampled will fail.

The following parameters have been chosen to have targets set for them:

1. **FRP** - filterable reactive phosphate. This is a measure of the phosphorus that is readily available for plant uptake and the potential for algal growth.
2. **DIN** - dissolved inorganic nitrogen. This is a measure of the nitrogen that is readily available for plant uptake and the potential for algal growth.
3. **Chla** - chlorophyll A. This is a measure of the amount of one of the photosynthesising pigments in all plant life. This measurement tells us how much algal growth is actually occurring.
4. **NH₃** - ammonia. Ammonia is one of the parts of DIN, but it is also important because high levels are toxic and this target measures the risk of toxicity to both plants and animals from ammonia.
5. **DO** - dissolved oxygen. It is essential to have oxygen dissolved in the water for fish to live. This target measures the risk of fish being killed through low oxygen levels. (Note the compliance rate is set at 15 per cent, based on 10 per cent figure plus 5 per cent uncertainty, because it is the occasional dramatic drop in DO that can cause problems, not the average levels).

7.10.3 Environmental water quality targets for the Scott River

The process for setting targets, described above, was also used for the Scott River.

The decisions made were:

- The Scott River appears healthy, with the exception in point 3 below, so targets are set at present levels with the 'fail' or compliance component designed to identify a significant change from the present status.
- There are three sites currently used to gather data from the Scott River. Due to the small data set available, there is considerable uncertainty regarding the existing water quality. Thus the proposed targets presented here are intended as interim values only. They should be revised in several years' time when more information is available.
- The exception is that, based on ANZECC guidelines, the observed levels of dissolved inorganic nitrogen (DIN) are considered to be too high. An incremental target was therefore set. This is a target, which under current conditions will fail. However, this provides a target, literally, to aim for.

Compliance with targets is tested by analysing the compliance data set to determine if more than 50 per cent of the data points are greater than the target. A small sample makes it hard to say with certainty that there are more than 50 per cent of the data points over the target. So in this example, 26 (65 per cent) of the 40 samples need to be above the target before the system being sampled will fail.

The following parameters have been chosen to have targets set for them:

1. FRP - filterable reactive phosphate. (See Section 7.10.2 for description.)
2. NH₃ - ammonia. (See Section 7.10.2 for description.)
3. DIN - dissolved inorganic nitrogen. (See Section 7.10.2 for description.)
4. Turb - turbidity. Is a measure of how clear the water is (i.e. light penetration). It is affected by the amount of solids suspended in the water and has a major effect on the growth of algae and aquatic grasses.
5. Col - colour. Is another measure of light penetration. However, unlike turbidity, colour is a measure of the amount of fine solids (colloids) that are in suspension. This indicates the amount of tannins or iron oxides in the water.

Table 7. Proposed water quality targets for Scott River

Parameters	Target	Units
FRP	≤ 0.059	mg/L
NH3	≤ 0.037	mg/L
DIN	≤ 0.6	mg/L
Turb	≤ 8.1	NTU
Col	≤ 220	Gilvin 440

Source: Water and Rivers Commission.

7.10.4 Reporting on targets

It is important that the community is kept informed of how it is performing in relation to these targets.

Recommendation 11

It is recommended that the Water and Rivers Commission coordinate the water monitoring programs as detailed in Appendices 7 and 8 and collate and reports on the data as required by the report card described in Section 11.

7.11 Sub-catchment planning and drainage management Strategy

- 7.11.1 Introduction
- 7.11.2 Summary of the current situation
- 7.11.3 Principles for catchment planning
- 7.11.4 Integrated drainage
- 7.11.5 Channel stabilisation
- 7.11.6 Detention and safe disposal
- 7.11.7 Contour drainage
- 7.11.8 Strategy rational for integrated drainage
- 7.11.9 Water management guidelines for integrating drainage

7.11.1 Introduction

This Strategy presents a summary of the discussion paper Surface Water Management within the Scott River Catchment. See Appendix 4 for a full discussion of changes to the landscape through clearing and drainage work and additional technical information on causes of erosion, and drainage design.

This section sets out a Strategy for managing surface water movement at sub-catchment level, involving all landholders, to maximise the interests of landholders and benefits to the environmental values of streams and receiving water bodies. It closes with discussion in regards to some potential options that may be implemented, or at least may change the way we think about managing catchment run-off.

7.11.2 Summary of the current situation

The action of clearing the native vegetation from, and draining extensive areas of the Scott River catchment and particularly the coastal plain, has had a significant impact on how surface water moves through the landscape.

The majority of cleared drains and watercourses within the catchment are subject to bank and channel erosion. Watercourses that have been identified on private land and left in a vegetated condition may also be subject to erosion and siltation, under increased pressure from livestock grazing and rising levels of, and intensity of, run-off. Drainage in the landscape is shown in Map 2.

The most common form of channel erosion found in naturally formed channels within the Scott catchment, is that caused by water flowing into the channel and/or undercutting of the bank. This results in the formation of gullies, away from the watercourse and the collapse of the banks. This is less serious than scour erosion, which is influenced by the velocity and direction of flow, channel dimensions and soil texture. Poor alignment and the presence of obstructions increase meandering and cause erosion along the channel (Schwab 1981). This form of erosion is common in artificial drainage on private land.

The augmentation of surface drainage has occurred in an uncoordinated fashion, with the outlet point usually consisting of the nearest down slope watercourse, ditch or property boundary. The objective appears to have been to achieve the most rapid rate of surface drainage in order to reduce waterlogging. This may not be in the best interests of downstream land users, who may be on the receiving end of increasing volumes of sediment laden drainage water. Further to this, the deposition of sediment within the natural drainage system of the downstream conservation areas will only serve to worsen the poor drainage situation within the catchment.

7.11.3 Principles for catchment planning

Catchment planning should aim to integrate as many aspects of land management as possible, including:

1. Drainage and earthworks, revegetation, remnant protection (including streamlining), BMP, monitoring and evaluation.
2. It should be led by the local community, e.g. the LCDC, with technical support from State agencies such as Department of Agriculture, Water and Rivers Commission and the Department of Conservation and Land Management.
3. Catchment planning should be collaborative and should aim to involve all stakeholders within a given catchment.
4. Catchment planning should be complemented by farm planning and individual business planning.
5. For catchment planning to be successful it must lead to action on the ground. Therefore a catchment Strategy should outline priorities and a timetable for action. This should not be seen as a contractual obligation for individual landowners, but instead as a fair and realistic way to move forward.
6. It requires acceptance at the land user level, that surface water management is a land use in its own right. This may require that areas of land need to be set aside solely for this purpose.
7. To maximise the effectiveness of any sub-catchment Strategy in a catchment with a high rainfall and diversity of land uses, surface water management requires coordination between all land users at the catchment scale and landowners at the property scale.

7.11.4 Integrated drainage

The first stage of development of the surface Water Management Strategy is to determine key watercourses within the catchment. This would involve an assessment of the drainage system at the catchment scale, involving factors such as catchment area and flow volumes, channel dimensions, current condition and usage. The network of key watercourses within sub-catchments provides for an integrated regional drainage approach.

Before conducting any on farm drainage works, planning should be done to ensure discharge water can be disposed of safely, without causing detriment to downstream land users or the environment. A key watercourse that is recognised by other landowners serves this purpose.

7.11.5 Channel stabilisation

The key element of the regional drainage network is stability. The purpose of the designated watercourses (whether they be streams, drains, banks or waterways) is to convey run-off water from high, to a lower level in the landscape, without resulting in damage to the land surface. The process of improving the stability of watercourses is often referred to as streamlining (Heady 1994) and may involve:

Physical modifications (Schwab 1981 et al.) such as:

- the use of drop structures to reduce the gradient of the channel floor to result in the reduced velocity of flow within the channel;
- battering of vertical sides to allow for revegetation, hence preventing undercutting and bank collapse;

- the provision of rock rip-rap to the channel, to roughen the surface, therefore reducing the velocity of flow and to protect the surface;
- construction of poundage and detention areas along the watercourse;
- the provision of levee banks to confine extreme flow events to within the riparian area.

Vegetation cover:

The benefits of the presence of vegetation cover, including grasses, sedges and shrubs, in terms of safe carrying capacity, has been discussed above. The requirement is for the protection of the immediate soil surface so that particles cannot be washed away. In ephemeral watercourses, a dense cover of grasses and sedges is usually sufficient. Whilst large and/or perennial watercourses may require the presence of vegetation with a more significant root system, in conjunction with the surface vegetation, to impart greater stability.

Livestock management or exclusion:

The exclusion (or site specific management) of livestock from at least key watercourses is essential in maintaining a vegetative cover of any description on streamlines. The action of livestock trample stream and drain banks (Heady 1994) and detach soil particles within the channel, greatly increasing the potential for channel erosion.

7.11.6 Detention and safe disposal

It is not practical to discuss all available alternative surface water management practices potentially available at the property level, due the wide variety of land uses in the catchment. However, detention is one common theme that should be relevant to all new proposed sub-catchment and drainage plans. The detention of soil and the temporary detention of water.

Channel erosion can be seen as a symptom that the dendritic tributary drainage network is unsuitable for use on cleared land, in an unprotected condition. The gradients of the channels are too steep for the regularly occurring peak run-off events. There is no ability to regulate the depth and velocity of flow within the channels. Hence, the result of drain failure (a term used to describe when a run-off event exceeds the design carrying capacity of earthworks) is channel erosion.

The orientation of a drain straight down the slope is also not seen to be the most conducive to water collection. In a relatively flat landscape, there may be no incentive (the force of gravity) for run-off to flow towards and into a drain. In many instances, run-off may proceed to flow parallel to the drain, or else may pond alongside. This necessitates the construction of additional feeder drains extending out from the main channel.

With key watercourses designated within the catchment, landowners would have access to safe discharge areas that would extend high in the landscape. With the need for localised drainage to be used on the property, to convey water from high in the landscape, to the lowest point, negated, this provides for other water management options.

7.11.7 Contour drainage

The use of diversion banks to redirect stream flow around intensive horticulture areas, is already becoming an accepted practice within the catchment. These types of structures have the capacity to detain and divert large volumes of water, particularly when constructed on relatively flat ground.

A contour diversion bank or grade bank is essentially a drain that is constructed across the slope, perpendicular to the path of natural run-off. The spoil is placed on the down slope side of the open channel, to form a bank. These are surveyed at a controlled gradient, that is pre-determined by the anticipated amount of run-off, size of the structure and likely condition of the channel surface during a run-off event (i.e. well grassed or bare and sandy).

The structures are constructed such that they intercept water flowing across the landscape and divert it to a safe discharge area. In this instance, this may consist of a key watercourse or other form of stabilised watercourse or detention basin. The dimensions, length and number of structures required, depends on the situation and landowner's objectives.

This type of water control structure offers many advantages over conventionally orientated open drains. These include some of the following:

- reduced erosion potential;
- increased peak run-off detention period;
- reduces peak run-off events;
- improved drainage efficiency;
- improved trafficability;
- flexibility of use.

When used as water control structures on cleared land, diversion banks may provide the added benefit of increasing the summer green grazing area. Conversely, deepening of the channel may provide for groundwater relief, when used as a cut-off/interceptor drain around an area of intensive land use.

7.11.8 Strategy rationale for integrating drainage

The use of open drains, diversion banks, raised beds and sub-surface drainage is seen as ways to improve plant growth by reducing inundation and waterlogging. However, it is important to ensure that excess water is disposed of appropriately. Water management and drainage works should be undertaken in such a way as to ensure there are no adverse impacts on the downstream environment, including neighbouring properties.

This WMS can only make broad recommendations with regards to surface water management and drainage, as issues will be site-specific and will require a coordinated approach from all local stakeholders. Individual drainage proposals are best considered within the context of an overall catchment plan, agreed to by affected landowners and relevant statutory authorities.

Drainage is an important catchment issue. Inappropriate drainage can have a detrimental effect on infrastructure (roads), areas of environmental significance and downstream properties. However, a properly planned and implemented proposal has the potential to minimise the impacts on these assets as well as increasing the productivity of the land.

7.11.9 Water management guidelines for integrating drainage

- Drainage management proposals are best conducted on a sub-catchment basis, with the involvement of other landholders, where they may derive benefit or suffer impacts from the proposal.
- Sub-catchment groups involving all landholders should prepare a sub-catchment Strategy for drainage management and identify a key watercourse or stream to provide a safe area for disposal of drainage and discharge water.
- Drainage is only one component of an overall plan to better manage the affected land and reduce the potential for land degradation.
- Streamlining is recommended as the principal means of providing stability to drains and streams, in combination with re-vegetation, physical works and livestock management.
- The process of preparing sub-catchment plans and managing the involvement of each landholder and the work they want to do, is recommended to be carried out by the Lower Blackwood LCDC, with technical assistance from State agencies.

More specific options for integrating drainage within a catchment and a detailed process for sub-catchment planning are outlined in Appendix 4.

Recommendation 12

It is recommended that the Lower Blackwood LCDC coordinate the sub-catchment planning for drainage

management in the Scott Coastal Plain area with technical assistance from Water and Rivers Commission, Department of Agriculture and local landholders.

References

- Heady, G. and Guise, N. (1994). Streamlining, an Environmentally Sustainable Drainage Network for the Swan Coastal Plain. Agdex 557, Department of Agriculture, Western Australia.
- Schwab, G.O., Frevert, R.K., Edminster, T.W. and Barnes, K.K. (1981). Soil and Water Conservation Engineering (third edition). John Wiley and Sons, United States of America.

Focus topic

Farm planning for surface water management

Introduction

A beef grazing and irrigation property on Jangardup Road was selected as a case study and demonstration for a whole farm surface water management plan. The Management Plan shows where and how to improve the removal of surplus surface water from the landscape, whilst improving the stability and performance of the existing drainage network. It also highlights opportunities to decrease export of particulate matter in run-off from the property. The complete management plan is included in Appendix 12 and summarised in Figure 5.

The drainage works, which are incorporated into the natural drainage network, aim to:

- use and improve the existing natural drainage system as far as is practical;
- protect irrigation sites from flooding from upstream catchment areas; and
- improve the performance of each irrigation site and reduce the impact of high groundwater levels and waterlogging. This has been achieved for this site without the use of sub-surface drainage.

Design considerations

Critical factors to consider when starting out on a farm surface water management plan include catchment run-off, slope, watertable depth and potential water detention areas. These attributes are used to determine the dimensions, layout and specifications of proposed works, such as drains, levees and settlement areas.

The approach recommended in the Scott Coastal Plain is to:

- determine your run-off management goals and objectives, based on the desired land use;
- identify catchment areas and estimate anticipated run-off, based on calculations and experience;
- using mapping and field survey techniques (such as measuring levels) identify opportunities and constraints for improved run-off management on your property. These may include diversion of run-off away from cropping/grazing areas; the increased use of natural drainage and detention areas and the ability to safely drain waterlogged areas without off-site affects;
- determine the dimensions of the required works. Aim to construct earthworks in a stable manner using broad gentle batters in favour of vertical sides. Avoid over excavation and creating deep narrow channels that will erode. The use of levee banks in lieu of drains, to control flooding, is usually more cost effective and poses less risk of

failure. Maximise the incorporation of existing watercourse and waterbodies on the property as they can reduce the overall cost of implementation and provide opportunities to detain and filter sediments and nutrients. Encourage growth of vegetation (may be pasture, reeds and/or shrubs) within and adjacent to earthworks and natural water features. This will reduce the potential for erosion and provide additional opportunities to trap suspended sediments;

- seek assistance from drainage consultants to design and construct surface water management works. It is essential to consider factors such as slopes on batters, in relation to soil types, to ensure the construction of a stable drain. Avoid the desire to over drain;
- monitor water entering and exiting the property to assess potential contributions of particulate matter and nutrients. This should be commenced prior to commencing the plan in order to ascertain the impact of surface water management works carried out.

Recommended works

The works recommended for Nelson Location 12894 are a comprehensive mix of broad based levee banks, diversion drains, wide 'v' drains, detention areas, grassed waterways, fencing and revegetation.

The recommended works for each catchment area are annotated on Figure 5. The works program involves earthworks and other development on nearly every part of the farm. Some drains have already been constructed and require modification and vegetating. These works will be done by the landowner a little at a time as resources permit, with work on streamlining and fencing in Catchment 1 already underway.

Monitoring

The run-off from this property has been monitored for several winters by WRC and the property owner. It is expected that reductions in nutrients and sediments will be evident with more of the works being completed. The results of water quality monitoring will be reported in the report card on sustainability for the Scott Coastal Plain.

Bulletins 4513: Scott Coastal Plain a strategy for a sustainable future

Bulletin 4513 : Scott Coastal Plain : a strategy for a sustainable future

June 2001

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8.1 Background

The vegetation of the Scott Coastal Plain is characterised by a rich mosaic of wetland and dunal vegetation associations combined with areas of forest and woodlands which vary from small pockets to broad zones. The complexity of vegetation is derived from a combination of unique hydrology of the area and the diversity of soils. Many of the vegetation associations contain DRF or Priority Species.

In relation to vegetation, the National Estate Identification and Assessment in the South West Region of WA 1998 as part of the Regional Forest Agreement process, identifies the Scott Coastal Plain area as one of two main areas having National Estate significance for high species richness; unusually high diversity of vegetation complexes; a concentration of rare, restricted and threatened communities; narrowly endemic plants; relict (primitive or Gondwanic) plants; plants with disjunct populations; wetlands of national importance; and natural landscapes.

In the Scott Coastal Plain Strategy Area, 70 per cent of the area has natural vegetation cover and 14 per cent of the natural vegetation is on private property.

Within the study area 31 vegetation complexes have been identified. Of these 10 have been found to be either poorly represented within secure land tenures or are so small in area both within and outside of the study area to be classed as rare. A further three complexes can be added to this list when the known occurrence of rare or Priority Species populations is considered. There is currently 235 known populations of rare or Priority Species within the study area. These populations occur across 18 of the vegetation complexes represented within the study area. Data analysis has identified 10 vegetation complexes that could sustain a level of disturbance given their level of representation in secure tenures and subject to current approval procedures.

Protection of native vegetation on private property in Western Australia is essential in stopping and reversing land degradation and loss of biodiversity (Department of Agriculture 1997). Any proposal to clear more than 1 hectare of remnant vegetation in Western Australia must have approval from the Commissioner for Soil and Land Conservation. There are four levels of assessment under the Memorandum of Understanding between government agencies for assessing clearing proposals, for further information see Appendix 27. The vegetation Strategy for the SCP will give government agencies a tool to assist them in the assessment process for clearing land parcels within the study area.

8.2 Statement of intent

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Vision for future	Justification	Issues to be addressed
8.2.1 Threatened flora		
Protection of Declared Rare and Priority Flora as listed by CALM.	Native vegetation which contains or is likely to contain threatened species or species of special interest should be a high priority for protection.	Information known from previous studies. Certain vegetation types are hotspots for threatened flora. Ongoing DRF surveying.
8.2.2 Threatened ecological communities		
Protection of TECs as described by CALM.	TECs have the same importance as threatened flora. CALM has worked to identify and define TECs which need protection. There is one TEC located at 43 sites within the study area.	Information known from previous studies. Botanical surveys to be carried out on all TECs.
8.2.3 Vegetation representation		
Protection of vegetation communities which are rare and those with no or poor representation on CAR reserves.	As part of the Regional Forest Agreement, vegetation communities have been identified across the forest areas of the State. There are vegetation communities present on remnants within the study area that have little or no representation on protected CALM conservation estate.	Information determined from remnant vegetation and RFA vegetation community GIS databases. Ongoing assessment will be required as database information improves and changes.
8.2.4 Corridors		
Protection of corridors or stepping stones between areas of conservation (CALM) land.	Corridors of remnant vegetation connecting areas of conservation estate are important for the natural movement of wildlife.	Determined from existing remnant vegetation information. As remnants are cleared these corridors will become more important.
8.2.5 Other vegetation of importance		
Vegetation with aesthetic values or particular significance for nature conservation must be protected from clearing.	The familiar rural landscape of farmland fringed and dotted with trees and patches of bush can only be maintained with positive action. Retain vegetation with high scenic quality, strongly defined vegetation patterns, unique specimen stands. Vegetation types that influence the tannin component of the Scott River.	These areas are identified in the Strategy.
8.2.6 Adequately reserved vegetation		
Vegetation complexes that are of sufficient size to withstand a reduction in area without compromising their status as being adequately reserved will be highlighted.	This will provide guidance in regard to future development proposals by land owners within the study area.	These areas are identified in the Strategy, however there is ongoing assessment required as more vegetation is cleared.

8.3 Strategy statements and recommendations

- 8.3.1 Threatened flora

- 8.3.2 Poorly represented vegetation
- 8.3.3 Corridors
- 8.3.4 Other vegetation of importance
- 8.3.5 Adequately reserved vegetation

8.3.1 Threatened flora

The presence of DRF or Priority Species on remnant vegetation will have a direct impact on the future management of those vegetated land parcels within the Scott Coastal Plain study area. Under the Wildlife Conservation Act 1950 (Section 23 F (2)), the Minister for the Environment may declare any Western Australian native flora to be 'rare flora' (DRF) if he/she is of the opinion that it is likely to become extinct or is rare or otherwise in need of special protection. This may be as a consequence of its rarity, or the prevalence of a threat from which the flora needs special protection.

Special protection is afforded DRF under the Act, with the written consent of the Minister being required before such flora can be taken. The term 'take' refers to either direct means, such as taking a scientific sample, collecting seed, clearing an area; or through indirect means, such as burning, grazing, introduction of pathogens, or the alteration of the watertable.

Complementary to the schedule of the DRF notice, CALM maintains a supplementary listing referred to as the Priority Species List. This lists those flora which may be rare or threatened but for which there is insufficient survey data available to accurately determine their true status (poorly known) and those taxa which have been determined as being rare, but are currently not threatened. Priority Species does not have the same level of legislative protection as DRF, in that Ministerial permission is not required to take them. Priority Species are, however, often known from fewer plants or populations than the DRF and hence should be managed in a similar manner to DRF until their status has been confirmed as being not rare or threatened. Environmental assessments take into account the occurrence of Priority Species and CALM encourages land managers to conserve Priority Species.

DRF and Priority Species are more likely to occur within certain vegetation types such as wetland, sedgeland and iron stone communities. An examination of DRF and Priority Species within the study area has highlighted those vegetation complexes that warrant a higher degree of protection due to their limited occurrence.

Map 4 shows the known locations of DRF within the study area. The study has shown that there are four main vegetation communities that are 'hot spots' for threatened flora. These complexes are Scott complexes Swd, Sd, Swi and Nillup complex N. It must be remembered that flora surveys have not been undertaken across the whole study area, thus DRF surveys will always be an essential part of any major clearing proposal. As more DRF surveying works are undertaken other vegetation types may become increasingly important for protection.

8.3.2 Poorly represented vegetation

Work carried out by CALM has identified one Threatened Ecological Community (TEC) which occurs at 43 sites within the study area. Like Priority Species CALM encourages the protection of TECs even though this protection does not currently exist within legislation. These TECs are illustrated in Map 4. They all occur within Scott Ironstone communities highlighted previously (Swd, Sd and Swi). This further enhances the requirement for protecting any area containing these vegetation types regardless of land tenure.

For the Scott Coastal Plain Vegetation Study, 10 per cent or less representation of vegetation complexes in CAR Formal and Informal reserves within the Study Area is classed as 'Poor' representation, and greater than 10 per cent is classed as 'Adequate' representation. In addition, the total area of some vegetation complexes is small (less than 250 ha) such that any loss of area is significant. These complexes are identified in the table as rare.

Recommendation 13

It is recommended that no disturbance at all occur on any area containing Threatened Ecological Communities.

There are a number of vegetation types other than the TECs that are either not contained or poorly represented in the study areas of the conservation estate. These complexes are identified within Table 8 and illustrated in Map 4.

Table 8. Summary of vegetation complexes

Recommendation 14

It is recommended that the feasibility of acquiring remnants for conservation reserves within vulnerable or poorly represented vegetation complexes through appropriate mechanisms, such as subdivision for conservation, boundary realignment, direct purchases and other processes suggested by the Native Vegetation Working Group, be examined. Any formal proposal to acquire land for the conservation estate should be extensively examined in the field with relevant landholders. CALM should liaise with Ministry for Planning and Department of Land Administration and relevant landholders to identify appropriate locations and determine an approach to be taken for implementing this initiative.

Recommendation 15

It is recommended that the Government needs to recognise the public good of retaining remnant vegetation on private property. This recognition should include financial assistance to support the viability of the whole farm business.

For the Scott Coastal Plain Vegetation Study, 10 per cent or less representation of vegetation complexes in Comprehensive Adequate and Representative (CAR) Formal and Informal reserves within the Study Area is classed as 'Poor' representation, and greater than 10 per cent is classed as 'Adequate' representation. A more detailed explanation of these classifications can be found in Appendix 15 - Vegetation Strategy supporting documents.

Note: Total area of some vegetation complexes is small (less than 250 ha), such that any loss of area is significant. These complexes are identified in the table as rare.

Source: Conservation and Land Management

8.3.3 Corridors

Remnant vegetation close to other remnants and with good connecting corridors are important for the health of fauna in that area (Safstrom 1996). Certain corridors will be viable for some species but not for others, but it can be assumed that wide (500 m plus), continuous linkages with core areas of undisturbed vegetation would be best for most fauna (Safstrom 1996). The Scott Coastal Plain study area does not contain any viable, continuous linkages on private property that meet Safstrom's criteria for fauna corridors, however the remnants can still have an important role for biodiversity conservation.

Recommendation 16

It is recommended that as more consistent data relating to the viability of certain corridors for specific species becomes available, vegetation corridor assessment be undertaken with the full knowledge and

involvement of the relevant landholders.

8.3.4 Other vegetation of importance

Within the Scott Coastal Plain study area there are many specific habitats which have particular significance for nature conservation and aesthetics. These areas need to be protected from clearing and other forms of degradation. Wetlands, unique coastal habitat, vegetation with high scenic quality, vegetation types that influence the colour of the Scott River are all habitats that require special consideration for protection.

'Wetlands play a key role in supporting the diversity and abundance of species within surrounding terrestrial ecosystems' (CALM 1992). Wetlands also add landscape diversity and aesthetic appeal to the rural landscape. There may be added pressure to clear wetlands in the study area to enable good summer grazing or crop production. The Water and Rivers Commission through the State of the Catchment document has highlighted the value of wetlands in the study area.

Wetlands in the Scott Coastal Plain are an important part of the aquatic and vegetation systems. Any proposal which impacts on a wetland including clearing needs to be assessed through the interagency assessment group as detailed in the strategy.

Recommendation 17

It is recommended that any proposal which impacts on wetlands including clearing needs to be assessed through the multi-agency assessment and approval process as detailed in this Strategy.

Coastal habitat within the study area has special conservation significance. These areas have appeal to visitors and are often habitat to unique biota. Coastal areas (within 500 m of the coast) are often not suitable for grazing or cropping. Further discussion on issues associated within the coastal zone of the study area will be addressed in the Land Use Strategy.

Coastal habitat within the study area has special conservation significance. These areas have appeal to visitors and are often habitat to unique biota. Coastal areas (within 500 m of the coast) are often not suitable for grazing or cropping. Further discussion on issues associated within the coastal zone of the study area will be addressed in the Land Use Strategy.

Recommendation 18

It is recommended that a high degree of protection be given to coastal areas. In addition, a separate management strategy for the coastal zone should be developed to address the unique issues associated with the area. Ministry for Planning, as the lead agency, in conjunction with CALM, Shire of Nunup, Shire of Augusta-Margaret River and the relevant landholders, should develop this strategy and management plan as a matter of urgency, before pressures to develop this area increase.

8.3.5 Adequately reserved vegetation

Vegetation complexes within the study area that are of sufficient size to withstand a reduction in areas without compromising their status as being adequately reserved have been identified within Table 8.

Any potential disturbance within these complexes must still be examined in the appropriate manner outlined in the Memorandum of Understanding governing the protection of remnant vegetation on private land within the agriculture region of Western Australia.

Recommendation 19

It is recommended that any potential future development involving clearing be examined in the appropriate manner outlined in the land clearing Memorandum of Understanding (Department of Agriculture 1997).

8.4 Vegetation management

The management of vegetation is dependent on many factors, such as the size and shape of the vegetation, the nature of the adjoining land use, the type of vegetation in the area and the quality of the vegetation. While it is not possible to define specific vegetation management practices in a Strategy document, the following points provide a guide to the issues that need to be addressed in considering appropriate vegetation management for a specific area. To develop a specific vegetation management plan, specialist advice might be required, or refer to such reference material as the book *Managing Your Bushland* by B.M.J. Hussey and K.J. Wallace (available through CALM).

The stages in vegetation management are:

- Regional or property vegetation management planning. This will assist the manager to determine which areas of vegetation have greater value for protection in the landscape for initial actions and where strategic revegetation may be required to re-establish functionality in the landscape. This vegetation Strategy primarily deals with this area of regional remnant vegetation management.
- Vegetation protection. Where the adjacent land use is stock grazing, the vegetation will need to be fenced and the stock excluded. This will enable regeneration to occur, will reduce soil compaction and will reduce weed invasion caused by soil disturbance and nutrient/seed inputs through dung. Vegetation should also be protected from detrimental invasions, such as from dieback disease, weeds, fertiliser, fire and feral animals.
- Vegetation management. Once isolated as a remnant, the vegetation will not persist without some form of management, such as the control of pests and diseases (such as small outbreaks of dieback, weeds and feral animals).
- Vegetation enhancement. The existing vegetation may be small, isolated or degraded. In such situations, vegetation enhancement may be necessary to ensure its longer-term survival. Enhancement may be by the establishment of a buffer of vegetation around the area to protect it (may be commercial Plantings), the establishment of a corridor of vegetation to link it to another area, or the regeneration or replanting of vegetation in disturbed areas within the site.

8.5 Review of assistance for native vegetation management

Native Vegetation Working Group final report

The Minister for Primary Industry in Western Australia established the Native Vegetation Working Group (NVWG) in order to 'develop mechanisms that minimise the economic burden carried by individual landholders in the protection and retention of privately owned bushland in agricultural areas'.

The group produced a discussion paper and held a workshop for representatives from farming bodies, community groups, local government and key agencies.

This report sets out a range of mechanisms aimed at both assisting in the protection and management of bushland, and ensuring that the costs are spread more equitably across the whole community. This report provides the first comprehensive framework of action on this issue, as well as useful information on current mechanisms. Included in the report is a discussion on the individual and public good benefits of vegetation retention (economic costs and

benefits of owning bushland, economics of clearing for property development, economic impacts of clearing controls, the cost of government administering clearing controls, and market trends for bushland).

The NVWG has made 15 recommendations on mechanisms for protecting and managing bushland, and the report has been endorsed by State Cabinet for release. The recommended assistance mechanisms include:

- Provision of better information on benefits of owning bushland.
- Greater equity in application of clearing controls.
- Review of procedures in controlled catchments (i.e. compensation for not clearing).
- Land tax exemptions for conservation managed land.
- Assistance to help local shires introduce differential rating for bushland.
- Formal submission to Federal Government on tax deductibility.
- Simple and economical covenanting scheme.
- Road verge widening incentive for landholders.
- Technical facilitation of 'subdivision for conservation proposals'.
- Natural Resources Adjustment Scheme to continue for notifications of clearing up to 31/12/99.
- Remnant Vegetation Protection Scheme to continue for another five years, but be broadened (\$9000,000.00).
- Farm Business Development programs to include bushland issues.
- Support the Bush Brokers program.
- Establish a revolving fund to facilitate trading in land for conservation outcomes.
- Establish a Special Assistance Process.

References

- Department of Agriculture (1997). The protection of Remnant Vegetation on Private Land in the Agriculture Region of Western Australia. Memorandum of Understanding. Department of Agriculture publication.
 - Department of Conservation and Land Management (1992). A Nature Conservation Strategy for Western Australia.
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 - Monaghan, J. and Associates (1997). Scott Coastal Plain - Background and Issues Paper for Land Use Development and Environment.
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Bulletins 4513: Scott Coastal Plain a strategy for a sustainable future

Bulletin 4513 : Scott Coastal Plain : a strategy for a sustainable future

June 2001

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There has been an overwhelming statement of appreciation for and identity with the area, its environment, landscape and lifestyle arising out of the community consultation for this project. The community wants to ensure this is protected to guarantee a viable future for themselves and an opportunity for their children. There also appeared to be a clear commitment to responsible development and conservation and a willingness to highlight and address the constraints to those objectives.

The Warren-Blackwood Regional Planning Strategy (WBRPS), which covers the Shires of Nannup, Manjimup, Bridgetown-Greenbushes and Boyup Brook, acknowledged the issues and concerns associated with the SCP and the study being undertaken by the Steering Committee. The WBRPS deferred detailed assessment and proposals for the SCP pending the outcome of this study and proposed to adopt the findings and recommendations of this study into that Strategy.

9.1 Agricultural development potential, workforce and accommodation

The agricultural development potential of the SCP has been assessed by Department of Agriculture and the vision and projections for agricultural land use includes three scenarios for various levels of agricultural diversification. From those projections various assumptions have been made to allow estimation of the likely employment generation, resultant population increases, accommodation requirements and demands for additional infrastructure and community services and facilities.

Of the various agricultural uses listed in the three land use scenarios, there is likely to be little additional employment generated, other than for the landowner and immediate family, for beef grazing, wool sheep grazing and sheep meat grazing. Farm forestry is unlikely to result in any significant additional on-site employment, as this industry tends to employ a number of specialists whose work demands range across the whole region.

On-site employment demands for horticulture vary significantly from one area to another and between one crop and another and are also influenced by whether the growing period is seasonal or continuous. With widespread winter waterlogging, a large proportion of the horticultural developments will be summer cropping, with a

resultant seasonal peak in employment demand.

Table 9 has been prepared on the basis of the Department of Agriculture projections and employment demand experience of local producers. It is intended to give an indication of the likely employment demands emanating from that scale of future development. To this should be added employment accommodation needs related to existing and future mining activity and future tourist and recreational demands.

Map 5. Existing land use for the Scott River Catchment

Table 9. Indicative workforce accommodation implications within the study area (based on three potential development scenarios outlined in Chamarette, 1999)

Agricultural activity	Employment per 100 ha (1)	Current		Scenario 1	
		Area (ha)	Employment	Area (ha)	Employment
Dairying (2)	2	1,750	35	1,893	38
Horticulture (3)	50	450	225	1,000	500
Other (4), (2)	-	-	30	-	31
Workforce	-	-		-	
Year round (5)			110		169
Seasonal (6)			180		400
Total			290		569
Additional accommodation requirement	-	-	-	-	
Permanent (7)			37		56
Seasonal (8)			90		200
Total			127		256
		Scenario 2		Scenario 3	
Dairying (2)	2	2,524	50	3,156	63
Horticulture (3)	50	3,000	1,500	5,000	2,500
Other (4), (2)	-	-	27	-	22
Workforce	-	-		-	
Year round (5)			377		585
Seasonal (6)			1,200		2,000
Total			1,577		2,585
Additional accommodation requirement	-	-		-	
Permanent (7)			126		195
Seasonal (8)			600		1,000

Total		726	1,195
Notes and assumptions:			
<ul style="list-style-type: none"> ● (1) The figures used in this column are based on local landowner advice and experience. ● (2) Year-round workforce. ● (3) Largely seasonal workforce, peaking around harvest time (March to May). ● (4) Includes beef grazing, wool sheep grazing, sheep meat grazing and farm forestry. ● (5) Includes 20% of the horticultural workforce and all the workforce of the other agricultural uses. ● (6) Includes 80% of the horticultural workforce. ● (7) Assumes that 1/3 of the workforce is accommodated at the workplace, 1/3 finds accommodation outside the study area and 1/3 will require an accommodation opportunity within the study area. ● (8) Assumes that 1/4 of the workforce is accommodated at the workplace, 1/4 finds accommodation outside the study area and 1/2 will require an accommodation opportunity within the study area. 			

Currently, the only accommodation available in the study area is on privately owned rural zoned lots, with the exception of the small scale development at East Augusta. Each landowner has the opportunity under local zoning provisions to erect an additional dwelling for the accommodation of a farm worker, but seasonal workers are not adequately catered for and mine workers need to find their own accommodation, generally in towns outside the study area. There is no provision for tourist accommodation at this stage.

9.2 Land tenure

Of the total 107,000 ha of the study area, State forests, national parks, nature reserves and other reserves account for about 57,400 ha, with the remaining 49,600 ha being private farmland. Most of the private land holdings on the SCP are much larger in area than those in other parts of the South West. North of the Scott River and east of Scott River Road most of the lots are between 600 ha and 1200 ha in area, but with some down to 150 ha. The vast majority of the holdings are family owned, some with two or more lots forming the total farming enterprise.

The large lot sizes, relatively low land values and minimal land speculation pressures in this area have provided a favourable basis for developing large scale agricultural enterprises. These factors have offered greater flexibility for the placement of 40 ha centre pivot irrigation systems, through reduced restriction by lot boundaries, streamlines, remnant vegetation, poorer soils or other constraints.

To the west of Scott River Road the lot sizes are generally in the range of 40 ha to 200 ha, but with a few lots of much smaller size. South of the Scott River the lot areas are much more variable, ranging generally from 100 ha to 500 ha. Several land holdings consist of a number of much smaller lots. In the area known as East Augusta, on the eastern bank of the Hardy Inlet and at the end of Scott River Road, there is a precinct of about 50 lots around 4000 m² to 8000 m² in area.

The SCP has been identified by the State Planning Strategy as being an agricultural area of State/regional significance. As such, its productive agricultural capacity should be protected against inappropriate subdivision or development, or land degradation. Further breakdown of agricultural lot sizes may impinge on the productive capacity of the land by restricting operational flexibility and by reducing the scale and viability of the farming enterprise. It may also lead to speculative pressures and increased land values. In turn these effects may limit the financial capacity of landowners to carry out the appropriate land management procedures.

9.3 Land capability

Large reserves of high quality groundwater are available to the majority of the properties within the study area. The main concerns which had been expressed by various government agency reports in respect of the more intensive agricultural land uses related to the suitability of the soils and the ability to control off-site nutrient impacts. Tille and Lantzkze (1990) reported a generally low capability for horticulture across the study area, due

mainly to poorly drained soils to the north of Scott River and to wind exposure and erosion risk to the south of the river.

This assessment was subsequently confirmed by Van Gool and Runge, indicating waterlogging as the main constraint. However, when summer cropping only was considered by Van Gool and Runge, most of the area north of the river and parts of the southern area were shown to have a fair capability, with some land having a high capability. However, this was qualified by the comment that occasional early breaks to the winter season may cause waterlogging, which may affect crop yields and can impede harvesting of the summer crop. On the agricultural land north of Scott River the principal concern is nutrient leaching/run-off.

9.4 Environmental constraints

Department of Agriculture through Cox (1999) has classified the waterways network of the Scott River catchment, into first to sixth orders of drainage and also according to channel formation. Most of the streams outside of the CALM estate have been modified or impacted upon to varying degrees and few retain their original vegetation and bank structure. The importance of retaining riverine vegetation and protecting the stability of stream banks is fully recognised. In some cases this may require additional treatments, such as reservation, fencing, revegetating or stock control. However, there may be opportunities to redirect lower order streams to facilitate placement of irrigation systems or other intensive agricultural developments, provided suitable management measures are taken.

The wetland distribution within the study area has been identified by WRC to indicate such features as lakes, sumpland, dampland, floodplain and palusplain. Most of the wetland features outside of the CALM estate have either been cleared of natural vegetation or have otherwise been significantly impacted upon. Where these features do remain in their natural state or close thereto, their value for retention will need to be evaluated, especially where they are associated with poorly represented vegetation complexes.

Retention of existing remnant vegetation also has other potential benefits, such as reducing wind erosion, enhancing the visual landscape, reducing waterlogging, providing biological filters for nutrients, protecting rare and endangered species, maintaining wildlife corridors, providing areas for wildlife refuge and protecting adjoining reserves. In particular, remnant vegetation within existing road reserves can play an important role. New irrigated horticultural proposals will be evaluated against various additional assessment criteria, as described in Appendix 23, and include nutrient management issues. The risk of nutrient losses from irrigation areas needs to be managed (Section 7.4) to maintain water quality in Scott River and Hardy Inlet to agreed levels (Section 7.10).

For those areas covered by vegetation types DE5, Dd5 and D5, maintenance of vegetation cover is very important for land stability. For each type, slope is a 'severe limitation' and land instability is a 'major limitation' and for DE5 wind erosion is also a 'major limitation' for land use capability. (Tille, P.J. and Lantzke, N.C. (1990). Busselton-Margaret River-Augusta Land Capability Study, Land Resource Series No. 5, Department of Agriculture WA.)

9.5 Minerals and mining

The Beenup titanium minerals mine has been closed recently because it is not economically feasible to handle the large proportion of slimes within the ore. Attendant problems such as the presence of pyrite and of strongly cemented sideritic horizons in the ore, added to the difficulties of balancing costs and sales revenue. A considerable mass of mineralised sediments remains in situ and the possibility of reopening the mine must be considered if there are further breakthroughs in technology.

The Jangardup mine and the nearby Jangardup South proposed mine are well-defined and no land use changes that could compete with the mining should occur. An important resource of titanium minerals known as 'Scott River' has been defined on the agricultural land immediately south of Governor Broome Road and north of the Scott River. The deposit is in the pre-feasibility stage of examination with the potential mine commencing within 10 years.

Although the western portion of the study area is underlain by the Sue Coal Measures, there are shallower and therefore more financially attractive seams occurring to the north and therefore any extraction of coal on the SCP is most unlikely to be contemplated in the foreseeable future.

Ferricrete gravels are an attractive base construction material for roads and other uses. Significant quantities can be extracted from the ferricrete cap-rock of the laterite profiles, common in the South West of Western Australia. However, these areas are not suitable for agricultural pursuits and tend to occur within areas still forested to the north of the agricultural lands. Some ferricrete related to shallow groundwater levels may occur in the SCP, although their location is less predictable than the laterite and they are not used greatly.

Construction sand is widely available from the surficial units (Safety Bay Sand, Guildford Formation). The resource is believed to have a relatively low demand and with the widespread nature is not seen to be an issue for land use planning.

The Tamala Limestone contains extensive deposits of both cemented limestone and lime sand. The former is used for road-base and for construction blocks and the latter, along with crushed limestone, for agricultural soil pH modification. The Tamala Limestone occurs widely in the coastal dunes. However, most of these areas are held within the conservation estate and mining is not judged acceptable to significant parts of the community. Areas of private land near the coast that are underlain by limestone or lime sand should be viewed as containing a resource that will probably become more valuable with time, and land use planning to allow for future access could be appropriate for such areas.

Peat occurs in low-lying areas subject to near continuous inundation. This is an attractive consumer product for plant growing, but in uncleared wetlands its extraction can produce undesirable environmental impacts.

9.6 Coastal constraints

The vast majority of the ocean frontage, extending from Hardy Inlet to Donnelly River, is a sandy coastline, with the main feature of variation being the large basalt outcrop at Black Point. The dunal areas are low in elevation in the western sector, grading to high in the east, particularly just to the west of Black Point and Donnelly River. There is a lack of information on coastal processes and stability, but the whole area is exposed to westerly to southerly winter storms and south-easterly to south-westerly sea-breezes in summer and that exposure can be described as extreme. There are large areas of dunal blowouts, stressing the importance of protecting the vegetation cover.

Although relatively remote from major population centres and local towns, there is growing pressure on this coastal area from tourism, recreation and fishing enthusiasts. That pressure extends into the D'Entrecasteaux National Park, which covers the eastern part of the study area coastal strip. A new management plan for the D'Entrecasteaux National Park is currently in preparation. It is understood there are concerns within CALM that there is limited visitor capacity around Black Point, one of the most popular spots within the park, to handle the degree of camping and vehicle pressures that are coming onto that area. The new management plan will endeavour to address that issue, but there are opportunities for this Land Use Strategy to assist in resolving some of that pressure. At this stage the only formal road access to the coast along the entire 70 km ocean frontage is at Black Point, and that is by way of a very intermittently four wheel drive sand track. Some landowners allow restricted public access through their properties.

Of the 70 km ocean frontage, D'Entrecasteaux National Park covers about 9 km and almost the entire remainder is vacant Crown land, being that strip of land along the water frontage of private landholdings between Black Point and Hardy Inlet. Full responsibility for implementation of the national park management plan rests with CALM. Currently, there is no vesting for the Crown land coastal strip, there is no management concept in place and so far no agency has been prepared to accept any management responsibility.

There are clearly significant opportunities for tourist, recreation and lifestyle development in this area as well as intensive agricultural use in some sections. However, there are also major issues to address, including vesting of the vacant Crown land, coastal management, foreshore access, road construction and services and infrastructure provision.

9.7 Roads and transport

Consistent with the remote nature of the study area, only Brockman Highway was constructed to a sealed standard until recent times and even that was of a rather poor standard. The development of two mineral sand mines has resulted in the reconstruction of parts of Brockman Highway, Black Point Road and Scott River Road and also the

construction of Sues Road to the north. Apart from a short section of Milyeannup Coast Road, all other roads in the study area are either graded earth roads or unconstructed dirt tracks. One of the major constraints to road construction and upgrading in this area is the lack of roadbase materials within a reasonable haulage distance, as most of the materials reserves are located within the CALM estate and are generally not available for local government road purposes. A more detailed outline of the background information is set out in the *Part 1 - Background and Issues report*.

Current developments in the area have placed considerable strain on a number of the existing local roads. As indicated in the *Part 1 - Background and Issues report*, each centre pivot site producing potatoes generates about 53 return truck movements (38 tonnes) at the time of harvest, with a further five return truck movements carrying in lime, gypsum and fertiliser at other times of the year. It could be assumed that there would be similar truck movements associated with other horticultural production, but their seasons of cartage may be different or may be more evenly spread throughout the year. Each dairy will involve the calling of a milk tanker each day of the year.

It should be noted that the upgrading of Sues Road has considerably improved the accessibility to the processing plants in the Busselton/Bunbury area for milk tankers and other products and has also facilitated the transport of farming requirements and equipment into the study area. Another route that has been used extensively outside the study area has been via Stewart Road, Coronation Road and Graphite Road to deliver potatoes from the study area to the processing plant in Manjimup. With that processing plant having recently closed down, the future demands on this route are uncertain, but Manjimup may remain a centre for sorting and/or processing of potatoes and other horticultural crops, given its current importance in horticultural production.

Harvested logs from the existing hardwood plantations may be destined for a woodchip mill that is likely to be built in the vicinity of Donnybrook or Bunbury. Indications at this stage are that Sues Road and Bussell Highway will be used as the truck transport route. However, further changes to the Regional Forest Agreement may result in using the existing Diamond Chip Mill for chipping some plantation timbers from the Manjimup/Pemberton/Scott River area. In that case both Stewart Road and Coronation Road could be used to gain access to the existing log haul route along Palings Road to the chip mill.

Future development potential will have considerable implications for the road network. Table 10 sets out the indicative volume of loaded heavy truck movements likely to be generated each year for the three development scenarios outlined in Chamarette (1999).

Table 10. Indicative truck generation implications

Agricultural activity	Current (1)			Scenario 1		
	Ha	Tonnes	Trucks	Ha	Tonnes	Trucks
Dairying	1,750	-	680	1,893	-	735
Support (2)	-	1,225	33	-	1,325	35
Horticulture (2)	450	22,500	592	1,000	50,000	1,315
Support (2)	-	2,250	59	-	5,000	131
Farm forestry (3), (4)	5,000	125,000	2,083	6,000	150,000	2,500
Support	-	-	-	-	-	-
Sheep/cattle grazing (5), (6)	24,356	9,744	213	23,662	9,466	207
Support (2)	-	16,685	438	-	16,209	426
Total (7)	31,556	167,404	4,098	32,555	232,000	5,344
Agricultural activity	Scenario 2			Scenario 3		
	Ha	Tonnes	Trucks	Ha	Tonnes	Trucks

Dairying	2,524	-	981	3,156	-	1,226
Support (2)	-	1,767	47	-	2,209	58
Horticulture (2)	3,000	150,000	3,945	5,000	250,000	6,579
Support (2)	-	15,000	394	-	25,000	658
Farm forestry (3), (4)	7,000	175,000	2,916	9,500	237,500	3,958
Support	-	-	-	-	-	-
Sheep/cattle grazing (5), (6)	19,031	7,613	166	11,900	4,760	104
Support (2)	-	13,038	343	-	8,153	215
Total (7)	31,555	362,418	8,792	29,556	527,622	12,798

Notes and assumptions:

- (1) Tonnages and truck movements for horticulture and sheep/cattle grazing based on road count figures taken by the Shire of Nannup in late 1997/early 1998; for dairying based on discussions with Bill Russell from Department of Agriculture; for farm forestry based on discussions with John Sanders from Bunnings Tree Farms.
- (2) Based on 38 tonne trucks.
- (3) Based on 60 tonne trucks.
- (4) The truck movements related to harvesting plantations occur 10 years after planting; that is, uptakes to these levels will be progressive.
- (5) Based partially on 60 tonne trucks and partially on 40 tonne trucks.
- (6) The overall figures for tonnage and truck movements were taken from the Shire of Nannup road count figures and proportionately expanded to include also the Shire of Augusta-Margaret River.
- (7) All truck numbers shown relate only to loaded large trucks; actual truck movement numbers will be double to account for empty return journeys.

9.8 Power and telecommunications

Agricultural properties are currently limited to single phase (240 volts) power supplies, which is sufficient to operate an irrigator, but a bore pump requires three-phase (415 volts). There is a considerable cost saving in using reticulated electricity supplies, rather than diesel fuel, to power the plant associated with irrigated horticultural production.

Many landowners in the study area have expressed a strong desire to connect to three-phase power supplies. This could be achieved by extending a 22 kv line from the Beenup substation, which is served by a 132 kv line. Previously, this would have necessitated the installation of filter banks to reduce the level of harmonics generated by mining equipment, but with the Beenup mine now being closed indefinitely, this is no longer required.

The power grid to supply the Jangardup Mine has been extended to allow farmers in the area to access three-phase power. A preliminary estimate by Western Power to extend a suitable transmission line from the Beenup substation to the eastern sector of the study area suggests that it may cost in the order of \$1-2 million.

Currently, most of the properties in the central and western sections of the study area are connected to the Telstra cable phone system, but those in the east mostly rely on radio or satellite connections. Mobile telephone coverage is very limited. The local community has expressed a strong desire for an improved telecommunications service.

9.9 Other community services

There is no established townsite in the study area and no urban commercial services. Currently local landowners and residents use the commercial and civic facilities in the surrounding towns. From a common point at the junction of Milyeannup Coast Road, Fouracres Road and Governor Broome Road, it is a distance of 47 km to Nannup, 60 km to Augusta, 68 km to Margaret River, 81 km to Pemberton and 84 km to Manjimup.

A small roadside shop exists on the north side of Brockman Highway, near the junction of Scott River Road. For the usual commercial and civic facilities, residents in the central and eastern sections generally use Nannup and those in the western end tend to prefer Augusta or Margaret River. Manjimup is the regional level focus for most of the local community and is the processing and servicing centre for the horticultural and timber industries.

Many of the local residents have expressed concern at the remoteness and lack of services and facilities. They have cited a general store, tavern/bottle shop, sporting facility (golf), community hall/social meeting area, rural supplies and product handling/storage unit as their main interests in that regard. Provision of these facilities is generally based on both need and commercial viability, with the implication that an increasing local population and greater economic activity may be the catalysts to achieving them.

9.10 Current zonings and land uses

In both the Shire of Augusta-Margaret River Town Planning Scheme No. 11 and the Shire of Nannup Town Planning Scheme No. 1, the privately owned land within the study area is currently zoned 'Rural'. These schemes allow for a wide range of uses to be permitted at the discretion of the Council, some requiring prior public advertising. A narrow strip of land on the eastern shore of Hardy Inlet is included within the Shire of Augusta-Margaret River Town Planning Scheme No. 19 and is zoned 'Special Residential', allowing for the creation of about 50 lots.

9.11 Reserved and Crown lands

Existing areas of State forest, national park, nature reserves and other reserves are vested in CALM or other relevant agencies. Nothing in this Land Use Strategy will affect the continued management of those lands by those agencies, but the Strategy will endeavour to reduce adverse impacts on those lands by appropriate management practices associated with agricultural and other land uses.

There are several relatively large parcels of vacant Crown land remaining within the study area which should be investigated further as potential land swap options in conjunction with the recommendations of the Vegetation Management and Water Management strategies. The vesting of the existing strip of vacant Crown land along the foreshore of the south coast needs to be resolved to facilitate appropriate planning and management of the coastal area.

Additional conservation protection on private land may be achieved by means other than acquisition. Various options, such as conservation covenants and incentives for voluntary protection, should also be considered.

9.12 General Strategy details

- 9.12.1 Rural agricultural zones
- 9.12.2 Rural landscape and conservation zone
- 9.12.3 Coastal management
- 9.12.4 Accommodation
- 9.12.5 Roads and transport
- 9.12.6 Power supplies

This Land Use Strategy recognises existing land uses and the need to consider a more diversified approach to agriculture in the catchment.

The land capability assessment carried out by Van Gool and Runge for summer horticulture indicated that the vast majority of the private land outside of the coastal dune area had a fair to high capability, subject to several cautionary notes. This suggested that, subject to appropriate land management practices being undertaken, seasonal irrigated horticulture and other intensive agricultural activities could be undertaken in some areas,

depending on soil types, depth to watertable and other factors, including location of watercourses. The key factors for sustainability are implementation of BMP and ongoing monitoring.

As a result, the broad land use concept for the study area is for continued and enhanced agricultural uses on private land to the north of the Scott River and for a range of rural-type land uses on the private lands to the south.

9.12.1 Rural agriculture zone

In recognition of the availability of large volumes of high quality water and the large lot sizes unconstrained by incompatible adjoining uses, the Strategy proposes that all the freehold land within the study area to the north of the Scott River. This will enable the continued development of a wide range of intensive and extensive agricultural land uses in conjunction with appropriate land management practices.

The principal objective of the Rural Agriculture zone is to provide for the sustainable use of land for crop growing (including horticulture and timber production) and extensive animal husbandry (including dairying and grazing) and to protect the long-term productive capacity of agricultural land from incompatible land uses (including subdivision).

Within the Rural Agriculture zone, proposed land uses and developments should be assessed in accordance with the following chart (note that where the use is listed as 'permitted', a formal planning application to the council may still be required).

In planning for new land uses and developments or extending existing ones, every effort should be made to avoid conflicting with existing waterways, areas of remnant vegetation and other areas of high conservation value. Irrigated horticulture developments should be positioned to ensure that natural watercourses do not enter or cross the site, and consider other location factors related to risk of nutrient losses such as soils, depth to watertable. First, second or third order streams or artificial drainage lines may be diverted as set out in the Water Management Strategy, but watercourses of fourth order or higher should be avoided. In addition, setbacks from environmental features should generally be in accordance with the Buffer Distance Guidelines set out in Table 5 and the Preliminary Guidelines for Assessing the Environmental Risk of Irrigated Agriculture on the Scott Coastal Plain Appendix 25.

The majority of the study area is underlain by the Yarragadee Aquifer, which can provide large quantities of high quality water for irrigation purposes. The aquifer extends well to the east of the study area, but its western limit approximates to the local government boundary between the Nannup and Augusta-Margaret River shires. To the west of the Yarragadee Aquifer lies the Lesueur Formation, a shallower aquifer with variable water quality and availability. In addition, several fault lines extend into the middle of the study area from the south coast, creating a narrowing wedge of land where basalt rock layers and other geological formations often render access to the underlying Yarragadee Aquifer more difficult and expensive.

Throughout the Rural Agriculture zone, a prime objective of this Strategy is to protect the productive capacity of the land from incompatible land uses, or those uses or developments which may prejudice their viability. One of the economic advantages of the SCP for extensive irrigated horticulture is the large lot sizes and the relatively low land values. To maintain and protect that advantage, there is a clear presumption against any subdivision of land within that zone.

Alexander Bridge - Nillup Cell

However it is acknowledged that the Nillup Cell (i.e. to the west of Scott River Road) is different from the majority of the Scott Coastal Plain. In terms of soil types, the area has a significant proportion of alluvial soils and sands that are suited to a large range of intensive agricultural activities. The subdivisions in this area reflect the different soil types. The topography of the area is more undulating and better drained than the majority of the Scott Coastal Plain. This area has access to three-phase power and better infrastructure which would assist in the development of more intensive agricultural industries. The land in this region has been subdivided to much smaller blocks in comparison to the rest of the Scott Coastal Plain. It is therefore recognised that subdivision to lot sizes comparable to the predominant surrounding lot size (i.e. to a minimum lot size of 40 ha) may be acceptable where it can be clearly demonstrated to be for productive agricultural purposes.

At the now closed Beenup minesite, current permitted land uses within the Rural Agriculture Zone, even capital intensive developments, should be allowed to proceed until new technology breakthroughs make a recommencement of mining activity a feasible proposition. However, it would not be appropriate to rezone the areas underlain by mineralisation to a more intensive or sensitive use, at least for the foreseeable future, and subdivision to areas smaller than 40 ha should not be contemplated. The area concerned has been identified by BHP Titanium Minerals in its latest environmental approval document. Additional areas of mineralisation are known, but should not be considered in land use planning until the economics of this type of ore extraction improve markedly.

At Jangardup, the style of mining undertaken or being proposed is eminently suited to sequential land use, whereby most other uses can satisfactorily proceed after mining and rehabilitation has been concluded, subject to appropriate environmental approvals. There is a narrow, north-west extension of the Jangardup mine that is covered with Retention Licence 70/22, that may be considered for mining in the future. Land uses possibly sensitive to this style of mining should be very closely examined prior to any decision to consent to them proceeding.

If any areas of potentially extractable ferricrete occur in the agricultural districts, consideration should be given to protecting them from competing land uses, particularly if an isolated occurrence. Where peat deposits occur in cleared farmland, its extraction may be acceptable and consideration could be given to protecting such areas from other uses that may prevent its future extraction.

Table 11. Land Use Strategy - Rural agriculture zone provisions

Use type	Permissibility of use	Comments and guidelines for assessment
Irrigated horticulture	Permitted	<ul style="list-style-type: none"> ● Groundwater well licence required from WRC. ● Full compliance with well licence conditions. ● All proposals for irrigated agriculture (or expansion) should show they have been considered by the multi-agency approval and assessment process, (see 'Application and Approval Process for New Irrigated Agriculture on the Scott Coastal Plain' and 'Guidelines for Assessing the Environmental Risk of Irrigated Agriculture on the Scott Coastal Plain'). ● May require EPA assessment of environmental factors including risk of nutrient loss from site. ● Full compliance with Ministerial conditions if the proposal is formally assessed by EPA and approved. ● Clearing permits required from Department of Agriculture where clearing is proposed. ● Full compliance with clearing permit conditions. ● Comply with the Best Management Guidelines for Horticulture. ● Setbacks from environmental features shall generally be in accordance with the Buffer Distance Guidelines set out in Table 5 of the 'Guidelines for Assessing the Environmental Risk of Irrigated Agriculture on the Scott Coastal Plain'.
Tree plantations	Permitted	<ul style="list-style-type: none"> ● Clearing permits required from Department of Agriculture where clearing is proposed. ● Full compliance with clearing permit conditions. ● Comply with the Best Management Practice Guidelines for tree plantations. ● Comply with the Timber Industry Code of Practice for timber plantations in Western Australia. ● Compliance with any district road transport Strategy or fire management Strategy.

Dairying	Permitted	<ul style="list-style-type: none"> • May require EPA assessment and/or DEP licence and works approval. • Full compliance with Ministerial conditions if the proposal is formally assessed by EPA and approved. • Effluent disposal to be located so as to comply with the environmental objectives.
Animal husbandry	Discretionary	<ul style="list-style-type: none"> • EPA approval required. • Full compliance with EPA approval conditions. • Effluent disposal to be located so as to comply with the environmental objectives.
Grazing	Permitted	<ul style="list-style-type: none"> • Comply with the Best Management Guidelines for grazing.
House	Permitted	<ul style="list-style-type: none"> • Effluent disposal to be located so as to comply with the environmental objectives.
Additional accommodation	Discretionary	<ul style="list-style-type: none"> • May be permitted only for accommodation of permanent or seasonal workforce on land under the same ownership. • To be positioned on-site to avoid conflict with existing or permissible adjoining land uses. • Effluent disposal to be located so as to comply with the environmental objectives.
Tourist accommodation	Discretionary	<ul style="list-style-type: none"> • To be positioned on-site to avoid conflict with existing or permissible adjoining land uses. • Effluent disposal to be located so as to comply with the environmental objectives.

Map 6. Land use strategy for the Scott Coastal Plain

9.12.2 Rural landscape and conservation zone

The freehold land areas to the south of the Scott River are characterised mainly by steep coastal dunes with relatively fragile coastal heath vegetation, but also have significant areas of protected woodland and forest and other areas of richer soils capable of various productive agricultural activities. A large portion of this area is also underlain by the Yarragadee Aquifer, providing ready access to large volumes of high quality water for various land use and development purposes. The coastal belt is exposed to the strong winter storms and summer sea-breezes, presenting a high risk of wind erosion and dunal blowouts. At the same time the whole area has high and varied visual landscape values and considerable potential for recreation, nature-based tourism and lifestyle living. In consideration of those factors, it is proposed that the freehold land south of the Scott River be zoned 'Rural Landscape and Conservation'.

The principal objective of the Rural Landscape and Conservation zone is to protect significant landscapes and environmental features and provide for development which is compatible with and will enhance the landscape and environmental qualities of the locality.

Within the Rural Landscape and Conservation zone, proposed land uses and developments should be assessed in accordance with the following chart (note that where the use is listed as 'permitted', a formal planning application to the council may still be required).

Given the variety of uses that may be permitted in this zone, care must be taken to ensure compatibility of adjoining uses. With large lot sizes being available, each development and use on a lot should be so located as to not have any adverse impact outside the boundary of that lot. In addition, each development or use should be so

designed and located as to be compatible with and complementary to the visual landscape and in particular should not be placed on exposed dunes or in visually conspicuous positions.

Other than for agricultural purposes, an essential pre-requisite to an increase in development and usage in this area is the preparation of a coastal management Strategy for the coastal strip extending from the western boundary of the D'Entrecasteaux National Park through to Hardy Inlet. An exception should be where a development proposal is for agricultural purposes and no additional people pressure will impact on the coastal zone. Subdivision of land and increasing development potential that will increase the pressure on the coastal zone will not be supported by the WAPC until the issue of the vesting of the vacant Crown land coastal strip is resolved and a suitable coastal management Strategy is approved and adopted. Negotiations need to be carried out with the respective local governments with a view to their accepting the vesting. Once these requirements have been fully addressed, subdivision of lots down to a minimum lot size of 40 ha may be considered where road access and road upgrading issues have been satisfactorily resolved. Further subdivision of land to smaller lot sizes for lifestyle purposes will not be considered unless and until urban type services and facilities are provided in close proximity to the subject land and the required infrastructure has been appropriately upgraded.

Areas of private land near the coast that are underlain by limestone or lime sand should be viewed as containing a resource that will probably become more valuable with time and authorities should plan for future access to these areas.

9.12.3 Coastal management

Coastal management to ensure appropriate protection of the coastal environment should be carried out at three separate levels. Firstly, the Warren-Blackwood Regional Planning Strategy (WAPC 1997) recommended that the Ministry for Planning, in conjunction with other parties, prepare a regional coastal management Strategy for the coastline stretching from Walpole to Augusta, addressing issues such as:

- Coastal processes.
- Tourist and recreational demands.
- Options for access, development and settlement.
- Location, type and style of tourist and recreational facilities.
- Areas for conservation and protection.
- Resourcing coastal management.
- Rationalisation of boundaries and vesting of the vacant Crown land coastal strip.

Secondly, the local governments should seek appropriate government funding and assistance to prepare a coastal management plan for the section of coastline abutting the freehold land extending westwards from Black Point. That plan should address such issues as:

- Proposed node(s) for formal public access to the coast.
- Vehicle and pedestrian management.
- Requirements (if any) for public facilities.
- Beach and dune management.
- Conservation requirements.
- Involvement of abutting landowners.
- Guidelines for site management plans.

Thirdly, where there is proposed subdivision or development on lots abutting the coastline or the existing vacant Crown land along the coastline, there should be a requirement to prepare and implement a site coastal management plan by the landowner/developer, relevant to the proposed scale of subdivision or development, addressing issues such as:

- Setbacks for development.
- Dune and vegetation protection measures.
- Beach access points.
- Vehicle movement control.
- Fencing.
- Fire management.

- Visual amenity.

Table 12. Land Use Strategy - Rural landscape and conservation zone provisions

Use type	Permissibility	Comments and guidelines
House	Permitted	<ul style="list-style-type: none"> ● Effluent disposal to be located so as to comply with the environmental objectives.
Additional accommodation	Discretionary	<ul style="list-style-type: none"> ● May be permitted only for accommodation of permanent or seasonal workforce on land under the same ownership. ● To be positioned on-site to avoid conflict with existing or permissible adjoining land uses. ● Effluent disposal to be located so as to comply with the environmental objectives.
Holiday chalets	Discretionary	<ul style="list-style-type: none"> ● Total number of units to be no greater than one unit per 10 ha of total site area (or appropriate similar performance criteria). ● Development to be low key, with all buildings and site works to be compatible with and complementary to the visual landscape of the area. ● Additional coastal management plan for the property to be submitted to address the impacts of the additional development. ● No units or other development to be placed on exposed dunes or in visually conspicuous positions. ● To be positioned on-site to avoid conflict with existing or permissible adjoining land uses. ● Effluent disposal to be located so as to comply with the environmental objectives.
Caravan park and/or camping ground	Discretionary	<ul style="list-style-type: none"> ● Total number of caravan bays and camp sites to be no greater than one per 4 ha of total site area (or appropriate similar performance criteria). ● Development to be low key, with all buildings and site works to be compatible with and complementary to the visual landscape of the area. ● Additional coastal management plan for the property to be submitted to address the impacts of the additional development. ● No buildings or other development to be placed on exposed dunes or in visually conspicuous positions. ● To be positioned on site to avoid conflict with existing or permissible adjoining land uses. ● Effluent disposal to be located so as to comply with the environmental objectives.
Irrigated horticulture	Permitted	<ul style="list-style-type: none"> ● All proposals for irrigated agriculture (or expansion) should show they have been considered by the multi-agency approval and assessment process, (see 'Application and Approval Process for New Irrigated Agriculture on the Scott Coastal Plain' and 'Guidelines for Assessing the Environmental Risk of Irrigated Agriculture on the Scott Coastal Plain'). ● Groundwater well licence required from WRC. ● Full compliance with well licence conditions. ● May require EPA approval - subject to assessment of risk of nutrient losses from the site. ● Full compliance with EPA approval conditions.

		<ul style="list-style-type: none"> • Clearing permits required from Department of Agriculture where clearing is proposed. • Full compliance with clearing permit conditions. • Comply with the Best Management Guidelines for horticulture. • Setbacks from environmental features shall generally be in accordance with the Buffer Distance Guidelines set out in Table 5 of the 'Guidelines for Assessing the Environmental Risk of Irrigated Agriculture on the Scott Coastal Plain'. • Development and use to be positioned on-site to avoid conflict with existing or permissible adjoining land uses.
Tree plantations	Discretionary	<ul style="list-style-type: none"> • Clearing permits required from Department of Agriculture where clearing is proposed. • Full compliance with clearing permit conditions. • Comply with the Best Management Guidelines for tree plantations. • Comply with the Timber Industry Code of Practice for timber plantations in Western Australia. • Plantation and associated development and site works to be restricted to areas compatible with the visual landscape protection objectives of the zone.
Dairying	Discretionary	<ul style="list-style-type: none"> • May require EPA assessment and/or DEP licence and works approval. • Full compliance with Ministerial conditions if the proposal is formally assessed by EPA and approved. • Effluent disposal to be located so as to comply with the environmental objectives. • Grazing not permitted on dunal areas or other areas susceptible to wind erosion.
Animal husbandry	Discretionary	<ul style="list-style-type: none"> • EPA approval required. • Full compliance with EPA approval conditions. • Effluent disposal to be located so as to comply with the environmental objectives.
Grazing	Permitted	<ul style="list-style-type: none"> • Comply with the Best Management Guidelines for grazing. • Not permitted on dunal areas or other areas susceptible to wind erosion.

9.12.4 Accommodation

As indicated in Table 9, there may be an existing demand for on-site accommodation across the study area, with those demands increasing considerably in the future if any of the three development scenarios outlined are achieved. Table 9 sets out the projected workforce resulting from the various development levels associated with agricultural activity. Further accommodation demands are also likely to arise in the future from both mining and tourism activities within the study area, but that is difficult to forecast at this stage.

Both permanent and seasonal workers may be satisfied with caravan, hostel, boarding house, chalet or unit type accommodation. Seasonal workers may also be satisfied with camping options, but the permanent workforce, who may also have family with them, may demand the option of detached housing on an urban or rural residential lot. Currently there is a relatively small apparent requirement for off-site accommodation within the study, but the future development scenarios would generate considerably higher demands, along with potential additional pressures from mining and tourism.

If this scale of development is to be achieved on the SCP, it is likely that one or two small townsites may need to be established. In the western part of the study area the most suitable general location would appear to be adjacent

to Milyeannup Coast Road, south of the Scott River. This area is mostly well drained dunal country, with close proximity to the coast for climatic benefits and recreational access, providing an attractive setting. The principal infrastructure demands (water, power and roads) would be relatively simple to provide to this area. The site could be positioned such that it would not be occupying the more productive agricultural lands and would not raise land use conflicts with agricultural uses. In addition, in this location it would better serve the tourist and recreation demands along the coastal strip and could provide for future lifestyle development.

The scale and disposition of the SCP suggests that there could also be a need for a smaller townsite development in the eastern sector. In this instance, the best location options would appear to be along Black Point Road on vacant Crown land or as an excision from State forest. In this position it could serve both the agricultural developments and the Jangardup and other future mineral sands mines.

The development of new townsites is also an opportunity to redress the lack of community services and facilities in the area. Sites for commercial facilities, such as convenience goods, tavern/bottle shop and rural supplies, should be allowed for in scale with the perceived development. Options for financial assistance to provide community facilities such as a community hall and sporting amenities should also be investigated.

The need, scale, type and timing of the new townsite developments will be dependent largely upon the scale and timing of other future developments in the area. To facilitate that progression, forward planning for the accommodation requirements should be undertaken at an early stage. The Zone Management Committee with assistance from the South West Development Commission should monitor future industry development and determine the potential need for infrastructure, roads, power and other amenities. This information should then be forwarded to the appropriate authorities.

9.12.5 Roads and transport

The levels of heavy truck movements outline for the three future development scenarios set out in Table 10, indicate that funding needs to be sought for considerable upgrading of a number of the existing roads. Progressively, Milyeannup Coast Road will need to be upgraded to bitumen standard possibly to the junction of Woodaburrup Road, and if a new townsite is to be located south of the Scott River, the sealed road will need to be extended to this junction. Scott River Road and Black Point Road have already been sealed to serve the Beenup and Jangardup minesites respectively and will adequately serve the main eastern and western entry/exit points to the study area.

The main east-west connecting roads will also require considerable progressive upgrading. This will apply particularly to Governor Broome Road and Fouracres Road and to a lesser extent to the first part of Pneumonia Road.

South of the Scott River, both Woodaburrup Road and the extension of Milyeannup Coast Road will require progressive upgrading depending on the scale and type of development that takes place. In particular, there are major horticulture developments along Woodaburrup Road and significant tree plantations along Milyeannup Coast Road, with more likely to develop in the future. In addition, if recreational usage of the south coast and D'Entrecasteaux National Park increases and low key tourism development is established, the roads standard will need to be suitable for cars and caravans. A major constraint to road building in this area is the lack of suitable roadbase material within reasonable proximity. To facilitate planning and funding of the construction, it is suggested that the local governments prepare a development potential concept and a road-upgrading plan to enable a schedule of road contributions to be produced.

Outside the study area, if any plantation timbers are to be transported to the Diamond Chip Mill for chipping, the Stewart Road/Coronation Road/Palings Road route is recommended. In the case of horticultural produce being transported to Manjimup for processing, packing or sorting, it is recommended that the opportunity for using Palings Road to Seven Day Road be investigated. This should result in a reduced road upgrading requirement, will separate tourist traffic on Graphite Road from heavy transport and will bypass the Manjimup main urban area.

9.12.6 Power supplies

The three future development scenarios outlined in Table 9 suggest significantly increased levels of demand for improved power supplies across the study area. This will come mainly from additional horticultural and dairying

developments, the vast majority of which would be located to the north of the Scott River. To this should be added the potential for one or two townsites, the principal one which would more than likely be located to the south of the Scott River, in the vicinity of Milyeannup Coast Road, plus a range of low key tourist developments along the south coast.

It would appear that there are three main options to consider for extension and improvement of the power supply grid within the study area:

Option 1

If the Jangardup Mine is to be connected by way of an extension from the existing Beenup substation, the proposed route should take into account the potential for up to a tenfold increase in the level of irrigated horticultural development, a doubling of the dairy production and the establishment of one or possibly two townsites. In this case, the local landowners and producers and other interested parties should approach Western Power as a collective group to negotiate the most appropriate power line route, connection points, power charges and other factors of common interest.

Option 2

If the Jangardup Mine is not to be connected to the existing power grid, then the local landowners should still approach Western Power as a collective group to negotiate similar issues for the agricultural enterprises, bearing in mind the potential for a new townsite connection in the future, also.

Option 3

There is always the opportunity for individual landowners or small groups to approach Western Power for separate minor extensions. However, due to economies of scale, this is often an expensive and inefficient method of connecting to the grid.

Recommendation 21

It is recommended that the Shires of Nannup and Augusta-Margaret River amend their district planning schemes after extensive consultation with land holders to incorporate the zonings, zoning table and scheme provision recommendations set out in the Land Use Strategy.

Recommendation 22

It is recommended that as a pre-requisite to increased development along the coast and access to the foreshore area, the vesting of the coastal strips should be resolved as part of the Regional Coastal Management Strategy and Local Coastal Management Plan mentioned in Recommendation 18.

Recommendation 23

It is recommended that the accommodation growth demands within the study area be monitored and, as appropriate, detailed investigations be carried out into the preferred siting of a settlement/townsite and the associated infrastructure and community services and facilities requirements.

Recommendation 24

It is recommended that emerging product source locations and processing/transfer destinations be monitored to determine the routes, standards and timings of future road upgrading requirements.

Recommendation 25

It is recommended that a combined approach from the landowners and producers within the study area be made to Western Power to determine the preferred option, connection points, grid layout, staging and associated cost contributions for three-phase power supplies to properties.

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Bulletins 4513: Scott Coastal Plain a strategy for a sustainable future

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June 2001

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In preparing this Strategy the Steering Committee has taken account of the economic, environmental and social circumstances in the SCP. All of these are intimately linked and change over time. As an illustration, when this project began in 1996 the most apparent issue was the potential environmental effect of the expansion of horticultural activity. In 1999 the most pressing issue was the closure of a major potato processing works in Manjimup that removed a significant market for the horticultural producers.

The challenge in implementing the Strategy is to develop a framework that can:

- address the economic, social and environmental issues of the SCP;
- assist people to work together for mutual benefit and to minimise the export of problems from one neighbour to another;
- is flexible enough to meet various changing circumstances;
- is robust and has feedback to monitor performance built into it;
- incorporate a range of different programs, strategies, policies and legislation that are available from the Government and private sector to address social, economic and environmental matters;
- operates effectively at both the scale of the whole of the SCP and at the local, farm scale;
- transfer information between these scales;
- resolve issues of decision-making power, management responsibility and cooperation on projects.

The process to develop management strategies is dependent on having enough information on which to make decisions. A limitation for this Strategy is the lack of detailed scientific information on the effects of land use on the environment, particularly waterways.

10.1 Components for implementing a Management Strategy

Any Management Strategy has five principal components:

- Appropriate effort for the appropriate level.
- Agreed ground rules.
- Quality planning.
- Management Group.
- Feedback and reporting mechanism.

10.2 Appropriate effort for the appropriate level

The implementation of this Strategy must occur at both the farm and the catchment level, however, there are different mechanisms for implementation for both, e.g. farm level management strategies are needed to take account of individual variations in soil conditions and allow individualised design of farm management plans. These farm plans should also be relevant within a catchment-wide context so that the aggregation of individual practices produces desired outcomes at the catchment level. Consequently the implementation of this Strategy is discussed for both these levels.

10.3 Agreed ground rules

- 10.3.1 Formal mechanisms
- 10.3.2 Informal mechanisms : guidelines for good decision making

There is a range of formal and informal means of controlling and managing development, changes in land use and managing potential for impact on the environment. Some of these are more effective at a farm level, others work better at the catchment level.

10.3.1 Formal mechanisms

At the catchment or study area level

It is anticipated that both the Nannup and Augusta-Margaret River Shire Councils will incorporate the Strategy into their respective district planning schemes. The Town Planning Scheme (TPS) for both Shires, once amended, will control changes in land use. Use class tables in each scheme text set out permissibility descriptions for each land use and describe general conditions of approval for most activities. Some forms of intensive land use will require council planning approval under the Scheme, others will be permitted within certain zones and will not require council planning approval. Existing land uses which do not conform with a change in zoning suggested by the Land Use Strategy are normally considered non-conforming uses and can usually continue at the current level or extent.

At the farm level

- An Assessment and Approval Process for New Irrigation Proposals has been developed by agencies to give landholders a streamlined process to follow in applying for approval to establish irrigation for horticulture or fodder crops in the SCP area. The approval process brings the agencies together, provides a single point contact for enquiries and applications for clearing remnant vegetation (if required), applying for a groundwater well licence and seeking advice from DEP on acceptability of irrigation proposals.
- Groundwater licensing for irrigation (Rights in Water and Irrigation Act) requires that proposals for new irrigated agriculture which require groundwater for irrigation will need a groundwater well licence, involving an application to the WRC.
- Clearing of remnant vegetation and drainage is controlled by the Soil and Land Conservation Act 1945 and Regulations 1992. Assessment of clearing proposals is managed through the Memorandum of Understanding between government agencies to protect biodiversity and conservation values. Any proposed clearing of more than 1 hectare should be documented into a preliminary proposal and submitted to the Commissioner for Soil Conservation (see information package for land clearing proposals in Appendix 18).
- Rare or Priority Species is protected under the Wildlife Conservation Act and landholders with identified rare or Priority Species on their property have been notified by CALM that the flora occur on their property.
- The Environmental Protection Act 1986 provides the legislation to protect the environment from damage, degradation or impact from pollution. The Environmental Protection Act can be used to assess environmental impact, to licence potentially polluting discharges, set environmental policy and require clean-up of damage.

10.3.2 Informal mechanisms - Guidelines for good decision making

At the catchment level

The Strategy for a Sustainable Future takes an integrated approach and establishes agreed objectives with community, landholders and government agencies for the management of the catchment and region. The process of developing the Strategy has informed many people of opportunities for development and how generally to proceed while meeting the objectives for environmental management. It is hoped that this process will bring landowners and agencies together in managing land and water in a sustainable way.

The Warren Blackwood Regional Planning Strategy has been developed by the WAPC to provide a framework for land use planning within the South West region. It will incorporate the Land Use Strategy from this project to add a further dimension to the WBRPS. It will form the basis for decision making on subdivision proposals for freehold land and for assessing local rural strategies, district planning schemes and other planning matters.

It is anticipated that both the Nannup and Augusta-Margaret River Shire Councils will incorporate the Land Use Strategy vision and direction for land use and development of the rural parts of their shires, into their Local Rural Strategies (LRS). Furthermore, both local governments will become a natural focus for advice and a local link to the community and back to the agencies, when reviewing and updating their LRS.

The report card on catchment performance is an innovative approach for providing a feedback mechanism to the Management Group (see Section 11.6), community and landholders on how well land use and management at the regional level is meeting the objectives of being economically, socially and environmentally sustainable.

At the farm level

Sub-catchment planning and drainage management is proposed in the Strategy to be coordinated by the Lower Blackwood LCDC, with technical assistance from government agencies. Improving the management of land and water through proper drainage can assist improving the environmental quality of waterways. A sub-catchment planning approach is recommended where drainage within a sub-catchment is identified and agreed between all landholders, and incorporating principles for streamlining and riparian management.

Best practice guidelines are reflective of current industry standards for land management, self-regulating and incorporate technical information on cropping and animal production practices. They are usually developed by farmers and the industry.

Recommendation 26

It is recommended that the Best Management Practices (BMPs) developed for this strategy be reviewed by the appropriate agencies and landholders on a regular basis. This is to ensure local knowledge and experience is incorporated into the BMPs.

The report card on catchment performance provides a feedback mechanism to landholders and farmers on how well land management at the farm level, as set out in the Strategy, is meeting the objectives of being economically, socially and environmentally sustainable.

10.4 Quality planning*Planning at the catchment level*

The Strategy for a Sustainable Future provides much of the catchment study area level planning for the SCP. The combination of the Water and Vegetation Management Strategy and Land Use Strategy, integrates planning for future development of the SCP by designating areas that are suitable for differing land uses.

It is anticipated that the integration of the Strategy into the WBRPS, the Shires' District Planning Schemes and the involvement of CALM and WRC will add to the recognition that the Strategy is an important part of future planning for the region. The Strategy has an in-built review mechanism that requires that the community and

agencies continue the process of improving management of the area.

Assistance with developing rural and agricultural industry and economic activity is provided through programs run by Department of Agriculture (Farmbiz, Progress Rural and Better Business and advice on market information), the Department of Trade and Commerce (funding for feasibility studies, advice on market information) and the South West Development Commission that particularly focuses upon assisting with infrastructure development and developing strategic regional initiatives.

Other funding programs covering land care and natural resource management activities can be found in Funding and Training Directory for Landcare Activities July 1999, prepared by Department of Agriculture.

Planning at the farm level

The major challenge is for the community to implement best practice in both planning and day to day operations. It needs to be recognised that the Strategy for a Sustainable Future represents a new level of sophistication in farming operations. It will need a corresponding commitment by farmers to use the best available expertise and to continuously monitor their operations.

The Strategy for a Sustainable Future suggests the use of BMP at the farm level and the challenge is before the community to use this information to best effect and to update it as required. Best Practice Guidelines for Irrigated Agriculture, Nutrient Management for Grazing, and Draft Code of Practice for Tree Plantations and others are included in Appendix 28 to 32.

The community consultation has identified that there is considerable opportunity for landowners and the agencies to work together to develop research projects addressing issues such as nutrient application, sound use of biocides, design and construction of drainage and nutrient stripping.

10.5 Management Group - Options for ownership

- 10.5.1 Characteristics of a Management Group
- 10.5.2 Zone Steering Committee of the Blackwood Catchment

10.5.1 Characteristics of a Management Group

The Scott Coastal Plain Steering Committee will have completed its work with the finalisation of this Strategy. Ongoing implementation, coordination of the report card and review of the Strategy requires a suitable management group to be identified and formed for this purpose.

The Steering Committee has identified the following characteristics for a suitable management group to oversee the ongoing implementation of the Strategy:

- Geographic range - The area of land most covered in the Management Group's jurisdiction.
- Type of membership - Who would typically participate?
- Number of groups - How many management groups would operate across the project area?
- Ability to do hands-on management - How effectively does the Management Group effect change on the ground?
- Ability to do hands-on monitoring - How effectively could the Management Group monitor performance?
- Reporting on monitoring - How good is the Management Group at processing and integrating data?
- Main communication mechanism - How does the Management Group communicate with its members?
- Flexibility to respond to changing circumstances - How quickly can the Management Group respond to changing circumstances?
- Access to BMP - How easy is it for the Management Group to develop, access and spread BMP?
- Ability to set policy and change the Strategy - How easy is it for the Management Group to change the Strategy?
- Government agency involvement - Degree to which government agencies are involved.
- Capacity to exercise statutory powers, i.e. licensing bores etc. - The legislative powers available to the Management Group.

- Ability to ensure compliance across the group - What power does the Management Group have to ensure good performance?
- Reporting to government - How easy is it for the Management Group to interact with the government?

As shown in Table 13, the management group has to have a number of necessary characteristics. There is no single entity with powers to effectively manage the ongoing implementation and review of the Strategy. As described earlier the government agencies tend to operate in a sectorial manner and only at the catchment area level with occasional extensions to the local level when licensing, monitoring or for the development of BMP. The landowners are good at on the ground management but do not have good access to the big catchment area picture.

Table 13. Management Group characteristics

Characteristic	Catchment area management	Local management
Geographic range	Whole of study area	Farm and neighbours
Type of membership	Most stakeholders - government agencies and landowner representatives	Neighbourhood or individual land owner
Number of groups	One	Many
Ability to do hands-on management	Low	Very high, good capacity to develop neighbourhood approaches
Ability to do hands-on monitoring	Low and only at major points in the landscape Able to measure gross changes	High for local areas Able to measure localised changes
Reporting on monitoring	High at integration and interpretation of data	Low for integration and interpretation of data
Main communication mechanism	Formal - letters, memos, reports, meeting	Informal - neighbourhood discussion, phone calls, visits
Flexibility to respond to changing circumstances	Low	High
Access to BMP	Moderate - with a good capacity to prepare information materials and design programs	Moderate - with a good capacity to work at developing practical examples and test ideas
Ability to set policy and change the Plan	High	Low
Government agency involvement	High	Low
Capacity to exercise statutory powers, i.e. licensing bores etc.	High because of government agency involvement	Low
Ability to ensure compliance across the Management Group	High if legislative powers are used - this is not wanted by the community	Only through common law
Reporting to government	High	Low

The success of the Strategy at a catchment area level requires cooperation and support from all stakeholders. Ownership of the Strategy will involve coordinating sustainable development activities in the catchment area, regularly updating and adapting the Strategy in response to the triennial report card (Section 11) and identifying and placing a priority on issues.

The Steering Committee has identified a number of options for ongoing ownership and stewardship of the Strategy for a Sustainable Future.

These include:

- Joint Shire Working Group.
- LCDC/Community Catchment Group.
- Blackwood Basin Group.
- SWDC.
- Continue the Scott Coastal Plain Steering Committee.
- Convene a shire/agency Technical Group as needed, or some other arrangement.

10.5.2 Zone Steering Committee of the Blackwood Basin Group

The Blackwood Basin Group (BBG) is a community managed catchment group for the Blackwood River basin, which includes the Scott River. The majority of the SCP lies within the BBG catchment; however, some eastern parts of the SCP are in the Donnelly River catchment.

The BBG is divided up into Zones covering the Upper, Middle and Lower Blackwood. Each Zone has a management committee to progress natural resource management within its designated area. The Steering Committee considers that a new zone could be created to cover the SCP. The advantages of this would be that it would give the SCP community access to an established administrative group that has both State and Federal Government recognition. The Zone Management Committee will be able to work within an existing community infrastructure, and progress the initiatives that have been developed in the Strategy for a Sustainable Future. Developing the SCP area as its own zone avoids the potential that local issues would get swallowed up into a larger organisation.

It is recognised that the Lower Blackwood Land Conservation District Committee is the peak community group for natural resource management in this area. This LCDC should then form the core of the Zone Management Committee for this area.

The Zone Management Committee and the BBG has no statutory power and rely on support from State government agencies and local government to implement regulatory control over land use and land management.

Considerable funding has been brought into the Blackwood catchment as a result of the BBG (and former BCCG) accessing State and Federal government funding initiatives (NHT etc.). These funding sources will be able to be accessed by the Zone Management Committee.

Recommendation 27

It is recommended that the Lower Blackwood LCDC become the core of the Zone Management Committee. This Zone Management Committee would be responsible for coordinating the implementation of the Strategy for a Sustainable Future.

Recommendation 28

It is recommended that the role of the Zone Management Committee should principally be one of review of the Strategy, coordination of activities and reporting to the community on the Strategy and the results of the Triennial report card. The Zone Management Committee should not have the role of granting approvals or enforcing regulations. This function should remain with government agencies.

Focus Topic : An assessment and approval for new irrigated agriculture proposals : Scott Coastal Plain [this is a pdf file]

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- 11.1 Key indicators for sustainability
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- 11.3 Indicators and data sets
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- References

A report card approach will be used to monitor and report on the effectiveness of proposed management strategies for land and water management for the SCP.

Indicators have been chosen for a range of sustainability criteria for the SCP. These indicators include data on economic, environmental and social indicators and will be collected annually by agencies and landholders. The WRC will report on water quality and health of waterway systems each year. Department of Agriculture will coordinate the preparation of a comprehensive report card on the Scott Coastal Plain every three years. The Strategy for a Sustainable Future will be updated based on the results of the report card.

Understanding how well land use generally and agriculture specifically as the major land use in the SCP, is meeting the aim of being economically, socially and environmentally sustainable is important for landholders and for the general community. The Steering Committee developed proposed criteria for sustainability, from information collected at the December 1998 public workshop. These criteria are summarised in Table 14 and the indicators to measure will be drawn from the criteria listed (not all criteria are represented as indicators in the proposed report card).

Table 14. Possible criteria for catchment health and sustainability

Sustainability issue	Criteria at farm scale	Criteria at catchment scale
Economic sustainability	<ul style="list-style-type: none"> ● The long-term real net farm income. ● Diversified agricultural production. ● Uptake and use of latest technology in agriculture. ● Uptake of best practice for all agricultural production. ● Development and use of written business plans. 	<ul style="list-style-type: none"> ● The long-term real net farm income. ● Diversified agricultural production. ● Uptake and use of latest technology in agriculture. ● Uptake of best practice for all agricultural production. ● Development and use of written business plans. ● Extent of monitoring of land assets. ● Agricultural farming systems research/trials in the region. ● Proportion of production (or total \$) going into export markets.
Social sustainability	<ul style="list-style-type: none"> ● Number of people employed. 	<ul style="list-style-type: none"> ● Measure of local population.

	<ul style="list-style-type: none"> ● Extent of services provided. ● Number of commercial businesses in the area. ● Measure of friendship in the local area. ● Community level social functions. 	<ul style="list-style-type: none"> ● Number of people employed in the area. ● Extent of services provided. ● Number of commercial businesses operating in the area. ● Community level social functions.
Environmental sustainability	<ul style="list-style-type: none"> ● Extent of protected riparian vegetation. ● Deep pools maintained in Scott River. ● Use of best practice for fertilisers. ● Monitoring soil and water conditions on farm. ● Remnant vegetation on private land protected. 	<ul style="list-style-type: none"> ● Extent of protected riparian vegetation. ● Deep pools maintained in Scott River. ● Use of best practice for fertilisers. ● Monitoring soil and water conditions on farm. ● Remnant vegetation on private land protected. ● Water quality in wetlands, rivers, estuary. ● Colour in Scott River water. ● Algal blooms in Scott River.

Indicators that are easily measurable need to be chosen and attributes used to measure each indicator need to be reliable and consistent. A process for recording and analysing the data and reporting the findings to the community and government, is also needed.

Such processes can be at two levels. Firstly at the farm level, where farmers can measure attributes of land and water relative to a desired state and compile a report card on the condition of their own property (Walker et al. 1996). Secondly, at the catchment level, where farm level data is placed in a catchment context, along with measures of land and water attributes taken from areas other than farms, such as streams or other receiving water bodies, to indicate overall catchment performance.

11.1 Key indicators for sustainability

- 11.1.1 Financial performance indicators
- 11.1.2 Environmental performance indicators
- 11.1.3 Social performance indicators

The performance indicators chosen to report on catchment health criteria are shown in Table 15 [this is a pdf file]. The indicators take into account local conditions, will address local issues and information needs and provides guidance on method of analysis or evaluation against agreed standards or targets. It has been acknowledged by both government and community that there is very little data available to develop accurate targets for water quality against known standards and that the next three to five years will be used to establish a baseline for most environmental monitoring data.

Table 15. Key indicators for monitoring catchment health and sustainability

For the SCP, the reporting issues are twofold; reporting on sustainability for the Scott River catchment and also being aware of the contribution the catchment makes to the health of Hardy Inlet. When considering sustainability, the indicators reflect the objective of reporting on the Strategy's success in achieving economic, environmental and social sustainability for the SCP.

Condition indicator data for the catchment include water quality monitoring programs carried out by WRC and soil condition surveys done by farmers. The condition data can be evaluated against agreed standards (targets for Scott River and Hardy Inlet, water quality standards from ANZECC, etc.) and then interpreted in terms of local threshold values or circumstances. Environmental attributes measured by condition indicators are not expected to vary greatly from year to year (Walker et al. 1996). The condition report card gives a view of the long-term health status of the catchment.

Trend indicators capture short-term changes in catchment health status. Trend indicators relate to attributes of the catchment that can be modified in the short term by changes in land use and land management. Reporting on trend

indicators will provide the first indications of how effective the management strategies are in addressing the needs of sustainable development on the SCP.

11.1.1 Financial performance indicators

Measuring economic performance is problematic due to the often complex nature of farm ownership and indebtedness. Farmers' terms of trade are not a local factor, being dependent on the exchange rate and changes in market demands that can be influenced by climatic events in other parts of the world.

In order to remain viable and profitable, farm businesses need to optimise returns on investments, recognise and correct yield-limiting constraints, align products to market specifications and diversify and integrate production systems. This approach will maintain a more reliable farm income and partially cover for fluctuations in commodity prices (Reuter et al. 1996).

Variations in farm income are expected across the study area, depending on climatic conditions, decisions on land use options, nature of soil resources, individual effort on the part of the landowner and skills of the landowner.

For the SCP area, the long-term real net farm income is suggested as the principal measure of economic sustainability and may allow useful comparison with other regions and Australian trends, given that the structure for assessing sustainability Australia-wide is already in place. Not all these measures are possible for the SCP. Farmers' terms of trade are a national attribute, however, may be provided on an industry sector basis (e.g. cropping, livestock, etc.) to indicate the type of economic environment farmers are trading in.

The indicators recommended here to provide an estimate of the long-term real net farm income are disposable income per family and farm business profit/ha. These represent factors that are relatively easy to measure, have a standard method and are significant at the catchment or study area scale. It is recognised that there may be difficulties in collecting this type of information from individual farmers, however, aggregated data reported on a study area scale should not compromise individual farmers. Some regional scale financial information is collected by ABARE in its annual Farm Surveys and may be useful for this exercise and should be evaluated when preparing the report card.

11.1.2 Environmental performance indicators

A range of physical, chemical and biological parameters have been selected to report on condition and trends in environmental health for both Hardy Inlet and Scott River.

Physical water quality parameters are quick, simple and inexpensive to measure and have a direct relationship to the chemical characteristics of a waterway. These parameters measured in conjunction with chemical parameters provide an overall view of waterway conditions at the time of sampling.

Temperature, turbidity and light penetration all have impacts upon the biological community and upon the type and rate of chemical reactions taking place. These things measured in association with chemical parameters provide an overall view of waterway conditions at the time of sampling. Dissolved oxygen is a standard requirement for aquatic life. It also has a marked affect on chemical cycles. Temperature, mixing, vertical stratification and biological activity influence dissolved oxygen concentrations.

Nutrients are sampled to provide an indication of the trophic state of the waterway. Eutrophic waterways are those which have become enriched with plant nutrients, specifically phosphorus and nitrogen. Hence these nutrients measured as totals and fractions provide an obvious chemical measure of the health of a waterway.

While the collection and interpretation of chemical data is of importance, there are limitations associated with it. The processes of nutrient cycling in aquatic ecosystems are not well understood making interpretation of data difficult. Data on the phytoplankton species presence and abundance is important in the assessment of trophic state. As a system becomes more eutrophic changes also occur in secondary productivity.

Aquatic macro-invertebrates are reasonably permanent inhabitants of ecosystems and as such are excellent indicators of environmental change. Invertebrate communities in eutrophic systems become simplified, containing fewer species than healthy systems. Also some species of invertebrates are particularly sensitive to toxicants and

die when exposed, thus any changes in the population may indicate the presence of pollutants other than nutrients.

It is proposed to collect and study the phytoplankton communities within the study area, as they are well known indicators of water quality. The succession of these microscopic flora is of profound significance in determining the flow of energy within a system. By looking at the presence and relative abundance of different phytoplankton species an understanding of the biological dynamics of the system can be better understood.

11.1.3 Social performance indicators

Social performance indicators have been determined to identify trends in population, business growth and service provision, to estimate the extent to which the social systems are sustainable. Concern has been expressed at the increase in tree plantations in the region, which may result in reduction in people and farmers. Providing increased services such as three-phase power, better data communications and roads will enhance agricultural and other enterprise in the region. Measures of these social criteria are listed in Table 15, with indicators for total population, number of people in employment, number of business enterprises in the region and extent and level of services such as power and roads.

11.2 Use of catchment health and sustainability indicators

Users, groups and organisations which will be interested in the report card include individual landholders, landcare groups (Lower Blackwood Land Conservation District Committee and the Blackwood Basin Group), local government authorities, State government agencies, conservation groups and the general community external to the catchment.

At some point, farmers and landholders will want to relate their land management practices to catchment performance, in a similar way to what they do for economic management purposes. Getting feedback on both economic and environmental performance will lead to better decisions on land management. Landholders will want to clearly identify water quality and general environmental impacts, which have been poorly understood due to a lack of environmental data for Scott River catchment, and monitor trends over time to better understand the level of impacts and seriousness of consequent changes in the environment. Landholders can use the report card approach to show the general community that land use is sustainable, what is working well and what needs further attention.

Landcare groups, conservation groups and the general community will want information on how well land use is managing environmental impacts and conforming with agreed management strategies and targets for water quality in Scott River.

Local government authorities (Shires of Nannup and Augusta-Margaret River) will want information on land use, including changes in land use and the sustainability of intensive agriculture, in order to keep the Land Use Strategy up to date. Monitoring changes in land use can also provide the shires with valuable information on infrastructure needs including land for residential and industrial use, roads, drainage and other servicing.

11.3 Indicators and data sets

For an indicator to be effective it needs, among a range of characteristics, to have data to support it and to be applicable to the economic/social/environmental system to which it is to be applied. Table 15 [this is a pdf file] lists the indicators that have been selected by the community as potentially being able to report on the sustainability of the SCP.

Some indicators are measured at the farm scale and used by the landholder in property management. These indicators can be aggregated to catchment or study area scale to provide trend information that helps to guide overall land and water management.

The data sets that support the indicators are those that have been identified by the government agencies as being relatively easy to collect from existing data, or proposed monitoring programs.

11.4 Monitoring and reporting

A range of people and organisations will carry out monitoring and collection of data.

Water quality and environmental monitoring programs have been established by the WRC and will be supplemented by monitoring done by the Lower Blackwood Catchment LCDC. Some farm level water monitoring is occurring through the NHT project assessing nutrient movement through groundwater at a range of land use sites and is coordinated by WRC. It is proposed that WRC report annually on the water quality monitoring in the Hardy Inlet and Scott River.

Farm level surveys will need to be carried out, by individual farmers and will be coordinated by Department of Agriculture. Farmers need to be consulted on this and it is recommended that the farmers concerned be approached personally to enlist their support. Farmer involvement in this process will be voluntary. Other sources of information will be used where possible. Any costs incurred in supplying this information, which are above what would be considered normal good practice, should be financially supported.

Standard survey forms will be used to collect data on soil condition for biophysical data and farm productivity and financial trend data. All individual farm information will be treated confidentially. Farm productivity and financial data will be aggregated up to study area level, to protect the confidentiality of individual farm businesses.

It is recommended that Department of Agriculture coordinate the preparation of the report card on the SCP, to be prepared every three years.

Recommendation 29

It is recommended that landholders provide farm level soil survey and business information, on a confidential basis, to assist with the preparation of the sustainability report card.

Recommendation 30

It is recommended that the Zone Management Committee coordinate the preparation of the report card on sustainability for the Scott Coastal Plain with technical assistance from Department of Agriculture and Water and Rivers Commission, to be prepared every three years. The report card will include analysis of monitoring information gathered by Water and Rivers Commission and the Lower Blackwood LCDC and farm level information provided by landholders.

11.5 Transferring information

For sustainable development to work information has to be transferred up and down from the landholders and farmers to the management group and vice versa. The Steering Committee is seeking feedback from the community on means of collecting and distributing information between landowners, the management group and agencies. Some options are presented below:

- The Management Group prepares pro forma report cards and distributes these to individual landowners. They are then collated and prepared as a pamphlet by one of the agencies for distribution.
- Use meetings of LCDC and grower groups to collect and distribute information.
- Put the collated results of the report card onto the Internet or fax so that the public can access it.
- Reports released in the local newspapers.

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- 12.1 Ecologically sustainable development (ESD)
- 12.2 State of water resources
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- 12.4 Land use strategy
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The Environmental Protection Authority (EPA) provided advice to the Scott Coastal Plain Steering Committee on the 'For public comment version of the Strategy'. This advice took the form of a public report (Bulletin 991) which was published by the EPA in September 2000.

The EPA's overall advice was that the Authority supported the approach used to prepare the Strategy and has commended the Steering Committee for providing an important framework for sustainable management and development of the Scott Coastal Plain area. The Steering Committee has considered the report and has addressed the specific issues raised in the following sections.

12.1 Ecologically sustainable development (ESD)

The EPA has recommended that the Strategy clearly define the term 'sustainability', and should also frame the final Strategy objectives with reference to the principles of ESD.

The Steering Committee clearly intends that sustainability include components of economic, social and environmental sustainability, and to recognise existing environmental values and current levels of impact from development. This is described in several sections in the Strategy, including the issue identification, implementation and reporting on sustainability sections. A statement defining sustainability has been included in the summary section of this strategy and a more detailed description is included in Section 6 'Sustainable development - frameworks'.

12.2 State of water resources

The EPA has advised of its view that the overall approach to water quality management and environmental values of wetlands used in the Strategy generally concurs with the guidelines in the State Water Quality Management Strategy and the Wetlands Conservation Policy. However, the EPA advised that since uncertainty about the ecological condition of the Hardy Inlet system has led to initial water quality (WQ) targets being set at the current levels, it would be advisable for the ecological investigations proposed under section 4 of the Strategy be carried out as soon as possible as part of an action plan. In addition, the WQ targets should be defined in terms of the environmental values and beneficial uses of identified water resources.

Other issues identified by the EPA include the lack of available information on ecological water requirements for significant wetlands, and the need for a comprehensive monitoring program for wetlands to detect any impacts

from changes in land use (e.g. Gingilup Swamp, Scott River wetlands).

Initial water quality targets were set at 'current levels' because there is insufficient information available to accurately determine current environmental values and beneficial uses in water quality terms. The Strategy establishes a process and framework to develop this over a number of years. In addition, the WRC are incorporating a comprehensive baseline assessment of Hardy Inlet into planned monitoring programs over the next several years. The strategy recommends that the Water and Rivers Commission accurately map the recharge area for these significant wetlands. Any development planned for this area will be subject to the multi-agency assessment and approval process used for any new development on the Scott Coastal Plain.

EPA has advised of its view that mechanisms to address the non-attainment of WQ targets could be more formally identified in the Strategy.

The Strategy intends (and states) that where WQ targets are not met, that the Strategy will be amended to address important environmental issues. The formal or regulatory means available to limit nutrient export from the catchment is through conditions on individual groundwater licences for irrigation, by tightening up on fertiliser usage, water usage, or reducing nutrient losses through soil amendments, use of bio-filters, or nutrient buffer plantings. It is felt that the most appropriate measures to respond to non-attainment of targets should be given detailed consideration when a better understanding of environmental and ecological condition and trends is available. The Strategy now includes a recommendation that Best Management Practices identified in the Strategy be regularly reviewed (Recommendation 26). The EPA advice has added a useful level of detail to the discussion on water quality and protection of environmental values of wetlands on the Scott Coastal Plain.

12.3 Vegetation Strategy

The EPA advise that the Vegetation Strategy should reference the nationally accepted criteria for conservation of biodiversity, should use the definition of secure representation used in Hopkins et. al. (1996) and the particular conservation significance of the flora of the Scott Coastal Plain. The EPA reaffirm their position statement on native vegetation land clearing in Western Australia, and recommend that there should be no net reduction in the extent of native vegetation within the catchment of the Scott River. The no net reduction principle means some limited clearing may be considered, but only applies to areas that are currently extensively degraded through fire, weeds, disease or other threats. Replacement or offsetting the clearing of native vegetation with plantings of bluegums and other timber plantation are not an acceptable substitute for the EPA.

CALM have revised the Vegetation Strategy to accommodate the EPA advice on use of criteria for conservation of biodiversity and the definition of secure representation. Other additions include information on mechanisms to support landholders in owning and managing native vegetation (NVWG recommendations). The Vegetation Strategy highlighted the importance and endemism of vegetation in the Scott area, and recommended that any proposals for clearing remnant vegetation should be thoroughly assessed through the land clearing assessment process under the clearing MOU between State agencies. The EPA advice has added a useful level of detail to the discussion on vegetation management and protection on the Scott Coastal Plain.

12.4 Land Use Strategy

The EPA advise that the Strategy does not identify clearly enough how the proposed land uses are compatible with the constraints and limitations of the soil, water and biological resources within each of the zones. The EPA would prefer an environmental hazard rating system be used, that contains analysis of soils, land capability and nutrient retention capability, proximity to wetlands and drainage/stream lines, and other site characteristics. The environmental acceptability of development proposals is likely to be highly dependent on the particular site characteristics of the relevant property, and the willingness of the individual proponents to commit to and implement best practice land and water management.

The Technical Working Group has developed assessment criteria based on soils and land capability, which address particularly the nutrient leaching risks for new irrigation proposals.

These criteria will meet the EPA's objectives for managing the pollution risk in the Strategy area, and combined with ongoing monitoring and review, will enable the management group and agencies to control intensive irrigation development to conform with the intent of the Land Use Strategy. This process has been developed in recognition that land use change towards intensive agriculture needs to be assessed on a case by case basis, given the variability of management in the industry, and the potential for land and water management practices to minimise nutrient leaching risks.

The EPA has suggested local government planning schemes should also control irrigation proposals. The Steering Committee decided that it was inappropriate to burden local government with the assessment of irrigation proposals, as they were generally lacking the technical expertise to make this assessment, and State agencies have primary statutory responsibility for this process. A comprehensive agency assessment process has been established, and the Land Use Strategy makes it essential that this combined agency approval is pre-requisite to any irrigation development being permitted in the area. Local governments involved in the Strategy have indicated their willingness to establish procedures in their delegation to planning staff that ensure State agency approvals are in place for irrigation development proposals.

The EPA advise that they have recently released draft guidance statements for the protection of groundwater catchments of nationally significant wetlands, where the hydrology is dominated by groundwater not surface water. Scott wetlands including Gingilup Swamp, lakes Jasper/Quitjup/Wilson/Smith and associated swamps are likely to come under this category.

The position set out in the draft guidance statement is that land uses that use large quantities of chemicals or fertilisers or water in the groundwater catchment of these nationally significant wetlands should not be permitted. The EPA also suggest that the Land Use Strategy be amended to take account of the guidelines on significant wetlands, that the groundwater catchments be identified, and constraints or zoning guidelines for land uses in these areas be included in the Land Use Strategy. Further investigation into the hydrology of these wetlands will establish the extent they are dominated by groundwater hydrology, particularly where there are several groundwater aquifers and one or more are confined. However, the Strategy recognises that even if the catchments of these wetlands are dominated by surface flow, their values will need to be protected through appropriate management. The EPA also suggest that an assessment process for new proposals should ensure that changes in land use will not lead to unacceptable impacts on either the water quality or hydrology of that wetland, so landholders will have an opportunity to demonstrate that a development does not impact on wetlands in an adverse way. The assessment process established by the agencies should be able to include this aspect in an overall assessment process for new development proposals. This issue may have a significant impact on the potential of the Scott Coastal Plain to develop further in both irrigation industries and tree plantation industries.

12.5 Assessment process

The EPA have advised they are not aware of whether the proposed assessment process, which is based on the land clearing assessment process, is adequate to assess broader impacts of agriculture and other development.

The Technical Working Group has developed the assessment process, to include assessment criteria for risk of phosphorus movement from irrigated sites. It is now up to the agencies concerned to demonstrate this process can work and to ensure that sufficient resources are available to permit effective and efficient assessment of new proposals. The assessment criteria were included in the appendices, and possibly were not available to the EPA.

12.6 Implementation and performance monitoring

The EPA generally agrees with the implementation model proposed in the Strategy, including the Zone Committee of the BBG being the ongoing management group. The EPA considers this Zone Committee will need to be supported by Government on a long-term basis. The EPA advises that proponents will need to ensure proposals for intensive development need to demonstrate that there will be a neutral or positive effect on water

quality on downstream water bodies within the catchment, otherwise the EPA is likely to consider the proposal environmentally unacceptable.

The Strategy recognises this view, and through the land and water strategies, use of BMPs, and the detailed assessment process, intends that all development proposals incorporate mechanisms to manage and minimise the risk of nutrient pollution. Proposals that do not address nutrient export risks will clearly not be compatible with the community vision developed through this Strategy.

The EPA endorse the model for reporting on sustainability of land use through the Report Card on Sustainability, and recommends that the proposed indicators be reviewed to enable them to be integrated with Western Australia's State of the Environment reporting framework, and to include regular re-evaluation of the reservation and protection status of vegetation complexes TECs and significant plant species in the catchment.

The Steering Committee intends that a Report Card on sustainability of land use be prepared for the catchment through the State agencies, and in collaboration with the Lower Blackwood LCDC. The indicators used and the structure of the Report Card should include the suggestions from the EPA. It should be noted however, that monitoring of some indicators in the proposed report card may involve resources that are beyond the ability of agencies and community groups to provide.

Conclusion

The EPA has provided detailed and constructive advice on how to improve the Strategy to provide better management of land and water use, and protection for environmental values on the Scott Coastal Plain. Most of the suggestions and recommendations are achievable, and can be incorporated in the final Strategy.

The Steering Committee has taken a slightly different approach from that recommended by the EPA on several issues, recognising the current knowledge of the state and condition of the Scott catchment and Hardy Inlet is limited. These details will be identified over a period of time with ongoing monitoring. An important factor that the Strategy highlights is the relative contribution of nutrients and other pollutants from other sources to the Hardy Inlet. In total quantity terms, the Blackwood River contributes significantly more nutrients, sediment and other pollutants than the Scott River. Although, as stated in Section 4.1 of the Strategy, the Scott River contributes a large proportion of the phosphorous entering the Hardy Inlet when compared to the Blackwood River, much of this phosphorus may be in dissolved form and may not significantly impact on the ecology of the Hardy Inlet. It is proposed that the ecological investigation proposed under the Strategy, will clarify the significance of nutrient levels in the Scott River for the health of the Hardy Inlet.

The Steering Committee acknowledges that land use needs careful management in the Scott catchment, and agencies and the community need to develop water quality, environmental and ecological targets that incorporate agreed values. Land and water management strategies then need to be established to deliver sustainable land use on the Scott Coastal Plain.

This 'sustainable' land use scenario needs to incorporate agreed targets for environmental and ecological values, social values and outcomes, and economic development. The Scott Coastal Plain Strategy has established an initial sustainable land use scenario to the best of our knowledge at this time. It is important that the Strategy is reviewed and updated regularly in light of new knowledge of environmental and ecological condition and impacts from land use, and new technologies for land and water management.

It is recommended that the Environmental Protection Authority Advice Report on the Strategy for a Sustainable Future be brought to the attention of the Zone Management Committee. The Zone Management Committee can then be aware of the EPA's position when the committee is formulating action plans for the implementation of the strategy.

Bulletins 4513: Scott Coastal Plain a strategy for a sustainable future

Bulletin 4513 : Scott Coastal Plain : a strategy for a sustainable future

June 2001

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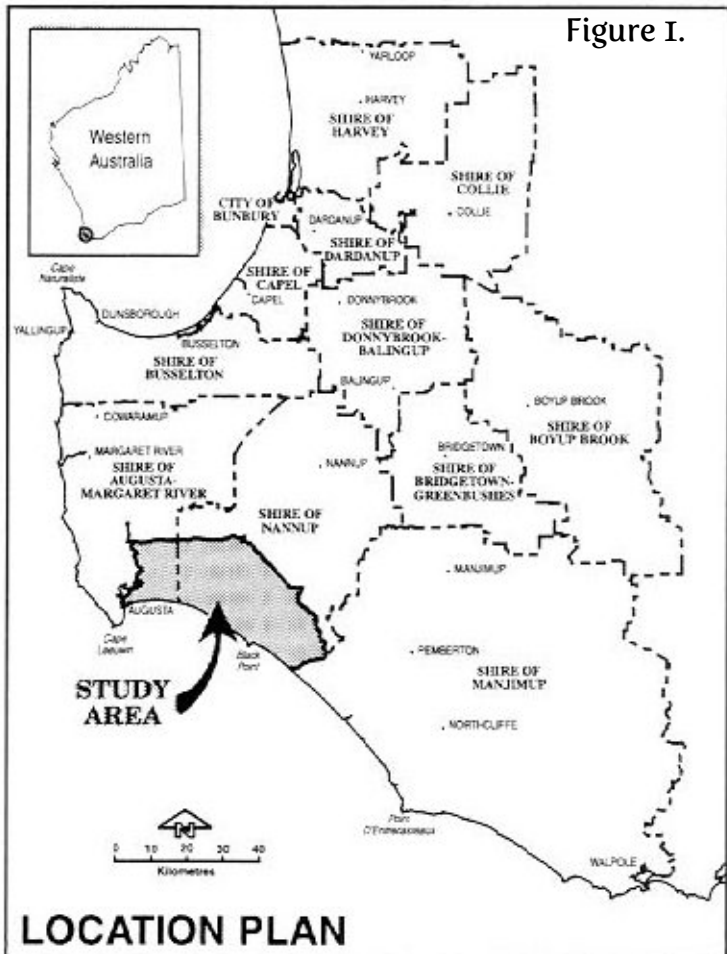
Bulletins 4513: Scott Coastal Plain a strategy for a sustainable future

Bulletin 4513 : Scott Coastal Plain : a strategy for a sustainable future

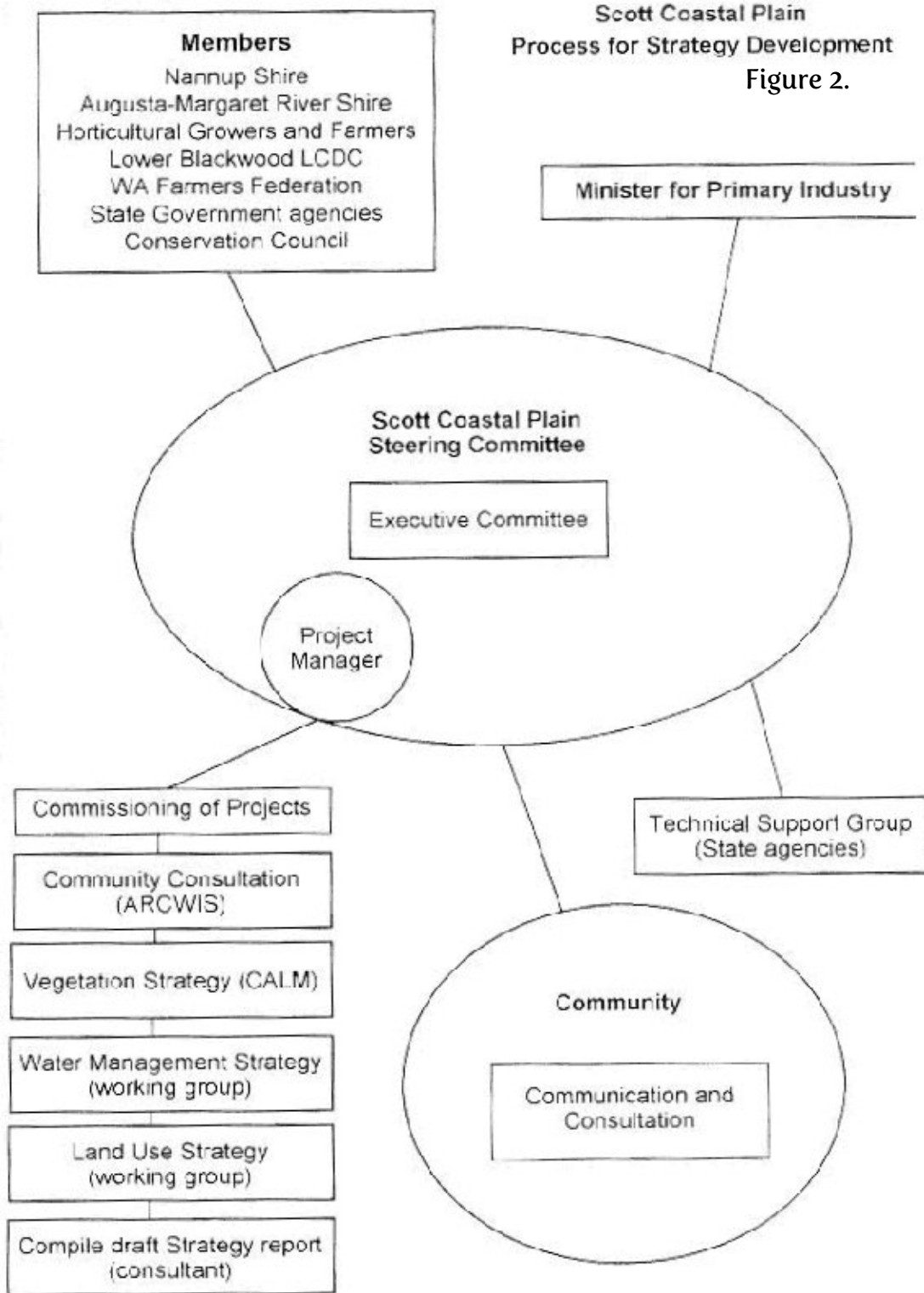
June 2001

ABARE	Australian Bureau of Agricultural and Resource Economics
Department of Agriculture	Department of Agriculture
ANZECC	Australian and New Zealand Environment and Conservation Council
	Australian Research Centre for Water in Society
	Blackwood Basin Group
ARCWIS	Blackwood Catchment Coordinating Group
BBG	best management practice
BCCG	Department of Conservation and Land Management
BMP	Comprehensive Adequate and Representative
CALM	Department of Environmental Protection
CAR	dissolved inorganic nitrogen
DEP	Declared Rare Flora
DIN	Environmental Protection Act 1986
DRF	Environmental Protection Authority
EP Act	Environmental Protection Policy
EPA	Ecologically Sustainable Development
EPP	Geographic Information System
ESD	Horticultural Research and Development Corporation
GIS	Land Conservation District Committee
HRDC	Local Rural Strategies
LCDC	Land Use Strategy
LRS	Natural Heritage Trust
LUS	Native Vegetation Working Group
NHT	phosphate retention index
NVWG	Regional Forest Agreement
PRI	Rights in Water and Irrigation 1914 Act
RFA	Scott Coastal Plain
RIWI Act	Soil and Land Conservation Act 1945
SCP	State Water Quality Management Strategy
SLC Act	Technical Advisory Group
SWQMS	Threatened Ecological Community
TAG	Town Planning Scheme
TEC	Western Australian Planning Commission
TPS	Warren-Blackwood Regional Planning Strategy
WAPC	World Commission on Environment and Development
WBRPS	Water Management Strategy
WCED	water quality
WMS	Water and Rivers Commission
WQ	
WRC	

Figure I.

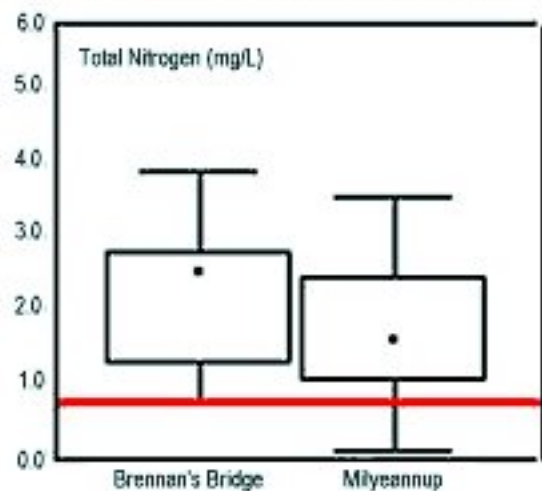


LOCATION PLAN



Scott River

(Median Box 25% 75%, Whisker 5% 95%)



Scott River

(Median Box 25% 75%, Whisker 5% 95%)

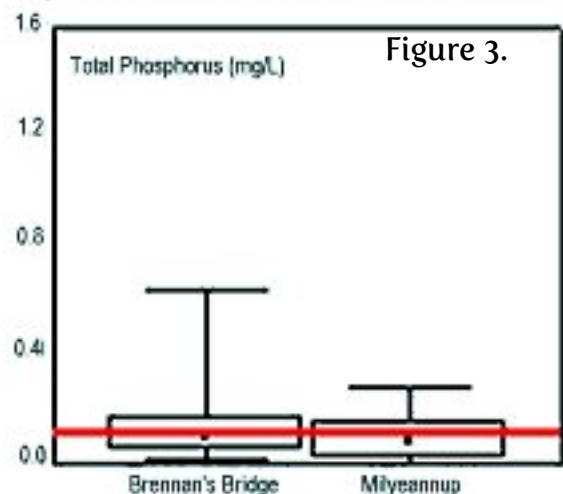
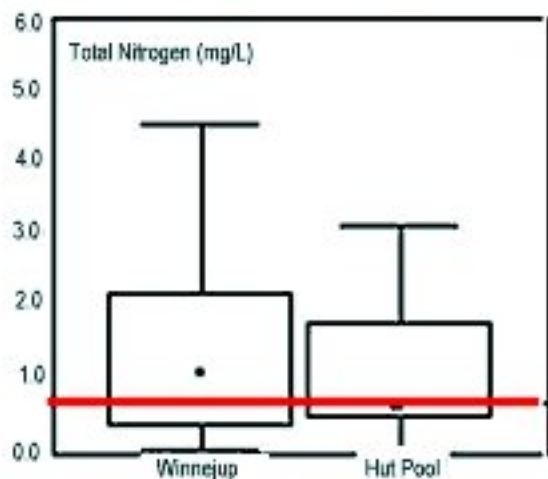


Figure 3.

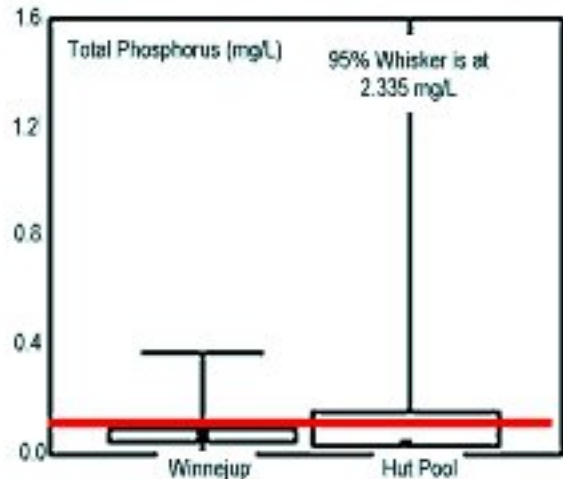
Blackwood River

(Median Box 25% 75%, Whisker 5% 95%)



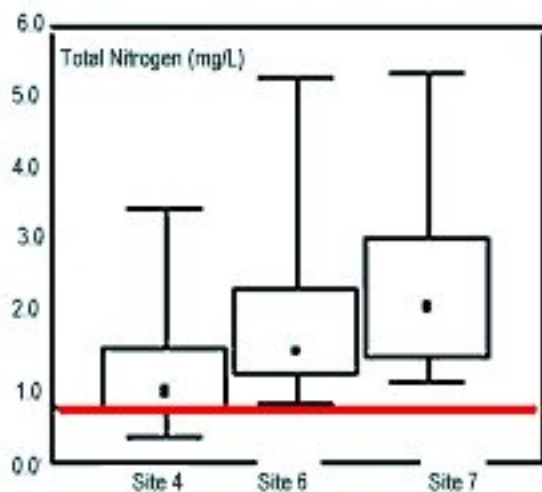
Blackwood River

(Median Box 25% 75%, Whisker 5% 95%)



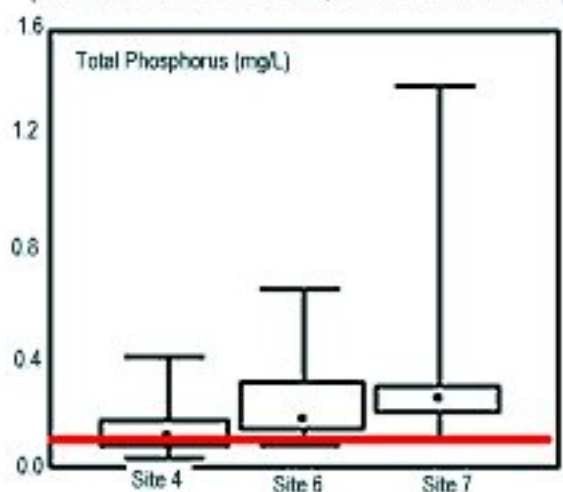
Serpentine River

(Median Box 25% 75%, Whisker 5% 95%)



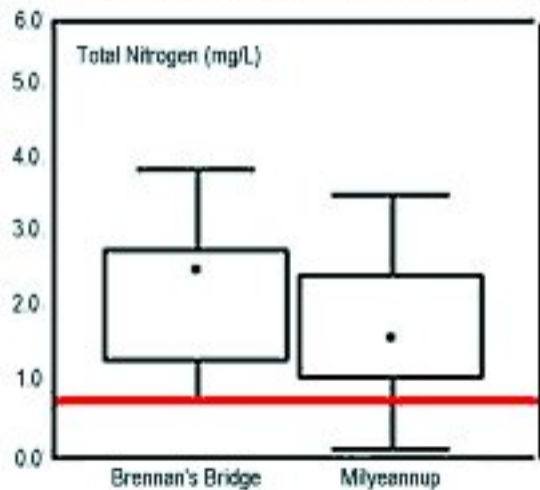
Serpentine River

(Median Box 25% 75%, Whisker 5% 95%)



Scott River

(Median Box 25% 75%, Whisker 5% 95%)



Scott River

(Median Box 25% 75%, Whisker 5% 95%)

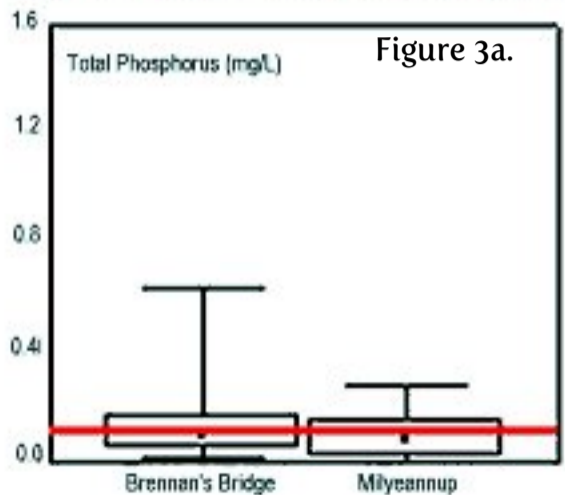
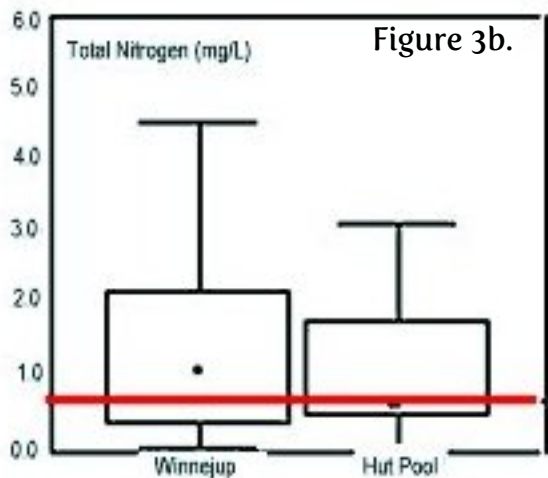
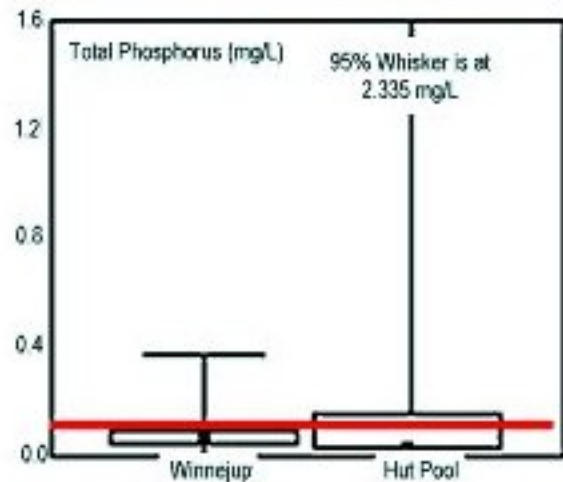


Figure 3a.

Blackwood River
(Median Box 25% 75%, Whisker 5% 95%)

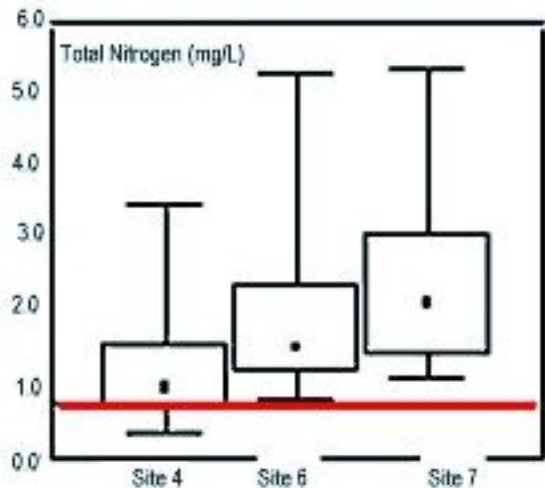


Blackwood River
(Median Box 25% 75%, Whisker 5% 95%)



Serpentine River

(Median Box 25% 75%, Whisker 5% 95%)



Serpentine River

(Median Box 25% 75%, Whisker 5% 95%)

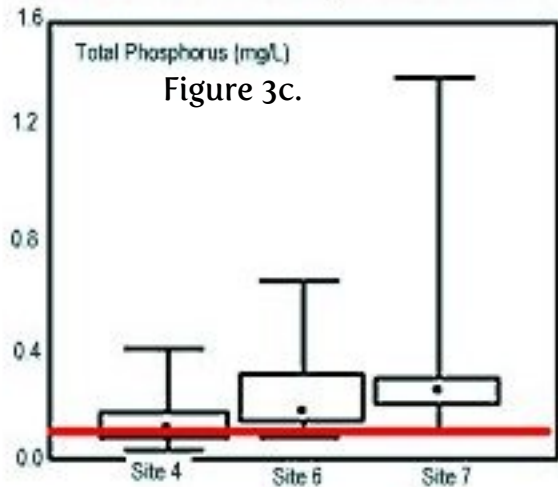


Figure 3c.

Figure 4a.

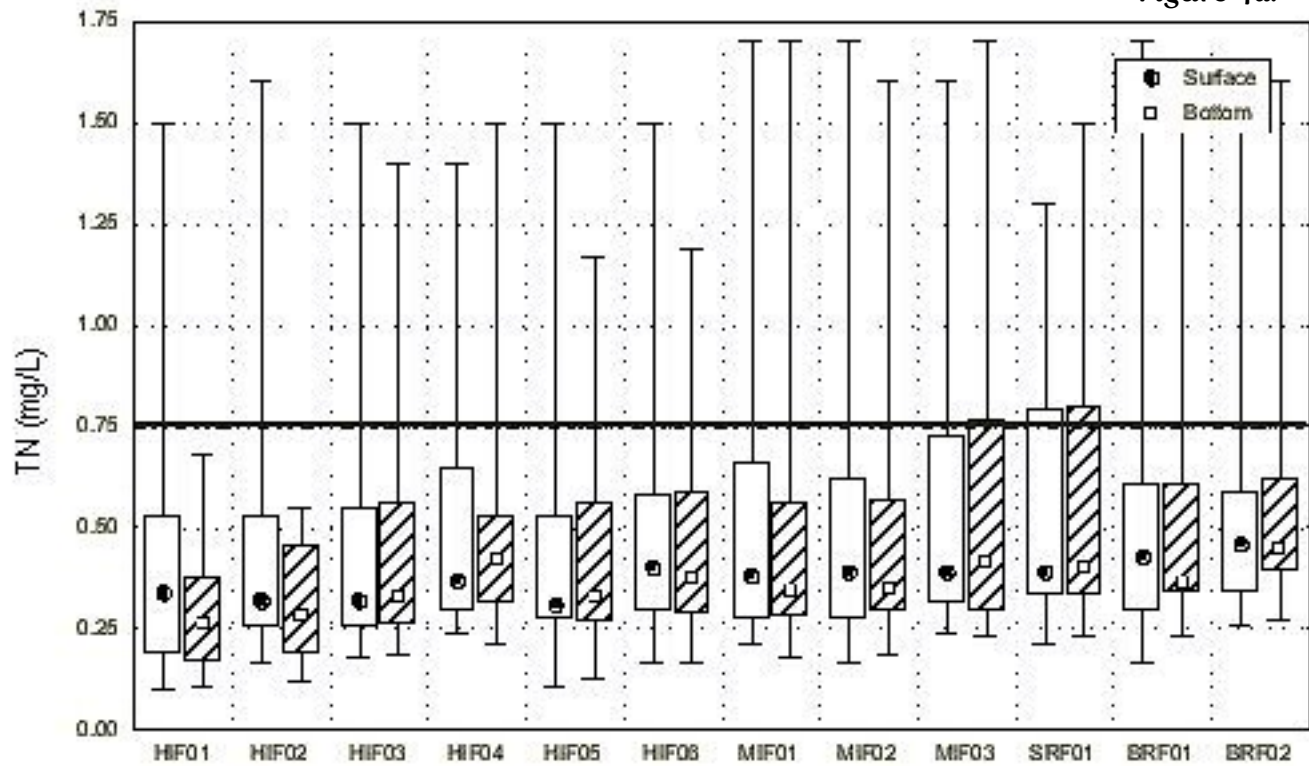


Figure 4b.

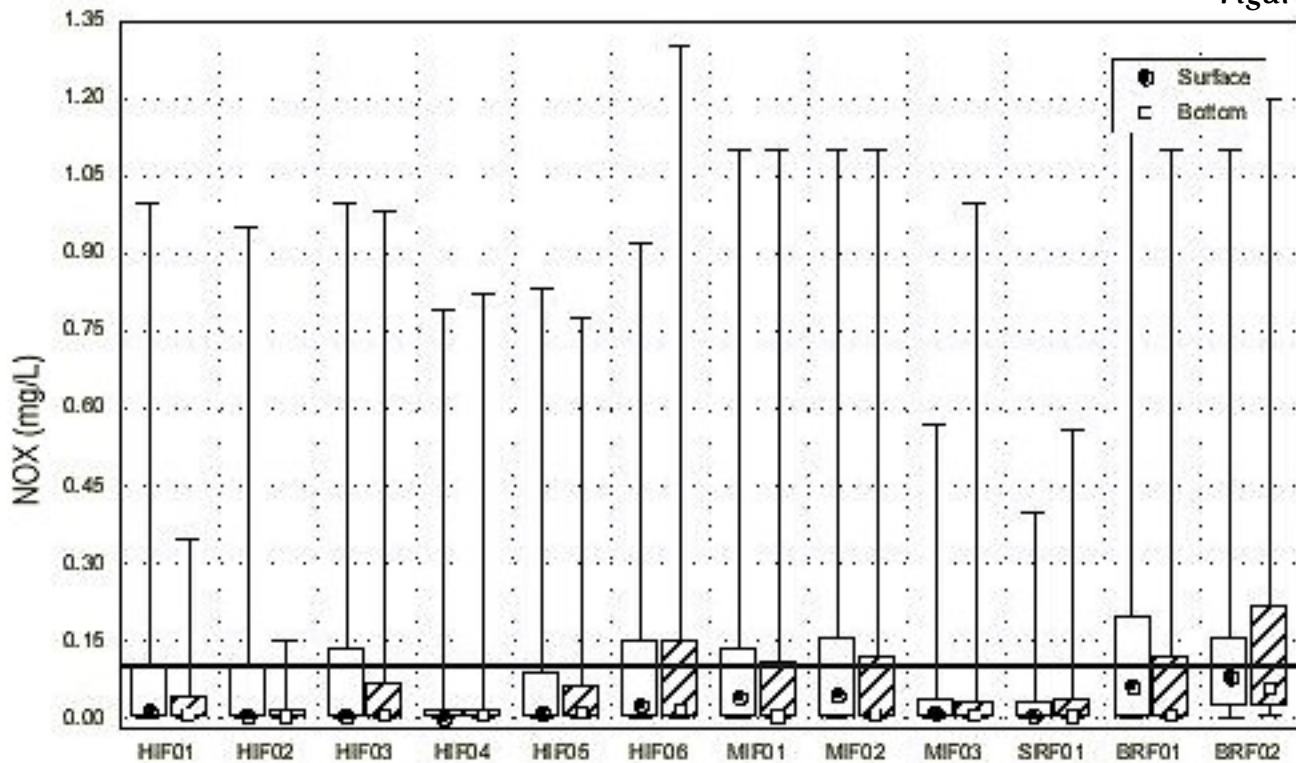


Figure 4c.

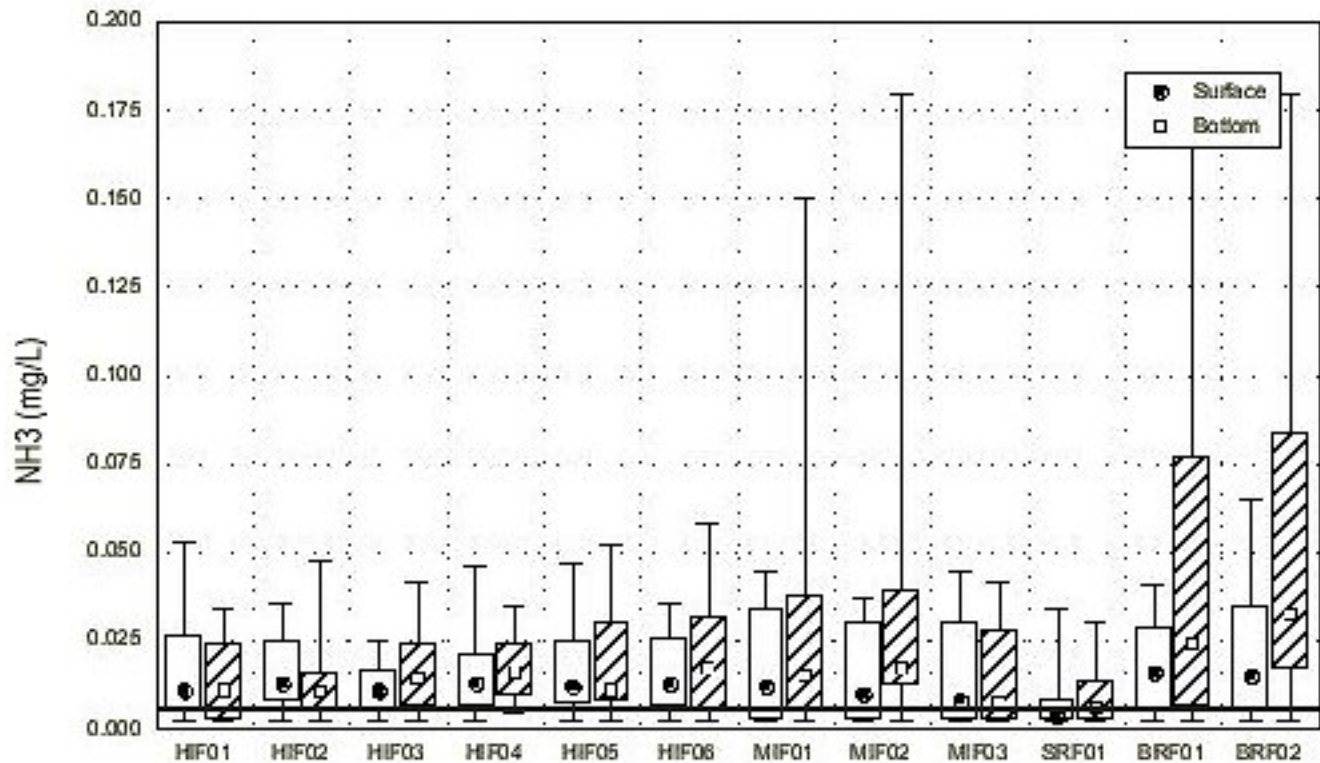


Figure 4d.

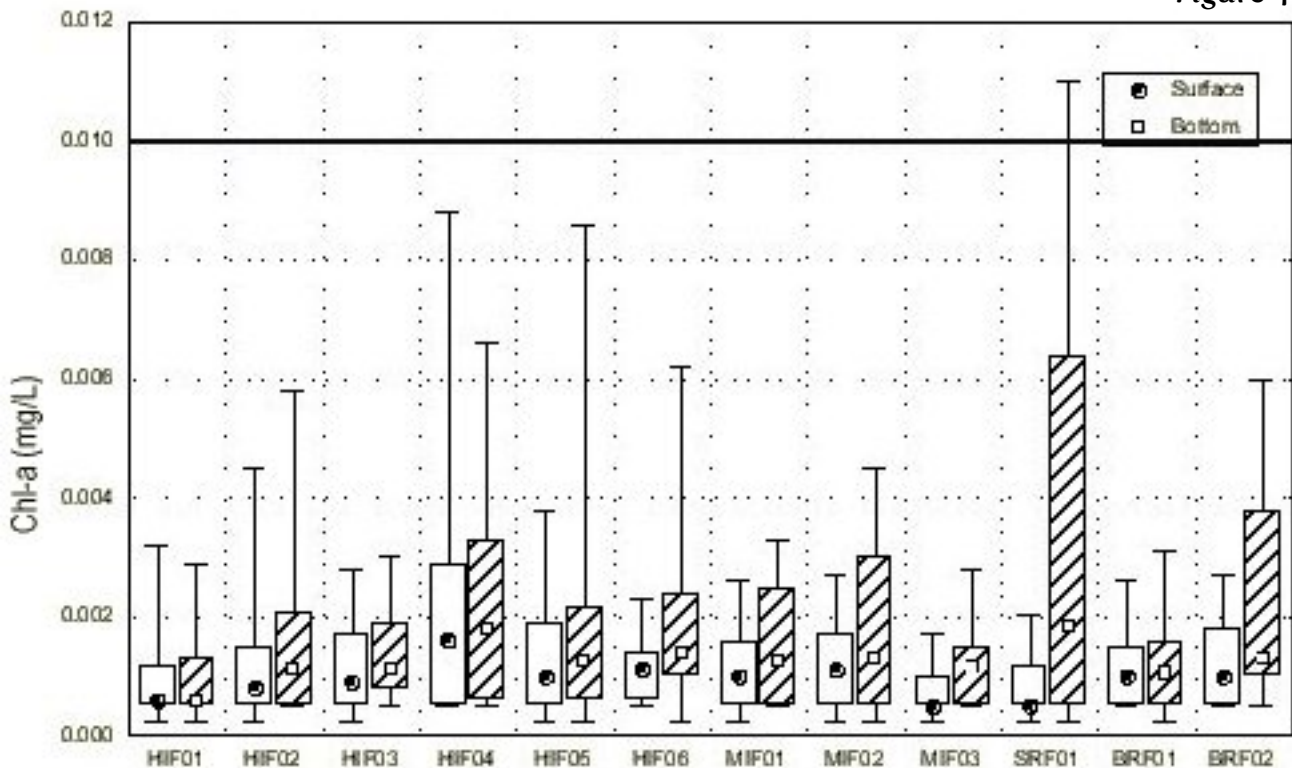


Figure 4e.

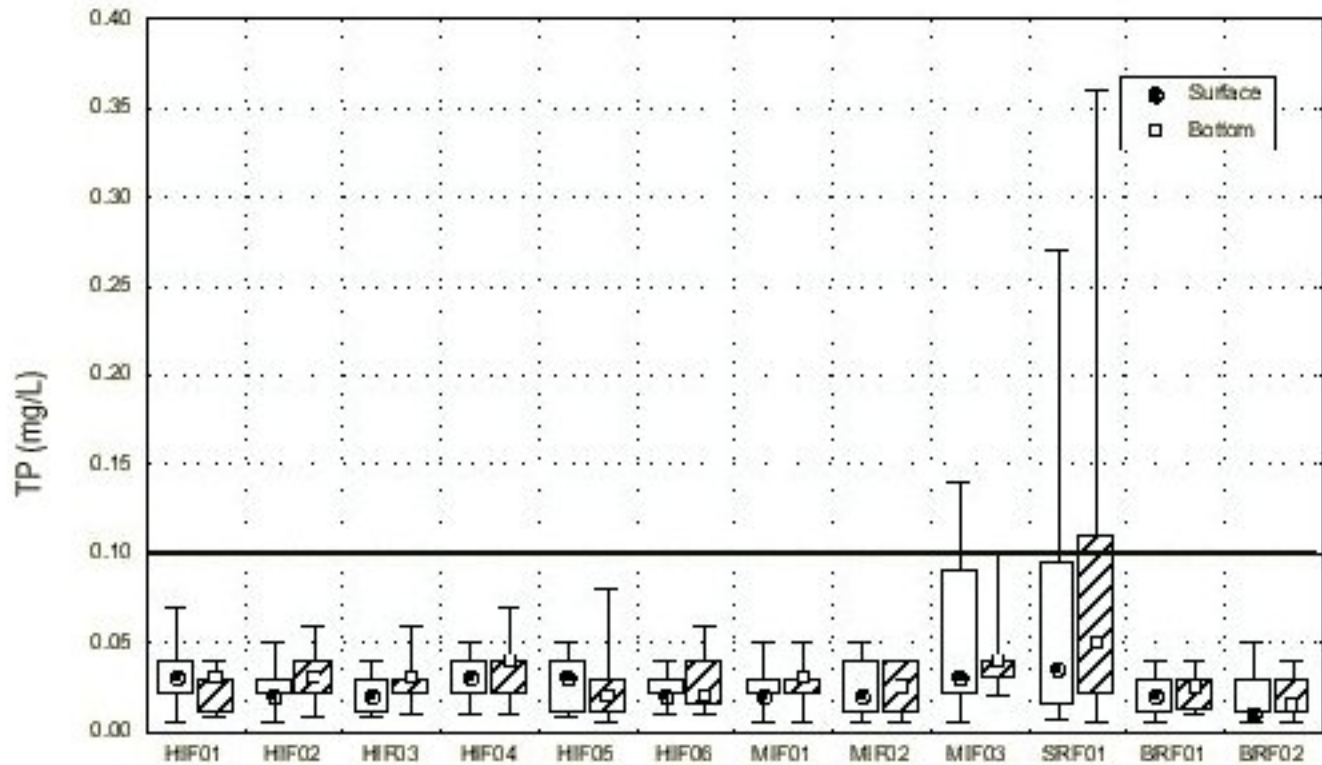
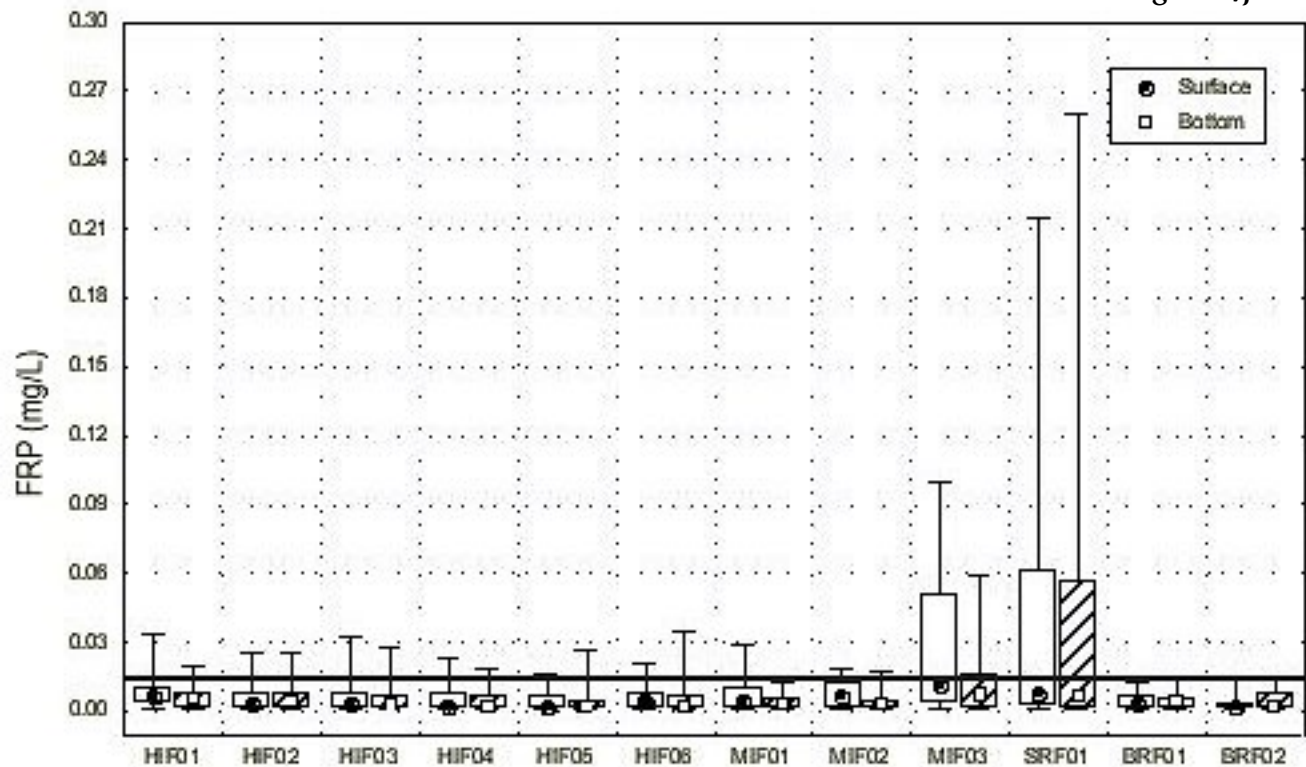
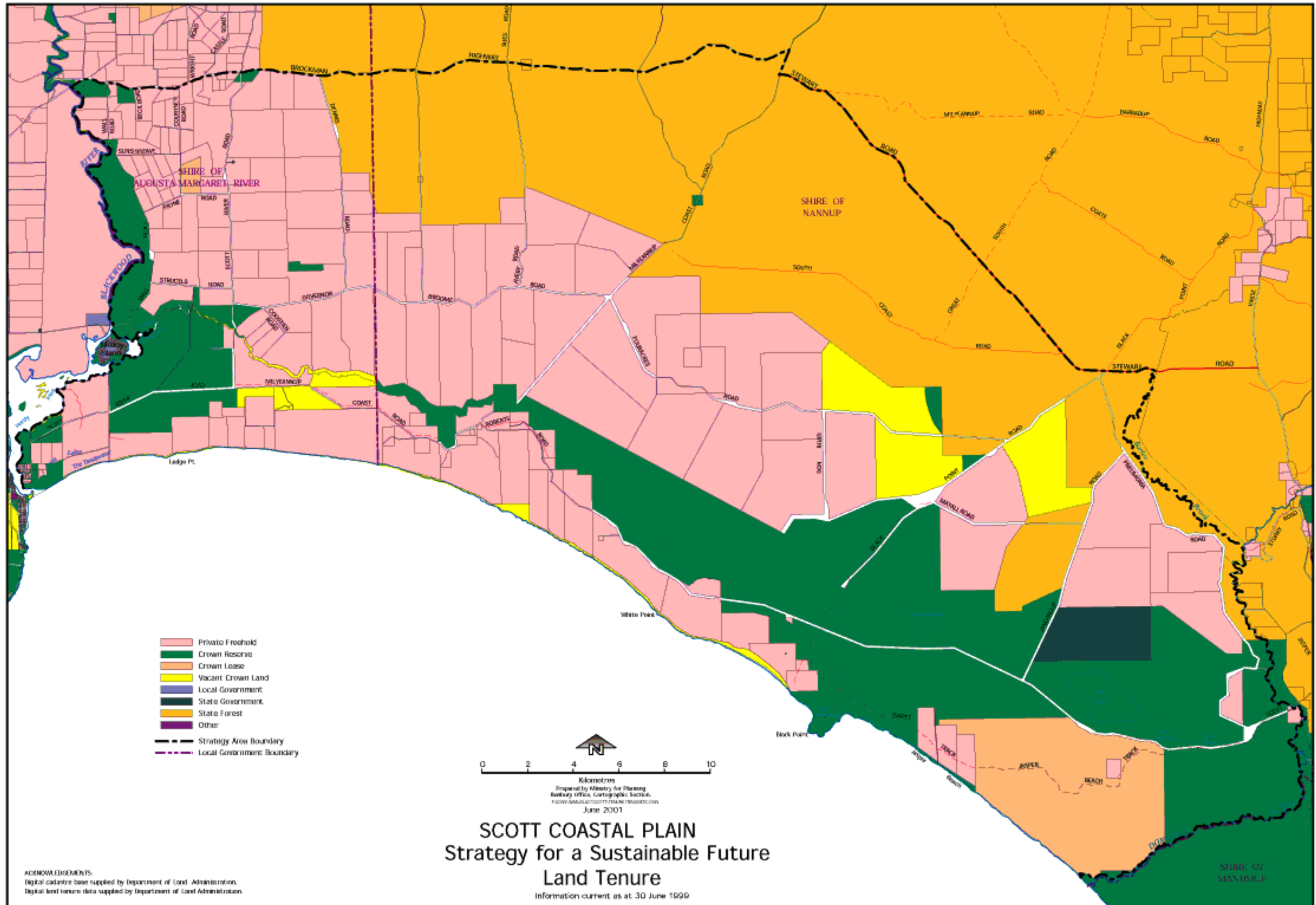
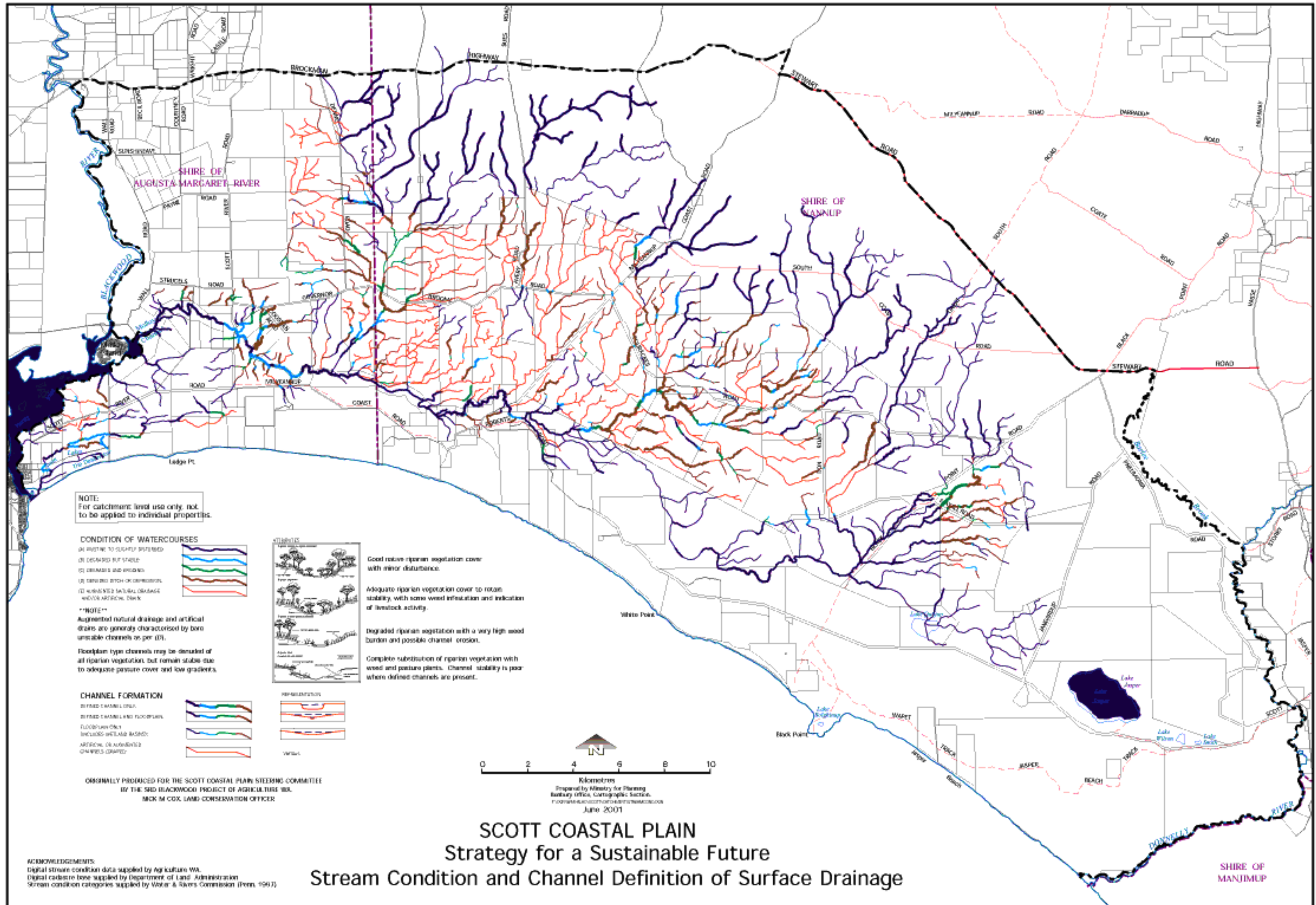


Figure 4f.





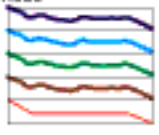
ACKNOWLEDGMENTS:
 Digital cadastral base supplied by Department of Land Administration.
 Digital land tenure data supplied by Department of Land Administration.



NOTE:
For catchment level use only, not
to be applied to individual properties.

CONDITION OF WATERCOURSES

- (A) NEARLY TO COMPLETELY UNDISTURBED
- (B) DEGRADED BUT STABLE
- (C) DEGRADED AND UNSTABLE
- (D) DEGRADED WITH OR WITHOUT
- (E) MODIFIED NATURAL DRAINAGE AND/OR ARTIFICIAL DRAIN



****NOTE****
Augmented natural drainage and artificial
drains are generally characterized by bare
unstable channels as per (D).

Floodplain type channels may be denuded of
all riparian vegetation, but remain stable due
to adequate pressure cover and low gradients.



Good native riparian vegetation cover
with minor disturbance.

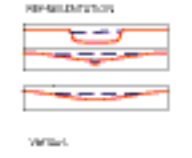
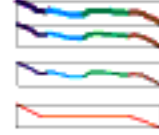
Adequate riparian vegetation cover to retain
stability, with some weed infestation and indication
of livestock activity.

Degraded riparian vegetation with a very high weed
burden and possible channel erosion.

Complete substitution of riparian vegetation with
weed and pasture plants. Channel stability is poor
where defined channels are present.

CHANNEL FORMATION

- DEFINED CHANNEL ONLY
- DEFINED CHANNEL AND FLOODPLAIN
- FLOODPLAIN ONLY
- INCLUDES WETLAND BASED
- ARTIFICIAL OR AUGMENTED CHANNELS DRAINED



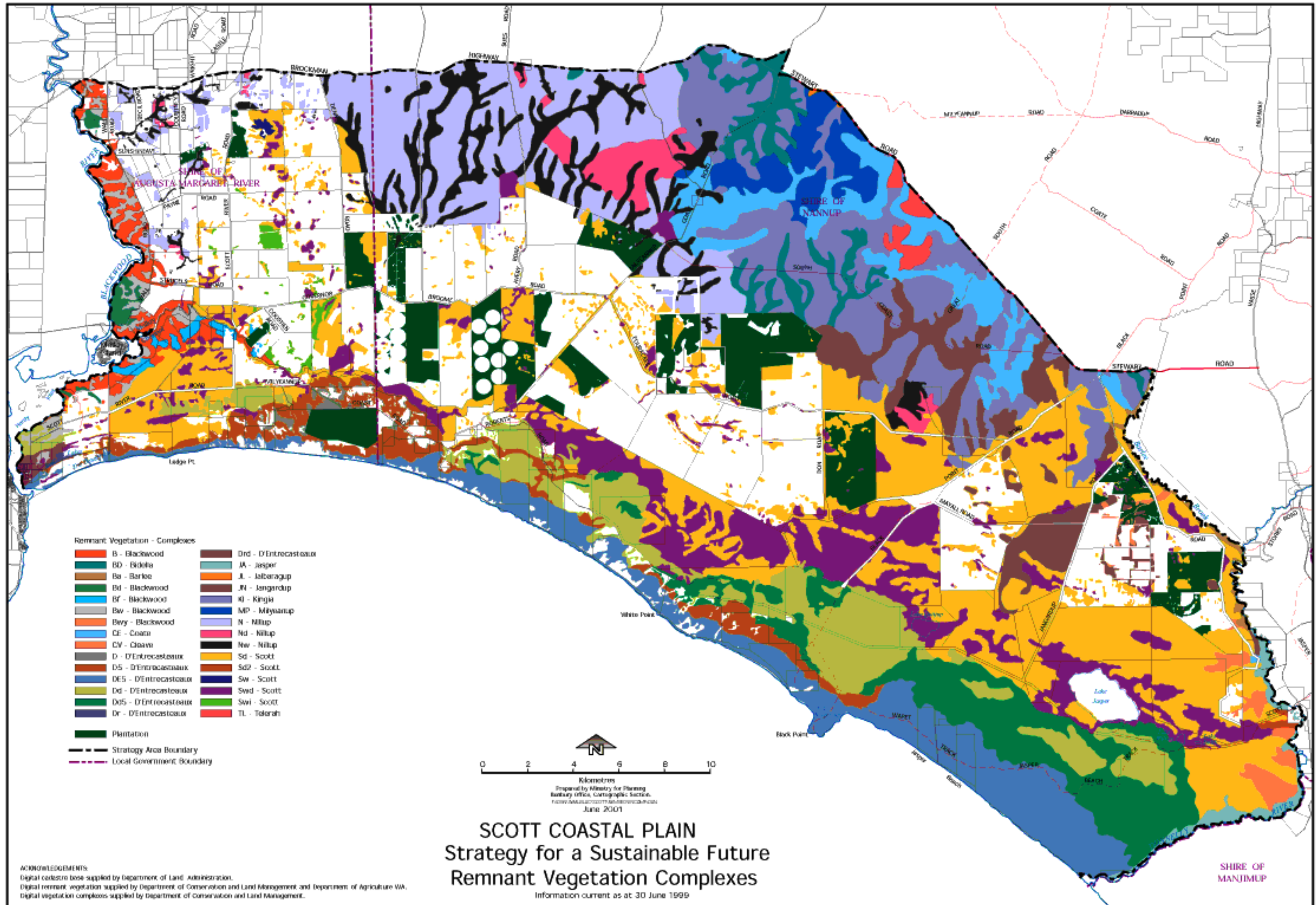
ORIGINALLY PRODUCED FOR THE SCOTT COASTAL PLAIN STEERING COMMITTEE
BY THE SRD BLACKWOOD PROJECT OF AGRICULTURE WA.
MICK M COX, LAND CONSERVATION OFFICER

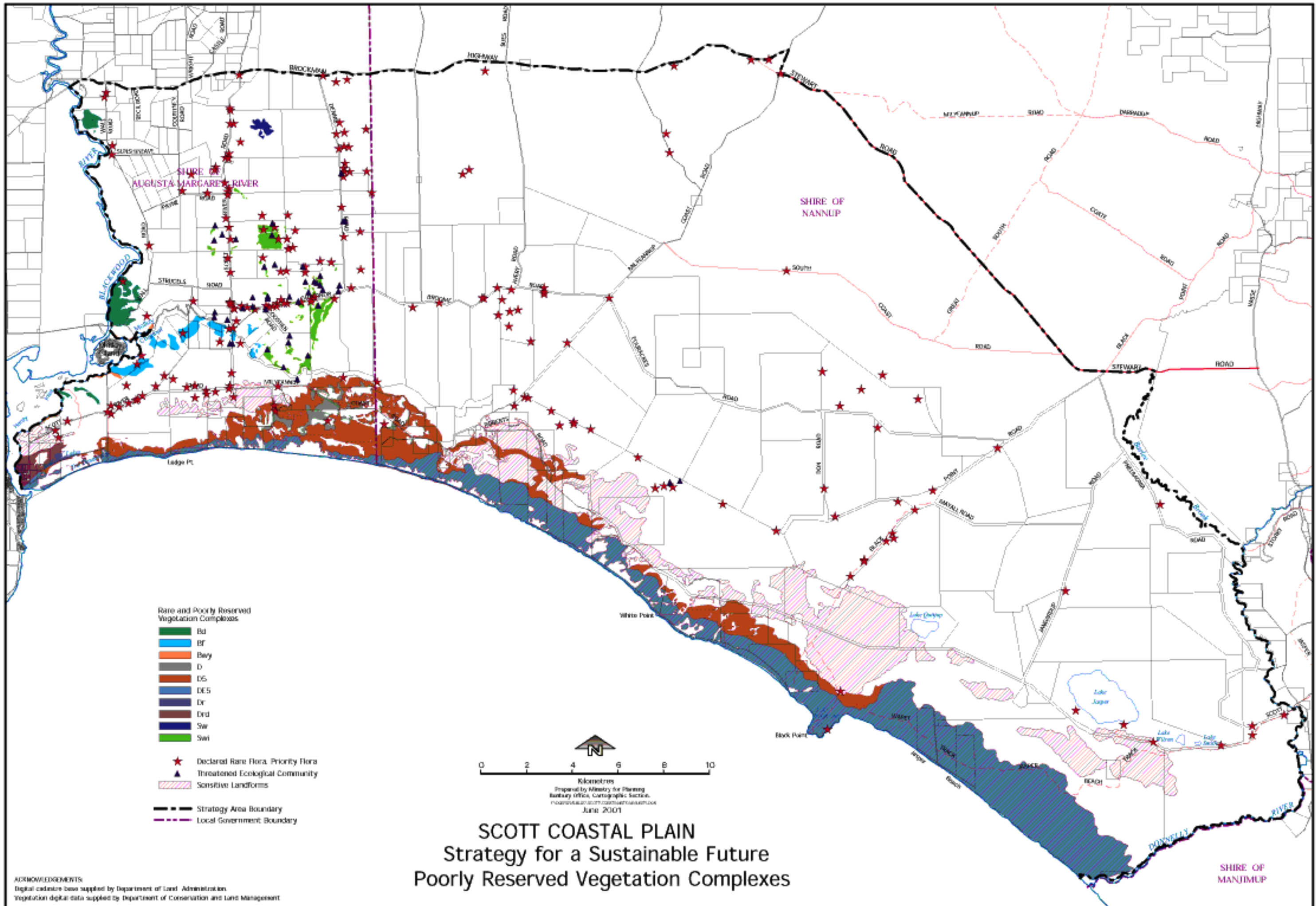


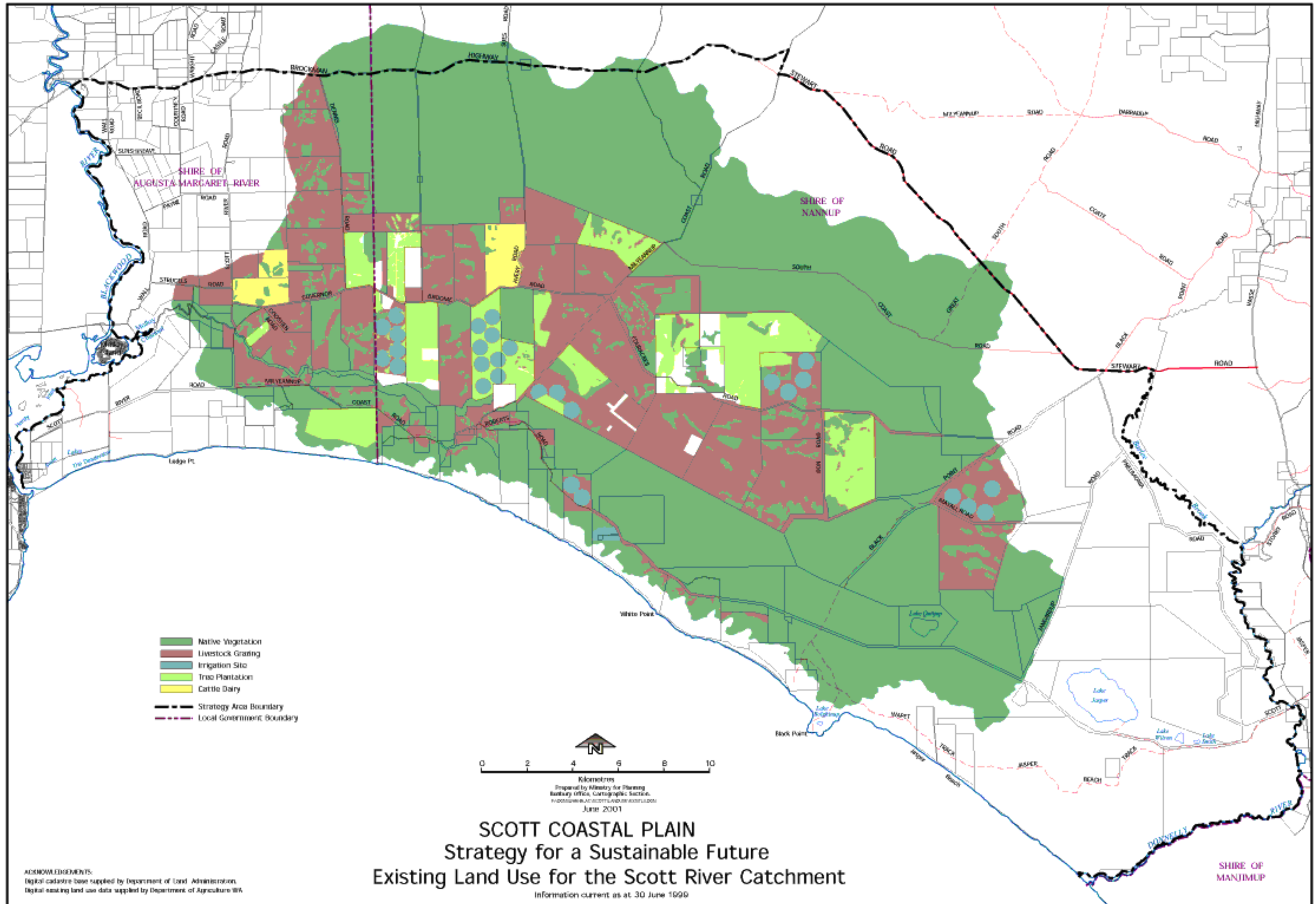
Kilometres
Prepared by Ministry for Planning
Survey Office, Cartographic Section.
June 2001

SCOTT COASTAL PLAIN
Strategy for a Sustainable Future
Stream Condition and Channel Definition of Surface Drainage

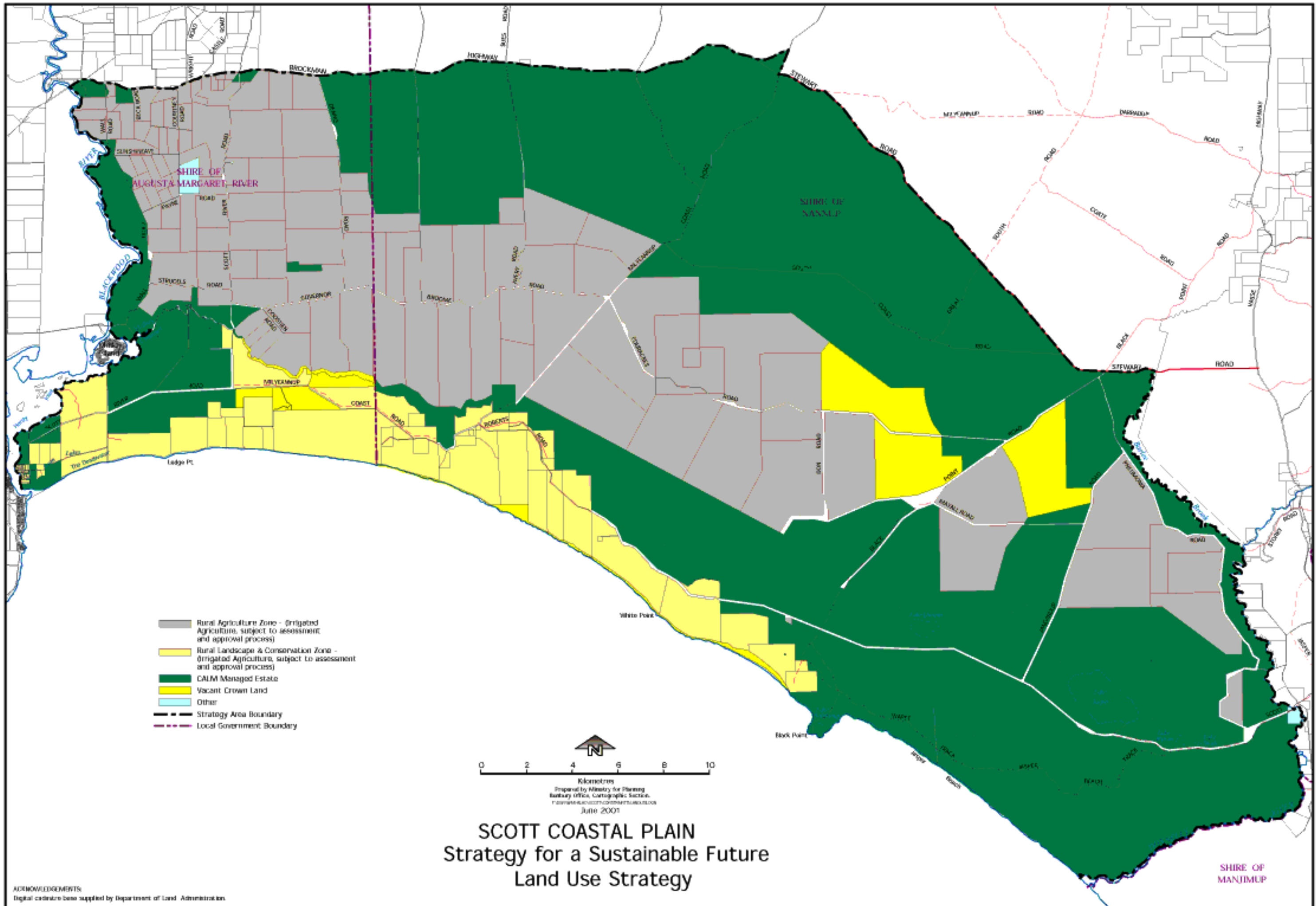
ACKNOWLEDGEMENTS:
Digital stream condition data supplied by Agriculture WA.
Digital cadastre base supplied by Department of Land Administration
Stream condition categories supplied by Water & Rivers Commission (Perth, 1997)







SCOTT COASTAL PLAIN
Strategy for a Sustainable Future
Existing Land Use for the Scott River Catchment
 Information current as at 30 June 1999

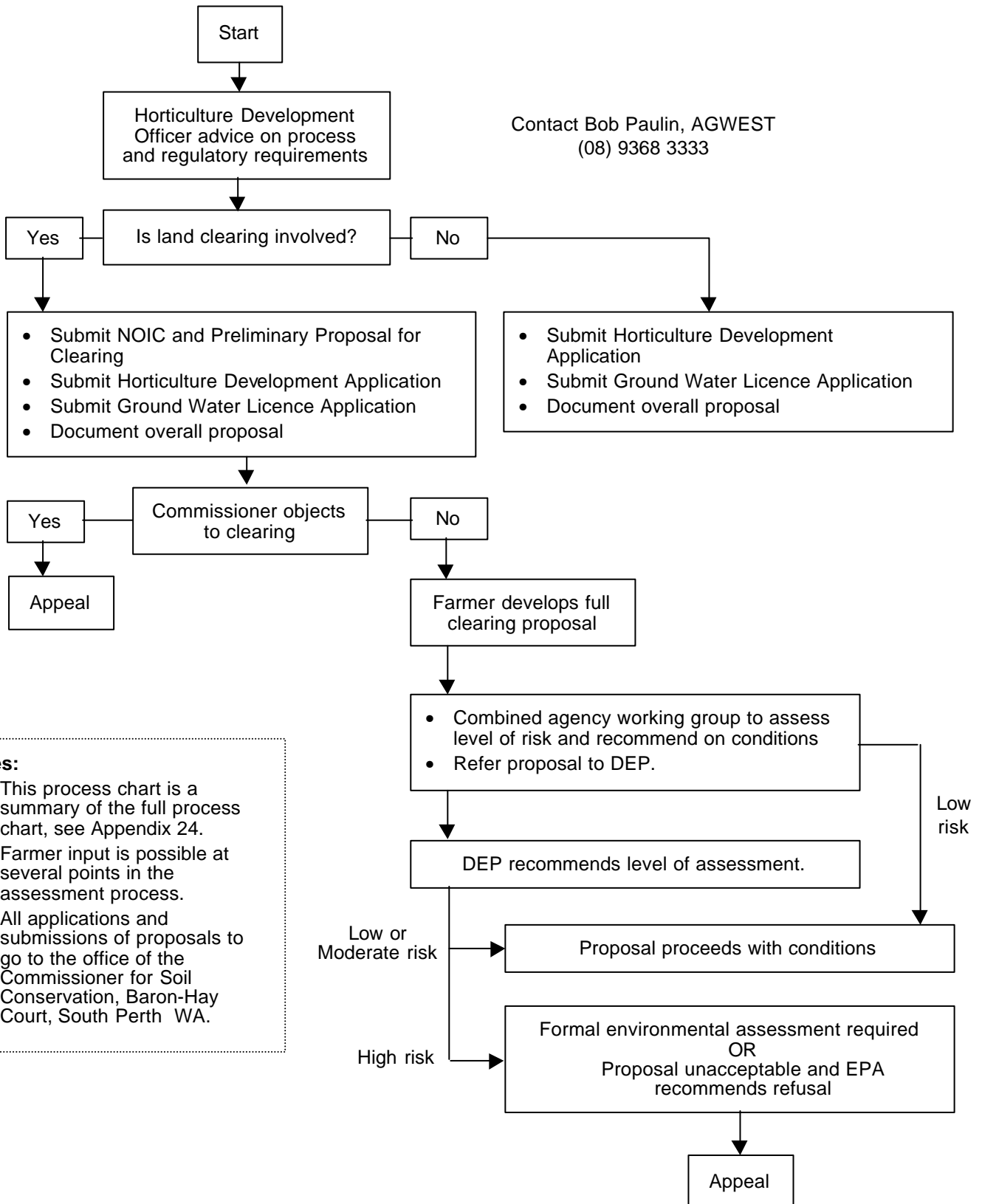


ACKNOWLEDGEMENTS
 Digital cadastre base supplied by Department of Land Administration

FOCUS TOPIC

— AN ASSESSMENT AND APPROVAL PROCESS FOR NEW IRRIGATED AGRICULTURE PROPOSALS — SCOTT COASTAL PLAIN

SUMMARY PROCESS CHART



- Notes:**
1. This process chart is a summary of the full process chart, see Appendix 24.
 2. Farmer input is possible at several points in the assessment process.
 3. All applications and submissions of proposals to go to the office of the Commissioner for Soil Conservation, Baron-Hay Court, South Perth WA.

Table 15. Key indicators for monitoring catchment health and sustainability

Parameter	Level	Sites	Sampling interval	Reporting interval	Evaluation	Standards
Biophysical condition: Hardy Inlet				3 years	Evaluate against standards or adaptive water quality targets	
Physical (temperature, pH, salinity and conductivity, turbidity)	Hardy Inlet	8	Fortnightly	Annual	Standards	ANZECC
Physical (dissolved oxygen)	Hardy Inlet	8	Fortnightly	Annual	Targets	Targets
Nutrients (dissolved P (FRP), dissolved nitrogen DIN, ammonia NH ₃)	Hardy Inlet	8	Fortnightly	Annual	Targets	Targets
Nutrients (total N, total P, nitrate, nitrite, silicate)	Hardy Inlet	8	Fortnightly	Annual	Standards	ANZECC
Chlorophyll a	Hardy Inlet	8	Fortnightly	Annual	Targets	Targets
Chlorophyll b, c and phaeophytin	Hardy Inlet	8	Fortnightly	Annual		N/A
Colour	Hardy Inlet	8	Fortnightly	Annual	Targets	Targets
Phytoplankton	Hardy Inlet	8		Annual	Species and distribution	N/A
Biophysical condition: Scott River Catchment				3 years		
Physical (conductivity, dissolved oxygen, temperature, pH)	Scott River	7	Fortnightly	Annual	Standards	ANZECC
Nutrients (total N, total P, dissolved P (SRP), nitrate, nitrite, ammonia)	Scott River	7	Fortnightly	Annual	Targets	Targets
Total suspended solids	Scott River	7	Fortnightly	Annual	Standards	ANZECC
Metals (Al, Mn, Fe)	Scott River	7	Quarterly	Annual	Standards	ANZECC
Pesticides (OCs, OPs)	Scott River	7	Quarterly	Annual	Standards	ANZECC
Major ions (Na, K, Mg, Ca, HCO ₃ , SO ₄ , Cl, CO ₃ , SiO ₂)	Scott River	7	Quarterly	Annual		N/A
Biology						
Phytoplankton	Scott River	7	Fortnightly		Species and distribution	N/A
Macro invertebrates	Scott River		6 monthly		Species and distribution	N/A
Vegetated streamlength	Catchment		3 years		Total length measure	N/A
Soil fertility (total N, total P, K, trace, S, organic carbon)	Farm	Irrigation and pasture	3 years – as per soil sampling guide		Farm level report. Aggregate to catchment level for area changes	Soil guide
Soil structure/consistency	Farm	Irrigation and pasture	3 years – 2 samples per soil type per paddock		Farm level report. Aggregate to catchment level for area changes	Soil guide
Soil quality/condition (salinity EC, soil pH)	Farm	Irrigation and pasture	3 years – 2 samples per soil type per paddock		Farm level report. Aggregate to catchment level for area changes	Soil guide

Table 15. Key indicators for monitoring catchment health and sustainability (continued)

Parameter	Level	Sites	Sampling interval	Reporting interval	Evaluation	Standards
Biophysical trends:				3 years	Overall comparison with similar systems and trends over time	
Area seagrass	HI		Annual		Report on trends	N/A
Species seagrass	HI		Annual		Species distribution and trends	N/A
Algal blooms	HI and SR				Frequency and species	N/A
Chlorophyll a, b, c and phaeophytin	HI		Annual		Annual median concentration	N/A
Nutrients	HI and SR		Annual		Standards	ANZECC
Turbidity	HI and SR		Annual		Standards	ANZECC
Fish populations	HI and SR		2 years		Species and assemblage	N/A
Periphyton	HI and SR		2 years		Report on trends	N/A
Remnant vegetation	Study area		2 years		Area total and area protected	N/A
Rare or Priority Species	Study area		2 years		Locations and number	N/A
Productivity and financial trends:				3 years	Overall comparison with similar systems and trends over time	
% Potential crop yield (per crop)	Farm	Irrigation and pasture	Annual		Aggregate to catchment	State and national averages
Actual crop yield (per crop)	Farm	Irrigation and pasture	Annual		Aggregate to catchment	
Disposable income per farm family	Farm		Annual		Aggregate to catchment	
Farm business profit/ha	Farm		Annual		Aggregate to catchment	
Diversified production	Farm		Annual		Report total number by diversified production	
Uptake of best practice	Farm		Annual		Report total number in use	
Social structure trends:				3 years		
Population	Study area		Annual		Total population, changes	N/A
Full time employment	Study area		Annual		Total number employed, changes	N/A
Business enterprise	Study area		Annual		Total number, distribution, type and changes	N/A
Service provision	Study area		Annual		Types, changes	N/A