South West Yarragadee Water Supply Development: Sustainability Evaluation/Environmental Review & Management Programme

Volume 1

INTRODUCTION, SUSTAINABILITY OVERVIEW, METHODOLOGY AND CONCLUSIONS

Prepared for
Water Corporation
by Strategen

February 2006

strategen

WATER CORPORATION

South West Yarragadee Water Supply Development: Sustainability Evaluation/Environmental Review & Management Programme

Volume 1

INTRODUCTION, SUSTAINABILITY OVERVIEW, METHODOLOGY AND CONCLUSIONS

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Client: Water Corporation

Report	Version	Prepared by	Reviewed by	Submitted to Client	
				Copies	Date
Draft Report	V1	CW/HV	WC	1 Electronic	10 Oct 2005
Draft Report	V2	CW/HV	WC/SP	1 Electronic	19 Oct 2005
Draft Report	V3	CW/HV	WC	1 Electronic	9 Nov 2005
Draft Report	V4	CW/HV	WC	1 Electronic	10 Nov 2005
Draft Report	V5	CW/HV	WC	1 Electronic	11 Nov 2005
Draft Report	V6	CW/HV	WC/SP	1 Electronic	14 Nov 2005
Draft Report	V7	CW/HV	WC	1 Electronic	18 Nov 2005
Review Draft	V8	CW/HV	WC/EPA/DoW/SP	1 Electronic	25 Nov 2005
Final Report to EPASU	V9	CW/HV	EPASU	2 Bound, 1CD	30 Jan 2006
Final Draft	V10	CW/HV	HV	1 Electronic	3 Feb 2006
Final	Final	CW/HV	HV	1 Electronic	20 Feb 2006

INVITATION

The Environmental Protection Authority (EPA) and Sustainability Panel[1] invite people to make a submission on this proposal.

The Water Corporation proposes to abstract 45 GL/yr of groundwater from the South West Yarragadee aquifer in the Southern Perth Basin in the south west of Western Australia to supply the Integrated Water Supply Scheme (including potential demand in the South West).

In accordance with the *Environmental Protection Act 1986,* the *Environmental Protection and Biodiversity Act 1999* and the *State Sustainability Strategy*, an Environmental Review and Management Programme (ERMP) and a Sustainability Evaluation have been prepared which describes this proposal and its likely environmental, social and economic impacts and how they are proposed to be managed. The document is also intended to provide information supporting the Water Corporation application to the Department of Water for a licence for groundwater abstraction under the *Rights in Water and Irrigation Act 1914* (RWI Act). The Sustainability Evaluation / ERMP is available for a public review period of twelve weeks from **Monday 27 February 2006, closing on Monday, 22 May 2006**.

Comments on all aspects of the proposal are invited for consideration by the EPA, Department of Water and Sustainability Panel. All comments will be responded to and a Response to Submissions document prepared and made publicly available on the Water Corporation and EPA websites. The Response to Submissions will be submitted to the EPA, Department of Water and Sustainability Panel.

Comments from Government agencies and from the public will assist the EPA and Sustainability Panel to prepare assessment reports in which recommendations will be made to Government. Electronic submissions are preferred, emailed to the project assessment officer or via the EPA Website (see address below).

Where to get copies of this document

Printed copies of this document may be obtained from Nick Churchill at the Water Corporation, 629 Newcastle St, LEEDERVILLE WA 6007, Ph (08) 9420 2420 at a cost of $10.00 per copy. CD versions and printed copies of the Executive Summary are also available free of charge from the same address.

Copies may also be obtained from the Water Corporation website at:
www.watercorporation.com.au/water/water_sources_sw_yarragadee.cfm

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[1] A Sustainability Panel has been established under the auspices of the Government's *State Water Strategy* as an independent body to provide advice to the Government and, as appropriate, to decision-making authorities at various stages of the sustainability assessment process. The Sustainability Panel will report to Government through the State Water Council and Cabinet. The Sustainability Panel provides transparent and independent advice on the proposal and provides a mechanism for integrated evaluation of social, economic and environmental factors. In preparing its advice, the Panel will assess the Sustainability Evaluation and will consider all the public submissions made during the 12-week public comment period, together with the Water Corporation response to those submissions, as well as the EPA report and recommendations. All Sustainability Panel advice is made publicly available. The Sustainability Panel may advise on all sustainability factors. Such advice is separate and additional to formal State or Commonwealth agency assessment procedures. The Sustainability Panel will maintain confidentiality on the authorship of all individual public submissions and on any organisation submissions that request such confidentiality.

Why write a submission?

A submission is a way to provide information, express your opinion and put forward your suggested course of action - including any alternative approach. It is useful if you indicate any suggestions you have to improve the proposal.

All submissions received will be acknowledged. Submissions will be treated as public documents unless provided and received in confidence subject to the requirements of the Freedom of Information Act, and may be quoted in full or in part in each report.

Why not join a group?

If you prefer not to write your own comments, it may be worthwhile joining with a group or other groups interested in making a submission on similar issues. Joint submissions may help to reduce the workload for an individual or group, as well as increase the pool of ideas and information. If you form a small group (up to 10 people), please indicate all the names of the participants. If your group is larger, please indicate how many people your submission represents.

Developing a submission

You may agree or disagree with, or comment on, the general issues discussed in the Sustainability Evaluation / ERMP or the specific proposals. It helps if you give reasons for your conclusions, supported by relevant data. You may make an important contribution by suggesting ways to make the proposal environmentally more acceptable. When making comments on specific proposals in the Sustainability Evaluation / ERMP:

- clearly state your point of view
- indicate the source of your information or argument if this is applicable
- suggest recommendations, safeguards or alternatives.

Points to keep in mind

By keeping the following points in mind, you will make it easier for your submission to be analysed:

- attempt to list points so that issues raised are clear. A summary of your submission is helpful
- refer each point to the appropriate Volume, chapter or recommendation in the ERMP / Sustainability Evaluation
- if you discuss different sections of the Sustainability Evaluation / ERMP, keep them distinct and separate, so there is no confusion as to which section you are considering
- attach any factual information you may wish to provide and give details of the source. Make sure your information is accurate.

Remember to include:

- your name
- address
- date
- whether you want your submission to be confidential.

The closing date for submissions is: **Monday 22 May 2006**.

Where to send your submission

You can either e-mail the submission to the project officer at the following address:

colin.murray@environment.wa.gov.au

OR use the submission form on the EPA website:

www.epa.gov.au/submissions.asp and click on the EIA Assessment Submission option

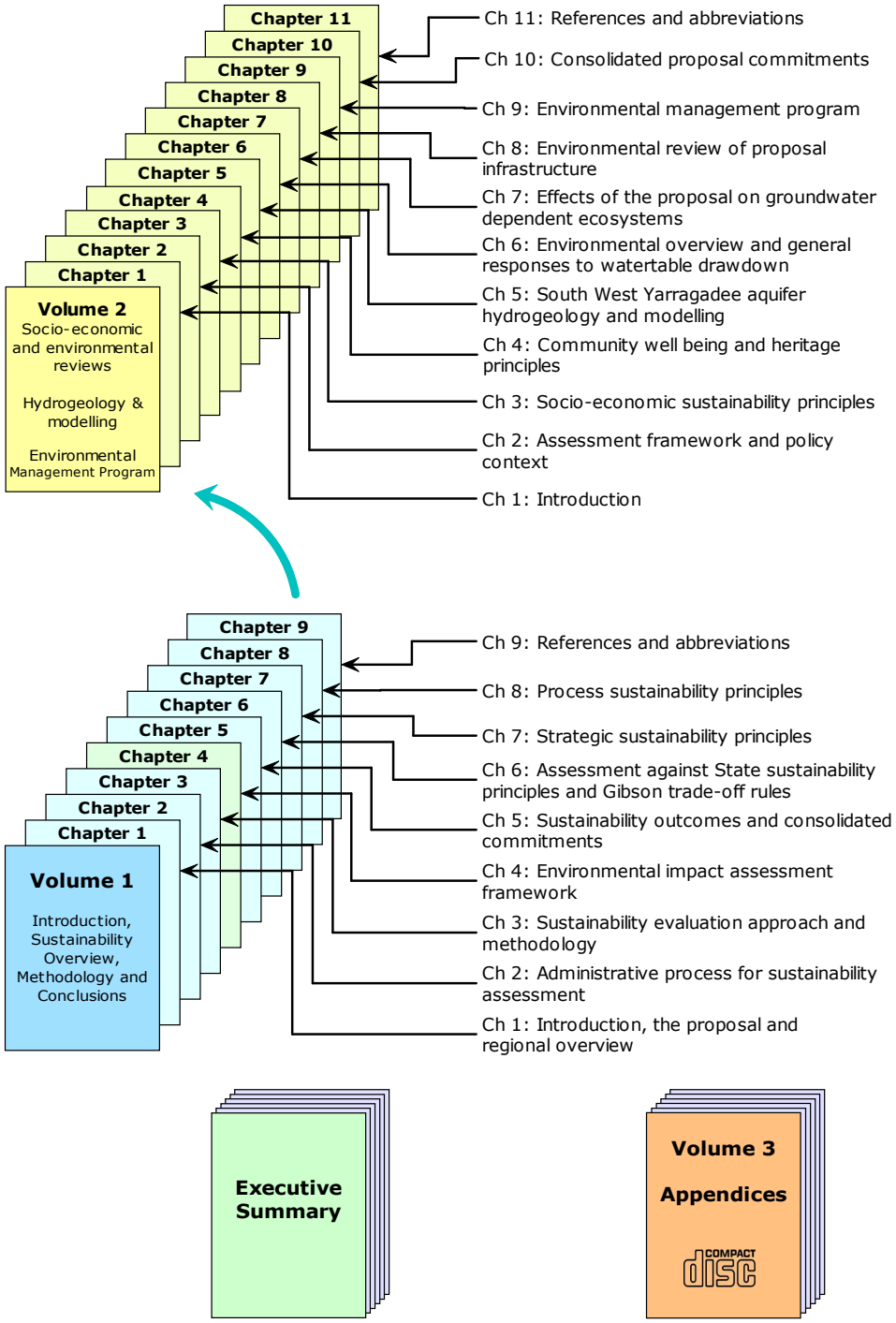
OR if you do not have access to e-mail then please post your submission to:

The Chairman
Environmental Protection Authority
PO Box K822
PERTH WA 6842
Attention: Colin Murray

SOUTH WEST YARRAGADEE WATER SUPPLY DEVELOPMENT
WATER CORPORATION PROPOSAL

Sustainability Evaluation/ERMP Document Structure

This Sustainability Evaluation and ERMP is presented in three volumes as shown diagrammatically below. The Executive Summary is presented in a separate stand alone document.



VOLUME 1

Introduction, Sustainability overview, Methodology and Conclusions

Chapters:

1. **Introduction, the proposal and regional overview**
2. **Administrative process for sustainability assessment**
3. **Sustainability evaluation approach and methodology**
4. **Environmental impact assessment framework**
5. **Sustainability outcomes and consolidated commitments**
6. **Assessment against State sustainability principles and Gibson trade-off rules**
7. **Strategic sustainability principles**
8. **Process sustainability principles**
9. **References and abbreviations**

Key Findings:

The South West Yarragadee Water Supply Development proposal involves the abstraction, treatment and conveyance of 45 GL/yr of groundwater from the Yarragadee Formation from a wellfield on the eastern side of the Blackwood Plateau for supply into the Integrated Water Supply Scheme.

The expected outcome of the proposal, which is committed to an adaptive management process with a high level of community involvement and accountability, is highly positive. It will provide social, environmental and economic benefits to the region and the State. The proposal is considered sustainable under the principles of the Western Australian Government *State Sustainability Strategy* and the Gibson sustainability decision-making principles (trade-off rules).

The proposal and its associated commitments are expected to provide significant benefits to:

- Water Corporation
- existing Integrated Water Supply System customers
- South West region
- Department of Water
- Environmental Protection Authority/Department of Environment
- State of Western Australia.

The environmental, social and economic impacts of the proposal are generally either insignificant or positive. Groundwater drawdown impacts will potentially affect watertable levels in several potential risk areas. Future growth in regional groundwater use will add further to the effects. The fundamental approach of the Water Corporation to managing the cumulative drawdown impacts in these areas is to take full responsibility for offsetting and management in those areas where the Water Corporation is the major contributor to the drawdown effect. In those areas where the Water Corporation is a minor contributor to drawdowns, involvement will be limited to monitoring, reporting, and only offsetting the impacts of the Water Corporation proposal. This effectively means the Corporation will be responsible for offsetting all groundwater drawdown impacts on the eastern Blackwood Plateau. The Corporation does not propose to take responsibility for managing the drawdown impacts of regional users on the Swan and Scott coastal plains or on the Blackwood Plateau, west of the Busselton Fault.

VOLUME 1: INTRODUCTION, SUSTAINABILITY OVERVIEW, METHODOLOGY AND CONCLUSIONS

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Chapter 1 Introduction, the proposal and regional overview

1 INTRODUCTION

1.1 WESTERN AUSTRALIAN STATE SUSTAINABILITY STRATEGY

The Government of Western Australia has produced the State Sustainability Strategy (the Sustainability Strategy) to illustrate the State Government response to sustainability issues by adopting a Sustainability Framework and undertaking actions to implement the strategy (Government of Western Australia 2003a).

The Sustainability Framework establishes the context for this Sustainability Evaluation/ Environmental Review and Management Programme (ERMP) of the South West Yarragadee Water Supply Development.

The Sustainability Strategy includes principles that reflect the core values of sustainability including (Table 1.1):

- seven foundation principles that align with the economic, social and environmental bottom lines
- four process principles that describe the way in which the foundation principles should be applied.

These principles guide the establishment of project-specific sustainability principles in this evaluation.

The Sustainability Framework also defines sustainability visions including the following for governance and natural resources:

> *"Western Australia's system of governance is world famous for responding to sustainability issues, implementing effective and financially responsible programs, supporting transparent and inclusive processes and reflecting the State's globally significant responsibilities towards the land and its people."*
>
> *"Western Australia's vast landscape and seascape, intricate web of biodiversity and other natural resources are conserved, managed and used sustainably for the common good, and the community is involved in management and planning processes that are transparent and visionary."*

These visions are used by the government to establish goals and priorities for government action. One of the sustainability goals derived from the governance vision is to "ensure that the way we govern is driving the transition to a sustainable future" which requires the establishment of sustainability assessment.

The goal established for natural resource management is to "value and protect our environment and ensure sustainable management and use of natural resources".

Table 1.1 Foundation and process principles of the State Sustainability Strategy

FOUNDATION PRINCIPLES	
Long-term economic health	Sustainability recognises the needs of current and future generations for long-term economic health, innovation, diversity and productivity of the earth.
Equity and human rights	Sustainability recognises that an environment needs to be created where all people can express their full potential and lead productive lives and that significant gaps in sufficiency, safety and opportunity endanger the earth.
Biodiversity and ecological integrity	Sustainability recognises that all life has intrinsic value and is interconnected, and that biodiversity and ecological integrity are part of the irreplaceable life support systems upon which the earth depends.
Settlement efficiency and quality of life	Sustainability recognises that settlements need to reduce their ecological footprint (i.e. less material and energy demands and reduction in waste), while they simultaneously improve their quality of life (health, housing, employment, community...)
Community, regions, "sense of place" and heritage	Sustainability recognises the significance and diversity of community and regions for the management of the earth, and the critical importance of "sense of place" and heritage (buildings, townscapes, landscapes and culture) in any plans for the future.
Net benefit from development	Sustainability means that all development, and particularly development involving extraction of non-renewable resources, should strive to provide net environmental, social and economic benefit for future generations.
Common good from planning	Sustainability recognises that planning for the common good requires equitable distribution of public resources (like air, water and open space) so that ecosystem functions are maintained and a shared resource is available to all.
PROCESS PRINCIPLES	
Integration of the triple bottom line	Sustainability requires that economic, social and environmental factors be integrated by simultaneous application of these principles, seeking mutually supportive benefits with minimal trade-offs.
Accountability, transparency and engagement	Sustainability recognises that people should have access to information on sustainability issues, that institutions should have triple bottom line accountability, that regular sustainability audits of programs and policies should be conducted, and that public engagement lies at the heart of all sustainability principles.
Precaution	Sustainability requires caution, avoiding poorly understood risks of serious or irreversible damage to environmental, economic or social capital, designing for surprise and managing for adaptation.
Hope, vision, symbolic and iterative change	Sustainability recognises that applying these principles as part of a broad strategic vision for the earth can generate hope in the future, and thus it will involve symbolic change that is part of many successive steps over generations.

1.2 WHAT IS A SUSTAINABILITY ASSESSMENT

The Sustainability Strategy defines sustainability as:

> *"meeting the needs of current and future generations through integration of environmental protection, social advancement and economic prosperity".*

This definition has been used in this Sustainability Evaluation/ERMP.

It reflects the vision of sustainability outlined in the Sustainability Strategy – our society and our economy functioning in a way that respects and protects the earth.

The first of the sustainability process principles requires the integrated application of the foundation principles, the seeking of mutually supportive benefits and the minimisation of trade-offs. This principle is central to the vision of sustainability in Western Australia and to sustainability assessment.

The key concepts embedded in this principle are that:

- All of the foundation principles are equally important and gains with respect to one principle cannot be made in a way that compromises another principle. Defining minimum standards or acceptability criteria with respect to relevant sustainability factors could help clarify what is and what is not acceptable with respect to each principle. The implication is that there are some impacts that are not acceptable and some things that we should not do from a sustainability perspective.
- Sustainability is much more than simply minimising negative impacts and ensuring that they are "acceptable", but is about seeking positive outcomes in all three accounts:, environmental, social and economic. Therefore, once minimum standards have been met, proposals should also seek to contribute to aspirational objectives and targets in these three accounts.
- The integration of environmental, social and economic considerations through the seeking of synergistic benefits is one of the great opportunities that sustainability offers, and proposals should seek to deliver mutual benefits in all accounts simultaneously. The message of mutual benefits and positive outcomes in each account is applied specifically to development proposals in the foundation principle of net benefit from development.

The Sustainability Strategy promoted the initiation and trial of sustainability assessment for complex or strategic projects, describing sustainability assessment as:

> *"a new process that provides integrated advice to achieve net benefit outcomes"*.

Sustainability assessment is intended to make transparent the environmental, social and economic issues that Government must take into account when considering a development. The environmental issues are required to be made transparent under legislative processes, whereas the social and economic issues are not.

Sustainability assessment provides information on the sustainability of a new proposal and promotes the incorporation of sustainability principles into the development of new proposals.

1.3 WHY A SUSTAINABILITY ASSESSMENT OF THE SOUTH WEST YARRAGADEE WATER SUPPLY DEVELOPMENT?

The South West Yarragadee Water Supply Development proposal involves the abstraction, treatment and conveyance of 45 GL/yr of groundwater from the Yarragadee Formation from a wellfield in the eastern part of the Blackwood Plateau.

One of the actions listed for implementation under the Sustainability Strategy is the sustainability assessment of the next major water source to satisfy long-term needs of the Integrated Water Supply Scheme[2] (IWSS). The South West Yarragadee aquifer is the next major strategic source identified in previous planning studies, with potential to provide a significant increase in the capacity of the IWSS to meet demand in the near future.

[2] The Integrated Water Supply System (IWSS) is the integrated combination of surface and groundwater sources and their distribution system that services Perth, Pinjarra, Mandurah, Harvey, Waroona and the Goldfields and Agricultural Water Supply. Sources supplying this system currently extend as far south as the Harris Dam, and through this, the system is connected to the Great Southern Towns Water Scheme.

The South West Yarragadee Water Supply Development is a strategic water issue for the State that includes consideration of broad-ranging economic and social matters (such as inter-regional transfers of water and perceptions of regional "rights") some of which are beyond the boundaries of traditional assessments. It is important that Government is aware of the range of issues and responses. These are best presented in the form of a Sustainability Evaluation which is ideally linked to consideration of this type of proposal.

1.4 NEED FOR THE DEVELOPMENT

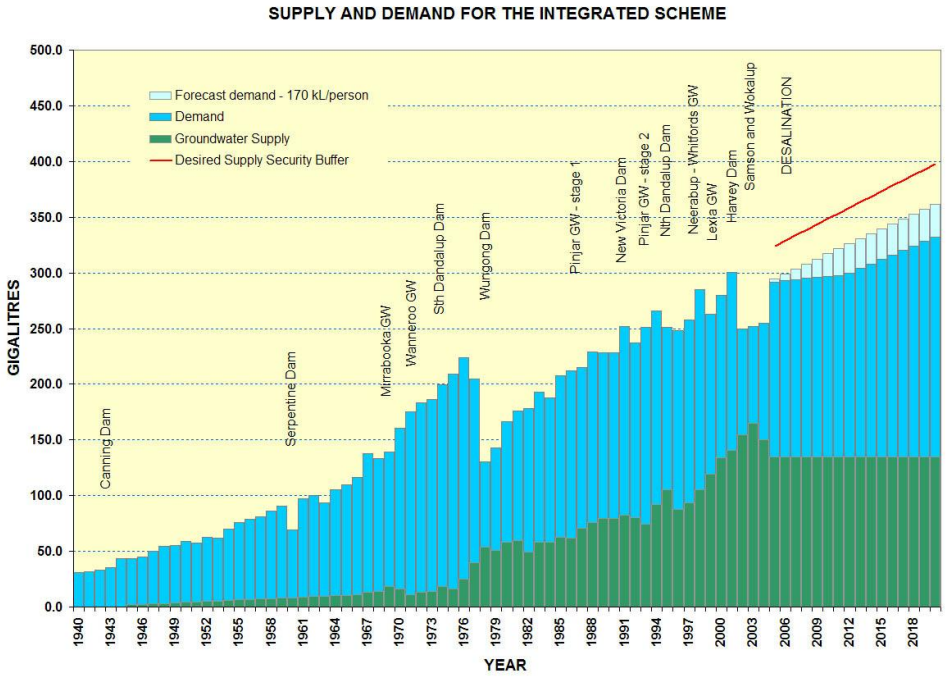
Western Australia needs new water sources to meet increasing demand in the existing and expanded IWSS and the rapidly growing South West Region. The need for additional water is the consequence of several factors including:

- forecast growth in the demand for water within the existing and proposed areas serviced by the IWSS (including the South West)
- recent low rainfall years and the prognosis for a drier climate has resulted in less water being available from the existing sources supplying the IWSS and the South West
- a need to increase the level of service by reducing the likelihood of total sprinkler bans in times of low rainfall.

The annual increase in unrestricted water demand from the IWSS is anticipated to average about 4 GL/yr over the next decade.

The growth in demand is a direct consequence of increasing population, a growing economy and the requirements for secure water supplies (Figure 1.1). While water use efficiency measures, including wastewater reuse, are already decreasing per capita water use, these improvements cannot cater for the overall growth in demand.

Figure 1.1 IWSS water use and projected demand growth



The Water Corporation has responded to these challenges by:

1. Setting new demand management benchmarks in Australia through a program to increase water use efficiency in the public water supply system[3] which includes:
   - "WaterWise" schools
   - water pricing
   - daytime sprinkler controls
   - proactive research into turf watering and the domestic water use study.
2. A program of source development to double the supply capacity of the IWSS over the last decade – including water recycling, water trading, catchment management, desalination and development of groundwater and surface water sources.

Continuing uncertainty regarding climate change presents significant challenges for developing a sustainable water supply system to meet the growing demand associated with strong economic growth.

The proposed South West Yarragadee Water Supply Development would proceed in conjunction with the above range of complementary initiatives.

1.4.1 Existing and future IWSS water demand

The Water Corporation has adopted medium population growth projections from the Department for Planning and Infrastructure to determine growth in water demand to satisfy the increasing population. Figure 1.1 shows the historical annual amounts of water supplied through the IWSS and projected future demand. The impact of restrictions on garden watering in the late 1970s and since 2002 are evident.

Per capita water use has declined over recent decades, largely as result of the introduction of a "pay for use" tariff system for water, imposition of water restrictions in the late 1970s, together with the more recent controls on sprinkler usage (Figure 1.2) and implementation of the "WaterWise" water use efficiency program.

The Water Corporation has assessed two scenarios for future per capita water demand for unrestricted water use:

1. The first scenario assumes that the extensive demand management projects undertaken by the Water Corporation continue to be successful and that unrestricted per capita demand will be 155 kL/yr by 2012.
2. The second scenario assumes that the water efficiency initiatives are not as effective as planned and unrestricted per capita demand is 170 kL/yr.

The second scenario has been used by the Water Corporation for water planning to ensure that adequate water supplies are ready for development. The first scenario is currently being used as the basis for scheduling new supplies.

[3] This work is part of a continual improvement program by the Water Corporation

Figure 1.2 Historical and projected per capita water demand for IWSS

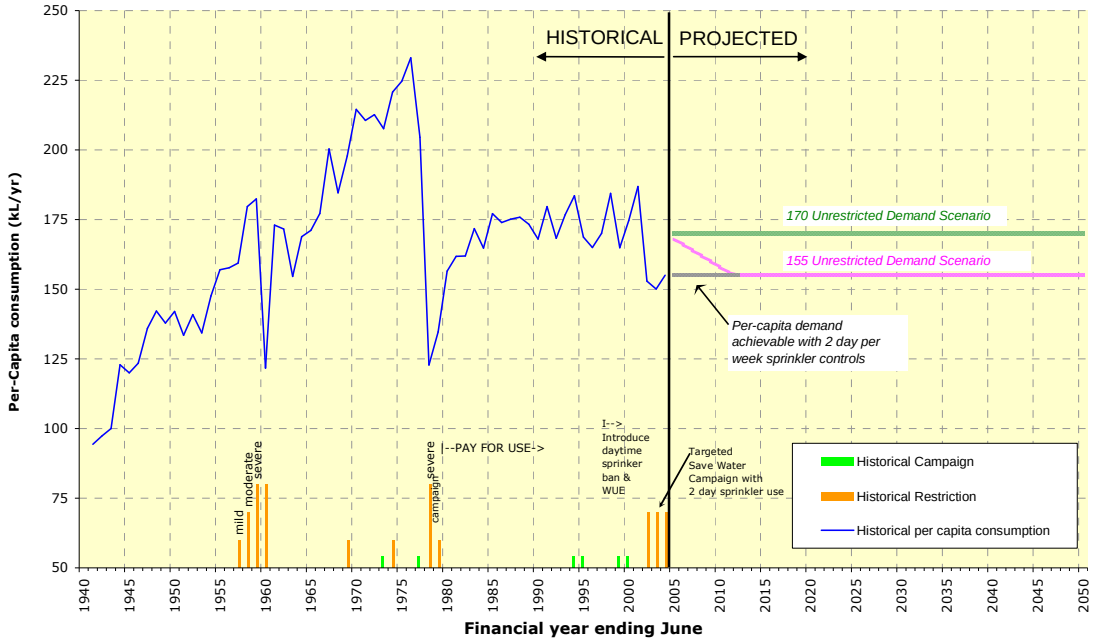


Table 1.2 shows projected demand under various growth scenarios. The current demand under two-day-per-week sprinkler controls is around 265 GL/yr. All growth scenarios show the need for substantial new supplies into the future.

Table 1.2 Summary of demand projections for the IWSS

Time horizon	IWSS Demand (GL/yr)		
	155 Demand Scenario Medium population growth	155 Demand Scenario High population growth	170 Demand Scenario Medium population growth
2015	315	333	343
2025	360	393	390
2050	455	536	495

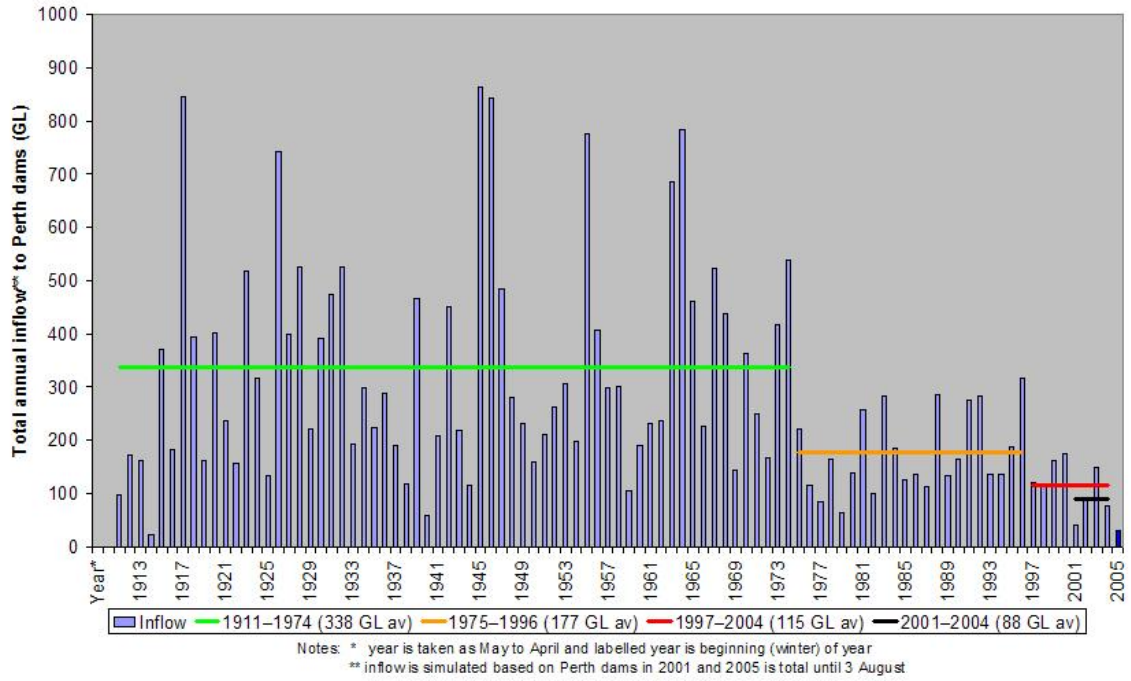
1.4.2 Supply reliability

The level of supply security is significant for individual consumers (for example, businesses providing garden related services) and for the community as a whole. The Water Corporation has adopted a reliability approach that ensures that the likelihood of a total sprinkler ban is very small, in accordance with the State Water Strategy (Government of Western Australia 2003b). The Corporation has interpreted "very small likelihood" to mean that the chances of having a total sprinkler ban in any given year is 0.5% (or 1 in 200). Prior to implementation of the State Water Strategy, source development was based on a 3% chance of total sprinkler bans applying in any given year. A more secure approach has been adopted because of the significant impact of a total sprinkler ban on the community and business.

1.4.3 Effect of climate change on existing water sources of the IWSS

Since the early 1970s, Perth's climate has been drier than the long-term averages, and even drier since the recent turn of the century. This has had a magnified negative effect on catchment runoff and consequently on inflow to dams (Figure 1.3).

Figure 1.3 Yearly streamflow into major metropolitan surface water sources



This has led to a re-evaluation of the estimated source yields to account for each source having a lower potential to yield water. In 1996, source yields were de-rated to account for the 50% reduction in inflows since the early 1970s. The Water Corporation has invested $523 million over the period from 1993 to 2002 accelerating source development to provide for growth in demand and the loss in supply capacity brought about by the reduced inflows.

The Water Corporation has experienced a further 30% decrease in inflows during the eight-year period from 1997 to 2004 with average inflows to the dams of 115 GL/yr compared to an average for 1975 – 2004 of 161 GL/yr.

1.4.4 Justification for the South West Yarragadee Water Supply Development

The selection of the South West Yarragadee as the next supply source for the IWSS followed planning studies conducted over the last two decades that applied multi-objective planning techniques. This involved the integration of environmental, social and economic planning in the assessment of supply options.

The planning studies were largely based on balancing competing environmental, social and economic objectives in developing a water resource plan, with an emphasis on achieving an overall net benefit. Multi-criteria analysis[4] has been an important planning tool in these studies for identifying the preferred option(s) to deliver the overall net benefit.

Unlike traditional benefit-cost analysis, which maximises economic efficiency, multi-objective water planning designs water systems to address all the objectives sought by planners, including non-economic values such as environmental quality.

The methodology ideally involves full participation of potentially affected parties, and identifies the range of solutions that offer optimum opportunities for achieving the community's objectives. Multi-objective planning involves trade-offs, and ultimately requires value judgments. This often requires a decision by Government in making the ultimate choice on the appropriate balance of trade-offs.

1.4.5 Perth's Water Future planning study – A water supply strategy

The Water Authority's Perth's Water Future study (A Water Supply Strategy for Perth and Mandurah) used multi-criteria analysis as the means of ranking options, with selection of the preferred option being the one that demonstrated the highest overall net benefit (Water Authority of Western Australia 1995a). This study was highly consultative in:

- development of the options
- identification of the public issues
- development of the objectives and criteria
- evaluation of the options in terms of the extent to which they satisfied the identified criteria (attained the objectives).

This historic planning process did not necessarily reflect the Sustainability Strategy goal of net benefit in all accounts (environmental, social and economic) but did ensure that all three factors were considered together from the beginning of the planning process which was inclusive and transparent.

This planning process identified the South West Yarragadee aquifer as a long-term strategic source requiring further research.

1.4.6 IWSS Source Development Plan – consideration of source options

The Perth's Water Future planning process provided a preliminary program of candidate sources for development. The effects of climate change were not evident when the Perth's Water Future planning study was conducted. It was thought that the South West Yarragadee aquifer source would not be needed until after 2021. Climate change has resulted in a downgrading of water availability from all existing sources, and increased water supply security requirements has had the effect of bringing forward the source development program by 25 years.

[4] Multi-criteria analysis: Assessment of options by listing criteria, measuring these where possible or rating them where not, weighting the criteria through community involvement, and providing integrated options from the analysis (State Sustainability Strategy).

The Water Corporation has released an updated IWSS Source Development Plan for the planning horizon 2005 – 2050 (Water Corporation 2005 at Appendix 7) that outlines the Water Corporation planning provisions for increasing demand in the context of a drying climate. Potential future sources were evaluated on the following basis:

- technical viability
- social and environmentally acceptability
- public health
- financial viability.

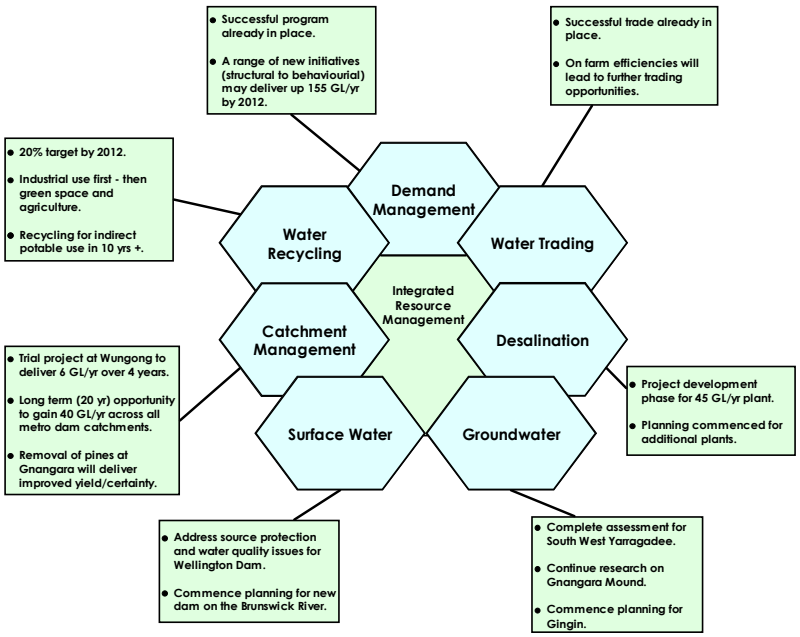
This process of the preparation of this plan examined a number of options which resulted in the selection of the South Yarragadee aquifer as the next potential source for the IWSS.

A comparison of the yields of currently available sources with projected demands shows a clear need to add substantially to the IWSS to meet future demands at the required level of reliability of supply. The South West Yarragadee Water Supply Development will provide part of that requirement within a comprehensive program involving a range of sources, as proposed in the Water Corporation Source Development Plan (Water Corporation 2005 at Appendix 7). These sources form part of the *Security Through Diversity* strategy being pursued by the Water Corporation and conform to the approach of the *State Water Strategy*.

1.4.7 Meeting existing and future IWSS demand through diversity

The Water Corporation approach to meeting future growth in demand is to ensure water supply security through diversity, adopting a multi-faceted strategy for supply and demand management (see Figure 1.4).

Figure 1.4 The Water Corporation strategy for supply and demand management



Implementation of the *Security Through Diversity* strategy has led to the development of an integrated resource plan based on viable supply and demand options (Table 1.3). The sequence of development takes account of:

- the costs and benefits of each option
- the timeframes involved
- the practicalities associated with implementing each option within specific timeframes
- security of supply requirements
- flexibility to deal with deviations from the planning assumptions and associated uncertainties.

Table 1.3 Potential future water sources considered for inclusion in the IWSS Source Plan

Source category	Source	Level of confidence	Yield (GL/yr)	Cost	
				Capital ($m)	Operating (c/kL)
Seawater desalination	Seawater Desalination No 1	Very high	45	376	40-44
	Seawater Desalination No 2	High	45	424-514	36-56
Groundwater	South West Yarragadee	High	45	383	22
	Eglinton	Medium	15-17	54	23
	Yanchep	Medium	9-11	33	23
	Gingin	Low	20-30	439	28
	Karnup/Dandalup	Low	Up to 22		
	Gnangara	Low	15-20		20
Surface water	Water trading Stage 1	High	17-18	134	5-123
	Water trading Stage 2	Medium	16-19	253	26
	Wellington Dam	Low-medium	12-45	87	35-60
	Catchment management (Wungong trial)	Medium	5-6	R&D	25
	Additional water trading	Low	TBD	TBD	TBD
	Catchment management (other catchments)	Low	31-34		22
	Brunswick River	Low	25-30	275	12
	Water from Kimberley	Very low	300	11 000	35
	Cloud seeding	Very low	TBD	TBD	TBD
Wastewater reuse	Aquifer storage and recovery	Low	20+ & growing	TBD	TBD
	Alternative supply to industry		25	TBD	TBD
Recycling	Drainage and storm water	TBD	TBD	TBD	TBD

Table adapted from the 2005 Water Corporation Source Development Plan. All figures are estimates, full explanation in Water Corporation (2005 at Appendix 7).

Water supply sources should not be considered as competing or alternative options where the selection of a "preferred option" implies rejection of the other options. For example, while the South West Yarragadee Water Supply Development and a second desalination plant might be seen as competing alternatives, the selection of one as the preferred alternative does not mean that the other is rejected and will, therefore, never be built. Sustainable and viable water sources to meet a continually increasing demand base should be only considered as being competitive (or as alternative options) in terms of timing. The fundamental question to be considered in terms of whether a source should be developed (included in a source development plan) is not whether there are other better alternatives, but rather, whether the source can be developed sustainably or not. If it can be developed, the timing is a question for the planning process to consider in terms of demand, economics and practicalities.

1.4.8 South West Yarragadee water source

The South West Yarragadee aquifer is within the Southern Perth Basin in the South West of Western Australia. Groundwater from the Southern Perth Basin has been recognised as a major water source for many decades. Its development for water supply commenced at the end of the 19th Century when the first wells for the Bunbury water supply were constructed. Bestow (1973) reported on its potential as a regional water supply source of considerable magnitude, and its potential for transfer to meet needs outside the region was considered by the Public Works Department in 1973 in an unpublished South West Regional Planning Study.

Currently, 72 GL/yr is abstracted from the Yarragadee aquifer to meet a range of local water demands in a range of water use sectors (Economics Consulting Services 2003 at Appendix 24).

The Perth's Water Future study (Water Authority of Western Australia 1995a) identified groundwater from the South West Yarragadee aquifer as "a very strategic longer term resource and more investigation is required". This statement was in the context of the 2020 timeframe for that study. The Perth's Water Future longer term vision statement (Water Authority of Western Australia 1995b) commented:

"By 2050, a major proportion of the water supply for Perth and Mandurah will come from the resources of the Yarragadee Formation in the Southern Perth Basin, south of Bunbury."

A screening process was undertaken by the Water Corporation and the Department of Environment (DoE) in 2002 to identify the candidate sources for accelerated development. A decision was made to proceed with evaluation of the South West Yarragadee Water Supply Development proposal in preference to groundwater from the Gingin area, or development of surface water from the Brunswick River. The decision was founded on an understanding that significant amounts of water were likely to be available from this major resource for which competition was limited (at least in the short term). The environmental issues were expected to be manageable, and the source was strategically important to development of the South West of the State.

1.4.9 Other sources available in the short term

Desalination

The Government decision to proceed with a 45 GL/yr desalination plant at Kwinana was a major initiative in response to the drying climate and the need for additional sources for the IWSS. This decision was taken because of the urgent need to increase IWSS capacity, and because desalination is the only major source option currently available that could add to capacity in a relatively short timeframe. A major contribution to this decision was the time required to carry out investigations to demonstrate the capability of the South West Yarragadee proposal and to gain the necessary approvals.

A second desalination plant is being considered for future inclusion in the IWSS. The Water Corporation will continue to evaluate and develop the full range of options in its *Security Through Diversity* strategy considering all sources that can be sustainable and viable.

The first desalination plant is planned for completion in 2006.

Harvey Water (water trading)

The Water Corporation is funding the piping of the channel-based Harvey Irrigation District irrigation distribution system to reduce the substantial water losses currently being experienced. The water saved will be made available to the Water Corporation for the IWSS. Work undertaken to date has yielded an additional 10 GL/yr and the Water Corporation estimates a total yield of 17 GL/yr can be transferred to the IWSS once the project is complete.

Trading of water from Harvey Water represents a competitively priced water source, but it is a limited supply in terms of magnitude.

1.4.10 Other sources potentially available in the longer term

Longer term water sources capable of substantial additions to the yield of the IWSS are:

- groundwater from the Perth metropolitan North West Corridor (Yanchep and Eglinton)
- Wellington Dam (pumpback scheme and desalination)
- groundwater from the Gingin and Karnup Dandalup areas of the Swan Coastal Plain
- catchment management to increase surface water runoff rates.

The level of confidence for approval to develop these sources is highly variable.

Wastewater reuse and recycling of drainage and stormwater have some potential to provide additional water, but at a significant cost.

Other potential source options will be developed sooner if the South West Yarragadee Water Supply Development project does not proceed. The likely feasible 'alternative' is a second desalination plant.

The timing of any alternative chosen may be affected by climate, government policy, community values and the environmental approval processes.

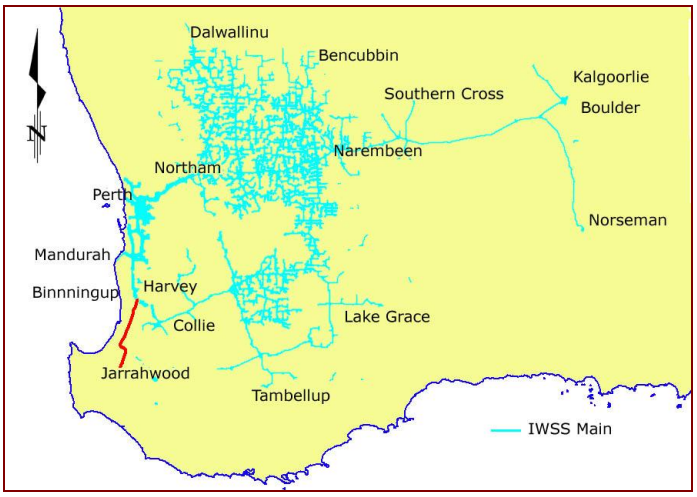
1.5 IWSS AND SOUTH WEST PUBLIC WATER SUPPLY SCHEMES

The Water Corporation provides a water supply within the IWSS in accordance with its operating licence issued by the Economic Regulation Authority, which requires planning for future growth in the scheme area. The IWSS services an estimated 1 200 000 people (78% of the State's population) including metropolitan Perth, Mandurah, Pinjarra, towns and properties along the Goldfields pipeline to Kalgoorlie-Boulder and agricultural areas (Figure 1.5).

The Water Corporation also provides public water supplies through 120 schemes around the state, including towns in the South West such as Augusta, Bridgetown, Margaret River and Nannup.

Aqwest (formerly Bunbury Water Board) and the Busselton Water Board are independent statutory authorities that provide public water supplies to the towns of Bunbury and Busselton respectively.

Figure 1.5 Schematic of IWSS



1.6 PURPOSE OF THIS DOCUMENT

The purpose of this document is to present:

1. An evaluation of the sustainability of the South West Yarragadee Water Supply Development proposal through an assessment of the environmental, social and economic factors relevant to the proposal for assessment by the Sustainability Panel (Chapter 2 Section 1.5) and to allow the Government and the Water Corporation to decide whether the source can be developed and included in supply planning for the IWSS.

2. An environmental review, together with a preliminary environmental management program, in the form of an ERMP in accordance with Administrative Procedures prescribed under the Western Australian *Environmental Protection Act 1986* (EP Act) for the consideration of the Environmental Protection Authority (EPA).
3. An environmental review to satisfy the requirements of the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). The proposal has been determined to be a controlled action under EPBC Act. The controlling provisions were Wetlands of international importance, Listed threatened species and communities, and Listed migratory species. This review has been specifically prepared to address potential impacts on these matters.
4. Information to the Water and Rivers Commission to allow assessment of the Water Corporation groundwater licence application to abstract up to 45 GL/yr from the Yarragadee aquifer under the *Rights in Water and Irrigation Act 1914* (RWI Act).

1.6.1 Sustainability Evaluation and ERMP document structure

The Sustainability Evaluation/ERMP is presented in three volumes with a separate Executive Summary (Figure 1.6). Volume 1 (this volume) describes the proposal, the sustainability evaluation process, the assessment of the proposal outcomes against a range of sustainability principles and rules, consolidated commitments and overall sustainability conclusions. Volume 1 also includes the discussion of the strategic and process principles that are relevant as both context for the proposal, (e.g. Government policy and climate change) and in relation to the proposal itself (e.g. extension of the IWSS into the South West and inclusion of climate change in the modelling).

Volume 2 contains a description of the aquifer hydrogeology and modelling, the evaluation against the socio-economic and environmental factors, and the environmental management program.

Volume 3 (Compact Disc) contains the Appendices.

1.7 THE PROPONENT

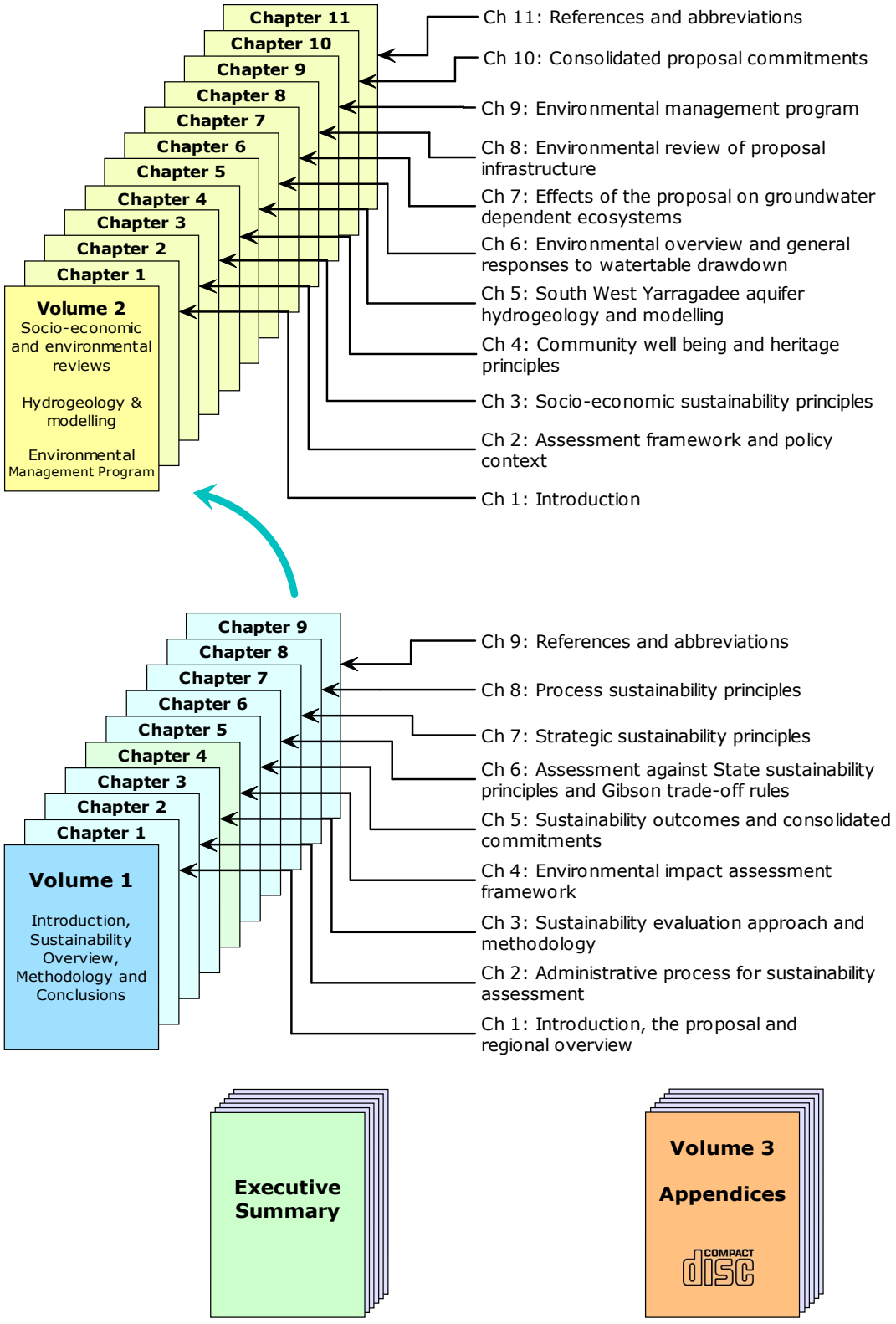
The proponent for this proposal is the Water Corporation, a corporatised government trading enterprise that provides water services[5] across Western Australia. The Corporation has the role of providing water supply services to the operating areas within Western Australia for which it has a licence under the *Water Services Licensing Act 1995*.

The Water Corporation is one of Australia's largest water service providers with nearly $10 billion invested in water service infrastructure in Western Australia. The Corporation has over 100 years of commercial and technical expertise in the water industry and provides water and wastewater services to hundreds of towns and communities in Western Australia.

The Corporation directly employs about 2000 people and its operations generate more than $1.2 billion in revenue a year. The majority of profits are returned to the Western Australian Government as a dividend to contribute to the development of the State.

[5] Water services includes water supply, irrigation, wastewater and drainage services.

Figure 1.6 Structure and contents of the Sustainability Evaluation & ERMP document



1.8 SCOPING OF THE SUSTAINABILITY EVALUATION & ERMP

A Scoping Report (Strategen 2005a at Appendix 1) was prepared and subsequently approved by the Sustainability Panel, EPA, Department of Environment and Heritage (Commonwealth), and the Water and Rivers Commission. The Scoping Report lists sustainability principles and environmental, social and economic factors. It documents proposed investigations that were determined to be relevant to the proposal and defines the scope of the sustainability assessment addressed in this document.

The factors presented in the Scoping Report will be considered by the Sustainability Panel, the EPA and the Water and Rivers Commission in their assessment of this evaluation. The scoping report was developed, in part, in response to advice from the Water and Rivers Commission on the information required to support the Water Corporation groundwater licence application (Appendix 2). The Scoping Report also formed the basis for referral of the project to the EPA for environmental assessment. The scoping report was developed in consultation with the community, including all key stakeholders.

2 PROPOSAL DESCRIPTION

The South West Yarragadee Water Supply Development project proposes to abstract 45 GL/yr of groundwater from the South West Yarragadee aquifer in the Southern Perth Basin in the South West of Western Australia to supply the IWSS (including potential demand in the South West).

2.1 LOCATION OF THE PROPOSAL

The wellfield will be installed within an area near the town of Jarrahwood in the north-eastern part of the Blackwood Plateau (Figure 1.7 and Figure 1.8).

The proposal also includes a filtration-based treatment plant to be located to the north of the source works and a transfer main to take water from the treatment plant to the existing Stirling Trunk Main at Harvey. The development will have economic and social effects throughout the South West, and within the regions served by the IWSS, which extend well beyond the area potentially affected by groundwater drawdown.

Figure 1.9 and Figure 1.10 show the wellfield and treatment plant and tank layouts. Figure 1.9 includes sites for possible future wells if modification of the wellfield is required as a contingency action to modify the impacts of abstraction on surface environmental features.

Figure 1.11 and Figure 1.12 show the nominal locations for the northern and southern portions of the proposed pipeline.

2.2 ALTERNATIVE DEVELOPMENT CONCEPTS CONSIDERED

Within the South West Yarragadee Water Supply Development proposal, alternative means of developing the groundwater source were considered. The alternatives include options for:

- wellfield configuration, including both the location and the depth of the wells
- pipeline and infrastructure routes
- staging of the supply development
- mitigation and enhancement options
- end use of the supply.

The assessment of alternatives or variations to the proposal led to the proposal described in this Sustainability Evaluation/ERMP, which is expected to provide the optimal environmental, social and economic outcomes.

Figure 1.7 Locality plan showing wellfield and nominal pipeline route

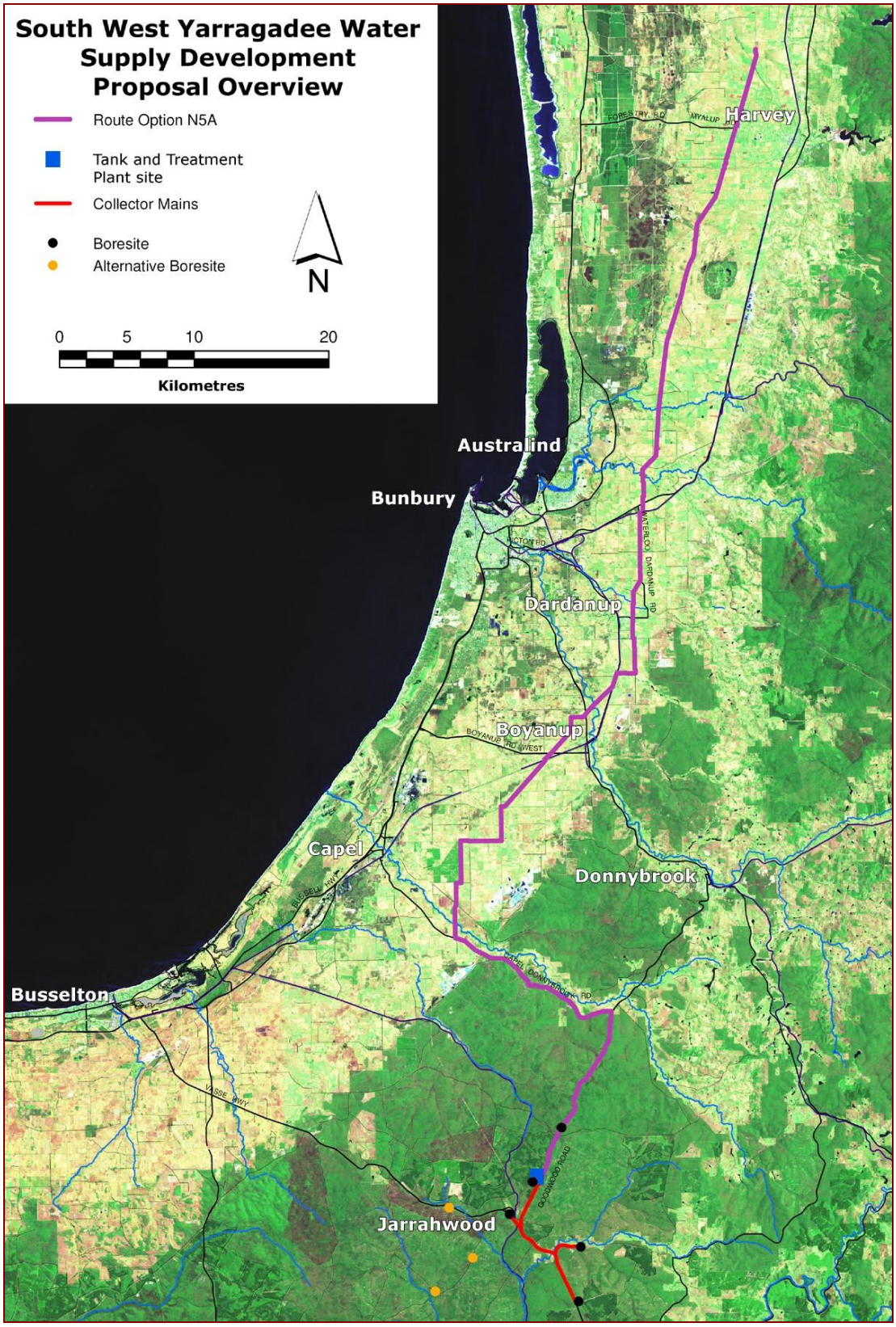


Figure 1.8 Infrastructure layout and CALM managed land

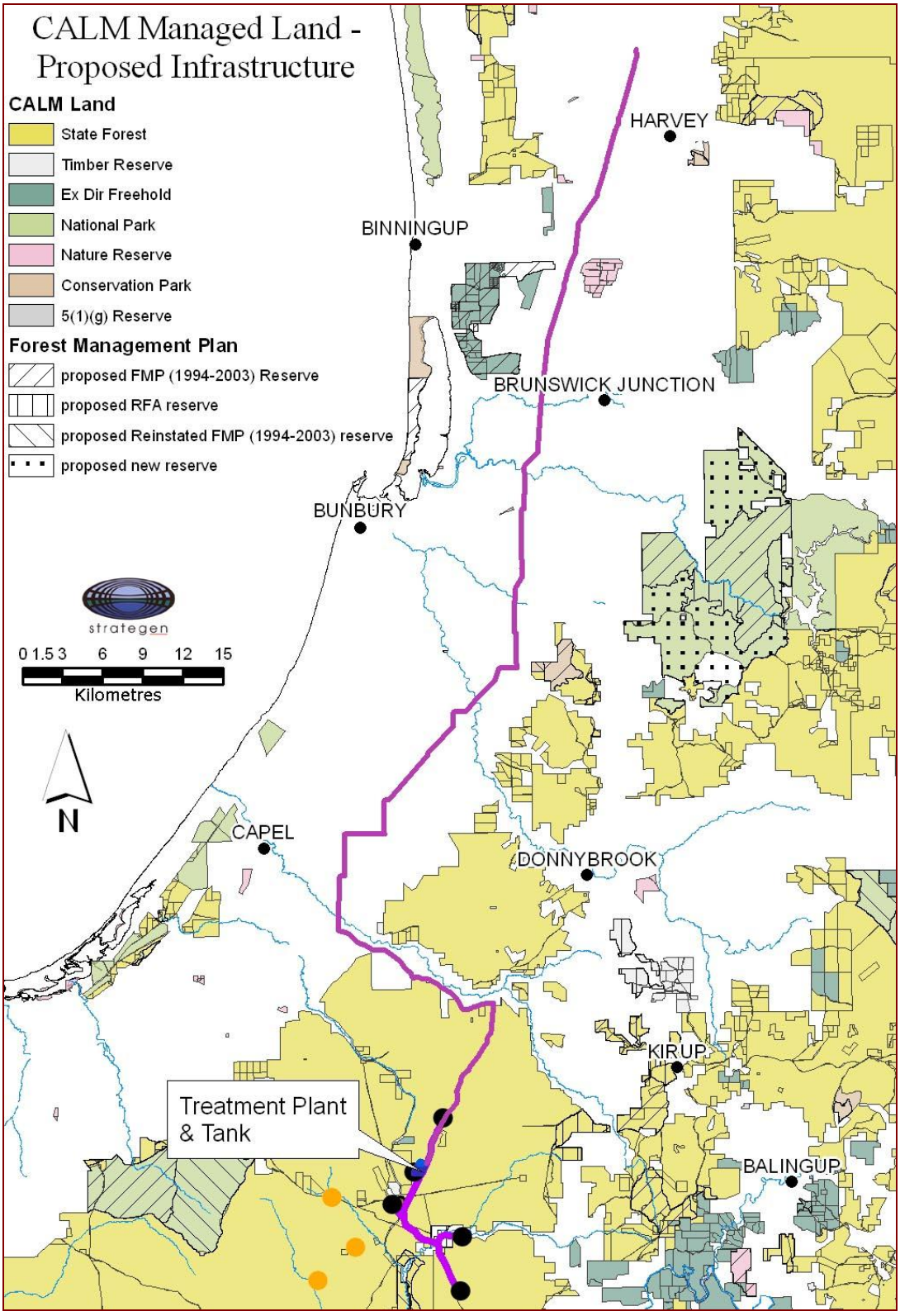


Figure 1.9 Proposed wellfield configuration and treatment plant layout

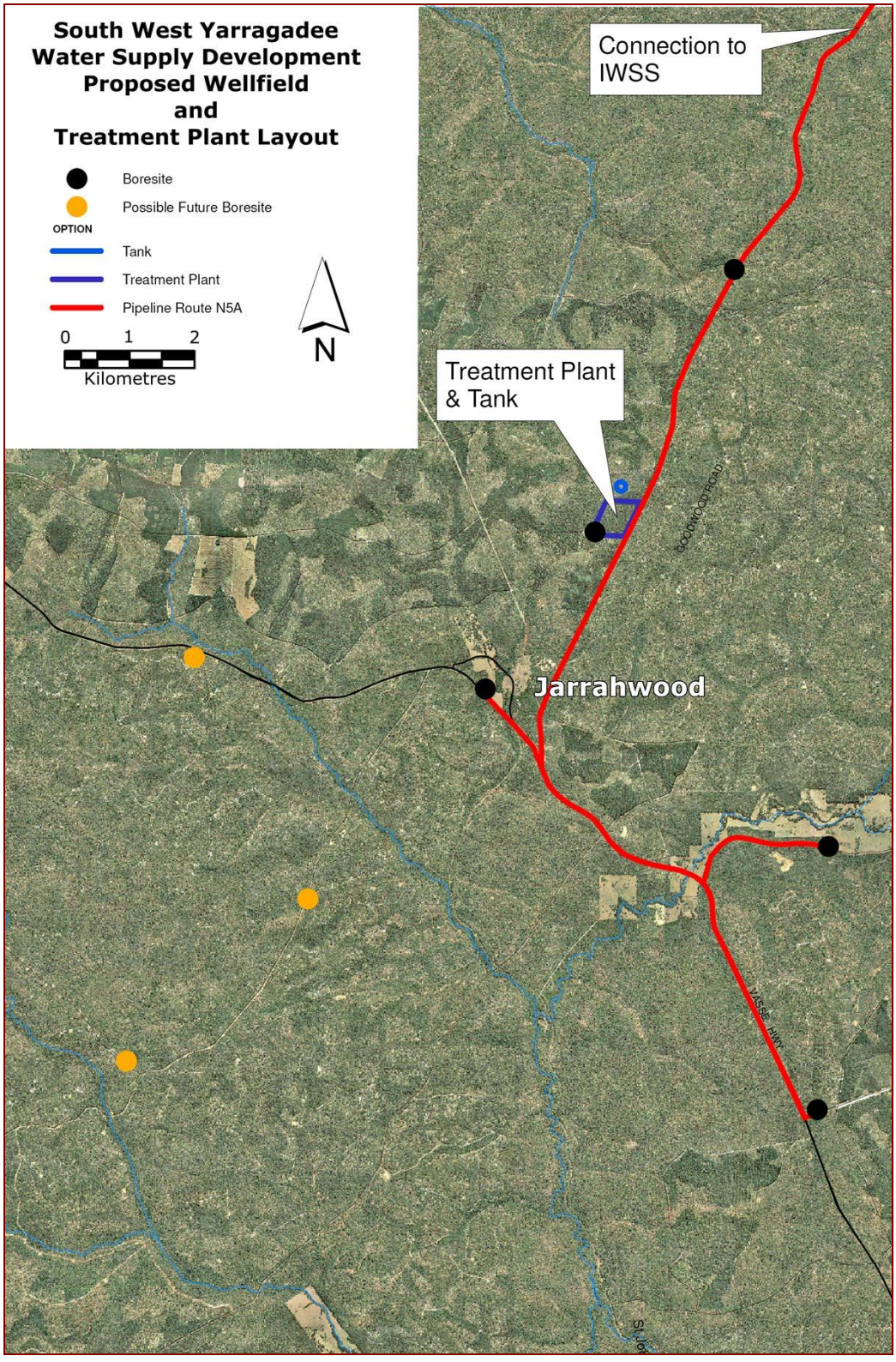


Figure 1.10 Proposed treatment plant and storage tank layout

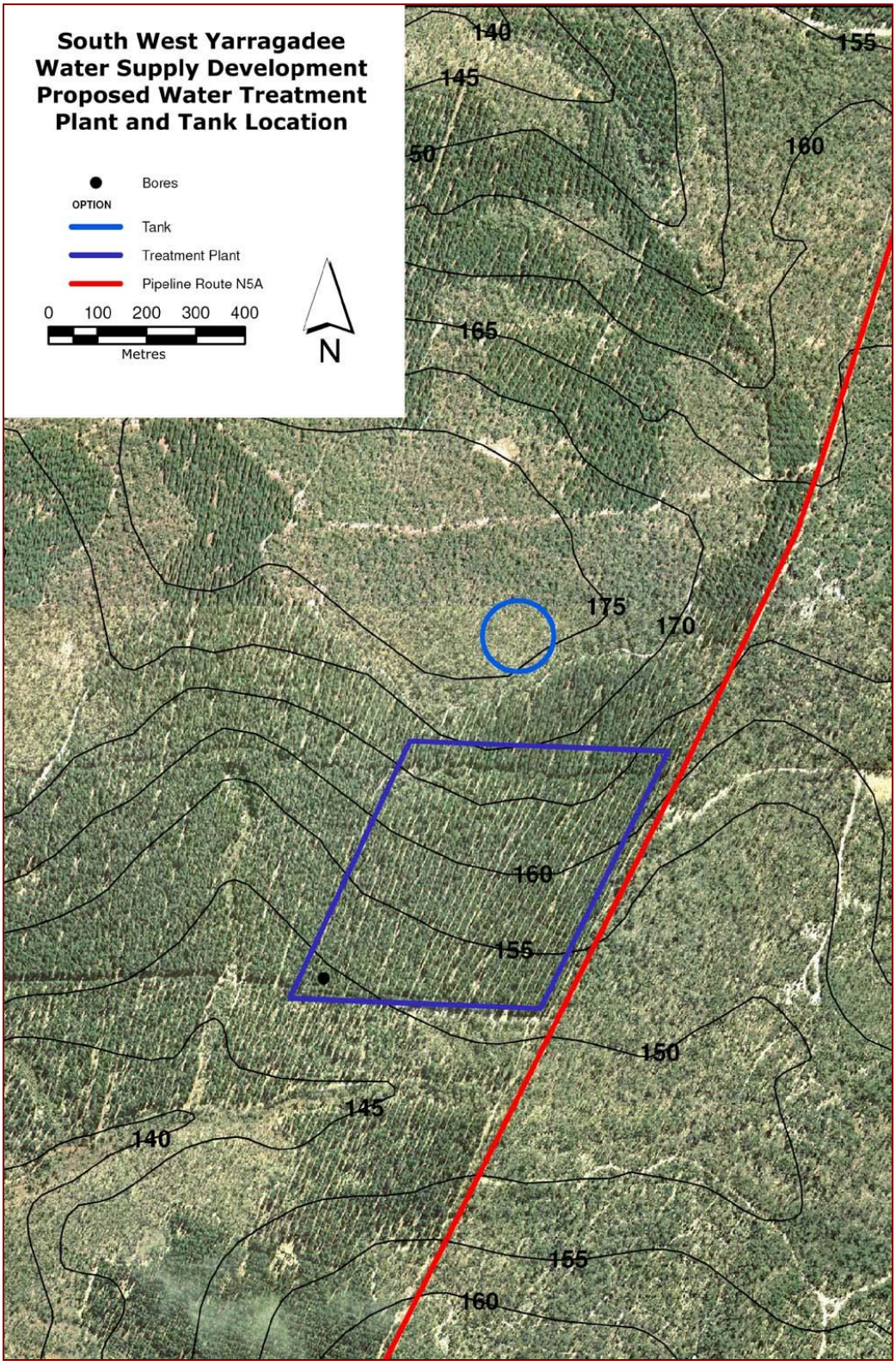


Figure 1.11 Northern section of trunk main – nominal alignment

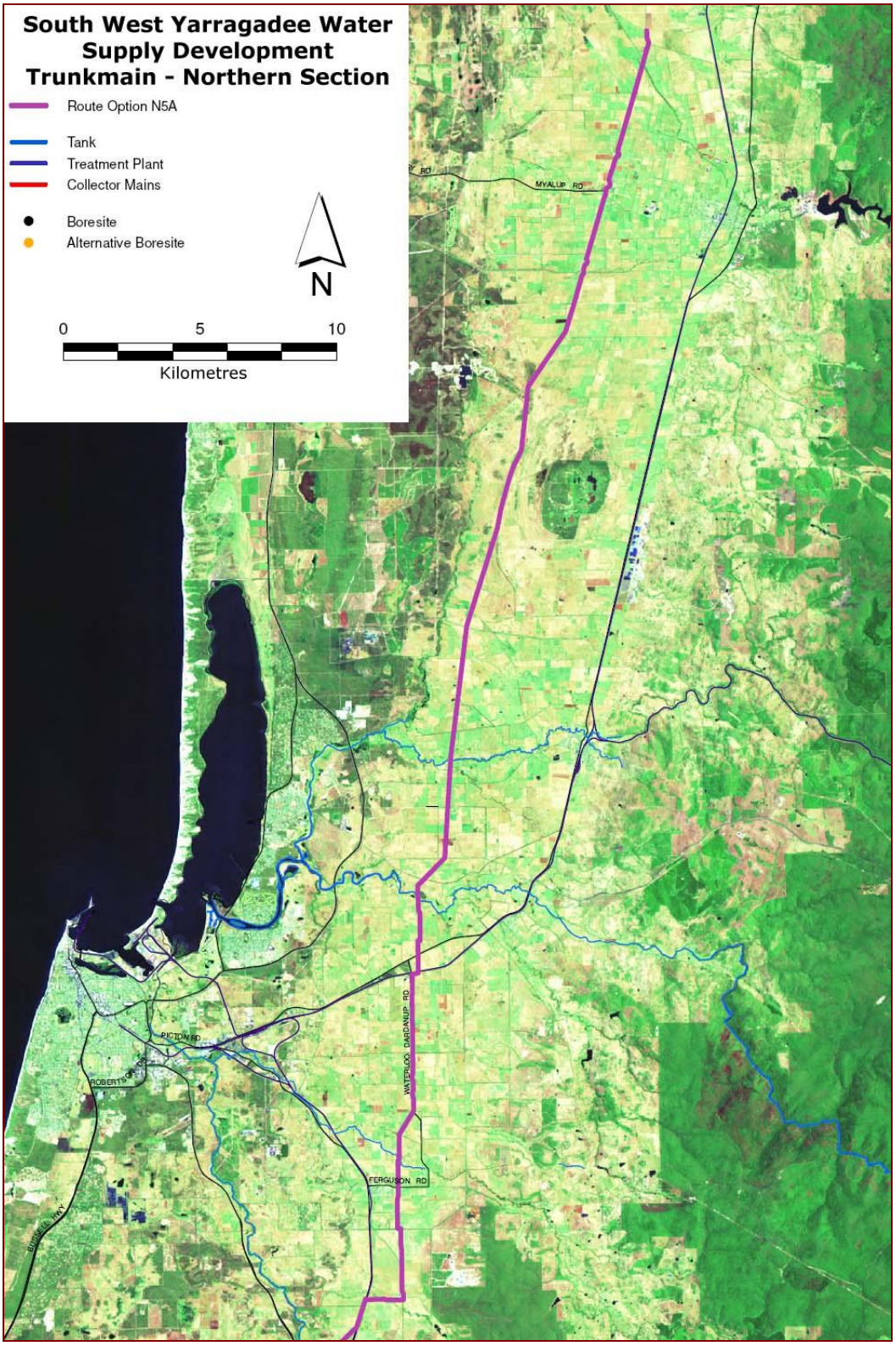
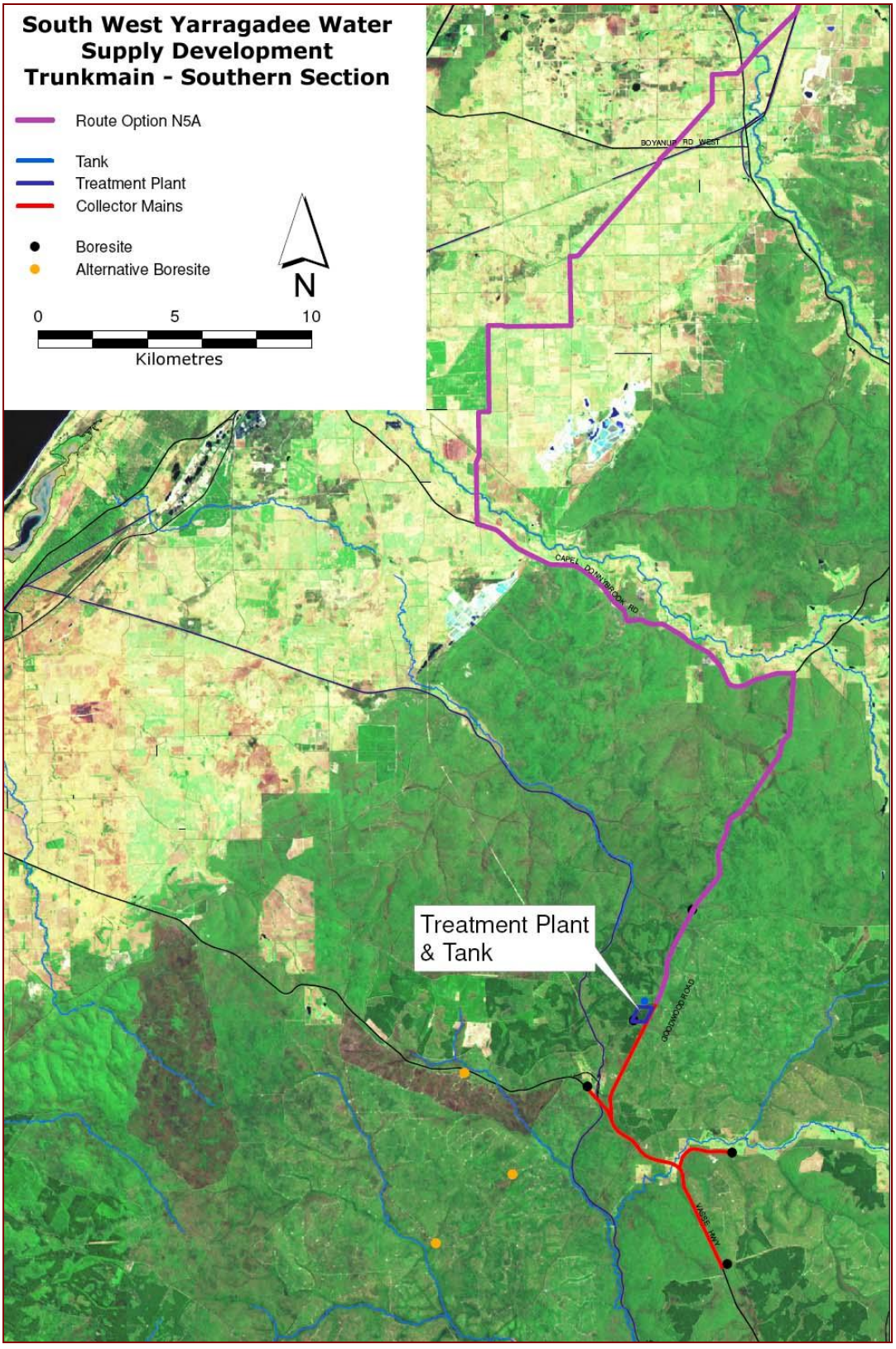


Figure 1.12 Southern section of trunk main – nominal alignment



2.2.1 Wellfield configuration

The Blackwood Plateau was chosen as the general location for the wellfield as:

The South West Yarragadee aquifer in this area is largely deep and confined, minimising the potential for surface impacts from drawdown.

The Blackwood Plateau is predominantly State forest and little groundwater abstraction occurs in the area. This minimises the potential for competition with other existing and future water users. State forest is also a suitable catchment land use to ensure a high level of water quality protection for public drinking water sources.

The area is remote from other existing groundwater users and minimises the potential for interference with groundwater levels in existing wells.

The location enables a greater amount of water to be drawn from the South West Yarragadee aquifer through spreading the overall (Water Corporation and private) abstraction, than would be possible if abstraction was less distributed.

The location of the wells within this broad area was refined using groundwater modelling to determine which configurations would minimise groundwater drawdowns in environmentally sensitive areas and minimise the impacts on other water users (both current and future).

The assessment of configuration options was also based on the need to avoid environmentally and socially sensitive areas and to use existing access routes. The preferred wellfield configuration is referred to as the "Eastern Split" wellfield, which designates the eastern location option, with abstraction "split" between two different layers of the Yarragadee Formation. This is discussed in detail in Volume 2 Chapter 5 Section 4.1.

2.2.2 Pipeline routes

A detailed study, using Geographic Information System technology, identified the constraints for routing the pipeline and identified routes meeting pre-defined criteria (GHD 2003). The criteria were:

- minimising cost through minimising length and number of pipeline bends
- avoiding areas of defined mineralisation
- avoiding clearing native vegetation
- avoiding EPP lakes or conservation/resource enhancement category wetlands
- avoiding Threatened Ecological Communities and Rare Flora
- avoiding dieback affected areas
- avoiding disturbance to structures or plantings of value to local community
- avoiding European heritage sites
- avoiding risks to archaeological or ethnographic Aboriginal heritage sites
- avoiding disturbance of land uses on pipeline route
- avoiding nuisance to residences from pipeline construction activities.

The general pipeline route is shown in Figure 1.7. The exact alignment will require further detailed negotiation with landholders prior to implementation.

2.2.3 Project staging

Because the project requires a large capital investment of $383 million,[6] the majority of which is the cost of the pipeline, staging of the project was rejected as a means of reducing environmental risk associated with groundwater drawdown. Instead, contingencies and an adaptive management approach have been developed to manage environmental risk.

Potential contingency options include supplementation of environmental and social flow regimes in selected watercourses, the use of new surface water sources and new wells in other locations. The adaptive management approach and contingency options are discussed in detail in Volume 2 Chapter 9 Section 12.

2.3 PROPOSAL DEVELOPMENT CONCEPT

The proposal concept at the commencement of this sustainability evaluation was to supply 45 GL/yr to the IWSS to meet only growing demand in areas currently connected to this scheme. However, through the sustainability evaluation, the concept has evolved to consider this development as extending the IWSS to the South West. Under this concept, the extended IWSS would provide the opportunity of extending public water supply to areas in the South West close to the proposed scheme infrastructure and its possible future extensions.

The pipeline and wellfield infrastructure in the South West associated with the proposal provides an opportunity to meet reasonable existing or future unsatisfied public water supply demand in the South West.

In addition, the scope exists for water to be transferred from other regions to the South West through the IWSS. This has occurred within the existing IWSS when water levels in Stirling Dam were at critical levels and water was transferred south from northern sources to supply towns such as Harvey to ensure continuity of service.

Under the proposed development concept, the South West becomes an integral component to be serviced by the IWSS.

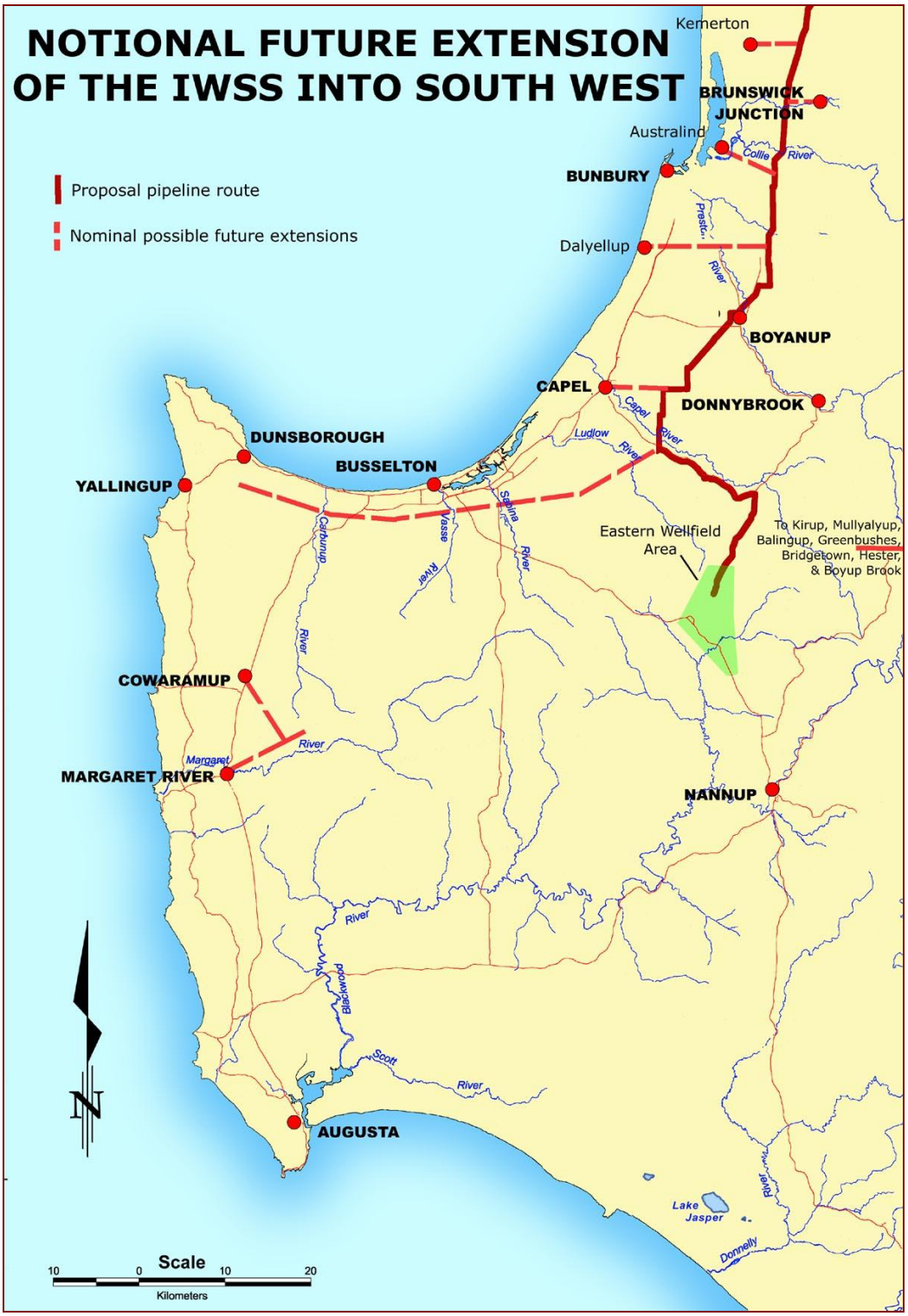
The expansion of the original Mundaring to Kalgoorlie–Boulder pipeline into an extensive integrated scheme that now supplies 33 000 rural water services throughout the wheatbelt and goldfields demonstrates this process.

Bunbury and Busselton–Capel are recognised as two of the strongest growth regions in the State. The proposal is well located to meet their longer term bulk water supply needs. The South West Yarragadee supply will be considered as an option for all future demand in the region.

Figure 1.13 presents a notional indication of how the infrastructure may develop in the future to meet growing regional public water supply needs. This diagram is highly notional and would require considerable future planning and design before finalised. The final configuration may be markedly different to that shown. The notional expansion of the IWSS to supply towns and other development areas in the South West is not part of this proposal.

[6] 2004 planning estimate.

Figure 1.13 Notional future extension of the IWSS into the South West



2.4 THE PROPOSAL

2.4.1 Key characteristics

The South West Yarragadee Water Supply Development proposal is to abstract 45 GL/yr from the South West Yarragadee aquifer to meet growing demand in the IWSS. The key characteristics of the proposal are set out in Table 1.4. This proposal will include up to ten production wells at five sites abstracting groundwater from the Blackwood Plateau in the South West (Figure 1.9). Additional sites for production wells that may be necessary as an adaptive management response have also been selected. The proposal refers to the preferred wellfield configuration (the "Eastern Split" wellfield) as discussed above and in detail in Volume 2 Chapter 5 Section 3.2.1.

The proposal also includes a water treatment plant to be located to the north of the source works and transfer main to take water from the treatment plant to the existing Stirling Trunk Main at Harvey. Water will be transferred to the IWSS through the trunk main which will be augmented by a new pumping station at Ravenswood, which is not part of the proposal.

A monitoring program, stakeholder involvement, and a range of management and mitigation actions are proposed as part of the project to provide for the achievement of social, environmental and economic net benefits through implementation of the proposal.

Table 1.4 Key characteristics table

Element	Description
Wellfield	
Source	South West Yarragadee aquifer
Rate of abstraction	45 GL/yr
Location of wells	Refer Figure 1.9 for indicative location
Well type	Conventional up to 20 ML/day capacity
No. of wells	Up to 10
Pipeline	
Water transfer mains	Shown as Route Option N5A in Figure 1.11 and Figure 1.12 from Storage Tank to Harvey
Length	105 km
Diameter	1400 mm
Wellfield connecting pipeline	Shown in Figure 1.9
Length	7.5 km
Diameter	1400 mm
Water treatment plant	
Location	Goodwood Road on the Whicher Scarp near Jarrahwood
Facilities	Filtration, chlorination, pH adjustment, sludge drying beds
Capacity	135 ML/day
Storage tank	25 ML
Energy use	
Wells	600 kW each 35 GWhr/yr
Treatment plant	600 kW each 5 GWhr/yr
Pump stations	None*

* Pump station at Ravenswood is not specific to the South West Yarragadee Water Supply Development project.

2.4.2 Wellfield

Up to ten wells will be drilled into the Yarragadee Formation in an area near Jarrahwood. These wells will be distributed across five well sites, with two wells at each site. One well at each site will be screened in the upper zone of the Yarragadee Formation (approximately 400 m below ground level), and the other well will be screened in a deep zone (approximately 700 m below ground level). Contingency sites to provide for modification of distribution of the pumping regime between aquifers have been selected. Wells will not be constructed at these contingency sites unless monitoring indicates they are required.

Each well has a diameter of about 600 mm with a surface casing of 900 mm which is sealed and locked down approximately one metre above ground. The wells will each have a capacity of 20 ML/day and the pumping rates will be designed for up to 20 ML/day. The actual pumping rates will be determined through testing of the wells after construction.

Construction of a well requires a clear area of about 80 x 80 m. The maintenance area required is about 20 x 20 m. The cleared area not required for maintenance will be rehabilitated after construction. Each well site is located adjacent to an existing cleared road to minimise clearing requirements. Collector mains will be located within the cleared areas associated with existing roads. The existing roads will be used for maintenance access without modification and clearing will be minimised.

2.4.3 Treatment, pumping and storage

The water quality of the South West Yarragadee aquifer is high. However, water treatment is required to reduce the concentrations of naturally occurring iron, manganese and dissolved carbon dioxide. In addition, chlorination will be required for disinfection, and fluoride will be added to comply with statutory health requirements for public water supply.

The treatment plant and a 5 ha sludge drying area will be enclosed within a 42 ha site adjacent to Goodwood road north of Jarrahwood (Figure 1.10). The treatment plant site will be within an existing pine plantation. The tank will be located within an area of remnant native vegetation.

The treatment plant is designed with the capacity to treat 135 ML/day with a 25 ML storage tank. The site will include gravity filters, two solids contact clarifiers, each with 75 ML/day capacity and a standard vertical spray type aerator.

Power transmission facilities on CALM managed land will be provided via underground transmission lines located in existing road clearings or power easements. Transmission facilities across private land may be overhead, depending on the final route and negotiations with Western Power.

Access to the treatment plant and storage tank will be via existing roads. The storage tank site may require clearing of an access track, depending on the final location to be determined following detailed investigations. Preference will be given to areas of pine plantation, or other areas not containing native vegetation.

2.4.4 Pipeline

Collector mains will link the individual wells and transfer the water to the water treatment plant and storage tank on the Whicher Scarp near Jarrahwood. A transfer main will then pipe the treated water north to the existing Stirling Trunk Main north of Harvey (Figure 1.7).

The main pipeline will be 105 km to 115 km long, depending on the final route chosen in consultation with the affected landholders. Figure 1.7, Figure 1.11 and Figure 1.12 shows the indicative pipeline route, although the final alignment will be subject to the results of flora, fauna and heritage surveys. The pipeline will be constructed of 1400 mm diameter steel pipe and buried to approximately 750 mm for almost its entire length including river crossings where possible. One exception is the crossing of the Harvey Diversion Drain at Eckersley Road, west to southwest of the Harvey townsite, where an above-ground crossing will be used.

The pipeline route crosses the Capel, Ferguson, Preston, Collie and Brunswick Rivers. As These are all registered as Aboriginal heritage sites or proposed to be registered (Capel River), the pipeline may need to be installed under or over the rivers without disturbance, depending on the outcome of Aboriginal heritage surveys to be carried out by the Water Corporation. At any other non-registered river and stream crossings it should be possible to use open cut techniques to install the pipeline below the watercourse. The Preston River is classified by the DoE as a conservation category wetland and disturbance will be minimised and managed accordingly.

The total area of clearing required for the pipeline is less than 50 ha of remnant vegetation.

2.4.5 Timetable for implementation

The construction of the project infrastructure will take two years. The planned starting date is late 2007 with operations starting in late 2009. Construction will be carried out during two summer periods (2007/08 and 2008/09) to minimise the impacts associated with trench excavation in periods when the watertable is close to, or at, the ground surface.

3 REGIONAL CONTEXT

The following sections provide a brief overview of the South West Region. More detailed information is included as appropriate in each of the social, economic and environmental review parts of this document (Volume 2).

3.1 SOCIO-ECONOMIC

3.1.1 Population

The population of the South West Region was estimated as 133 387 in June 2003. In the 10 years prior to 2001, the population increased at an average of 2.3% compared to the State average of 1.7% per annum. The population is expected to reach 218 000 by the year 2031 (Medium Scenario Population Projection, Department for Planning and Infrastructure) and reflects a growth rate of 1.7%. The major towns in the region are Bunbury, Busselton, Margaret River, Augusta and Nannup. The population is concentrated in coastal towns with more than 30 000 people living in Bunbury, which is the largest town in the region.

3.1.2 Economy

The main industries in the South West Region are mineral resources development, retail and tourism (Table 1.5). Agriculture currently uses the most groundwater and the South West has been identified as a region with the potential for greater agricultural production. Reliable water supply for irrigation would be required to develop this potential further. The figures below are for the South West Region which includes the City of Bunbury and the shires of Nannup, Augusta–Margaret River, Busselton, Capel, Manjimup, Bridgetown–Greenbushes, Boyup Brook, Dardanup, Donnybrook–Balingup, Collie and Harvey.

Table 1.5 Value of major industries in 2001/02

Industry	Value of Regional Product ($million) for 2001/02
Mining and mineral processing	1430
Retail	1108
Tourism	609
Agriculture	557
Building	433
Timber production	63
Other industries	1668
Total South West	**5868**
% of Gross State Product	**6.6%**

from South West Development Commission 2005.

3.1.3 Land use

Much of the land in the region is forested, particularly on the Blackwood Plateau where the wellfield is proposed. Plantations make up a portion of the forest and the rest is managed for resource protection and nature conservation.

A substantial proportion of the region is used for agricultural purposes. Broad acre livestock production is the major agricultural activity. Other uses include intensive animal production and cropping. Irrigated and seasonal horticulture are also important industries in the area.

3.1.4 Water use

The total licensed groundwater allocation in the region is about 116 GL/yr. Estimated actual use is about 72 GL/yr (Economics Consulting Services 2003 at Appendix 24). The Leederville aquifer is widely used on the Swan Coastal Plain for town water supply, horticulture and industrial use. Most large-scale use of groundwater is from the Yarragadee aquifer. These uses include town water supply, irrigation, mining and industry. The Lesueur Sandstone aquifer is used in the Augusta area for town water supply and more recently, for dairy farm operations.

3.1.5 Aboriginal heritage

Brad Goode Consulting Anthropologists conducted an Aboriginal Cultural Values Survey of the region for the Water and Rivers Commission in August 2003 (Goode 2003 at Appendix 23). They also prepared a report for the Water Corporation outlining the results of a desktop preliminary Aboriginal heritage survey of the proposal area. These reports provide comprehensive summaries of all previous reports, registered sites, and sites that are awaiting registration. They also detailed the significance of water to traditional Nyungah culture.

The *Kaneang* group of Nyungars occupied land north of Bunbury with their far north boundary being Harvey. The *Wadandi* (sea) people occupied land from south of Bunbury to Cape Leeuwin. Native Title and other heritage matters in the area are now overseen by the South West Aboriginal Land and Sea Council (SWALSC).

All the major rivers in the area have mythological significance, predominantly associated with the creative actions of the dream time ancestor known as the "*Waugal*". There are many historical camps and stone tool artefact scatters identified within the region. Burial sites occur along the coast and the only example of Aboriginal rock art recorded in the South West occurs near Lake Jasper.

3.2 ENVIRONMENT

3.2.1 Climate

The climate of the South West is a humid mesothermal (Mediterranean) climate with distinct seasons, characterised by cool, typically wet winters and warm to hot dry summers. Weather patterns are dominated by the west to east movement of high pressure systems across Western Australia, a coastal trough, and the movement of cold frontal systems across the region, particularly in winter.

Average annual rainfall decreases from about 1200 mm in the south to 800 mm in the north. The average rainfall at Jarrahwood is 950 mm/yr (for the period 1975 – 2004) with 134 rain days.

The average annual potential evapotranspiration is slightly less than 1200 mm. The average actual evapotranspiration varies from 700 to 800 mm/yr, increasing from north-east to south-west (Bureau of Meteorology 2001a, b).

Wind roses for Cape Leeuwin (Bureau of Meteorology 2005) show strong summer sea breezes from the south-east and winter westerlies associated with frontal systems.

Climate change

Climatic trends in the South West of Western Australia indicate widespread changes in rainfall and temperature throughout the region. Winter rainfall has decreased since the mid-1970s (average rainfall over the period 1971 – 2003 is about 93% of the longer term average). Day-time and night-time temperatures have increased gradually over the last 50 years, particularly in winter and autumn.

A combination of the enhanced greenhouse effect and natural climate variability has been presented by the Indian Ocean Climate Initiative as the most credible explanation of the climatic changes (IOCI 2002).

The expected trend for the South West of Western Australia is for the decrease in rainfall and cold days, and the increase in evaporation and hot days, to continue into the future. A decrease in rainfall in the South West will affect water supplies as a result of reduced runoff and recharge of groundwater aquifers. The higher temperatures may result in changes in vegetation complexes, which, collectively, will have a direct impact on catchment hydrology. In addition, drier climates and increased moisture stress may exacerbate the effect of other threatening processes such as wildfires.

This Sustainability Evaluation/ERMP has considered the potential impacts of future climate change on water availability, and on sustainability of the proposed development through examination of several possible scenarios. The key issue for consideration is the baseline against which acceptability of potential impacts can be considered, given the uncertainty over the possible extent of climate change and the consequent uncertainty over the changes to the baseline induced by climate change alone. This issue is discussed in detail in Chapter 7 Section 2.

3.2.2 Physiography

The Southern Perth Basin lies between the Darling Scarp and the Leeuwin–Naturaliste Ridge. The main physiographic features of the basin are the Blackwood Plateau, and the Swan and Scott Coastal Plains (Figure 1.14).

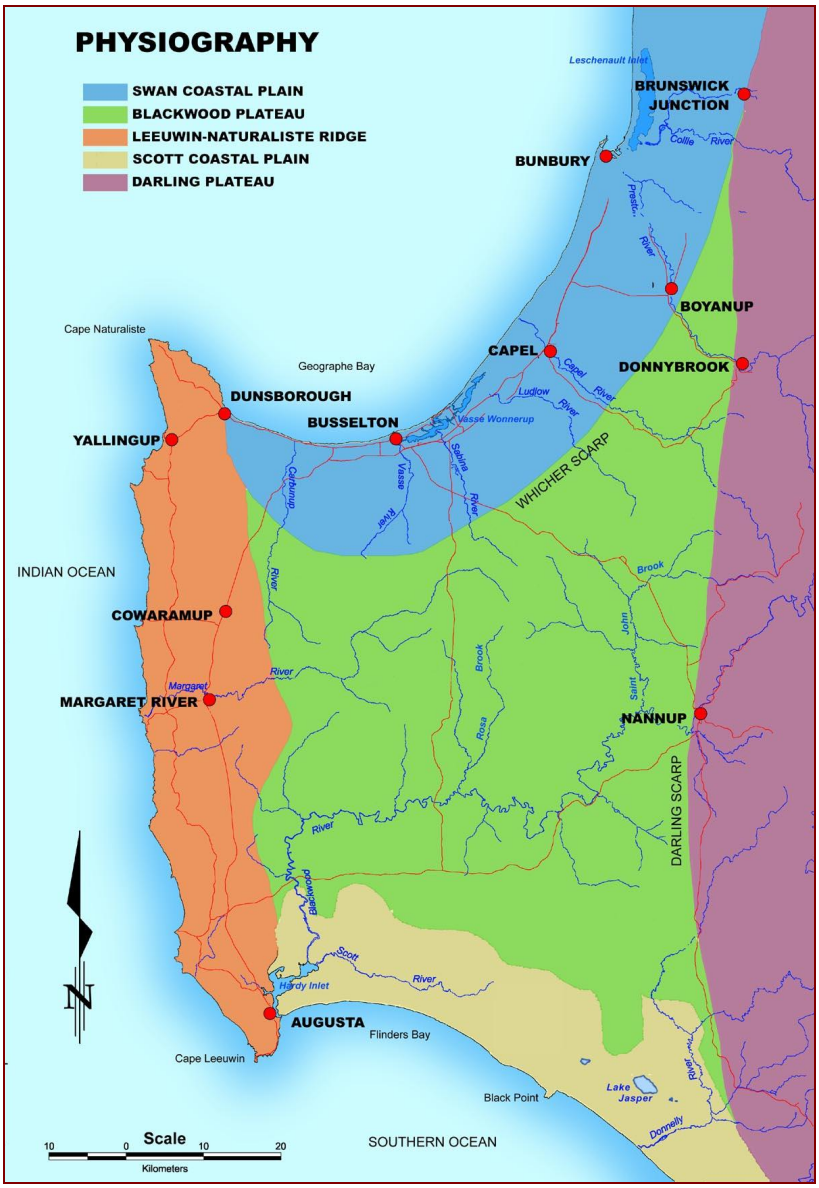
The Blackwood Plateau surface is lateritic and is dissected by deep surface drainage features, notably the Blackwood River, which drains most of the Blackwood Plateau and a large area east of the Darling Scarp. The Margaret River drains from the Blackwood Plateau across the Leeuwin–Naturaliste Ridge. Short, northward flowing rivers drain from the Whicher Scarp across the Swan Coastal Plain into Geographe Bay. Elevations on the Blackwood Plateau vary from 40 to 180 mAHD. Perennial pools occur in low-gradient sections, such as on the Margaret River and St John Brook.

The coastal plains consist of thin sand and clays with thicker sand areas associated with coastal dune systems. The plains reach elevations of 40 mAHD and slope gradually to the coast. Basalt outcrops in the Bunbury area of the Swan Coastal Plain to form a distinct promontory. A similar outcrop of the basalt forms Black Point on the south coast. The western part of the Scott Coastal Plain is drained by the Scott and Blackwood Rivers which run into Hardy Inlet. Sand dunes to 200 m elevation fringe the southern boundary of the Scott Coastal Plain.

The Scott River catchment mainly comprises thin superficial formations overlying the Leederville Formation, Yarragadee Formation or Bunbury Basalt. The eastern part of the Scott Coastal Plain is poorly drained, and is characterised by swamps and permanent freshwater lakes, including Lake Jasper which covers an area of about 4.5 km^2. This area mostly overlies the Yarragadee Formation. Barlee Brook and the Donnelly River drain the eastern part of the Scott Coastal Plain, originating on the Darling Plateau and running across the superficial formations overlying the Leederville Formation.

The Leeuwin–Naturaliste Ridge extends along the western boundary of the study area from Cape Naturaliste to Cape Leeuwin. The surface undulates gently with high coastal dunes and limestone ridges along its western boundary. Elevations along its western margin reach 220 mAHD. The ridge is underlain by granitic basement rocks similar to those of the Darling Plateau.

Figure 1.14 Physiography



3.2.3 Biodiversity

The Southern Perth Basin underlies three main vegetation regions: Swan Coastal Plain, Blackwood Plateau, and Scott Coastal Plain districts. Remnant vegetation in these areas includes:

- fringing and established woodlands on the drainage lines and along creeks and minor gullies
- woodlands, shrub lands, heaths and sedge lands in swamps, wetlands, minor tributary gullies and seasonally inundated areas
- halophytic complexes and woodlands on fringes of estuarine areas
- woodlands and forests within State forests, Reserves and National Parks.

Mattiske (2005 at Appendix 31) described the vegetation of the Blackwood Plateau as diverse, reflecting the variability of soils, soil moisture availability and landform in the area. The flora and vegetation of the Scott Coastal Plain are highly diverse and include a significant range of rare and priority species. The range of species is both restricted to this area and confined to very narrow niches within the local environments.

Vegetation on the southern Swan Coastal Plain has been extensively cleared for agriculture. Remnant areas are commonly significant with ten known threatened ecological communities (TECs). Significant clearing for agriculture has also taken place over large areas of the Scott Coastal Plain.

In a survey of the Blackwood valley systems and the Scott Coastal Plain, Mattiske (2005 at Appendix 31) recorded a total of 616 vascular plant taxon from 68 plant families and 232 genera from 32 transects. This represents approximately one fifth of the total number of taxon known in the southwest of Western Australia. A total of 21 introduced species were recorded, largely smaller annual species.

The diverse range of habitats in the South West provides for a diverse and extensive array of terrestrial faunal species, potentially including 16 frog species, 43 reptile species, 160 bird species and 34 mammals (Bamford 2005).

Aquatic habitats exist throughout the Southern Perth Basin in:

- estuarine systems (Hardy Inlet, Vasse–Wonnerup) that provide habitat for saltwater fish and other vertebrate species and for macro-algal growth
- riverine and riparian habitats (river channels, pools and floodplains) that create and maintain a range of habitats along and within rivers
- a wide range of wetlands within the project area that support many diverse plant species and communities.

The Blackwood River and its tributaries have a relatively diverse freshwater fish community although the macroinvertebrate diversity is generally low. CENRM (2005a) recorded seven native fish species and one introduced species (the mosquitofish, *Gambusia holbrooki*) in a July 2004 survey.

Morgan & Beatty (2005) found that the diversity of fish species in the main stem of the Blackwood River in summer was greater within, and downstream of, the main groundwater discharge area (five freshwater species) than upstream of the discharge (one freshwater species). The tributaries were found to be dominated by endemic freshwater fish species in both summer and winter.

Macroinvertebrate sampling by CENRM (2005a) in July 2004 indicated that the biodiversity of the Blackwood River system was generally low. Most macroinvertebrate groups expected to be present were represented in both the tributaries and the main channel. A total of 67 species were recorded: 56 of these in the main channel, and 47 in the tributaries.

3.2.4 National Parks and Reserves

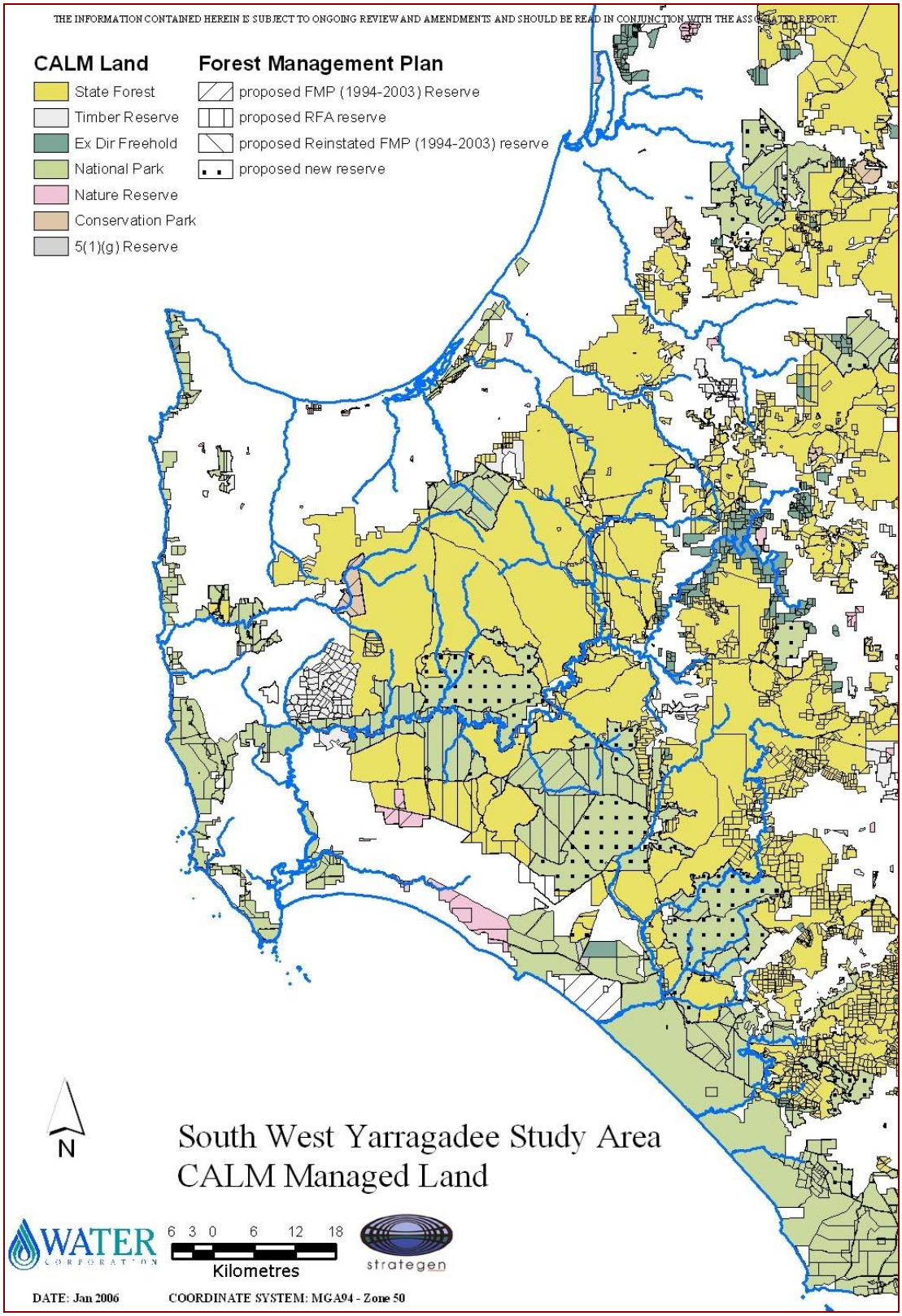
There are several existing and proposed reserves and national parks on the Blackwood Plateau (Figure 1.15). There are no significant reserves or national parks in the Bunbury–Capel region, as most of the area is privately owned. There is however, one conservation reserve immediately north of Capel. The Blackwood Plateau and Scott Coastal Plain reserves include:

- a mosaic of State Forest areas, timber reserves, formal reserves, and proposed conservation areas which cover the Blackwood Plateau (interspersed with private landholdings)
- a range of proposed reserves and parks within the Blackwood Catchment and Milyeannup area
- a mix of agricultural holdings and native vegetation contained within conservation reserves and national parks, including the Scott River National Park and western section of D'Entrecasteaux National Park.

3.2.5 Acid sulphate soils

There are sulphate soils on both the Swan and Scott Coastal Plains. The predicted decline in watertable levels on the coastal plains is small, will occur gradually over a long period of time, and full recovery of coastal plain watertable levels is expected each year. The effects of acid sulphate soils are therefore expected to be minimal, because exposure of the sediments will be limited and only for short periods. The potential for acid discharge as a consequence of the proposal is discussed in detail in Volume 2 Chapter 5 Section 4.14.

Figure 1.15 National Parks and other CALM Act Reserves



Chapter 2 Administrative process for Sustainability Assessment

1 ASSESSMENT PROCESS

The administrative process for sustainability assessment of the South West Yarragadee Water Supply Development involves linking the following statutory and administrative processes (Figure 2.1).

1. Environmental impact assessment by the Western Australian EPA and decision-making by the Minister for the Environment (or Cabinet) on the implementation of the proposal under the EP Act (statutory process). The decision by the Minister would be made after consideration of the EPA assessment report, advice from the Water and Rivers Commission on licensing aspects, and advice from the Sustainability Panel (a combination of statutory and administrative processes).
2. Environmental impact assessment and decision-making by the Commonwealth on whether the action may proceed under the EPBC Act (statutory process).
3. Groundwater licence application assessment by the Water and Rivers Commission under the RWI Act (statutory process).
4. Assessment and advice to Government from the Sustainability Panel (administrative process).

The three primary decision-making authorities in this process are:

1. Minister for the Environment (or Cabinet)
2. Water and Rivers Commission
3. Commonwealth Minister for the Environment.

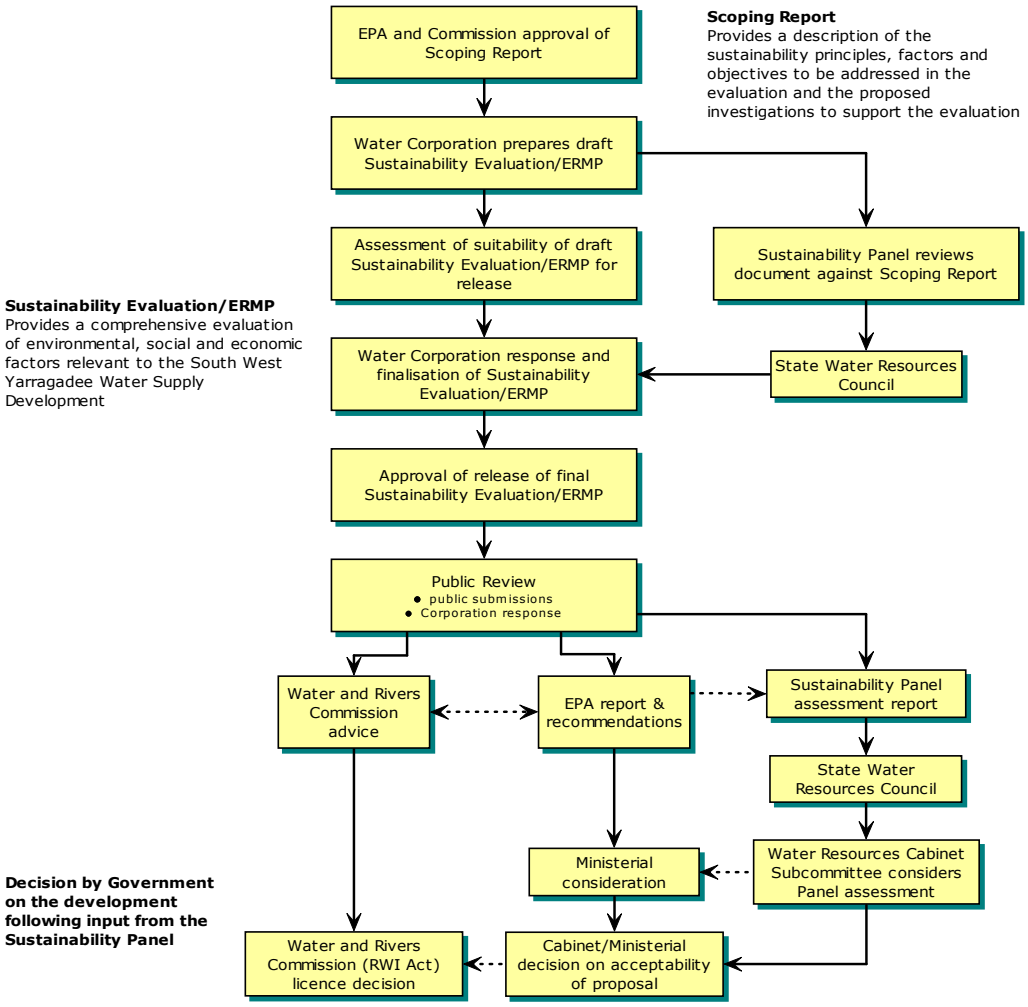
In addition, a "water removal permit" will be required from the Department of Conservation and Land Management (CALM) to allow the proposed activity to be undertaken within the CALM estate.

1.1 EPA ERMP ASSESSMENT PROCEDURE

Under the EP Act, proposals that may have a significant effect on the environment are referred to the EPA for consideration. The EPA then determines whether a proposal shall be assessed, and if it is to be assessed, at what level. The EPA has set an ERMP level of assessment for the South West Yarragadee Water Supply Development. Under the EPA administrative procedures for this level of assessment the proponent was required to prepare:

1. An acceptable scoping report which outlines the environmental factors to be addressed, investigations to be conducted, the methodologies for the conduct of investigations, stakeholder consultation, and a timetable for the assessment process. The Scoping Report was subject to a four week public review.
2. An ERMP document, suitable for public review, which provides a detailed review of potential environmental impacts, and management measures for the relevant environmental factors outlined in the scoping report, for public and government agency review and subsequent assessment by the EPA.

Figure 2.1 Administrative process for sustainability assessment process



The ERMP is intended to provide the EPA, other government agencies and the public with an understanding of the proposal, its potential environmental impacts, and the environmental management measures and commitments required to ensure EPA objectives are met for each relevant environmental factor.

The ERMP (and the Sustainability Evaluation of which it is part) is subject to a 12-week public review period. At the end of this period, issues raised in written submissions from the public and government agencies are collated and transmitted to the Water Corporation (the proponent) by the EPA Service Unit. The proponent may then provide responses to the submissions for consideration by the EPA before it finalises its assessment report. The proponent's responses are conveyed, along with the EPA report (EPA Bulletin), to the Minister for the Environment.

The EPA will assess the ERMP component of the Sustainability Evaluation and if considered environmentally acceptable will provide recommendations to the Minister for the Environment on the implementation of the proposal. Separate and additional to this, recent amendments to the EP Act now allow the EPA, if it sees fit, to include information, advice and recommendations on issues other than the environment in its assessment report. This may be interpreted to provide opportunity for the EPA to consider and provide advice on economic and broader social factors, if it so wishes.

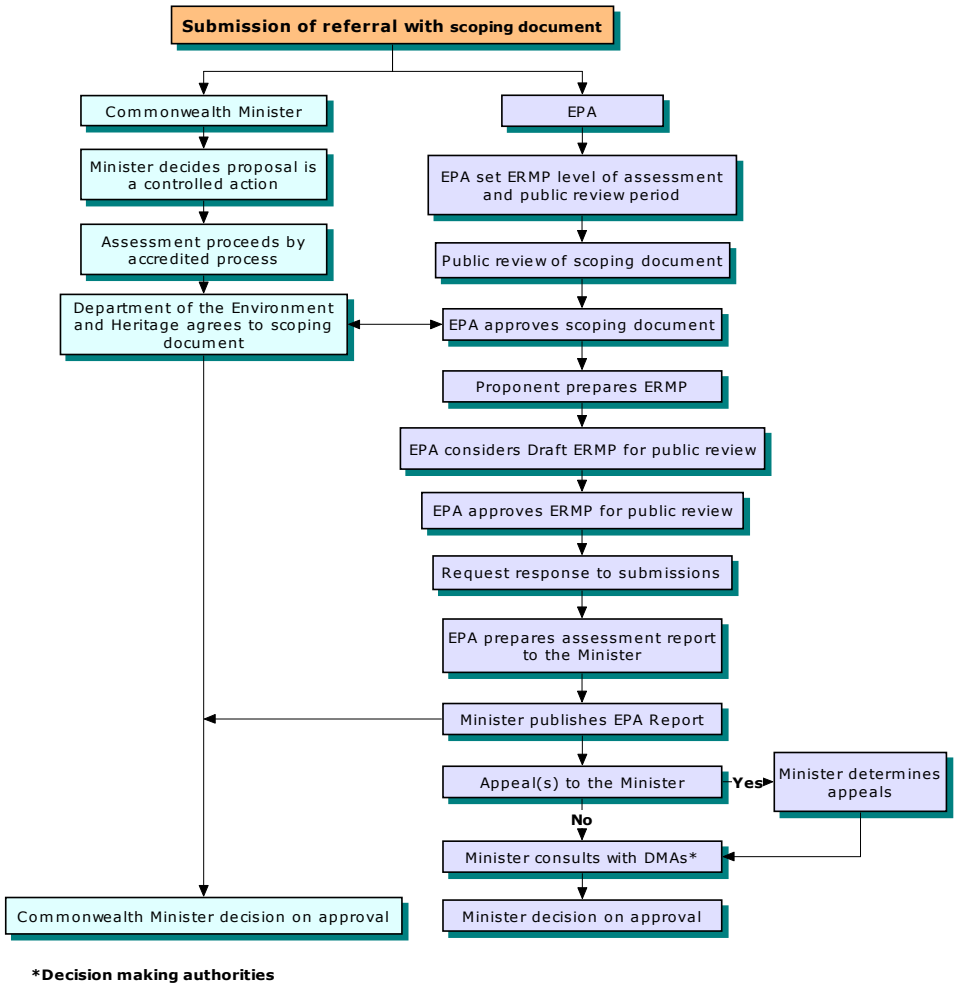
The Minister for the Environment has supported the EPA holding public hearings on the proposal during its assessment. The EPA will also receive advice from the Department of Water/Water and Rivers Commission on water resource management aspects of the proposal before finalising its assessment of the proposal.

1.2 WA MINISTER FOR THE ENVIRONMENT DECISION MAKING UNDER THE EP ACT

The Minister releases the EPA report to the public and any person has the right to appeal, within 14 days, against the content and recommendations of that report. The Minister is required to consult with other relevant Ministers before making any decision on the proposal and the conditions that will be applied to the proposal, if implemented. The Minister for the Environment, in determining whether a proposal should be implemented, is not constrained as to the matters that may be taken into account when making a decision, and may include consideration of the Sustainability Panel's assessment report.

The environmental impact assessment (EIA) and decision-making process for the ERMP under the EP Act is shown in Figure 2.2**.**

Figure 2.2 EP Act and EPBC Act assessment processes



1.3 CALM WATER REMOVAL PERMIT

A water removal permit is required to be issued under the *Conservation and Land Management Act 1984* (CALM Act) by the Executive Director of CALM. The Minister for the Environment, after consultation with the Conservation Commission of Western Australia, will publish a notice in the Government Gazette that a water removal permit is required. The permit will allow water to be extracted from CALM Act lands and will allow associated and necessary infrastructure to be located on those lands. The permit is approved by the Minister for the Environment after consultation with the Conservation Commission.

The CALM Act water removal permit may be issued by the Executive Director of CALM if a management plan under the CALM Act provides for water extraction and its associated infrastructure on the CALM Act lands. The Forest Management Plan 2004 – 2013 provides for such water abstraction.

The water removal permit may be issued if the abstraction and associated infrastructure are not inconsistent with the conservation objectives of the CALM Act. CALM will provide input to the EPA and in turn will be guided by the EPA and the Department of the Environment and Heritage in assessment of any environmental impacts.

The CALM Act water removal permit will represent the required 'interest in the land' under the *Water Agencies (Powers) Act 1984* for 'major works' such as the South West Yarragadee wellfield.

1.4 COMMONWEALTH ASSESSMENT PROCEDURE AND DECISION MAKING

The South West Yarragadee Water Supply Development proposal has been referred to the Commonwealth Minister for the Environment pursuant to the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The proposal has been declared a controlled action under the EPBC Act and consequently requires the approval of the Commonwealth Minister. The process of approval is similar to the rigorous assessment of proposals under the Western Australian EP Act.

The Commonwealth has accredited the Western Australian impact assessment process under the bilateral agreement between the Commonwealth and Western Australian Governments. The Commonwealth assessment process under this accreditation is shown in Figure 2.2.

The Commonwealth Minister for the Environment makes a decision on whether the action may proceed at about the time the Western Australian Minister for the Environment makes a decision on the implementation of the proposal (Figure 2.2).

1.5 SUSTAINABILITY PANEL

A Sustainability Panel has been established under the auspices of the Government's State Water Strategy as an independent body to provide advice to the Government and, as appropriate, to decision-making authorities at various stages of the sustainability assessment process. The Sustainability Panel will report to Government through the State Water Council and Cabinet. The Sustainability Panel provides transparent and independent advice on the proposal and provides a mechanism for integrated evaluation of social, economic and environmental factors.

In preparing its advice, the Panel will assess the Sustainability Evaluation and will consider the public submissions made during the 12-week public comment period, together with the Water Corporation response to those submissions, as well as the EPA report and recommendations. All Sustainability Panel advice is made publicly available.

The Sustainability Panel may advise on all sustainability factors. Such advice is separate and additional to formal State or Commonwealth agency assessment procedures.

1.5.1 Membership of Sustainability Panel

The membership of the Sustainability Panel is:

Barbara Wiese (Chair)	Nicky Cusworth
Professor Peter Newman	David Reid
Dr Geoff Syme	

1.5.2 Terms of reference

The terms of reference for the Sustainability Panel are:

1. Provide advice on whether the Scoping Report was adequate for its purpose. In particular, consistency of the proposed assessment process with the State Sustainability Strategy and comprehensiveness and relevance of the sustainability principles, factors and associated objectives, measures and proposed investigations.
2. Provide advice on whether the Sustainability Evaluation/ERMP has addressed the sustainability principles, factors and associated objectives outlined in the Scoping Report, such that the document can be released for public review.
3. Provide advice on the sustainability of the proposal to Government based on information presented in the Sustainability Evaluation/ERMP, public and Government agency submissions, EPA assessment, Water Corporation response to submissions, and relevant Government policies.
4. Provide advice to Government on the overall sustainability evaluation and assessment processes including the broader strategic context for the proposal.
5. Respond as required to requests for advice on matters relevant to the assessment of the sustainability of the proposal from the Water and Rivers Commission, EPA, Appeals Convenor, Water Taskforce, Minister for the Environment and Government.

1.5.3 Sustainability Panel assessment procedure

The Sustainability Panel provides an assessment report to the State Water Council following the release of the EPA assessment report. This report is made publicly available and is considered by the Water and Rivers Commission, the Minister for the Environment and Cabinet before making a decision on the proposal (Figure 2.1).

1.6 WATER AND RIVERS COMMISSION LICENCE APPLICATION ASSESSMENT PROCEDURE AND DECISION MAKING PROCESS

On 24 September 2002, the Water Corporation applied to the Water and Rivers Commission for a water allocation licence to reserve 45 GL/yr of groundwater from the Yarragadee aquifer for use in the IWSS. In late 2003, the Water Corporation submitted an amended licence application that provided for consideration of alternative wellfield layouts.

The Water and Rivers Commission and the Water Corporation undertook a joint project to investigate the proposal during 2003 and early 2004. A description of the studies undertaken and summarised results have been included in the Scoping Report (Strategen 2005a at Appendix 1). The information from the technical aspects of the program was summarised into a Water Study Report (Strategen 2004 at Appendix 10). The Water and Rivers Commission assessed this information and concluded that further work was required to demonstrate the extent and manageability of impacts in local areas of potential risk.

This Sustainability Evaluation/ERMP is the primary means of providing the requested information to the Water and Rivers Commission.

The Water and Rivers Commission is required, in assessing licence applications under the RWI Act, to consider a range of matters that include public interest; ecological sustainability; and environmental acceptability. The scope of these considerations is usually limited to the sustainability of the groundwater abstraction and use, which may include economic, social and environmental impacts as contained in the Water and Rivers Commission letter outlining its information requirements (Appendix 2).

The Water and Rivers Commission will make an assessment of the licence application and the supporting Sustainability Evaluation/ERMP following consideration of the Sustainability Panel assessment of the evaluation, public submissions and proponent response to submissions. It is understood that the assessment of the licence application will be made public, in terms of outlining the proposed decision and its justification.

The Water and Rivers Commission will then make a decision on the licence application. Further information that may be taken into account is the EPA assessment report, Sustainability Panel assessment report and the Ministerial decision. If the Minister determines that the proposal cannot be implemented, or imposes conditions such that the proponent decides that the proposal cannot be implemented, the Water and Rivers Commission would not issue a licence.

The Water and Rivers Commission is required to notify the Water Corporation of its licensing decision, which the Water Corporation may appeal if aggrieved by any aspect of the decision.

1.7 PEER REVIEW

Peer review of the hydrogeological aspects of the project and drawdown impacts of the proposal was undertaken by a panel of independent expert hydrogeologists. The panel reviewed the conceptual groundwater model, the numerical computer model and the modelling results and provided a report on their review (Peer Review Panel 2005 at Appendix 20). The panel comprised:

- Paul Whincup (Chair)
- Phil Wharton
- Richard Martin

1.8 SUSTAINABILITY EVALUATION TEAM

This Sustainability Evaluation/ERMP is based on a consolidation of the results of a range of specialist studies carried out by a team including Strategen, Economics Consulting Services, Synnott Mulholland Management Services Pty Ltd and a range of other specialist consultants (Table 2.1).

Table 2.1 Sustainability Evaluation team

Team member	Role	Responsibilities
Strategen	Lead consultant Environmental impact assessment	Strategic project advice, report preparation, sustainability evaluation, water resource management and review, environmental review and management
Water Corporation	Groundwater modelling	Determination of groundwater drawdown
Economics Consulting Services	Economic consultant	Future water demand analysis, economic impact assessment
Synnott Mulholland Management Services Pty Ltd	Social impact and consultation consultant	Consultation process, social impact assessment
Centre of Excellence for Natural Resource Management	Ecological consultant	Assessment of impacts on aquatic ecology
Cymod Systems Pty Ltd	Groundwater modelling	Sensitivity analysis of groundwater model
Froend, Bowen and Associates	Ecological consultant	Assessment of susceptibility of various vegetation units to changes in groundwater levels
Integral Sustainability	Sustainability review	Sustainability evaluation methodology
M.J. & A.R. Bamford	Ecological consultant	Assessment of impacts on terrestrial fauna
Mattiske Consulting Pty Ltd	Botanical consultant	Vegetation surveys, changes and susceptibilities within risk areas
Nield Consulting Pty Ltd	Modelling review	Advice on groundwater modelling approach and methodology
Rockwater Pty Ltd	Hydrogeological consultant	Hydrogeology investigation of the eastern Scott Coastal Plain
Social Science Research & Environmental Planning	Social impact review	Social impact assessment methodology
URS Australia	Hydrogeological consultant	Hydrogeology investigation of the Reedia wetlands, St John Brook, Blackwood River and tributaries.

Chapter 3 Sustainability Evaluation approach and methodology

1. INTRODUCTION

1.1 SUSTAINABILITY CONCEPT

The concept of sustainability gained prominence in 1987 with the World Commission on Environment and Development (1987) report Our Common Future (the Brundtland Report) which defined ecologically sustainable development as meeting the needs of the present without compromising the ability of the future generations to meet their own needs.

Sustainable development has become an integral part of global business and economics. Globalisation has resulted in companies with international interests adopting "best practice" throughout their operations rather than following the standard practice of each country they operate in. These international standards are highly visible in the resource sector where major resource companies have been undertaking sustainable development projects which aim to leave communities better off in the long-term, with sustainable industries that continue after mining has finished.

This is an important concept of sustainability. Companies are aiming for long-term social and environmental benefits from their projects as well as the economic gains that drive the project.

1.2 INTERNATIONAL EXPERIENCE IN SUSTAINABILITY ASSESSMENT OF MAJOR PROJECTS

A recent review of international experiences in sustainability assessment has revealed a rapidly evolving practice around the world. A vast number of tools and techniques have been developed to promote integrated consideration of sustainability. Many of these tools have been developed by individual organisations (particularly corporations, development banks and programs of the United Nations) to guide their own decision-making processes (internal assessment). There remain however, very few international examples of sustainability assessment processes by government agencies (external assessment) that have a statutory basis, or which are applied in a project approvals context (Dalal-Clayton & Sadler 2005).

Although there are few international examples of formal sustainability assessment processes applied in a project approvals context, there is increasing evidence that sustainability assessment approaches are gradually and organically evolving from statutory EIA practices. This is the case in jurisdictions including South Africa, Hong Kong and Canada. The evolution from EIA to sustainability assessment is often driven by proponents in response to corporate commitments, community expectations, financiers' requirements and perceived and actual planning and policy vacuums. It may involve broadening the scope of assessments to embrace social and economic as well as environmental elements; touching upon more strategic aspects of decision-making, including the policy context in which the assessment is conducted; and/or a shift towards seeking positive impacts as well as minimising negative ones (Theo Hacking, Cambridge University, *pers comm.* Sept. 2005).

1.2.1 UK experience

One of the best-developed and codified international applications is the process of sustainability appraisal in the United Kingdom (UK), where current practices have evolved over the past 15 years. Environmental appraisal of local and regional development plans and strategic environmental assessment (SEA) of sector plans have been replaced by voluntary sustainability appraisals of a range of activities of local authorities. More recently, statutory processes have been put in place in response to the European Union SEA Directive of 2004 and recent legislative changes to the UK planning system. For the first time, both SEA and sustainability appraisals are statutory requirements for local authority development plans (Dalal-Clayton & Sadler 2005).

However, sustainability appraisal in the UK is not applied to project proposals, which are subject to EIA in accordance with the requirements of the relevant local authorities (Janine Barrow, Sinclair Knight Merz, *pers comm.* Sept. 2005) and as such are difficult to apply to the South West Yarragadee Water Supply Development project proposal.

1.2.2 Canadian experience

The international example of external sustainability assessment that is closest to the Western Australian approach comes from Canada. *The Canadian Environmental Assessment Act 1992* at the federal level, supplemented by relevant provincial legislation, provides the basis for project impact assessment in Canada. It allows for four different levels of assessment: screening; comprehensive review, mediation and Review Panel. The Canadian legislation is sufficiently broad that assessments are not limited to environmental concerns, but can address broader sustainability issues, and this is particularly the case with the highest level of assessment, the Review Panel.

Review Panels (or Joint Review Panels across the federal and provincial jurisdictions) are appointed by the Minister for the Environment for project proposals that are likely to have significant adverse environmental impacts and/or which are likely to be controversial or sensitive. The Panels, together with responsible authorities (federal or provincial government agencies or bodies that have some involvement with the proposal) are responsible for scoping the project. The Panel issues guidelines to the project proponent for the preparation of an Environmental Impact Statement (EIS). Following submission of the EIS by the proponent, the Panel reviews its sufficiency for the purposes of hearings, holds public hearings, and then produces an environmental assessment review report for the Minister for the Environment and any responsible authorities that must take it into consideration when making their decisions.

The Review Panel is also responsible for coordinating what is the differentiating feature of this level of assessment: a series of public meetings and hearings. According to the Canadian Environmental Assessment Agency (2003):

> *"Review panels have the unique capacity to encourage an open discussion and exchange of views. They also inform and involve large numbers of interested groups and members of the public by allowing individuals to present evidence, concerns and recommendations at public hearings. A panel allows the proponent to present the project to the public and explain the projected environmental effects, and provides opportunities for the public to hear the views of government experts about the project."*

Review Panel assessments are increasingly incorporating broad sustainability considerations into the Canadian project approvals process. This commenced with the Voisey's Bay Mine and Mill Project in 1997/98 and has been further developed in the current assessment of the Whites Point Quarry Project, the scoping document for which was released in March 2005, and which includes a broad range of qualitative and quantitative sustainability issues (Robert Gibson, University of Waterloo, Ontario, Canada, *pers. comm.* Sept 2005). The review panel process is also currently being applied to a public project, Hydro-Québec's proposed Romaine hydroelectric complex (Hydro-Québec's sole share-holder is the Government of Québec), although this assessment is too narrow to qualify as sustainability assessment.

The South West Yarragadee sustainability assessment has much in common with the Canadian Review Panel process:

- it is conducted sufficiently early in the process so that the assessment can lead to revisions to the proposal to improve overall outcomes
- positive overall outcomes are sought
- there is extensive community engagement in a deliberative context
- the Review Panel provides advice to the various responsible authorities (in this case the EPA and Water and Rivers Commission) as well as the Minister for the Environment.

The main differences are that:

- a Canadian Review Panel is appointed by the Minister for the Environment and has statutory powers and responsibilities, in contrast with the less formal South West Yarragadee Sustainability Panel
- in the Canadian system it is the Review Panel, rather than the proponent, that is responsible for conducting the public meetings and hearings
- the Canadian Review Panel also has some responsibility for the scoping process, rather than simply playing an advisory role (although noting that scoping commences during the government drafting of the terms of reference for the panel)
- the relationships between the Review Panel and the relevant responsible authorities are clearly articulated in the Canadian system, in contrast to the somewhat ambiguous arrangements in Western Australia.

Another important characteristic of the Canadian system is that although sustainability assessments of projects have been conducted in Canada since the late 1990s (Voisey's Bay is generally considered the first real example) there are no formal guidelines for acceptability limits, offsets and the management of trade-offs.

Canadian practice is still evolving slowly as experience is gained, as it is in Western Australia. Given the similarities between Canadian and Australian systems of government and economic structure, there is much the jurisdictions can share and learn from each other.

1.2.3 Key features of the South West Yarragadee Water Supply Development evaluation process

The key features of the South West Yarragadee sustainability evaluation process are:

1. The establishment of the Sustainability Panel to provide feedback throughout the process and to provide integrated, holistic advice on the sustainability implications of the final proposal to Cabinet.
2. The emphasis on internal sustainability assessment. That is, sustainability assessment conducted by the proponent as a tool to develop the best and most sustainable proposal possible, ahead of the external assessment by regulators (EPA and the Water and Rivers Commission) and others. As a result of this proactive approach, sustainability assessment has played a significant part in shaping this proposal and aligning it with sustainability objectives and community expectations. Furthermore, incorporating sustainability assessment into the process of developing and refining the proposal facilitates the integration of environmental, social and economic considerations, since the proposal can (and has been in this case) iteratively modified in response to identified tensions between competing objectives, resulting in better outcomes in all areas.
3. The extensive community engagement throughout the internal sustainability assessment process, and the opportunities provided for community members to articulate their hopes for the future and express their concerns about the proposal with respect to these hopes. The application by the proponent of internal sustainability assessment to guide the development and refinement of the proposal itself has meant that community views expressed during the process have significantly shaped the development of the final proposal.

1.3 RELEVANT KEY SUSTAINABILITY POLICIES

1.3.1 State Sustainability Strategy

The "Keating Review" (Government of Western Australia 2002) recognised the need for explicit processes to consider environmental, social and economic aspects, and recommended that the Government should consider the overall impact of major projects within a sustainability context. The Review recommended that proponents should prepare sustainability statements to address the environmental, social and economic aspects of those projects. The Sustainability Strategy acknowledged this and responded with a commitment to the initiation and trialling of sustainability assessment as "an integrated and holistic approach to decision-making to create "net benefit" outcomes."

A key aspect of the sustainability evaluation framework proposed by the Sustainability Strategy is a shift away from the approach that tends to be taken within "impact assessments" where the focus is on the negative aspects of impacts and on justifying and minimising them. Sustainability assessment is intended to focus on positive objectives and the means of creating net environmental social and economic benefits such as:

- improving biodiversity and ecological integrity
- building life support systems
- providing conservation benefit and net socio-economic benefit
- ensuring there are acceptable levels of risk with adaptive processes for the worst scenarios.

While the sustainability evaluation process is a new concept in many respects, this evaluation is intended to build on established processes, principles and lessons learnt from previous work. This process is intended to assist the Minister for the Environment, the Government, the Water and Rivers Commission and the EPA in the implementation of their legislative roles in accordance with the State Sustainability Strategy.

1.3.2 EPA Environmental Offsets Position Statement No. 9 (preliminary version 2)

The EPA has recently amended Version 1 of its Position Statement on Environmental Offsets and issued Version 2 of the paper for a second round of comment. This paper sets out the application of offsets as a "last line of defence" for the environment where other mitigation options to avoid, minimise, rectify or reduce significant adverse impacts are not possible. The aspirational goal for the application of offsets is to have no net environmental loss, or to gain a net environmental benefit, in these situations.

Offsets may be applied following the application of the mitigation hierarchy, which requires consideration be given sequentially to avoid, minimise, rectify and reduce impacts of the proposal.

In addition, the offset policy nominates critical environmental assets that must be fully protected. The EPA would presumably not recommend an approval for proposals that are likely to have a significant adverse effect on a critical asset. The EPA would consider it inappropriate to validate or endorse the use of environmental offsets in these situations except under special circumstances.

Special circumstances provide for those instances where the State Government approves significant adverse impacts to provide an essential community service (such as electricity, water, gas or transportation infrastructure).

This paper, in effect, provides:

- an indication of environmental bottom lines
- the concept of mitigation to be applied where adverse impacts are likely
- offset principles
- the aspirational goal of no net environmental loss, and (where achievable) net environmental gain or benefit.

The approach to internal sustainability assessment taken in this evaluation applied these concepts to considerations of environmental impact and to the social and economic impacts.

2 SUSTAINABILITY ASSESSMENT APPROACH

2.1 OVERVIEW

The sustainability evaluation process involves both internal assessment by the proponent in conjunction with the sustainability team, and presentation of information for external sustainability assessments by Government agencies and the Sustainability Panel.

The external process of assessment of this evaluation involves:

- assessment by the EPA to determine environmental acceptability as a prerequisite for the proposal to be considered sustainable
- assessment by the Water and Rivers Commission of the sustainability of abstraction of groundwater under the proposal
- Sustainability Panel assessment of the overall sustainability of the proposal.

The above assessments are provided to Government to make a decision on whether the proposal should be implemented, and to the Water and Rivers Commission to decide whether a licence for the abstraction should be issued.

The overall sustainability assessment approach adopted in this evaluation, to address both internal and external assessment, involved a number of stages:

1. Scoping process where:
   - relevant principles, factors and associated objectives were identified for the proposal
   - information requirements to enable assessment were established
   - consultation processes were developed and implemented.
2. Information gathering and progressive definition of the proposal.
3. Identification of potential impacts (positive and negative).
4. Mitigation of negative impacts and enhancement of benefits.
5. Evaluation of impacts against objectives for key factors.
6. Aggregation or integration of key factors outcomes to the sustainability principle and account levels.
7. Cross check of outcomes against recognised external generic sustainability criteria.

2.1.1 Integration

Integration was achieved throughout the development of the proposal and the sustainability evaluation of the final proposal by:

- assessment of impacts against each sustainability principle
- identification of relationships or linkages between key sustainability factors and their impacts
- consideration and assessment of mitigation options concurrently against key environmental, social and economic factor objectives

- seeking mitigation with win-win outcomes, or minimising conflicts and trade-offs between as many factors as possible.

2.2 SCOPING PROCESS – IDENTIFICATION OF SUSTAINABILITY PRINCIPLES AND FACTORS

A set of thirteen sustainability principles were developed for this project. The principles provide the broad framework for the Sustainability Evaluation/ERMP and were developed through a consultative scoping process that included consideration of the following:

- the Foundation and Process Principles of the State Sustainability Strategy
- Water and Rivers Commission information requirements
- outputs from the extensive consultation and issues scoping by the Water and Rivers Commission
- specialist social value, economic value, Aboriginal heritage and ecological water requirement studies by the Water and Rivers Commission during 2003 and 2004.
- a preliminary environmental risk assessment based on an identification of the environmental aspects of the proposal that may potentially have a significant effect on the environment
- public and stakeholder review of a draft Scoping Report
- comment received from the Sustainability Panel on the Scoping Report
- outcomes of the community consultation program.

The sustainability principles reflect the core values of society that may influence the development of the proposal, or may be affected by the proposal. The principles have been classified for convenience into environmental, socio-economic, strategic and process groupings.

Key sustainability factors are the elements of the principles that are relevant to the proposal and its potential impacts. For each key factor, project-specific sustainability objectives (analogous to "criteria" in the State Sustainability Strategy) were defined. The objectives define a sustainable outcome for each key factor in relation to the project.

2.2.1 Sustainability principles and factors

The thirteen principles and associated key sustainability factors determined for the proposal through the scoping phase are presented in Table 3.1. Table 3.2 presents the details of each of the sustainability factors, their objectives, potential impacts and investigations undertaken to allow them to be addressed.

The information in Table 3.1 and Table 3.2 is taken directly from the Scoping Report (Strategen 2005a at Appendix 1) as approved by the EPA and Water and Rivers Commission.

Table 3.1 Sustainability principles and factors relevant to the evaluation

Number and topic	Principle	Key factors
Environmental		
1. Biodiversity and ecological integrity	The proposal will result in a net increase in ecological function or biological diversity in the region	Flora and fauna Priority and Rare Flora Threatened Fauna Threatened ecological communities Blackwood River and tributaries Wetlands Other groundwater dependent ecosystems Development footprint (from infrastructure)
2. Energy efficiency	The proposal will be designed and operated at a level which is best practice in Australia	Greenhouse gas emissions
Socio-economic		
3. Long-term economic health	The proposal will assist current and future economic growth, generate government revenue, business development and investment opportunities within IWSS and South West Region	Economic growth Economic efficiency Economic diversity Business development
4. Public water supply for existing and future generations	The Water Corporation in conjunction with other water supply authorities, will supply water of appropriate quality to meet existing and future public demand in the IWSS and South West Region.	Water use efficiency Quality of supply Existing and future needs South West town supplies Drinking water source protection
5. Regional needs	The proposal will be developed such that reasonable regional needs for water, including social, recreational and projected future development needs are not compromised by the proposal.	Regional needs for private water supplies Current key water users
6. Community well being and heritage	The proposal will maintain or improve the quality of life for the Western Australian community.	Lifestyle, amenity and recreational use and access Direct and indirect job generation Sense of place Indigenous communities Development footprint
Strategic		
7. Government policy	The proposal will facilitate the implementation of relevant government policies in a local, regional and State context.	Equitable access to water Government plans Regional development
8. Climate change	The current low rainfall period and possibility of future climate change should be taken into account in decision-making about the development of the Yarragadee aquifer as a water source.	Climate change
9. International and national competitiveness of water users	The proposal will facilitate the competitiveness of local and regional industries in the national and international context.	Cost of water
10. Improved knowledge and skills	The proposal will enhance the knowledge of the resource to enable optimal use of the resource by self suppliers.	Environmental risk Supply security

Number and topic	Principle	Key factors
Process		
11. Precautionary principle	Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, decisions should be guided by • a careful evaluation to avoid, where practicable, serious or irreversible damage to the environment • an assessment of the risk-weighted consequences of the options This definition from the EP Act 1986 (amended 2004).	Precautionary approach which includes – Risk management – Further knowledge – Environmental monitoring – Adaptive management – Precautionary project design – Contingency planning – Future legacy
12. Stakeholder engagement	The Water Corporation will seek the participation and views of stakeholders and take them into account in the development, construction and operation of the proposal.	Comprehensive and regular communication Relevant, balanced and inclusive consultation Openness and transparency Closed loop process (listen and respond)
13. Accountability	The Water Corporation will report publicly on its sustainability performance and provide public access to information on the proposal.	Define performance targets Report on achievement of performance targets

Table 3.2 Sustainability principles, factors, objectives, potential impacts and investigations undertaken

Factor	Objective	Description	Potential impact (+ve/-ve)	Supporting investigations
ENVIRONMENTAL PRINCIPLE – Biodiversity and ecological integrity				
Flora and fauna	The Water Corporation will seek to achieve a net increase in flora and fauna in the region At a minimum, the proposal will have no adverse impact on flora and fauna in the region	Much of the area overlain by the Yarragadee aquifer is State forest, National Park, other conservation reserve, all of which have a management requirement to protect flora and fauna	Draw down of the watertable may occur in areas of groundwater dependent ecosystems potentially leading to changes in these ecosystems	Determine potential drawdown in vulnerable areas Identify significant ecosystems, vegetation and fauna habitat in these areas and susceptibility to changes in groundwater level
Rare and Priority Flora (groundwater dependent)	The Water Corporation will seek to achieve a net increase in priority and rare flora in the region At a minimum, the proposal will have no adverse impact on priority and rare flora in the region	There are 223 rare and priority flora species in the region. 79 taxa have been identified as highly dependent on the maintenance of soil moisture levels.	Potential for drawdown in areas where rare and priority plants are located	Determine the risk of drawdown in vulnerable areas Assess the presence of species dependent on groundwater in vulnerable areas and susceptibility to changes in groundwater level Search CALM database for locations of rare and priority flora in vulnerable areas
Threatened Fauna	The Water Corporation will seek to achieve a net increase in the viability of threatened fauna populations in the region At a minimum, the proposal will have no adverse impact on the distribution and viability of threatened fauna populations in the region	Species that are of conservation significance in the region (excluding estuaries) include 4 freshwater fish, 4 frogs, 4 reptiles, 6 birds and a high proportion of mammals. In addition there are 7 bird species that are listed as vulnerable or endangered.	Potential to affect groundwater discharge to streams and vegetation that may be important habitat for fauna.	Identify significant habitats and species in vulnerable areas and susceptibility to changes in groundwater level Determine the extent of any effect the discharge of groundwater to stream has on significant fauna habitat
Threatened ecological communities (TECs – groundwater dependent)	The Water Corporation will seek to achieve a net increase in the viability of threatened ecological communities in the region At a minimum, the proposal will have no adverse impact on the distribution and viability of threatened ecological communities in the region	There are 17 threatened ecological communities in the region.	Potential for drawdown in areas where TECs are located	Identify the location of groundwater dependent TEC communities and susceptibility to changes in groundwater level Determine areas likely to be at risk from drawdown

Factor	Objective	Description	Potential impact (+ve/-ve)	Supporting investigations
Blackwood river and its tributaries	The Water Corporation will seek to increase the ecological integrity of the Blackwood River and its tributaries. At a minimum, the proposal will have no significant adverse impact on the Blackwood River and its tributaries	The Yarragadee aquifer is estimated to discharge between 20 and 40 GL/yr of freshwater to the Blackwood River and its tributaries. This supports the river flow in summer and is a source of fresh water in the brackish river. The tributaries are also a source of freshwater to the Blackwood River.	Lowering of pressure in the Yarragadee aquifer could affect groundwater discharge to streams	Determine the extent of any changes to groundwater discharges to the Blackwood River and tributaries Estimate the effect changes in groundwater discharge would have on summer water levels and salinity levels of the river. Identify ecological values of tributaries that may be affected by diversions or changes to groundwater discharge.
Wetlands	The Water Corporation will seek to increase the ecological integrity of wetlands in the region. At a minimum, the proposal will have no significant adverse impact on wetlands	There is a wide range of wetlands within the region. These include a Ramsar wetland, areas that are listed on the Directory of Important Wetlands in Australia, wetlands with endemic flora species and TECs, and wetlands with special value identified by WRC.	Draw down of the watertable may occur in areas of wetlands potentially leading to changes in wetland ecosystems	Identify wetlands in vulnerable areas and their significance. Identify susceptibility to change in groundwater levels Determine potential drawdown in these areas
Other Groundwater Dependent Ecosystems (GDEs)	The Water Corporation will seek to increase the ecological integrity of other groundwater dependent ecosystems in the region. At a minimum, the proposal will have no significant adverse impact on other groundwater dependent ecosystems	Other GDEs include aquifer and cave ecosystems, estuarine and near-shore marine systems, aquatic vegetation and fauna, and terrestrial vegetation and fauna (based on phreatophytic vegetation).	Draw down of the watertable may occur in areas of other GDEs potentially leading to changes in these ecosystems	Determine potential drawdown in vulnerable areas Identify significant ecosystems, vegetation and fauna habitat in these areas and susceptibility to changes in groundwater level
Development footprint	The construction of the proposal will cause minimal permanent disturbance	The proposal includes a wellfield on the Blackwood Plateau near Jarrahwood, a micro filtration based treatment plant to the north of the source works and transfer mains to transport water to the Stirling Trunk Main.	Clearing and ground disturbance associated with the implementation of the proposal Accidental fire and weed or dieback spread during construction	Identification of significant vegetation and fauna habitat in potentially affected areas Search CALM database for locations of rare and priority flora in potentially affected areas Dieback assessment in potentially affected areas Geotechnical assessment
ENVIRONMENTAL PRINCIPLE – Energy efficiency				
Greenhouse gas emissions	The proposal will be designed and operated according to Australia best practice regarding greenhouse gas emissions	Greenhouse gas emissions can contribute to climate change.	Use of electricity to pump water will indirectly result in an increase in greenhouse gas emissions Additional source of water will diversify supply options and decrease future reliance on additional desalination projects.	Calculate greenhouse gas emissions Assess design options to minimise use of energy Assess fuel switching to minimise green house gas emissions

Factor	Objective	Description	Potential impact (+ve/-ve)	Supporting investigations
SOCIO-ECONOMIC PRINCIPLE – Long-term Economic health				
Economic growth	The proposal will facilitate economic growth in the IWSS and South West regions.	Reliable water supply is an important requirement for economic growth in Western Australia.	The building and maintenance of the infrastructure will increase economic activity in the region. The water supply will support development in the IWSS and South West	Investigate the value of the proposal to the state and regional economy
Economic efficiency	The proposal will provide the most cost effective water supply source for the State.	Economic (allocative) efficiency relates to maximising the economic output by selection of the most efficient water supply option.	Maximum (value added by) return for water used	Compare realistic water supply options for cost and public benefit
Economic diversity	The proposal will enhance economic diversity in the IWSS and South West	Many industries rely on a secure, competitively priced supply of water for growth and development.	Water supply will support a diversifying economy	Assess the potential business developments that could be facilitated by the source development (supply of services, developments facilitated by having infrastructure to deliver the water). Assess potential benefits on similar basis for supply into the IWSS
Business and industry development	The proposal will provide opportunities for increased business activity	Water is an essential resource for many businesses and industries. Supply availability, quality and security may all be relevant to some investment decisions.	Increased water supply security will increase investment confidence for water dependent business and industry. Likely to increase the range of employment for the South West and Perth populations. New business or industries not supplied by the Water Corporation could have their supply security impacted if there is competition for water resources in the future.	Identify water dependent industries Identify impact of proposal on water dependent industries Discussion with key industries on potential impacts (including small business) Explore possibilities for industry to tender for works Evaluate job creation in region and IWSS
SOCIO-ECONOMIC PRINCIPLE – Public Water Supply				
Water use efficiency	The Water Corporation will encourage the efficient usage of water.	The State Water Strategy requires efficiency targets as a condition of water allocation licences. The Water Corporation has implemented several measures to encourage the efficient use of water including: • Rebate Scheme for water efficient items and practices • Higher prices for high water consumers • Education program	Greater awareness in the community of the value of water in Western Australia. Reduction in per capita water usage.	Ongoing monitoring of water use to determine the effectiveness of recently implemented water efficiency strategies.

Factor	Objective	Description	Potential impact (+ve/-ve)	Supporting investigations
Quality of supply	To supply high quality water to consumers	The Water Corporation uses National Health and Medical Research Council Guidelines based on the requirements of the World Health Organisation. The Yarragadee is a high quality water resource that will be treated appropriately for use as a potable supply.	High water quality for IWSS water consumers	Ongoing monitoring of water quality Design of treatment plant Public Water Supply protection areas
Existing and future needs	The proposal will contribute to meeting the existing and forecasted demand for public water supply in the IWSS and the South West under a range of possible future climate scenarios. Water will be available to meet reasonable regional public water supply needs.	The Corporation will take into account • forecasted demand • current demand • need for supply security; and • the State Water Strategy. The State Water Strategy requires that all reasonable regional needs for water, including social, recreational, projected future development and environmental water provisions will be satisfied before transfers can take place.	The proposal will increase supply security in the IWSS and the South West There is potential for competition between the Water Corporation proposal and other existing or future users.	Forecasting of potential demand for water in the SW Investigate the cumulative impacts of the forecasted demand + Water Corporation proposal. If the cumulative impacts are unacceptable, the elements of potential demand that form reasonable regional needs and their sustainability will be investigated. Monitoring of IWSS source capability against current demand and predicted growth
South West town supplies	This proposal will increase supply security for South West towns	The development of the Yarragadee resource will allow this source to be considered in water source planning for South West towns	The infrastructure would allow the Yarragadee aquifer to be considered as a future public water supply option for South West towns	Evaluate water supply security for all South West towns
Drinking water source protection	The Water Corporation will work with the Water and Rivers Commission, Conservation Commission and CALM to protect recharge areas.	The Yarragadee aquifer is recharged directly by rainfall where it outcrops and by downward leakage via the Leederville aquifer and superficial aquifer.	The abstraction would have no direct impact on recharge areas. The proposal may include measures that increase the protection of recharge areas.	Identify major recharge areas in the South West Outline process for the development of protection plans
SOCIO-ECONOMIC PRINCIPLE – Regional needs				
Regional needs for private water supplies	The proposal will be developed such that reasonable regional needs for water, including social, recreational and projected future development needs are not compromised by the proposal.	The State Water Strategy requires that all reasonable regional needs for water, including social, recreational, projected future development and environmental water provisions will be satisfied before transfers can take place.	There is potential for groundwater abstraction to affect yields for other users	Identify future regional water demands. Consider cumulative effects of reasonable regional needs and the proposal.

Factor	Objective	Description	Potential impact (+ve/-ve)	Supporting investigations
Impact on current key water users	Water Corporation will seek to understand and articulate the impact of the proposal on current key water users, to ensure that existing water users are recognised and protected from unreasonable impact.	The requirements of the RWI Act are that existing water users are recognised and protected from unreasonable impact.	Aquifer drawdowns have the potential to lower yields in existing bores.	The potential for yields in existing bores to be impacted by the proposal will be investigated.
SOCIO-ECONOMIC PRINCIPLE – Community well being and heritage				
Lifestyle, amenity and recreational use and access	Water Corporation will determine, through community consultation, whether community members anticipate changes to lifestyle, amenity, or recreational use and access as a result of the proposal, to ensure that negative impacts do not occur from this project and to explore potential positive outcomes.	Walking trails, fishing or picnic spots, scenic drives and so on all contribute to the lifestyle and amenity of the South West.	Physical impacts of the proposal on the environment may in turn impact lifestyle, amenity or recreation.	Identify general lifestyle aspirations Community values Consultation with the community to determine both what contributes to lifestyle, amenity and recreation and whether aspects of these are expected to be threatened by the proposal.
Direct and indirect job creation	The proposal will create employment opportunities	The project would create employment directly in the building and maintenance of the infrastructure. Reliable water supply would also stimulate economic growth and industry with indirect benefits for employment.	Job creation both in the South West and the IWSS regions	Identify the economic growth expected from this proposal and predict the associated employment opportunities Identify the number of people the project will directly employ.
Sense of place	Water Corporation will determine, through community consultation, whether community members with strong attachments to places and heritage values anticipate changes to those places and values as a result of the proposal, to ensure that negative impacts do not occur from this project and to explore potential positive outcomes.	Landscapes, people, and cultural or environmental “icons” (such as the Blackwood River or a National Park) can contribute to “sense of place”.	Places with social significance are identified. Impacts of the proposal on the environment may affect areas that contribute to people’s sense of place in an area.	Consultation with the community to determine both what contributes to their “sense of place” and whether aspects of this are expected to be threatened or enhanced by the proposal.

Factor	Objective	Description	Potential impact (+ve/-ve)	Supporting investigations
Indigenous communities	Water Corporation will undertake to protect and avoid disturbance of Aboriginal heritage sites. The Corporation will explore potential positive outcomes for and with the Indigenous communities.	Infrastructure has the potential to directly impact specific sites or areas of Aboriginal cultural value. Land management, biodiversity conservation, protection of culture, language and heritage, economic development, health, housing, education and employment are all integral parts of the well-being of Indigenous communities. The proposal will impact some of these elements but has the opportunity to create positive outcomes for Indigenous communities.	Aboriginal heritage sites could be disturbed by the project. Aboriginal communities involved in the proposal development to create positive outcomes for Indigenous communities.	Investigate all requirements under the Aboriginal Heritage act Involve Indigenous communities through the consultation process to achieve maximum community benefit from the project. Conduct detailed ethnographic studies.
Development footprint	The construction and maintenance of infrastructure will cause minimal permanent disturbance to the community	The proposal includes a wellfield on the Blackwood Plateau near Jarrahwood, a micro filtration based treatment plant to the north of the source works and transfer mains to transport water to the Stirling Trunk Main.	The construction and maintenance of the infrastructure has the potential to affect traffic, aesthetics and access for the public. If land acquisition is required, it will affect some landholders. Infrastructure will temporarily interrupt agricultural production in farmland areas. Improved infrastructure could mean improved local access and amenity.	Investigate potential sites / routes for infrastructure. Identify landholders that may be affected Investigate suitable arrangements with affected landholders.
STRATEGIC PRINCIPLE - Government policy				
Equitable access to water	The Water Corporation will ensure fair and equitable access to water for domestic use for all Water Corporation customers.	Water is a shared resource that should be available to all through equitable distribution. To ensure this, the cost of reasonable domestic water requirements should be affordable to all.	There is potential for inequity in the distribution of water.	Identify any supply shortages through the existing source monitoring activities of Water Corporation
Government plans	The proposal will be consistent with the following Government agency plans and policies where they are appropriate and congruent: • Environmental protection • Regional development • Forest management • Regional planning; and • Allocation planning and licensing	The relevant Government agency plans and policies are listed in the Objectives	The proposal or its impacts may be inconsistent with government and agency planning.	The relevant Government plans and policies will be identified and consistency and congruency of the proposal assessed.

Factor	Objective	Description	Potential impact (+ve/-ve)	Supporting investigations
Regional development	The proposal will provide opportunities for regional development	The South West has a rapidly growing population that relies on security of water supply for industrial and commercial growth and associated employment opportunities as well as for domestic water supply.	Increased regional development in the South West Likely to increase the range of employment for the South West	Identify social and economic impacts of proposal on the region Discussion with stakeholders and community on regional development issues
STRATEGIC PRINCIPLE – Climate change				
Climate change	Determine the impact of likely climate change scenarios on the sustainability of the proposal.	The South West of Western Australia has been experiencing a drier climate since the mid 1970's. The last seven years have been significantly drier again. The Water Corporation has re-assessed the amount of water that is available from existing water supplies due to the current low rainfall trend.	A drier climate may reduce recharge to the Yarragadee aquifer and reduce the potential supply from surface water sources.	Model the aquifer response to different climate scenarios with and without the Water Corporation proposal.
STRATEGIC PRINCIPLE – International and national competitiveness of water users				
Cost of water	The proposal will facilitate the competitiveness of local and regional industries in the national and international context.	The supply cost of this proposal is less than other options such as desalination. This will enable Water Corporation to supply competitively priced water with benefits for local and regional industries.	Competitively priced water assists industries in being competitive in the national and international market.	Identify the comparative costs, quality, availability and security of water supply sources in Western Australia.
STRATEGIC PRINCIPLE – Improved knowledge and skills				
Environmental risk	Reduce environmental risk by Improving the scientific certainty of the South West Yarragadee characteristics and the ecosystems that it interacts with.	Extensive hydrogeological and environmental studies have been carried out as part of this proposal, increasing the knowledge base of groundwater and groundwater dependent ecosystems in the area.	Improved knowledge base will facilitate sound decision-making and reduce the risk of adversely impacting the natural environment.	Evaluate knowledge gaps against the studies being undertaken
Supply security	Increase supply security by improving the scientific basis for decision-making and planning regarding the use of the South West Yarragadee as a water source.	Increased knowledge of the aquifer will mean that better decisions can be made regarding its use as a water source. Better understanding of its yield potential will provide greater security for users of the resource.	Greater supply security for users of the South West Yarragadee	Hydrogeological investigations

Factor	Objective	Description	Potential impact (+ve/-ve)	Supporting investigations
PROCESS PRINCIPLE – Precautionary principle				
Precautionary approach	Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, decisions should be guided by: • a careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and • an assessment of the risk-weighted consequences of the options This definition from the EP Act 1986 (amended 2004).	The following aspects of the precautionary principle will be applied as needed: – risk management to predict and avoid unacceptable environmental harm[7] – further knowledge to decrease scientific uncertainty – environmental monitoring to check performance against targets – adaptive management allows operations to be modified according to monitoring results – precautionary project design will avoids risks where possible – contingency planning to cater for unexpected outcomes – consideration of future legacy will ensure future generations are not disadvantaged by the proposal.	Risks associated with the project may not be managed appropriately. Application of the precautionary principle will facilitate sound decision-making and management.	Risk assessment Management plans including monitoring, adaptive management and contingency planning Technical investigations to reduce scientific uncertainty regarding expected impacts
PROCESS PRINCIPLE – Stakeholder Engagement				
Comprehensive and regular communication	Water Corporation will maintain a comprehensive and regular information flow to the community about the project and the process throughout the sustainability assessment process.	Regular, comprehensive and easily accessible information will include a website, newsletter and use of local and state media.	The community and stakeholders will have full and accurate information. This will allow informed input into the project.	Develop accurate community profiles as a basis for understanding and communication with communities. Define and understand perceptions about what the proposal means to the local communities.

[7] The level of acceptability of environmental harm would be assessed by the EPA.

Factor	Objective	Description	Potential impact (+ve/-ve)	Supporting investigations
Relevant, balanced and inclusive consultation	Water Corporation will engage with key stakeholders and the broader community to discuss issues, and potential impacts and benefits of the project.	The Corporation has designed a complete consultation process that will be run in conjunction with project design and impact assessment. The consultation will include proposal design, risk management, monitoring and contingency planning as well as mitigation measures and possible positive outcomes. The Community Reference Group will be strongly involved in the process.	Stakeholder and community concerns will be expressed, issues identified and options for mitigating impacts and enhancing benefits discussed.	Obtain feedback from the community and stakeholders on the adequacy of consultation Develop stakeholder engagement framework Regular meetings with the Community Reference Group
Openness and transparency	The Water Corporation will conduct investigations and proposal development processes in an open and transparent manner	The Water Corporation is committed to preparing the Evaluation in an open and transparent manner.	Stakeholders will know exactly what the proposal is, how their concerns are being responded to and what the approval process involves.	Continued consultation with the community to ensure they are getting the information they require in a suitable form.
Closed loop process	Water Corporation will respond to issues and queries raised by the community and will provide feedback about how those issues have been dealt with and how they have influenced the process.	The closed loop process will ensure that community and stakeholder input is addressed in an open and transparent manner.	The community and stakeholder know how their input has been responded to.	Both the communities' comments and the Corporation responses will be documented.
PROCESS PRINCIPLE – Accountability				
Define performance targets	The Water Corporation will define economic, social and environmental performance targets that reflect achievement of the objectives set out herein	Measures to reflect each of the objectives within this sustainability assessment will be used as performance targets for subsequent comparative reporting to evaluate achievement of intended outcomes.	Allows an evaluation of the sustainability performance of the proposal.	Finalise sustainability objectives
Reporting performance on achievement of targets	The Water Corporation will report regularly and publicly on performance of sustainability measures	The Water Corporation will commit to a reporting schedule and report on its performance against agreed sustainability objectives.	The sustainability performance of the Water Corporation fully documented and available to the public.	Finalise the sustainability objectives that the Water Corporation will report against.

2.2.2 Investigations

To support the evaluation of the proposal against the sustainability principles and objectives proposed for each factor, an extensive range of technical investigations were undertaken. These investigations included:

- regional and local-scale hydrogeological drilling investigations to supplement existing information available on the groundwater resources of the region
- ecological investigations on the presence, susceptibility and potential impacts of the proposal on flora and fauna in the region
- economic studies into water demand and the economic values associated with the resource and its use
- studies into the social values and impacts of the proposal.

The results of these investigations have been communicated to the public and the full technical reports, together with summarised versions, have been made publicly available as they have been received.

2.3 DEVELOPMENT OF A SUSTAINABLE PROPOSAL – INTERNAL SUSTAINABILITY ASSESSMENT

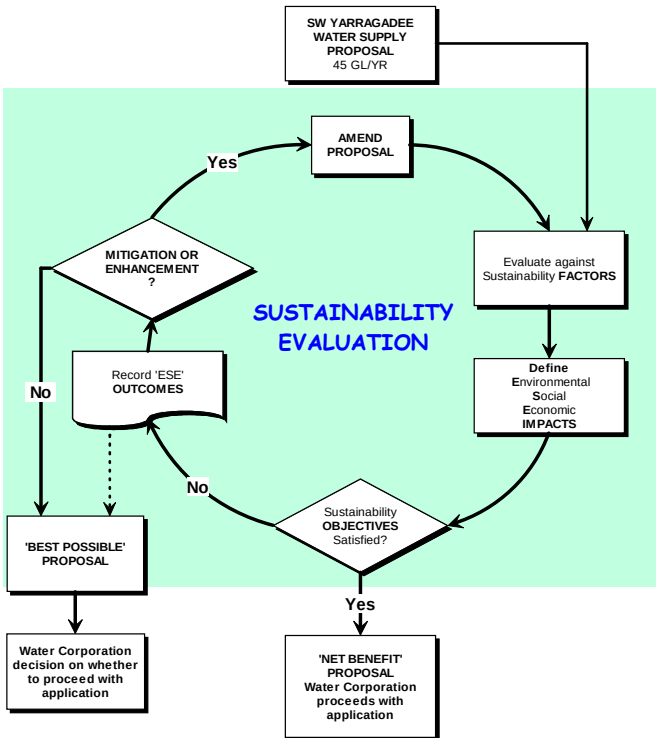
The proponent, in consultation with key stakeholders, applied a process of internal sustainability assessment to development of the proposal. Internal assessment used the project-specific sustainability principles and objectives developed through the scoping process. The results of investigations to assess the sustainability of proposal options were used to develop mitigation measures and to enhance benefits.

The proposal was developed by mitigating negative impacts and enhancing the positive impacts with the aim of achieving a net benefit in each of the environmental, social and economic accounts.

Often the term "balance" of economic, social and environmental aims is used in conjunction with sustainability. However, within each account there are broad criteria, or "bottom lines" that should not be compromised if a project is to be considered sustainable. These are:

1. **Environment**: The project shall not result in a significant net loss in biodiversity.
2. **Social**: The project will not significantly disadvantage any community.
3. **Economic**: The project will be financially viable and contribute to the State economy.

Figure 3.1 Process to develop the proposal



The internal assessment was an iterative process. The proposal was amended and refined, and mitigation measures were applied, or benefits achieved, through an integrated consideration of environmental, social and economic factors. The process continued until the outcome most consistent with sustainability principles was found (Figure 3.1).

Community and stakeholder input and a transparent process were integral parts of the development of the final proposal.

Mitigation and enhancement

The concepts described in the EPA Position Paper for Environmental Offsets (EPA 2005) were applied in the development of mitigation measures and determination of environmental bottom lines (critical environmental assets). Nonetheless, the proposal may be considered to provide an essential community service and therefore may be subject to special consideration under the "special circumstances" provisions.

In the internal assessment process, the potential environmental, social and economic impacts of the original proposal, both positive and negative, were determined and the acceptability of these impacts or benefits was then tested against the sustainability objectives and principles. Mitigation[8] measures to address negative impacts, and measures to enhance positive impacts of the proposal, were then considered in consultation with the Community Reference Group. The impacts of the amended proposal and mitigation/enhancement "package" were then retested against the objectives in an iterative process. The environmental, social and economic outcomes were then used to determine whether a "net benefit" proposal was possible.

Where an unavoidable significant adverse impact was identified, an appropriate offset was developed. The opportunity was also taken to enhance positive benefits where reasonable to do so. The unavoidable adverse impacts that were not considered significant were collectively subject to a general offset commitment to provide broad environmental and social benefits to the South West Region through a Sustainability Initiative (Chapter 7 Section 4.1.1). This approach was taken to ensure an overall net benefit and to avoid the cumulative effect of a range of insignificant impacts.

The final proposal developed through the internal sustainability assessment process was subject to a detailed evaluation prior to external assessment by the Sustainability Panel, EPA and the Water and Rivers Commission.

The evaluation was conducted at three levels:

1. Impacts and outcomes of the proposal at the factor level with recognition of the links and relationships to other sustainability factors. The outcome for each factor includes an assessment as to whether the objective for that factor has been met.
2. Aggregation or integration of evaluation at factor level to the principle level and, finally, to account level. This involved consideration of whether the project has been consistent with each of the sustainability principles and whether there is a net benefit within each account and for the project overall.

[8] Mitigation refers to actions taken to avoid, reduce, rehabilitate or offset (counterbalance with positive impacts) adverse environmental impacts.

3. The conclusions regarding the sustainability of the proposal were then tested against externally developed sustainability criteria (Gibson 2005) as a way of double-checking consistency with contemporary sustainability requirements.

2.4 EXTERNAL SUSTAINABILITY ASSESSMENT

2.4.1 Environmental Review and Management Programme

The ERMP is a major component of this Sustainability Evaluation document. The ERMP has not been separated out as a stand alone document as the consideration of environmental acceptability and overall sustainability are inherently linked. All the environmental considerations are relevant to a sustainability assessment and most of the sustainability considerations are relevant to an ERMP (e.g. social, strategic and process principles). A note has been provided after the document structure in each volume, outlining which sections are not considered directly relevant to the environmental assessment of the proposal.

The core of the ERMP is Volume 2 Chapters 6 through 10, which address all the relevant environmental factors and provide an assessment of impacts as well as the mitigation measures to be applied to avoid, minimise, rectify, reduce or offset unavoidable adverse impacts.

2.4.2 Social and economic impact assessments

Independent assessments of the social and economic impacts of the proposal were made as part of this evaluation. They are presented for external assessment by the Sustainability Panel and as appropriate by the EPA and Water and Rivers Commission, as part of the assessment process. These social and economic impact assessments are discussed in Volume 2.

3 SUSTAINABLE WATER MANAGEMENT BY THE WATER CORPORATION

3.1 WATER CORPORATION ENVIRONMENTAL COMMITMENTS AND SUSTAINABILITY PRINCIPLES

The Water Corporation considers its environmental responsibilities to be a high priority, as demonstrated in the Corporation Environmental Policy which addresses environmental soundness, economic viability and social responsibility. The Water Corporation vision is:

"Sustainable management of water services to make WA a great place to live and invest."

The Water Corporation is Western Australia's biggest investor in safeguarding environmental and public health, and is the biggest user of renewable energy on the State's southern power grid, currently drawing six per cent of its total energy needs from that source.

The Water Corporation won the prestigious 2003 Australian Greenhouse Challenge Gold Award for outstanding performance in total greenhouse gas abatement and economic and environmental performance – among other criteria.

The Busselton Environmental Improvement Initiative, to reduce nutrient inflow to Geographe Bay from surrounding farmlands, won the environment category of the Premier's Awards for Excellence in Public Sector Management, and tied for the overall Excellence Award.

The Water Corporation report to the community on environmental performance (Water Corporation 2000) briefly documented a range of examples of commitment to sustainable water source development. These included:

- significant reductions in groundwater abstraction from metropolitan wellfields to reduce impacts of falling groundwater levels on vegetation
- identification of environmental water requirements for river pools below the Harding Dam in the Pilbara
- the aggregate release of 4.7 GL of water during 1998 – 99 for environmental and riparian purposes
- development of new water supply sources at several country locations to maintain draws from existing groundwater schemes within sustainable limits
- significant investment in water use efficiency to reduce per-capita water consumption levels
- development of a program to identify high-volume water system losses in country areas.

A range of more recent water supply related environmental activities have been undertaken, together with numerous initiatives in other areas of Water Corporation business (wastewater, drainage and irrigation services).

The Water Corporation is developing its Sustainability Principles and a draft dated 5 September 2005 is presented in Appendix 5. The draft principles cover social, economic and environmental aspirations, together with ethical, stakeholder and process commitments.

Environmental management systems

The Water Corporation has a corporate Environmental Management System (EMS) that provides a structured framework to assist it to proactively manage environmental aspects of its operations. The EMS provides greater assurance that the organisation will achieve the environmental commitments that may accompany approval of a new development.

Chapter 4 Environmental impact assessment framework

The EIA and decision-making process for the ERMP under the EP Act and the Commonwealth accredited assessment process under the Commonwealth EPBC Act is presented in detail in Chapter 2 Sections 1.1 through 1.4.

1 SCOPING OF THE ERMP

A Scoping Report was prepared and subsequently approved by the EPA and Department of the Environment and Heritage (Commonwealth) (Strategen 2005a at Appendix 1). This report lists sustainability principles and factors that relate to the environment and proposed investigations that were determined to be relevant to the proposal (Chapter 3 Section 2.2.1). It also defines the scope of the sustainability assessment addressed in this document (Strategen 2005a).

The scoping report was developed in consultation with the community, including all key stakeholders as described in detail under the *Stakeholder engagement* principle in Chapter 8 Section 2.1.2.

2 CONSIDERATION OF ALTERNATIVES

2.1 ALTERNATIVES TO THIS PROPOSAL

The consideration of alternatives to this proposal is addressed in detail in Chapter 1 Sections 1.4.6 and 1.4.7, and under the socio-economic principle of *Public water supply* in Volume 2 Chapter 3 Sections 2.1.4 and 4.1.

In summary, the Corporation approach to meet future growth in demand is to ensure water supply security through diversity, adopting a multi-faceted strategy for supply and demand management.

Implementation of the "*Security Through Diversity*" strategy has lead to the development of an integrated resource plan based on viable supply and demand options. The plan draws viable supply and demand options together in an integrated program that sequences their development and takes account of:

- the costs and benefits of each option
- the timeframes involved
- the practicalities associated with implementing each option within specific timeframes
- supply security requirements
- flexibility to deal with deviations from the planning assumptions and associated uncertainties.

If the South West Yarragadee Water Supply Development is not approved, then a second 45 GL/yr desalination plant will need to be constructed. Desalination is the only alternative water supply source capable of supplying the required amount of water within an appropriate timeframe to meet the immediate needs of growing demand at the level of security required by the community.

2.2 ALTERNATIVE OPTIONS FOR DEVELOPMENT OF THE PROPOSAL

Within the South West Yarragadee Water Supply Development internal evaluation, alternative means of developing the source were considered. The alternatives include options for:

- wellfield configuration, including both the location and the depth of the wells (Volume 2 Chapter 5 Section 3.2.1)
- pipeline and infrastructure routes
- staging of the supply development
- mitigation and enhancement options
- end use of the supply.

The assessment of alternatives or variations to the proposal leads to the proposal described in this Sustainability Evaluation/ERMP, which is expected to provide the optimal environmental, social and economical outcome.

3 ENVIRONMENTAL PRINCIPLES AND FACTORS

3.1 SPECIFIC ENVIRONMENTAL PRINCIPLES AND FACTORS

The sustainability environmental principles developed during the scoping process for the proposal are:

Biological and ecological integrity

The proposal will result in a net increase in ecological function or biological diversity in the region

Energy efficiency

The proposal will be designed and operated at a level which is best practice in Australia

The key environmental factors and objectives associated with these principles are presented in Table 4.1. The aim for all factors is to achieve a net benefit for each factor and as a minimum; the proposal will have no significant adverse impact on the environmental factor.

Table 4.1 Sustainability principles and factors that relate to the environment

Topic/relevant environmental factor	Principle/objective
Biodiversity and ecological integrity	*The proposal will result in a net increase in ecological function or biological diversity in the region, with particular emphasis on critical assets*
Flora and fauna	The Water Corporation will seek to achieve a net increase in flora and fauna in the region At a minimum, the proposal will have no adverse impact on flora and fauna in the region
Priority and Declared Rare Flora	The Water Corporation will seek to achieve a net increase in Priority and Rare Flora in the region At a minimum, the proposal will have no adverse impact on Priority and Rare Flora in the region
Threatened Fauna	The Water Corporation will seek to achieve a net increase in the viability of threatened fauna populations in the region At a minimum, the proposal will have no adverse impact on the distribution and viability of threatened fauna populations in the region
Threatened ecological communities	The Water Corporation will seek to achieve a net increase in the viability of threatened ecological communities in the region At a minimum, the proposal will have no adverse impact on the distribution and viability of threatened ecological communities in the region
Blackwood River and tributaries	The Water Corporation will seek to increase the ecological integrity of the Blackwood River and its tributaries. At a minimum, the proposal will have no significant adverse impact on the Blackwood River and its tributaries
Wetlands	The Water Corporation will seek to increase the ecological integrity of wetlands in the region. At a minimum, the proposal will have no significant adverse impact on wetlands
Other groundwater dependent ecosystems	The Water Corporation will seek to increase the ecological integrity of other groundwater dependent ecosystems in the region. At a minimum, the proposal will have no significant adverse impact on other groundwater dependent ecosystems
Development footprint (from infrastructure)	The construction of the proposal will cause minimal permanent disturbance
Energy efficiency	*The proposal will be designed and operated at a level which is best practice in Australia*
Greenhouse gas emissions	The proposal will be designed and operated according to Australian best practice regarding greenhouse gas emissions

4 DETAILED ASSESSMENT OF RELEVANT ENVIRONMENTAL FACTORS

4.1 OBJECTIVE FOR THE FACTOR

The sustainability objectives for each factor describe the criteria or desirable outcomes that are sought for the proposal. Where feasible and in contrast to traditional environmental objectives applied in EIA, the aim is to achieve a positive outcome for the factor. For some factors such as *Priority and rare flora*, the objective has been designed to show that the Water Corporation will explore opportunities for a positive outcome but as a minimum will ensure that no net adverse impact occurs.

The EPA objectives are also listed as it is the aim of the Corporation to meet these objectives as part of developing a sustainable proposal.

4.2 EXISTING ENVIRONMENT

The existing environment is described in relation to each factor and potential groundwater and infrastructure impact area. In the case of groundwater abstraction, this includes the relevant groundwater dependent ecological values, the significance of those values, pressures and any existing management.

4.3 ASSESSMENT FRAMEWORK OR POLICY CONTEXT

Legislation and agency policies and guidelines exist regarding the protection of environmental values and biodiversity. These instruments provide the framework or context for the assessment of impact on relevant environmental factors. The policies and guidelines provide an up-to-date basis for evaluating the significance of impacts and development of environmental management measures.

The key policies that relate to the assessment of environmental effects in areas of interest are:

1. Environmental Offsets Preliminary Version 2 Position Statement No. 9 Environmental Protection Authority, June 2005 (EPA Offset Position Statement).
2. Protection of Native Vegetation Position Statement No 2, 2000 (EPA Vegetation Position Statement).
3. Forest Management Plan 2004 – 2013 (within State forest).
4. Management Plans for the Conservation Estate (where and as they apply to areas of interest).

4.4 POTENTIAL IMPACTS AND MITIGATION

4.4.1 Environmental risk

The level of environmental risk has been assessed in Volume 2 Chapter 7, based on interpretation of the results of regional groundwater modelling to the local scale. The interpreted drawdowns are believed to contain a residual conservatism as a consequence of several factors not able to be quantitatively evaluated within the limits of existing knowledge. However, they are considered to provide an appropriate evaluation of the risks in the potential impact areas sufficient to enable assessment of the proposal.

The associated risks to ecosystems have been identified and evaluated according to the likely groundwater dependence of each ecosystem. Contingencies have been defined for those areas where there is a low risk of an impact which could be considered unacceptable (for example: supplementation of flows in St John Brook, Milyeannup Brook and the Blackwood River).

4.4.2 Significance

The significance of a potential impact is defined by the assessment framework, in particular the key EPA policies for environmental offsets (EPA 2005) and protection of native vegetation (EPA 2000) and significance criteria including:

- change in representation or occurrence of vegetation communities (locally and regionally)
- change in species composition/abundance of vegetation communities
- change of ecological function
- effect on ecosystem resilience
- change to faunal habitat
- effect on values other than ecological (enjoyment, recreation, aesthetics, usage) most relevant to national parks and conservation parks.

The ease and timescale in which impacts may be remedied also determines significance. Social values such as sense of place and lifestyle that are affected as a result of a change to the environment are considered in Volume 2 Chapter 4 of this Sustainability Evaluation/ERMP.

4.4.3 Consistency with key EPA policies

The two key EPA policies that provide specific guidelines that help determine the environmental sustainability of the proposal are described above, namely:

1. EPA Offset Position Statement
2. EPA Vegetation Position Statement

The proposal may potentially affect a number of areas which contain critical assets as defined by the EPA Offset Position Statement. This statement indicates that there is a presumption against recommending approval for proposals that are likely to have significant adverse effects to critical assets and EPA would not endorse the use of offsets.

The statement also outlines eight principles that the EPA will apply in its assessment of a proposal as follows:

1. Environmental offsets should only be considered after all other reasonable attempts to mitigate adverse impacts have been exhausted.
2. An environmental offset package should address both direct offsets and contributing offsets.
3. Environmental offset and impact should ideally be “like for like or better”.
4. Positive environmental offset ratios should apply where risk of failure is apparent.
5. Environmental offsets must entail a robust and consistent assessment process.
6. Environmental offsets must meet all statutory requirements.
7. Environmental offsets must be clearly defined, transparent and enforceable.

8. Environmental offset must ensure a long lasting benefit.

A test of environmental sustainability applied to the proposal in this evaluation is whether implementation of the proposal:

- is in accordance with these principles
- does not have a significant adverse effect on critical assets
- provides offsets to achieve a net environmental benefit.

The EPA Vegetation Position Statement also provides principles to be applied in the assessment of proposals that involve the clearing of vegetation in areas other than agricultural areas as follows:

1. A comparison of development scenarios, or options, to evaluate protection of biodiversity at the species and ecosystem levels, and demonstration that all reasonable steps have been taken to avoid disturbing native vegetation.
2. No known species of plant or animal is caused to become extinct as a consequence of the development and the risks to threatened species are considered to be acceptable.
3. No association or community of indigenous plants or animals ceases to exist as a result of the project.
4. There would be an expectation that a proposal would demonstrate that the vegetation removal would not compromise any vegetation type by taking it below the "threshold level" of 30% of the pre-clearing extent of the vegetation type.
5. Where a proposal would result in a reduction below the 30% level, the EPA would expect alternative mechanisms to be put forward to address the protection of biodiversity.
6. There is comprehensive, adequate and secure representation of scarce or endangered habitats within the project area and/or in areas which are biologically comparable to the project area, protected in secure reserves.
7. If the project area is large (and what is meant by large will vary depending on where in the State) the project area itself should include a comprehensive and adequate network of conservation areas and linking corridors whose integrity and biodiversity is secure and protected.
8. The on-site and off-site impacts of the project are identified and the proponent demonstrates that these impacts can be managed.

The proposal does not involve the clearing of native vegetation except for the construction of infrastructure but will result in drawdowns of the watertable that could potentially affect groundwater dependent ecosystems. Vegetation deaths from drawdowns are extremely unlikely given the rate of declines expected in the watertable. The effect of drawdown on vegetation or flora is not analogous to the trauma of clearing (which removes the vegetation) but more likely to be, at worst, a change in the composition of vegetation communities in affected areas. The communities are anticipated to retain most if not all of its ecological functions.

Nonetheless, the above principles have been applied in assessment of the proposal as another test of environmental sustainability of the proposal (Volume 2 Chapter 7).

4.4.4 Management/mitigation of impacts

Management measures and modifications to the proposal to mitigate environmental impacts and achieve positive outcomes are outlined under each factor and detailed in the preliminary environmental management program presented in Volume 2 Chapter 9.

In addition, the level of confidence in estimating the impact or consequences as a result of applying environmental management procedures is described based on previous experience and the reliability of the management measure.

The process of risk management is ongoing and has already resulted in modifications to the proposal to avoid or reduce the likelihood of negative impacts and to undertake positive actions to offset residual risks. Potential negative environmental impacts associated with this proposal were and will be managed in accordance with the EPA Offsets Position Statement through the application of the sequencing concept of environmental mitigation which is described in the statement as follows:

1. Avoidance of adverse impacts by eliminating the causes or potential causes (hazards/aspects) of impact.
2. Minimising the likelihood of the impact through application of environmental management procedures or redesign of the proposal.
3. Reduction in the consequences or extent of impact through application of environmental management procedures including rehabilitation, contingency planning and incident response.
4. Offsetting impacts through restoring and/or enhancing environmental protection or conservation values of areas unaffected by the proposal.

4.5 MONITORING, ADAPTIVE MANAGEMENT AND ACCOUNTABILITY

This evaluation includes a monitoring program to confirm the impacts or assess the effectiveness of measures to mitigate impacts as part of an adaptive management framework. Monitoring programs will be routinely reviewed and reported to ensure that they are adequate to meet the level of potential impact or environmental risk. Community involvement in monitoring activities and reviewing of results will be actively encouraged and is addressed under the *Stakeholder engagement* principle described in detail in Chapter 8 Section 2. If monitoring indicates that unacceptable impacts are occurring or not being mitigated the project will be modified accordingly as part of an adaptive management approach.

The effectiveness of environmental management will be assessed on an ongoing basis. Reviews would be triggered by changes in community, regulatory or proponent expectations, monitoring results, performance indicators, new advice or advances in technology. Such reviews may result in modification of the proposal, changes to environmental management procedures or monitoring to ensure continual improvement in environmental performance and minimising impacts.

The Corporation will prepare a Sustainability Review detailing the environmental actions and incidents (if any) that occurred as part of the South West Yarragadee Water Supply Development Project. The Sustainability Review will be produced annually during construction and the first five years of operation, after which it will be produced triennially if no change in management has been required through the adaptive management process. The report will allow an assessment of the project operations against the commitments in the Sustainability Evaluation/ERMP and will be made public.

A summary description of residual impact including consideration of the likelihood of achieving the relevant objectives would be included in the review. The significance of the outcome and its consistency with EPA objectives would also be addressed. The environmental outcome may be described in temporal and spatial terms according to the environmental factor being addressed.

4.6 PROPONENT COMMITMENTS

The evaluation details the specific commitments made by the Water Corporation as part of the project. The commitments are auditable.

4.7 ENVIRONMENTAL OUTCOME

The environmental outcome is the predicted residual impact (positive or negative) of the project on the environmental factor after all mitigation has been applied and is an indication of consistency with key EPA Offset and Vegetation position statements.

Chapter 5 Sustainability outcomes and consolidated commitments

This Chapter sets out all the project commitments made through this evaluation with the intention of achieving sustainability in respect of all the sustainability factors together with the expected outcome for each sustainability factor.

1 COMMITMENTS AND OUTCOMES

1.1 CONSOLIDATED PROPOSAL COMMITMENTS

The following sections set out the full range of commitments made by the proponent to be implemented in proceeding with the proposal if approved. The subset of these commitments expected to form part of the conditions of formal environmental approval of the proposal is presented in Table 5.1.

1.1.1 Legal requirements to be fulfilled under other legislation

This section outlines actions and procedures that the Water Corporation is committed to undertaking under legislation or regulations other than Part IV of the EP Act.

Rights in Water and Irrigation Act 1914

1. Seek approval for the water pipeline crossings of all streams from the Department of Water pursuant to the RWI Act.
2. Prepare, and report on the implementation of, abstraction management plans and associated monitoring programs for the groundwater abstraction in accordance with any licence issued pursuant to the RWI Act and the Groundwater Abstraction Management Plan described in Volume 2 Chapter 9 Section 8.

Aboriginal Heritage Act 1972

3. Conduct a detailed Aboriginal heritage survey of the proposed infrastructure footprint before construction of proposal infrastructure in consultation with the local Indigenous community and in accordance with the requirements of the DIA.
4. Seek approval for any disturbance of identified heritage sites under s18 of the AH Act.

Environmental Protection Act 1986 Part V

5. Operate the treatment plant in accordance with conditions of any licence or works approval issued pursuant to Part V the EP Act.

Environmental Protection (Noise) Regulations 1987

6. All construction and operational activities will comply with the Noise regulations.

1.1.2 General Commitments

This section outlines commitments made by the Water Corporation that are not likely to be conditions of approval issued under Part IV of the EP Act and are not necessarily requirements under other legislation. These commitments will be publicly reported on and independently audited by an accredited Environmental Auditor every five years.

1. Work with the DoW and CALM to arrange declaration of a public water supply catchment area over the relevant portions of the Yarragadee aquifer recharge zones.
2. The Water Corporation will establish and support a South West Yarragadee Monitoring Review Group with the following functions:
   - 2.1. regular review and advice to the Water Corporation on monitoring programs, monitoring objectives and performance measures for the operation of the proposal
   - 2.2. review and provide public advice to the Water Corporation on monitoring results and provide comment on adaptive management measures
   - 2.3. review any changes to management of groundwater abstraction from the Yarragadee aquifer by the Water Corporation and provide advice on the acceptability of these changes.
3. Establish a South West Yarragadee Interpretive Centre in the South West to provide information to the community and visitors about development of the aquifer.
4. If existing Aqwest (formerly Bunbury Water Board) or Busselton Water Board public water supply wells are affected by saltwater intrusion (to the extent that they no longer meet the water quality criteria for potable use) caused by the Water Corporation groundwater abstraction from the Yarragadee aquifer, the Water Corporation will provide alternative means for accessing an equivalent amount of potable water at an equivalent cost, through either:
   - 4.1. provision of funding to install new wells into the Yarragadee aquifer further inland
   - 4.2. direct supply of water to the relevant company by the Water Corporation.
5. Develop and implement a landowner engagement program to finalise the pipeline alignment, management of pipeline construction and ongoing maintenance procedures.
6. Act within the provisions of the *Land Administration Act 1997* for the pipeline easement interest, but wherever possible, agree on compensation for the interest in land, for loss or for compensation through negotiation.
7. The water from the proposal will be available to any consumer prepared to enter the standard access arrangements (user pays cost of connection or as otherwise supported by the Government) and the uniform tariff pricing policy that applies to other IWSS water users in the State.
8. If the groundwater abstraction is reduced by the Water Corporation in accordance with the adaptive management program, or the Water and Rivers Commission reduces the licence allocation in the future, the Water Corporation commits to develop alternative strategies to address any shortfall in IWSS supply to IWSS consumers including those in the south west[9].

[9] It is understood that the development of alternative sources to meet supply shortfalls would be subject to the usual approvals, and no approval of contingencies would be implied by approval of this proposal.

9. Undertake a South West Public Water Supply Future Planning Study to provide a plan for meeting the future public water supply needs in the South West. This plan would be undertaken in conjunction with Aqwest and Busselton Water Board and involve extensive consultation and market surveys of community satisfaction with the water planning and management. The plan would investigate and address the following:
   9.1. future public water supply demand
   9.2. potential sources for public water supply
   9.3. source development program for public supply
   9.4. assessment of quality and security of existing public water supplies
   9.5. program for upgrading existing quality and security of public water supplies where required
   9.6. program for new connections to the extended IWSS or other sources.
10. Undertake a South West Yarragadee Sustainability Initiative that includes:
   10.1. the biodiversity and acid sulphate soils studies in Environmental Commitment 2
   10.2. sponsor a research program up to the value of $0.5M on
      10.2.1. the magnitude and potential means of management of irrigation return water
      10.2.2. the effects of changing land use on water demand, availability and quality.
11. Provide opportunities for indigenous people to be employed in undertaking monitoring programs.

1.1.3 Environmental commitments

Table 5.1 Consolidated environmental commitments

No	Commitment	Factor	Timing	Seek advice from

1.	Implementation of the following environmental offsets:
	• The Water Corporation will contribute to a 5 year program to assist the management of threatening processes in areas that may be affected by the proposal. The funding will be up to $1M with the capital and any earned interest made available to the management program over a period of five years. The program will address weeds, disease, feral animals, erosion and uncontrolled public access issues insofar as they exist within these areas:
	  • along the Blackwood River
	  • Poison Gully and Milyeannup Brook valleys
	  • the proposed Blackwood National Park
	  • the proposed St John Brook Conservation Park
	  • the Scott Coastal Plain
	  • Swan Coastal Plain.
	• Protect the conservation value of selected land establishing conservation covenants or incorporate land into the conservation estate by the freehold transfer of land to the Executive Director of CALM to offset clearing of native vegetation in areas of State Forest for the project infrastructure using a clearing loss/gain ratio of 1:1.5 and of comparable or higher conservation value.
		TECs, Rare and Priority flora, Other GDEs, Flora and fauna, Threatened fauna, Wetlands, Development footprint.	To commence prior to operation	DoE, CALM

No	Commitment	Factor	Timing	Seek advice from
2.	a) Undertake a biodiversity and acid sulphate soils study in areas potentially affected by groundwater drawdown resulting from the proposal. The studies will be funded up to the value of $1.5M, with the capital and any earned interest made available to the studies over a period of ten years. The biodiversity component of the study may include but not be limited to the following (subject to the detailed scoping of the study in Commitment 3): • the occurrence, condition, spatial extent and groundwater dependence of floristic and vegetation communities at local and regional scale • the occurrence, condition, spatial extent and groundwater dependence of TECs • the occurrence and spatial extent of significant aquatic fauna • investigate the genetic diversity of significant aquatic fauna that use the tributaries as refugia • the identification and spatial extent of terrestrial fauna habitat • the occurrence and abundance of vertebrate fauna, including specifically, threatened fauna as defined in the Wildlife Conservation Act 1950 and the EPBC Act, Priority fauna as defined and listed by CALM b) The acid sulphate soils component of the study will be restricted to vulnerable areas on the Scott and southern Swan Coastal Plain to determine the occurrence, spatial extent and depth of acid sulphate soils. The studies will be scoped in consultation with CALM, any biodiversity and acid sulphate soils study technical steering committee, DoE and DoW and will be documented and made publicly available.	Blackwood River and tributaries, TECs, Rare and Priority flora, Other GDEs, Flora and fauna, Threatened fauna, wetlands	This commitment will be completed within 10 years of the commencement of construction	Send finalised reports to CALM, DoE & DoW
3.	Prepare and publish in a Water Corporation Sustainability Report on the following relating to the South West Yarragadee Water Supply Development: • compliance with environmental conditions and commitments • assessment of environmental performance and environmental management response • implementation of environmental management plans • summary of environmental monitoring information • summary of progressive results from the proposed biodiversity and acid sulphate soils studies • stakeholder engagement • Water Corporation response to the advice and recommendations on environmental issues from the Monitoring Review Group.	Blackwood River and tributaries, TECs, Rare and Priority flora, Other GDEs, Flora and fauna, Threatened fauna, wetlands	Annually during construction and for the first five years of operation. The frequency of reporting will then be reviewed.	DoE, DoW

No	Commitment	Factor	Timing	Seek advice from
4.	a) The Water Corporation will not, unless otherwise approved by the Minister for the Environment on advice of the Environmental Protection Authority, construct the proposed infrastructure so as to cause or contribute to the direct or indirect disturbance of the following: • TECs (including candidate TECs) • Declared Rare Flora unless the disturbance is approved under the Wildlife Conservation Act 1950 • significant habitat for Threatened or Priority listed fauna b) The Water Corporation will ensure that the proposal construction activities do not cause or contribute to the following: • acidification of land or surface water through the exposure of acid sulphate soils to the extent that it adversely affects native vegetation or streams • an increase in severity status of weeds or pests in State Forest • the spread of dieback disease to previously unaffected areas • placing any species or ecological community into a higher category of threat • visible dust at sensitive premises. • breach of noise regulations	As above	Prior to and during construction	CALM, DoE
5.	Undertake the following surveys along the pipeline route: • a soil sampling program to further define the risk of exposure of acid sulphate soils • a detailed flora and fauna habitat survey to identify species and communities of conservation significance.	As above	Prior to construction	CALM, DoE
6	Ensure independent third party audit of compliance of with commitment 5b above at quarterly intervals. Auditor reports will be made publicly available and submitted to DoE.	As above	During construction	DoE
7.	Finalise the suite of environmental management plans required for the proposal, as outlined in Volume 2 Chapter 9, and implement those plans.	As above	Plans to be finalised prior to construction. Implementation to be undertaken during construction and operation, as appropriate.	DoE, DoW

1.2 SUMMARY OF PROPOSED OFFSETS

Construction

Some clearing will be required for the construction of the proposal alongside existing roads and other areas. All unavoidable clearing required within State Forest will be offset through a contribution of land to the conservation estate. This will be done either through the establishment of a conservation covenant on private land or through supporting the transfer of freehold land. The clearing in State Forest will be offset with a loss/gain ratio of 1:1.5 of land with an equivalent or higher conservation value.

Operating

The groundwater abstraction does introduce some risk of impact to the potentially affected areas. The impacts are not expected to be significant and contingencies are in place in areas where potential but unlikely significant impacts have been identified. However, the following mitigation is proposed to offset the adverse but not significant impacts of the abstraction and contribute to the overall sustainability of the proposal through enhancing biodiversity in areas potentially affected.

The Water Corporation proposes to sponsor a program to manage threatening processes in the areas that may be affected by the proposal. The funding will be up to $1 million with the capital and any earned interest made available to the studies over a period of five years. The funding will support a five year management program that will address weeds, disease, feral animals, erosion and uncontrolled public access issues that exist within the potentially affected areas. This could include activities such as bank stabilisation works along the Blackwood River, weed management (eg. introduction and spread of rust to bridal creeper areas), control of feral pigs or a contribution to the Western Shield program. This management would be expected to significantly improve the health or condition of ecosystems in the potentially affected areas on the Blackwood Plateau and the Swan and Scott coastal plains.

The Water Corporation is also proposing to implement a South West Yarragadee Sustainability Initiative (Chapter 7 Section 4.1.1) intended to provide further information on the ecological, social and economic environment of areas potentially affected by the proposal. The Sustainability Initiative is largely a research offset that will enhance the understanding of the ecosystems in the South West and their relationship to water. The initiative will be funded through a capital investment of $2 million with the capital and any earned interest made available to the initiative over a period of ten years.

1.3 OUTCOMES

1.3.1 Environmental outcomes

This section sets out the expected outcomes in respect of achievement of objectives of each of the sustainability factors. The full impact assessment that resulted in these conclusions is presented in Volume 2 Chapter 7 and Chapter 8. The environmental outcomes are listed geographically for ease of presentation.

The expected outcomes are all based on modelling using recent rainfall data (1971 – 2004), which is 9% lower than the long-term average. For each area, the impacts of the Water Corporation proposal are presented both separately and cumulatively with the estimated future regional use. The estimated future regional use is based on economic and population forecasts and is described in Volume 2 Chapter 5 Section 2.1.2.

Table 5.2 sets out the factors and objectives associated with the environmental principles.

Table 5.2 Factors: Environmental Principles

Factor	Objective
Flora and fauna	The Water Corporation will seek to achieve a net increase in flora and fauna in the region At a minimum, the proposal will have no adverse impact on flora and fauna in the region
Rare and Priority Flora (groundwater dependent)	The Water Corporation will seek to achieve a net increase in priority and rare flora in the region At a minimum, the proposal will have no adverse impact on priority and rare flora in the region
Threatened Fauna	The Water Corporation will seek to achieve a net increase in the viability of threatened fauna populations in the region At a minimum, the proposal will have no adverse impact on the distribution and viability of threatened fauna populations in the region
Threatened ecological communities (TECs – groundwater dependent)	The Water Corporation will seek to achieve a net increase in the viability of threatened ecological communities in the region At a minimum, the proposal will have no adverse impact on the distribution and viability of threatened ecological communities in the region
Blackwood River and its tributaries	The Water Corporation will seek to increase the ecological integrity of the Blackwood River and its tributaries. At a minimum, the proposal will have no significant adverse impact on the Blackwood River and its tributaries
Wetlands	The Water Corporation will seek to increase the ecological integrity of wetlands in the region. At a minimum, the proposal will have no significant adverse impact on wetlands
Other Groundwater Dependent Ecosystems	The Water Corporation will seek to increase the ecological integrity of other groundwater dependent ecosystems in the region. At a minimum, the proposal will have no significant adverse impact on other groundwater dependent ecosystems
Development footprint	The construction of the proposal will cause minimal permanent disturbance
Greenhouse gas emissions	The proposal will be designed and operated according to Australia best practice regarding greenhouse gas emissions

Blackwood River

No impact is expected on the terrestrial or riparian environment along the Blackwood River. They rely on peak surface flows and shallow alluvial aquifers that are isolated from the Yarragadee Formation, and will not be affected by the proposal.

The predicted drawdown from the Water Corporation proposal would only result in a 6% reduction in the summer baseflow of the Blackwood River in the driest years (those with no summer surface runoff). The cumulative impact from both the estimated future regional use, and for water required for the proposal, is expected to result in a 13% reduction in the minimum summer flows. In most years, there is some summer rainfall in the catchment and the reduction in flow would be substantially less than 10%. The cumulative reduced baseflow will continue to meet all Environmental Water Requirements defined for the Blackwood River.

The Water Corporation proposal alone would cause an increase in salinity of less than 10% during the two driest summer months of the year. This change in salinity is not expected to have a significant impact on the ecological values of the already altered Blackwood River. A reduction in groundwater discharge to the Blackwood River is expected to cause a 14% increase in the summer salinity of the river during the driest two months of the year but will still be much lower than during the rest of the year. The significance of the change to salinity in the Blackwood River should also be viewed in the context that the salinity of the river is expected to double over the next 50 years.

Proposed mitigation includes a commitment to supplement summer flows in the Blackwood River if unexpected and unacceptable baseflow or salinity related impacts are likely to occur.

Other commitments to reduce threatening processes within the area will restore ecological values currently affected or under threat and enhance biodiversity in the area. The knowledge and data obtained from the proposed biodiversity study and comprehensive monitoring program will improve the understanding of the area, and provide for adaptive management to ensure the area is cautiously managed into the future even in the context of climate change.

Poison Gully and Milyeannup Brook

Watertable drawdowns in Poison Gully are expected to occur within a localised area and would potentially pose a risk to groundwater ecosystems within 10 m of the watertable.

The proposal alone may potentially result in a drawdown of 1 – 2 m in both Milyeannup Brook and Poison Gully. In combination with estimated future regional use the total drawdown is predicted to be 2 – 4 m. The drawdown may potentially affect up to 230 ha of vegetation. A change over the long term, in the composition of species in some groundwater dependent vegetation types is the most likely response.

The localised change in vegetation composition will not significantly affect any significant flora or fauna species, or the local or regional occurrence of any vegetation complex or site-vegetation types. The composition of some site types may change in a small section of Milyeannup Brook and Poison Gully, but there will be no significant loss of keystone species, ecosystem function (including fauna habitat) or resilience.

No extensive vegetation deaths are expected due to drawdown, as the rate of drawdown is slow. However, over time species composition may change, depending on the adaptability of species.

The spring in Poison Gully (3.5 km upstream from the Blackwood River) may migrate several hundred metres downstream in response to a 30% reduction in groundwater baseflow. Similarly, the stream length of Milyeannup Brook is predicted to reduce from 2.5 km to 1 km. Although these tributaries are important refugia for significant freshwater fish species, all the defined Ecological Water Requirements are predicted to be met, and the instream ecology is not expected to be significantly affected.

Proposed mitigation includes a commitment to supplement summer flows in Milyeannup Brook if the habitat of the Balston's pygmy perch is put at risk.

Commitments to reduce threatening processes within the area will restore ecological values currently affected or under threat and enhance biodiversity in the area. The knowledge and data obtained from the proposed biodiversity study, and comprehensive monitoring program, will not only improve the natural understanding of the area, but provide for adaptive management to ensure the area is cautiously managed into the future, even in the context of climate change.

Rosa Brook

The predicted groundwater drawdowns are small in Rosa Brook and the proposal is likely to result in a "low – no measurable change" potential impact through most of the valley. The creek line is narrow and there are relatively few species with high groundwater dependence. Any vegetation change that does occur will not significantly affect the conservation status of any significant flora or fauna species or the local or regional occurrence of any vegetation complex. Small changes may occur in some site-vegetation types but their regional occurrence will not be significantly affected.

Rosa Brook is ephemeral and its intermittent flow is driven by rainfall, so will not be affected by the proposal.

Proposed commitments to reduce threatening processes within the area and the proposed Blackwood River National Park will restore ecological values currently affected or under threat and enhance biodiversity in the area. The knowledge and data obtained from the proposed biodiversity study and comprehensive monitoring program will not only improve the understanding of the area, but provide for adaptive management to ensure the area is cautiously managed into the future, even in the context of climate change.

The proposed mitigation measures are anticipated to provide for a net improvement in the biodiversity of the area.

St John Brook

The proposal has the potential to change the composition of vegetation in a 700 ha area along St John Brook through a contraction in the distribution of phreatophytic flora species, and increased abundance of more drought tolerant (xeric) species. The change in vegetation composition will not significantly affect the conservation status of any significant flora or fauna species, or the occurrence of any vegetation complex, but will affect the local occurrence of some site-vegetation types in a small section of the brook. The combined impacts of the proposal and estimated future regional use would affect approximately 720 ha.

Reduction in artesian pressures in the Yarragadee Formation below some sections of the brook has the potential to reduce summer flow from groundwater discharge, and to lower pool levels upstream from Barrabup Pool. Barrabup Pool and other pools downstream from Barrabup Pool are not expected to be affected.

Proposed mitigation includes a commitment to supplement summer flows in the brook to maintain pool levels if abstraction causes any significant change to summer baseflows or pool levels. Commitments to reduce threatening processes within the area and the proposed St John Brook Conservation Park will restore ecological values currently affected or under threat and enhance biodiversity in the area. The knowledge and data obtained from the proposed biodiversity study and comprehensive monitoring program will improve the understanding of the area and provide for adaptive management to ensure the area is cautiously managed into the future, particularly in the context of climate change.

The proposed mitigation measures are anticipated to provide for a net improvement in the biodiversity of the area, notwithstanding the anticipated changes in composition of vegetation along a narrow section of St John Brook.

Reedia wetlands

No impact from the Water Corporation proposal is expected on the Reedia wetlands. Groundwater monitoring will be carried out to ensure that no unexpected changes in water levels occur as a result of the project. There is a risk of a water level impact from future growth in other groundwater abstraction in the region. The highest risk is associated with groundwater abstraction in areas west of the Busselton Fault, and close to the Reedia wetlands.

The investigations to date and the proposed ongoing hydrological monitoring of the Reedia wetlands will provide increased knowledge of other threats to the wetlands that will help inform management decisions makers and reduce risk to the environment.

Scott Coastal Plain

The areas on the eastern Scott Coastal Plain with potential to be affected by predicted groundwater drawdowns from the Water Corporation proposal are mainly in the "low – no measurable change" potential impact category, as defined by Froend & Loomes (2004), with some smaller areas in the "moderate" to "high" potential impact categories. The predicted drawdowns apply only to summer minimums and there will be full winter recovery of the watertable over the majority of the area where there is a shallow watertable.

The drawdowns will occur slowly, at rates that will allow gradual adjustment of the vegetation and associated habitat. In the northern part of the eastern Scott Coastal Plain, there may be gradual local changes to some site-vegetation types, but this will not significantly affect the conservation status of any significant flora or fauna species, or the presence of any vegetation complexes.

The drawdown resulting from the proposal is expected to be less than 0.25m over most of the plain, and will be in an area with high seasonal watertable fluctuations. The decline in watertable levels will occur gradually over a long period of time, and full recovery of coastal plain watertable levels is expected each year. The effects of acid sulphate soils are therefore expected to be minimal, because exposure of the sediments will be limited and only for short periods.

No impact from the proposal is expected on either Lake Quitjup or Lake Jasper. However, the cumulative drawdown from the proposal and estimated future regional use is predicted to be in the range 0.1 – 0.25 m near both of these lakes. The proposal will not cause any significant impact on the seasonal wetlands of the Scott Coastal Plain as surface water levels will recover fully each winter and the amount of extra recharge required to replenish the watertable each winter is substantially smaller than the amount of recharge rejected each year.

The predicted groundwater drawdowns from the proposal on the western Scott Coastal Plain are minimal and there is not expected to be a measurable impact from the proposal. The Scott River Ironstone Association TEC and the significant Scott (Swi) vegetation complex are not within the area predicted to be affected by the proposal.

The cumulative predicted drawdowns as a result of the proposal and estimated future regional use are up to 1 – 2 m on the eastern Scott Coastal Plain, and up to 0.5 – 1 m on the western Scott Coastal Plain. They have the potential for significant impact over a substantial area, irrespective of the impact of the proposal, and will require management in their own right.

Proposed mitigation commitments to reduce threatening processes within the area, and in the D'Entrecasteaux National Park, will help protect and restore ecological values currently affected or under threat, and enhance biodiversity in the area. The knowledge and data obtained from the proposed biodiversity study and comprehensive monitoring program will improve the understanding of the area and provide for adaptive management to ensure the area is cautiously managed into the future, particularly in the context of climate change.

Swan Coastal Plain

Most of the areas of predicted drawdowns after 30 years on the Swan Coastal Plain as a result of the proposal alone are expected to result in "no measurable change". Small areas south of Bunbury are expected to be in the "moderate – small change" category of potential impact on vegetation. As the drawdowns will recover fully each winter, the proposal will have no significant impact on the vegetation of the Swan Coastal Plain.

The total predicted drawdowns, 30 years in the future, from both estimated future regional use and the proposal, spread wider than the area of the proposal. The total drawdowns are mostly less than 1 m, with small areas of drawdown in the 1 – 2 m range. The predicted drawdowns from the proposal alone are all less than 0.5 m (after 30 years abstraction), and less than 0.25 m in areas east of Busselton.

On the Swan Coastal Plain, the areas of predicted drawdowns do not generally coincide with areas designated as being high risk for acid sulphate soils. There are some areas with a moderate risk of acid sulphate soils that coincide with predicted drawdowns of less than 0.25 m after 30 years pumping.

Given the expectation of full recovery of coastal plain watertable levels each winter, the effects of exposure of any existing acid sulphate soils are expected to be minimal and temporary.

Three TECs are known in areas of potential drawdown from the proposal. The drawdown at these sites is predicted to be less than 0.25 m after 30 years abstraction, and there is not expected to be a measurable or significant impact at any of them. Six TECs have been identified in areas of potential drawdown from the cumulative effects of both the proposal and the estimated future regional use. The predicted drawdowns at these sites are all less than 0.5 m, and most sites fall in the "low – no measurable change" category. Two sites are in the "high" category with some "measurable change" possible (Froend & Loomes 2005 at Appendix 30). As the watertable levels and soil moisture will recover fully each winter, the cumulative impacts on TECs are not expected to be significant.

No impact from groundwater abstraction is expected on the Vasse–Wonnerup Wetland system, as the water levels are controlled by the adjacent ocean. The proposal will not cause any significant impact on the seasonal wetlands of the Swan Coastal Plain as surface water levels will recover fully each winter and the amount of extra recharge required to replenish the watertable each winter is substantially smaller than the amount of recharge rejected each year.

Proposed mitigation commitments to reduce threatening processes within the area will help protect and restore ecological values currently affected or under threat and enhance biodiversity in the area. The knowledge and data obtained from the proposed South West Yarragadee Sustainability Initiative biodiversity study, and a comprehensive monitoring program, will improve the understanding of the area and provide for adaptive management to ensure the area is cautiously managed into the future, particularly in the context of climate change.

Development footprint

The proposal involves the clearing of about 45 ha of native vegetation for the pipeline, wellfield, treatment plant and storage tank. This will not result in the reduction of any vegetation complex below 30% of its pre-European extent. On the Swan Coastal Plain, some clearing of mostly degraded remnant vegetation will be required along road sides in vegetation complexes that have less than 10% of their pre-European extent remaining. The total clearing on the Swan Coastal Plain is less than 4 ha and will reduce the remaining area of these vegetation complexes by a maximum of 0.06%.

There are no known TECs along the proposed pipeline route. Clearing of Declared Rare and Priority flora will be avoided where possible, and individual plants will be relocated if modification of the pipeline route is not feasible. Therefore, no significant impacts are expected on significant species.

No significant impact on fauna is expected due to limited clearing requirements that are restricted to already disturbed areas.

The remoteness of the proposal infrastructure limits the potential impacts of noise and vibration associated with construction and operation. In areas near residences, compliance with guidelines will ensure there are no significant impacts.

Most construction will be well away from sensitive areas and with the application of control measures described in the Air Quality Management Plan, dust emissions should be kept to acceptable levels.

All heritage sites potentially affected by the proposal will be identified prior to construction. Appropriate action will be taken in compliance with the Aboriginal Heritage Act and in consultation with the local Aboriginal community.

The construction of the infrastructure for the project is not expected to impact on water quality. The day-to-day operation of the plant will be managed to prevent any impact on the environment.

The limited scope for encountering acid sulphate soils and implementation of the Dewatering Management Plan will ensure that no significant impacts occur due to acid sulphate soils.

The treatment plant is located well away from sensitive areas and well beyond the anticipated required buffer zone for the facility. The facility will not pose a significant risk to public safety.

Energy efficiency

The proposal will utilise 4.6 MW of electric power from the Western Power South West Integrated System. Implementation of the proposal will consequently contribute to a resultant increase in greenhouse emissions. The increase in emissions is estimated to be 41 000 t/yr CO_2e[10], based on an assumed indicative carbon intensity of the Western Power South West Integrated System of 1032 kg CO_2/MWh. This figure is indicative, as it is understood that the carbon intensity of the grid is changing as the overall configuration of power stations changes. The proposed retirement of Muja A and B power stations, and commissioning of the proposed new 300 MW gas turbine stations, will substantially change the overall intensity of the grid over the period leading up to commissioning of this proposal. The Water Corporation will develop and implement a Greenhouse Emissions Reduction Plan to achieve an aspirational target of carbon-neutrality for its total operations by 2030.

Implementation of the project will delay the need for future desalination projects that are significantly more energy intensive.

1.3.2 Socio-economic outcomes

This section sets out the expected outcomes against each of the socio-economic and strategic sustainability principles and factors determined as applying to this proposal.

[10] Co_2e – carbon dioxide equivalent.

Long-term economic health

Table 5.3 Long-term economic health factors and objectives

Factor	Objective
Economic efficiency	The proposal will provide the most cost effective water supply source for the State.
Economic growth	The proposal will facilitate economic growth in the IWSS and South West regions.
Economic diversity	The proposal will enhance economic diversity in the IWSS and South West
Business and industry development	The proposal will provide opportunities for increased business activity

The proposal will contribute to the maximisation of economic output for the State. The proposal will enhance economic diversity and provide opportunities for economic growth through increased business activity in the South West region and areas served by the IWSS. The proposal is cost-effective in comparison with other options that could be constructed at this time in terms of improving the economic outcomes associated with the IWSS and the areas currently serviced.

Extension of a major integrated water supply scheme into the South West is a significant means of achieving positive outcomes that meet the objectives of the long-term economic health factors (Table 5.3).

The proposal will facilitate economic growth in the IWSS and SW regions through the provision of expanded water supply infrastructure. The development of new water supply infrastructure in the region enhances water access to those consumers willing to connect to the new services. Businesses that rely on reticulated water supplies will benefit from the infrastructure.

Water users in the urban areas serviced by the two regional water boards (Bunbury and Busselton) will have the opportunity to access additional supply infrastructure thus ensuring future water supplies in the areas serviced by the Boards. Government ownership of all three water supply utilities will mean that all agencies will share in local water supplies.

Future large industrial customers will benefit in that most, including the Kemerton Industrial Park and light industrial estates around Bunbury, are expected to locate in areas close to the new pipeline. A water supply will facilitate the establishment of such activities with most industrial processes seeking a reticulated and potable water supply.

Reticulated water supplies are desired by most secondary and tertiary economic activities. These activities will expand the region employment base and business diversity. They will add to the agricultural and mining base.

Public water supply

Table 5.4 Public water supply factors and objectives

Factor	Objective
Water use efficiency	The Water Corporation will encourage the efficient usage of water.
Existing and future needs	The proposal will contribute to meeting the existing and forecasted demand for public water supply in the IWSS and the South West under a range of possible future climate scenarios. Water will be available to meet reasonable regional public water supply needs.
South West town supplies	This proposal will increase supply security for South West towns
Quality of supply	To supply high quality water to consumers
Drinking water source protection	The Water Corporation will work with the Water and Rivers Commission, Conservation Commission and CALM to protect recharge areas.

The Water Corporation has committed to achievement of per capita water consumption targets in the IWSS through the *State Water Strategy*. The proposal will add capacity to the IWSS and use of the water by customers will be subject to the "Waterwise" program aimed at achievement of the targets.

The proposal will provide a major increase in the public water supply capability and reliability of the IWSS intended to meet the existing and forecasted demand. Extension of the IWSS into the South West will ensure water is available to meet reasonable regional public water supply needs through availability of a major integrated scheme capable of servicing local needs.

The proposal to develop a South West Public Water Supply Future Planning Study (Chapter 8 Section 3.2.6) will result in a comprehensive plan to provide for the future development of regional public water supplies.

The outcome of use of the Yarragadee aquifer as proposed is expected to be a high quality water supply suitable for use as a public water supply with minimal treatment. The administration of catchment protection under the *Country Areas Water Supply Act 1947* will assist in ensuring the quality of water is maintained for the future.

Regional needs

Table 5.5 Regional needs factors and objectives

Factor	Objective
Regional needs for private water supplies	The proposal will be developed such that reasonable regional needs for water, including social, recreational and projected future development needs are not compromised by the proposal.
Impact on current key water users	Water Corporation will seek to understand and articulate the impact of the proposal on current key water users, to ensure that existing water users are recognised and protected from unreasonable impact.

Formulation of the proposal has resulted in gathering of information that has enabled more reliable assessment of environmental risks and reduced uncertainty in forecasting impacts of the proposal. The proposed adaptive management approach (Chapter 8 Section 3.2.1) and commitment to the Sustainability Initiative (Chapter 7 Section 4.1.1) will provide further knowledge of the Yarragadee aquifer resource and the dependencies on it. This increased knowledge will enable greater certainty in the sustainable management of this resource.

The proposal is not anticipated to significantly constrain water availability from the Yarragadee aquifer to meet reasonable regional needs. Contingency plans to augment supply capacity will be developed in the event that the Water and Rivers Commission reduces the licensed allocation for IWSS from the Yarragadee aquifer because of:

- unforeseen reasonable regional need exceeding current expectations
- available water proving to be less than anticipated.

The proposal has the potential to enhance overall water availability from the aquifer through:

- mitigation and offsetting cumulative impacts
- application of an adaptive management approach that provides for increased knowledge and certainty while proceeding cautiously
- location of the proposal wellfield away from existing and proposed agricultural water demand areas
- application of contingency actions including development of other water sources in case of unforeseen impacts
- research into acid sulphate soils and associated management issues
- provision of an information base to support water management and maximisation of water availability.

Based on current information, it is not anticipated that competition between the proposal and regional needs will occur in the near future and may be up to several decades away. However, it is apparent that expansion of usage in localised areas of the Scott and Swan Coastal Plains may be limited by environmental constraints, even in the absence of the proposed Water Corporation abstraction**.**

Community well being and heritage

Table 5.6 Community well being and heritage factors and objectives

Factor	Objective
Lifestyle, amenity and recreational use and access	Water Corporation will determine, through community consultation, whether community members anticipate changes to lifestyle, amenity, or recreational use and access as a result of the proposal, to ensure that negative impacts do not occur from this project and to explore potential positive outcomes.
Direct and indirect job creation	The proposal will create employment opportunities
Sense of place	Water Corporation will determine, through community consultation, whether community members with strong attachments to places and heritage values anticipate changes to those places and values as a result of the proposal, to ensure that negative impacts do not occur from this project and to explore potential positive outcomes.
Indigenous communities	Water Corporation will undertake to protect and avoid disturbance of Aboriginal heritage sites. The Corporation will explore potential positive outcomes for and with the Indigenous communities.
Development footprint	The construction and maintenance of infrastructure will cause minimal permanent disturbance to the community

No changes to amenity, lifestyle and recreational use in the area will occur as a consequence of the proposal. The benefit will come from increased community involvement in monitoring and reporting of results through the proposed South West Yarragadee Monitoring Review Group (Chapter 8 Section 3.2.3), leading to better safeguards of community amenity.

Employment opportunities will be created in both the IWSS and South West through the contribution of the proposal to the *Long-term economic health* factor as discussed above.

No changes to sense of place will occur, which is a neutral outcome.

The Water Corporation will protect and avoid disturbance of Aboriginal heritage sites, and commits to explore potential positive outcomes for and with the Indigenous communities. The Water Corporation has undertaken the preliminary infrastructure design to minimise any disturbance to Aboriginal heritage sites, which includes avoiding all sites on the current Department of Indigenous Affairs register, except in the case of linear features such as listed rivers. Further consultation will establish the protocols for further field surveys to identify any sites not currently on the register.

Where possible, opportunities will be provided for Aboriginal people to be employed on aspects of the project.

The Water Corporation will follow a program of direct dialogue with those affected by the proposal, including landholders on the proposed pipeline route. Construction impacts can be largely minimised through Water Corporation standard procedures which include discussion with landholders to plan construction activities to minimise disruption.

The outcome will be positive overall, but in the short term it may be negative for farmers whose properties are along the pipeline route. Water Corporation will determine a final alignment in consultation with landowners and will manage construction of the pipeline to minimise impact on those properties affected. The impact would occur during one cropping season, and it is anticipated that impacts would be confined to that season, with no ongoing impacts during operation, thereby achieving the objective of minimal permanent disturbance to the community.

The potential benefits of employment and economic activity will be enhanced through the Water Corporation "buy local" policy. The potential impacts on smaller communities from the influx of construction workers will be managed through discussion with the shires potentially affected.

1.3.3 Strategic principles

Government policy

Table 5.7 Government policy factors and objectives

Factor	Objective
Equitable access to water	The Water Corporation will ensure fair and equitable access to water for domestic use for all Water Corporation customers.
Government plans	The proposal will be consistent with the following Government agency plans and policies where they are appropriate and congruent: • Environmental protection • Regional development • Forest management • Regional planning; and • Allocation planning and licensing
Regional development	The proposal will provide opportunities for regional development

Equitable access to public water supply schemes will be maintained through continued implementation of the Government uniform tariff policy and Water Corporation Customer Charter. Equitable access will be enhanced through the preparation and implementation of the South West Public Water Supply Future Plan.

Participation of the community in the development of public water supply plan for the South West as well the proposed adaptive management approach will empower the community in future decision-making on the extension of public water supplies in the South West.

The proposal will comply with relevant Government plans and policies. Proposals to address policy gaps will enhance the development of Government policy to facilitate the consideration of this proposal and proposals for groundwater abstraction in other areas of the State.

The outcomes for opportunities for regional development are discussed above under the *Regional needs* and *Improved knowledge and skills* principle.

Climate change

Table 5.8 Climate change factors and objectives

Factor	Objective
Climate change	Determine the impact of likely climate change scenarios on the sustainability of the proposal.

Climate change will affect recharge to the groundwater systems of the South West which may result in changes to the watertable, with impacts in areas where there are groundwater dependent ecosystems. Under the scenario where climate in the south west of Western Australia will become drier, the proposal may cause a further lowering of the watertable in areas where the drawdowns in the Yarragadee aquifer are transmitted to the watertable.

The evaluation was undertaken using a groundwater model with rainfall at 9% less than that understood to have been experienced over the longer term history of the region. This rainfall scenario estimate is approximately central in the range of scenarios considered possible for the future climate in the region in 30 years time. Modelling of the effects of a further progressive reduction in recharge by 5% and 10% was undertaken to understand the potential watertable impacts of extreme drying of the climate.

The approach taken in the evaluation and the subsequent implementation of this proposal will ensure that climate has been comprehensively considered by:

- modelling drawdowns under a range of drier climate scenarios
- committing to continuing to monitor and support climate research
- proposing an approach that will account for the uncertainty associated with predictions of future climate change in the region.

A suite of principles for determining the acceptability of change induced by the proposal in the context of the uncertainty of climate change has been proposed.

International and national competitiveness of water users

Table 5.9 International and national competitiveness of water users factor and objective

Factor	Objective
Cost of water	The proposal will facilitate the competitiveness of local and regional industries in the national and international context.

Extension of the IWSS into the region will enhance the competitiveness of local and regional industries through the provision of competitively priced water via a comprehensive integrated scheme capable of supporting high value enterprises.

Preparation of the proposed South West Public Water Supply Future Planning Study (Chapter 8 Section 3.2.6) will provide a rational planning base for the future development of public water supplies in the region. Implementation of the plan will support the development of high value regional enterprises and consequently the competitive contribution of the region to the State and national economy.

Table 5.10 Improved knowledge and skills factors and objectives

Factor	Objective
Supply security	Increase supply security by improving the scientific basis for decision-making and planning regarding the use of the South West Yarragadee as a water source.
Environmental risk	Reduce environmental risk by Improving the scientific certainty of the South West Yarragadee characteristics and the ecosystems that it interacts with.

The proposal has been based on an array of extensive scientific studies into the range of technical, social, environmental and economic aspects that has contributed substantially to the knowledge base of the region. Experience in developing the evaluation has also assisted in development of a skill base. The direct benefit to the region of the improved knowledge and skill base is the opportunity to maximise the future opportunities that might be available through use of regional water resources. These opportunities would be limited if a lack of information resulted in conservative decision-making on water availability to future development projects.

Information on the groundwater resource, its hydrogeology, environmental dependencies and social values will assist in maximising water availability from the Southern Perth Basin. This information will be enhanced through the proposed South West Yarragadee Sustainability Initiative (Chapter 7, Section 4.1.1).

Making the groundwater model available to the DoW/Water and Rivers Commission for assessment of licence applications from prospective self-suppliers wishing to develop groundwater based projects in the region should reduce the amount of information required to be provided by applicants in support of their applications. In some cases, obtaining the required information is a severe non-refundable financial impost on applicants which can be prohibitive, and carries no assurances that a licence will be issued as a result of providing the required information. Availability of the model and ongoing monitoring information should provide a level of enhancement to the basis for water resource management in the area, with direct benefit to current and future landholders in the region.

The Sustainability Evaluation model has application to assisting Government assessments of future major project proposals.

The extensive investigations undertaken to support development of the proposal have improved the scientific certainty and contributed to reducing the consequent environmental risks. The residual risk will be addressed through an adaptive management approach (Chapter 8 Section 3.2.1) that will ensure unlikely and unexpected adverse significant impacts can be adequately mitigated.

Precautionary principle

Table 5.11 Precautionary principle factor and objectives

Factor	Objective
Precautionary approach	Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, decisions should be guided by: • a careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and • an assessment of the risk-weighted consequences of the options This definition is taken direct from the EP Act.

The application of a proposed adaptive management and ongoing risk assessment model will ensure a precautionary approach will be applied to the implementation of the proposal. These approaches will substantially reduce the risk of serious or irreversible impacts on social and environmental values dependent on the Yarragadee aquifer.

Outcomes: Strategic Principle – Stakeholder engagement

Table 5.12 Stakeholder engagement factors and objectives

Factor	Objective
Comprehensive and regular communication	Water Corporation will maintain a comprehensive and regular information flow to the community about the project and the process throughout the sustainability assessment process.
Relevant, balanced and inclusive consultation	Water Corporation will engage with key stakeholders and the broader community to discuss issues, and potential impacts and benefits of the project.
Openness and transparency	The Water Corporation will conduct investigations and proposal development processes in an open and transparent manner
Closed loop process	Water Corporation will respond to issues and queries raised by the community and will provide feedback about how those issues have been dealt with and how they have influenced the process.

The results of the range of studies undertaken to support the proposal have been progressively made available to the community in their technical form, and in a form designed to be understood by the interested community. The information has been discussed with the community through an extensive stakeholder engagement process (Chapter 8 Section 2.1).

The stakeholder engagement process undertaken during the development of this Sustainability Evaluation/ERMP has resulted in substantial changes to the design and intent of the South West Yarragadee Water Supply Development. This process has also:

- identified issues of concern
- influenced the mitigation and enhancements to the proposal
- influenced the extent and content of formal sustainability commitments
- enhanced community awareness of the proposal and its potential consequences
- provided a social baseline for the implementation of the development.

The proposed stakeholder engagement following Government approval of the development will ensure that the community is empowered to input to the decision-making processes of the Water Corporation and provide effective input to water licensing by the Water and Rivers Commission.

Accountability

Table 5.13 Accountability factors and objectives

Factor	Objective
Define performance targets	The Water Corporation will define economic, social and environmental performance targets that reflect achievement of the objectives set out herein
Reporting performance on achievement of targets	The Water Corporation will report regularly and publicly on performance of sustainability measures

The performance targets for the proposal have been developed in terms of a range of expected impacts and outcomes expected to be achieved as a result of the proposal.

The proposed accountability framework and Water Corporation commitments for an open, transparent and accountable process during the implementation of the proposal, in particular the South West Yarragadee Monitoring Review Group (Chapter 8 Section 3.2.3) will continue to promote and enhance stakeholder engagement. This engagement will enhance the empowerment of stakeholders in the implementation and management of the proposal.

The proposal to provide a public annual Sustainability Report (Chapter 8 Section 3.2.4) will ensure information is made available to the community on performance of the sustainability measures.

1.4 IMPACT ASSESSMENT SUMMARY

Table 5.14 summarises the impact assessment and outcomes in relation to the environmental, socio-economic, strategic and process factors.

Table 5.14 Summary of relevant sustainability factors, proposed management and expected outcomes

Factor & objectives	Potentially affected area	Existing environment	Potential impact (+ve/-ve)	Proposed management	Expected outcomes
ENVIRONMENTAL PRINCIPLE – Biodiversity and ecological integrity					
Flora and fauna The Water Corporation will seek to achieve a net increase in flora and fauna in the region As a minimum, the proposal will have no adverse impact on flora and fauna in the region **Rare and Priority Flora** (groundwater dependent) The Water Corporation will seek to achieve a net increase in priority and rare flora in the region. As a minimum, the proposal will have no adverse impact on rare and priority flora in the region	Blackwood River	The Blackwood River discharges 940 GL/yr of water to the Hardy Inlet and is extensively used for recreation. The river is affected by salinity with around 30-40 GL/yr of fresh groundwater baseflow that lowers the salinity of the river during summer. Other issues in the river are nutrient levels, erosion, turbidity, pool aggradation and pool anoxia. Five species of freshwater fish (salt tolerant) exist in the River. Riparian vegetation is dominated by Flooded Gums, Peppermints and Paperbarks. Human disturbance has led to high numbers of understorey weeds in some sections.	No significant impact is expected on the terrestrial or riparian environment along the Blackwood River. The predicted drawdown from the Water Corporation proposal only is expected to result in a 6% reduction in the summer baseflow of the Blackwood River in the driest years with an associated less than 10% increase in salinity during January-February These hydrological changes are not expected to have a significant impact on aquatic fauna.	Proposed mitigation includes a commitment to the supplementation of summer flows in the Blackwood River if unexpected and unacceptable impacts are likely to occur.	The predicted change in salinity is not expected to have a significant impact on the ecological values of the already altered Blackwood River. All ecological water requirements will be met even with the predicted change in flows from both the proposal and estimated future regional use. The commitment to support reduction in threatening processes within the area will enhance ecological values currently affected or under threat and improve biodiversity in the area.

Factor & objectives	Potentially affected area	Existing environment	Potential impact (+ve/-ve)	Proposed management	Expected outcomes
Threatened Fauna The Water Corporation will seek to achieve a net increase in the viability of threatened fauna populations in the region As a minimum, the proposal will have no adverse impact on the distribution and viability of threatened fauna populations in the region **Threatened ecological communities (groundwater dependent)** The Water Corporation will seek to achieve a net increase in the viability of threatened ecological communities in the region As a minimum, the proposal will have no adverse impact on the distribution and viability of threatened ecological communities in the region	Poison Gully and Milyeannup Brook	Poison Gully and Milyeannup Brook are permanent tributaries of the Blackwood River that contribute approximately 0.1 GL/month of Yarragadee Formation discharge to the Blackwood River. Milyeannup Brook is a narrow tributary with Jarrah, She-Oak, Marri with Peppermints and dense undergrowth. Poison Gully is more diverse with a greater range of soil and moisture conditions. Five species of endemic freshwater fish were recorded in Milyeannup Brook and four in Poison Gully. Two of these, the mud minnow and Balston's pygmy perch are Priority 4 species. Both species were recorded in Milyeannup Brook and only the mud minnow was recorded in Poison Gully.	The predicted watertable drawdown resulting from the proposal is up to 1-2 m in Poison Gully and up to 2-3 m in Milyeannup Brook after 30 years of pumping. The total predicted watertable drawdown resulting from the proposal together with estimated future regional use in both valleys after 30 years is up to 3-5 m. There are approximately 177 ha of vegetation in Poison Gully and 52 ha of vegetation in Milyeannup Brook that has a depth to watertable of <10m and may be affected by groundwater drawdowns. Within this area, there may be a shift in some vegetation types in the lower slopes of the valleys; however the full range of vegetation types will still exist, only their extents may change. The current spring in Poison Gully may migrate several hundred metres downstream from its current position 3.5 km upstream from the Blackwood River and the permanent stream length of Milyeannup Brook flow may contract from 2.5 km to 1 km from the proposal and estimated future regional use. There is expected to be an approximate 30% reduction in summer baseflow.	An extensive monitoring program will be undertaken in Poison Gully and Milyeannup Brook. If unexpected and unacceptable impacts are likely to occur, contingencies will be implemented. A specific contingency is proposed to supplement flows in Milyeannup Brook if hydrological changes are likely to significantly reduce the habitat available for the Balston's pygmy perch in Milyeannup Brook. If supplementation is required, the rates of flow will be designed to mimic natural flows and water quality conditions.	Watertable drawdowns in Poison Gully are expected within a localised area. Some local changes in vegetation composition are expected. This change in vegetation composition will not significantly affect any significant flora or fauna species or local or regional occurrence of any vegetation complex or site-vegetation types. The composition of some site types may change in a small section of Milyeannup Brook and Poison Gully but there will be no significant loss of keystone species, ecosystem function (including fauna habitat) or resilience. The tributaries are important refugia for significant freshwater fish species but all defined ecological water requirements are predicted to be met and instream ecology is not expected to be significantly affected. Proposed mitigation includes a commitment to the supplementation of summer flows in Milyeannup Brook if the Balston's pygmy perch habitat is substantially affected. Commitments to reduce threatening processes within the area will enhance ecological values currently affected or under threat and improve biodiversity in the area.

Factor & objectives	Potentially affected area	Existing environment	Potential impact (+ve/-ve)	Proposed management	Expected outcomes
Blackwood river and its tributaries The Water Corporation will seek to increase the ecological integrity of the Blackwood River and its tributaries. As a minimum, the proposal will have no significant adverse impact on the Blackwood River and its tributaries	Rosa Brook	Rosa Brook is not perennial and generally flows for six months from early winter to late spring. Localised pools persist in the brook throughout the year The valley is entirely within State Forest and has similar vegetation to Milyeannup Brook; forests and woodlands of Jarrah, Marri and Peppermints with dense undergrowth. No DRF species but three Priority 3 species were recorded in Rosa Brook. Four species of freshwater crayfish and five species of freshwater fish occur including the Priority 4 mud minnow.	The predicted drawdown likely to occur after 30 years as a result of the proposal is between 0.1 m and 0.25 m with small areas of drawdown in the 0.25 – 0.5 m range near Crouch Road. This drawdown over 30 years is not expected to have a measurable effect on vegetation or habitat values. The total predicted watertable drawdown resulting from the proposal together with estimated future regional use in Rosa Brook after 30 years is up to 0.5 m (with a few very small areas with a drawdown in the 0.5 – 1 m range). The Yarragadee Formation does not outcrop at the surface in Rosa Brook and the stream is not permanent so the proposal will have no discernible impact on the hydrology of the stream.	No measurable changes in Rosa Brook are expected. The groundwater levels will be monitored to ensure that the system responds as expected. If unexpected water level changes occur, contingency measures will be developed depending on the extent of impact.	The predicted groundwater drawdowns in Rosa Brook are small and the proposal is likely to result in a "low – no measurable change" impact through most of the potentially affected area within the valley. Any vegetation change that occurs will not affect the conservation status of any significant flora or fauna species or the local or regional occurrence of any vegetation complex. Small changes may occur in some site-vegetation types but regional occurrence will not be significantly affected. Rosa Brook flows will not be affected by the proposal.
Wetlands The Water Corporation will seek to increase the ecological integrity of wetlands in the region. As a minimum, the proposal will have no significant adverse impact on wetlands **Other Groundwater Dependent Ecosystems (GDEs)** The Water Corporation will seek to increase the ecological integrity of other groundwater dependent ecosystems in the region. As a minimum, the proposal will have no	St John Brook	St John Brook is the largest tributary of the Blackwood River and has a number of large permanent pools including Barrabup Pool and Workmans Pool. The brook has a small summer baseflow from the Leederville Formation of approximately 0.3 GL/yr (10 L/s), which is approximately 0.6% of the mean annual flow in the brook. Most of the St John valley is included within proposed conservation reserves and 16% of the St John Brook catchment has been cleared. The vegetation of St John Brook is dominated by open forest with an overstorey of Marri and Jarrah in the valleys and jarrah on the lateritic slopes. Three species of freshwater crayfish and four species of freshwater fish occur in St John Brook including the Priority 4 mud minnow.	The total predicted watertable drawdown resulting from the proposal together with estimated future regional use upstream of Barrabup Pool after 30 years is 1-2 m with most of this drawdown attributable to the proposal. There are approximately 700 ha of vegetation in St John Brook within the general area that may be affected by groundwater drawdowns. Within this area, the lower slopes are most likely to show change, with a small down-slope shift in the vegetation types. The scale of the model and the accuracy of the depth to groundwater contours is not sufficient to refine the area of actual expected impact further, however St John Brook is highly dissected and the lower slopes that may show some change would make up only a small proportion of the 700 ha. Drawdown above (not including) Barrabup Pool is expected to cause a small reduction in summer water levels in permanent pools and reduce summer streamflow. As the summer flows are already very low, there is potential that the groundwater discharge will cease in the upper section of the brook.	An extensive monitoring program will be undertaken in St John Brook. If unexpected and unacceptable impacts are likely to occur, contingency measures will be developed depending on the type and extent of impact. One proposed specific contingency is to supplement flows in St John Brook if hydrological monitoring indicates that the permanence of the stream is at risk. If supplementation is required, the rates of flow will be designed to mimic natural flows and water quality conditions.	The proposal has the potential to cause some groundwater drawdown within a general 700 ha area along St John Brook. There may be an effect on some vegetation on the lower slopes of the valley within this broad area. This will not significantly affect the conservation status of any significant flora or fauna species or the occurrence of any vegetation complex, but may affect the local occurrence of some site-vegetation types in a small section of the brook. Reduction in artesian pressures in the Yarragadee Formation below some sections of the brook also has the potential to reduce summer baseflow from groundwater discharge and pool levels above Barrabup Pool. Barrabup Pool itself and other pools below it are not expected to be affected. A contingency to supplement flows is proposed to ensure that this does not result in an unacceptable impact on the brook.

Factor & objectives	Potentially affected area	Existing environment	Potential impact (+ve/-ve)	Proposed management	Expected outcomes
significant adverse impact on other groundwater dependent ecosystems	Reedia Wetlands	The Reedia wetlands occur both north and south of the Blackwood River between Hut Pool and Adelaide Brook within the State forest. The wetlands consist of narrow channels of creek-line flow and small permanent pools that are maintained by groundwater flows from the Leederville Formation supported by artesian heads from the underlying Lesueur Sandstone. The Reedia wetlands are named after the Priority 4 Reedia spathacea species that is found within the wetlands. The significant components of the Reedia wetlands are the valley floors with small permanent pools that support a proposed threatened ecological community and a habitat for a critical frog species.	The investigations undertaken by the Water Corporation have shown that groundwater abstraction from the Yarragadee aquifer will not transfer across the Busselton Fault and affect water table levels in the Reedia wetlands. Therefore, the Water Corporation proposal is expected to have no impact on the Reedia Wetlands.	Monitoring will be undertaken to ensure that no unexpected impacts occur on the Reedia Wetlands.	No impact from the Water Corporation proposal is expected on the Reedia Wetlands. Groundwater monitoring will be carried out to ensure that no unexpected changes in water levels occur as a result of the project. This will provide an early warning system if the aquifers do not perform as predicted. The investigations to date and the proposed ongoing hydrological monitoring of the Reedia wetlands will provide increased knowledge of other threats to the wetlands that will help inform management decisions that reduce the risk to the environment and may contribute to a net improvement.

Factor & objectives	Potentially affected area	Existing environment	Potential impact (+ve/-ve)	Proposed management	Expected outcomes
	Scott Coastal Plain	The Scott Coastal Plain occurs south of the Blackwood Plateau and north of the coastal dunes system. The eastern Scott Coastal Plain is internally draining and characterised by swamps and lakes. The surface geology comprises largely sandy deposits. The D'Entrecasteaux National Park includes a large area of the south eastern Scott Coastal Plain and includes Lake Jasper, Lake Quitjup and the lower parts of Barlee Brook and the Donnelly River. The Scott Coastal Plain is partially cleared for agriculture with large areas of remnant native vegetation. The flora and vegetation on the plain are highly diverse and specialised, and many species have a restricted range. The "Scott River Ironstone Association" vegetation community is listed as Endangered by CALM but the community has not yet been formally listed by the State Minister for Environment and is not listed as a TEC under the EPBC Act.	The watertable drawdowns (on the basis of a 9% reduction in long term rainfall) from the proposal on the eastern Scott Coastal Plain are expected to be mostly less than 0.25 m in the summer minimum after 30 years, with up to 1m drawdowns in small areas in the northern part of the coastal plain. Drawdowns from the proposal combined with future regional use abstractions are expected to be more widespread with drawdowns of up to 1 – 2 m. Drawdowns on the western Scott Coastal Plain are expected to be minor (less than 0.25 m) from the proposal and up to 1 m from the combined abstractions. Drawdowns will occur very gradually over the 30 year period providing the opportunity for groundwater dependent ecosystems to adapt. Lake Jasper and Lake Quitjup are not expected to be affected by drawdowns from the proposal. Most other wetlands on the Scott Coastal Plains are seasonal and will not be affected by a drop in summer minima of water levels. There are 7150 ha of vegetation within the eastern Scott Coastal Plain and 110 ha on the western Scott Coastal Plain where the watertable is likely to be within 10 m of the surface and may potentially be affected by drawdowns from the proposal. No drawdown is expected under the Scott Coastal Plain Ironstone Association. The estimated drawdown in the majority (about 90%) of this area is expected to be 0.25 m or less resulting in a "low – no measurable change" potential impact on groundwater dependent ecosystems. Some small areas (north eastern part of the plain) where drawdown may be as much as 1 m, there may possibly be a "moderate" to "high" potential impact on groundwater ecosystems. Any adverse impact on these systems is likely to be mitigated by soil conditions and the recovery of the watertable during winter where inundation of the landscape occurs. There is not expected to be a measurable change in vegetation (except in small areas where there is potential for changes in site vegetation types in the north eastern part of the plain) given the anticipated full recovery in the watertable each year, soil characteristics and that drawdowns are much smaller than the observed seasonal watertable variation. Similarly, the effect of drawdowns on acid sulphate soils (acid generation) is expected to be minor.	The Water Corporation will develop and implement an extensive biological, hydrological and physical monitoring program for the region including the Scott Coastal Plain to assist in the adaptive management of the proposal. If unexpected and unacceptable impacts are likely to occur, appropriate responses will be developed and submitted to the Monitoring Review Group and the Department of Water for assessment. The Water Corporation is also committed to undertaking a comprehensive biodiversity study (within the proposed Sustainability Initiative) which will include the Scott Coastal Plain and investigate the relationship between ecosystems and groundwater. This study is proposed as a research offset and to assist with the adaptive management of the proposal. The Water Corporation will contribute to a program for the management of threatening processes (weeds, feral animals, etc) in area of conservation significance and areas of potential impact.	Over the majority of the area of potential impact (areas where the watertable is within 10 m and a drawdown is expected) no detectable changes in groundwater dependent ecosystems are anticipated for the Water Corporation proposal. In the northern part of the eastern Scott Coastal Plain there may be gradual local changes to some site-vegetation types but this will not adversely affect fauna habitat or the conservation status of any significant flora or fauna species or occurrence of vegetation complexes. The Scott River Ironstone Association is not expected to be adversely affected. Given the expected small predicted drawdowns and recovery of watertables each year, the effects of acid sulphate soils are expected to be minimal on the Scott Coastal Plain. Similarly, no significant adverse impact on wetland functions is expected. Proposed mitigation commitments to reduce threatening processes within potential areas of impact will help protect and restore ecological values currently affected or under threat and enhance biodiversity in the area. The knowledge and data obtained from the proposed biodiversity study (within the proposed Sustainability Initiative) and comprehensive monitoring program will improve the natural understanding of the area and provide for adaptive management to ensure the area is cautiously managed into the future, particularly in the context of climate change. The proposal combined with estimated future regional abstraction is expected to result in a much greater area and amount of drawdown.

Factor & objectives	Potentially affected area	Existing environment	Potential impact (+ve/-ve)	Proposed management	Expected outcomes
	Swan Coastal Plain	The portion of the Swan Coastal Plain considered in this report is from Busselton to Bunbury. The plain is relatively flat with shallow, highly seasonal watertables and the plain is prone to seasonal flooding and waterlogging. Much of this area has been cleared and drained for agriculture. Remnant vegetation in this area is highly significant and contains several listed TECs. The Vasse–Wonnerup Wetland system (Ramsar wetland) occurs in a linear system along much of this coastline.	The predicted drawdowns in summer watertable minimums from the proposal alone after 30 years are all less than 0.5 m south of Bunbury and less than 0.25 m east of Busselton. Combined drawdowns are mostly less than 1 m with small areas of drawdown in the 1 – 2 m range. A total of 2270 ha of remnant vegetation on the Swan Coastal Plain is within areas of potential drawdown from the proposal where the watertable is within 10 m of the surface. Predicted proposal drawdowns of 0.25 m in this area may possibly result in "low" potential impact where there is likely to be "no measurable change" in ecological processes and species composition and abundance. Therefore, the proposal is not expected to have any significant impact on the vegetation of the Swan Coastal Plain in these areas. "Moderate – small change" in groundwater dependent ecosystems may possibly occur in small areas where drawdown may be up to 0.5 m after 30 years (south of Bunbury). Given the full recovery of the watertable each winter, the natural seasonal variation is greater than predicted drawdowns, no significant adverse impact on vegetation is anticipated. Three TECs occur in areas where the predicted drawdown from the proposal is less than 0.25 m after 30 years. There is not expected to be a measurable or significant adverse impact at any of these sites given the full recovery of the watertable in winter, presence of clay pans and ironstones and moisture holding capacity of soils in these areas. The potential for drawdown to adversely affect acid sulphate soil (acid generation) are expected to be minimal as the drawdowns are small and full recovery of water level is expected each year.	As for the Scott Coastal Plain.	The proposal alone is not expected to have any significant impact on the vegetation or TECs of the Swan Coastal Plain. The risk of effects of drawdown on acid sulphate soils (acid generation) is expected to be minimal. No impact is expected on the Vasse–Wonnerup Wetland system from groundwater abstraction as the water levels are connected to the ocean. The proposal will result in no significant impact on the seasonal wetlands of the Swan Coastal Plain, as surface water levels will recover fully each winter. Knowledge and data obtained from the proposed South West Yarragadee Sustainability Initiative biodiversity study and comprehensive monitoring program will improve the understanding of the area and provide for adaptive management to ensure cautious management into the future, particularly in the context of climate change.

Factor	Objective	Existing environment	Potential impact (+ve/-ve)	Proposed management	Expected outcomes
ENVIRONMENTAL PRINCIPLE – Biodiversity and ecological integrity					
Development footprint	The construction of the proposal will cause minimal permanent disturbance	The development footprint for this proposal includes the wellfield, treatment plant, storage tank and the pipeline to join with the Stirling Trunk Main at Harvey. The pipeline route crosses the Capel, Ferguson, Preston, Collie and Brunswick Rivers.	Clearing of 50 ha of native vegetation. Clearing of pine plantation for the treatment plant. Five river crossings that are Aboriginal heritage sites. Dewatering may be required in some areas for installation of the buried pipeline. This introduces the risk of temporary exposure of acid sulphate soils.	A flora and fauna survey will be undertaken of all areas to be cleared. The method of installing the pipeline across the rivers will be determined through the heritage survey. All crossings will be stabilised and rehabilitated to minimise erosion and water quality impacts. The Water Corporation proposes to provide an offset for clearing through the contribution of land to the conservation estate using a loss/gain ratio of 1:1.5 and the principle of "like for like or better".	The impacts of the proposal infrastructure have been minimised through avoiding areas of environmental significance as far as possible. The 50 ha of vegetation clearing required will be offset through land contribution to the conservation estate.
ENVIRONMENTAL PRINCIPLE – Energy efficiency					
Greenhouse gas emissions	The proposal will be designed and operated according to Australia best practice regarding greenhouse gas emissions	Groundwater will be extracted from each well and pumped to a treatment plant and holding tank for treatment. The treated water will then be gravity fed from the holding tank to Harvey and on to Perth for use. Power will be required for each well and at the treatment plant, and will be sourced from the South West Interconnected System.	Energy consumption for pumping and operation of the treatment plant will amount to approximately 4.6 MW. The increase in emissions is estimated to be 41 000 t/yr CO_2e based on an assumed indicative carbon intensity of the Western Power South West Integrated System of 1032 kg CO_2/MWhr.	The Corporation has set an aspirational target of being carbon-neutral by 2030. As part of the GHG management portfolio approach, a Greenhouse Emissions Reduction Plan will be developed to manage GHG emissions consistent with the Water Corporation purpose of "sustainable management of water services to make Western Australia a great place to live".	Implementation of the proposal will indirectly contribute to increased energy use in Western Australia. The Corporation will utilise best practice in the design and operation of the infrastructure to minimise energy use and will pursue its carbon neutral policy with the expected longer-term outcome of no increase in greenhouse gas emissions.

Factor	Objective	Existing environment	Potential impact (+ve/-ve)	Proposed management	Expected outcomes
SOCIO-ECONOMIC PRINCIPLE – Long-term economic health					
Economic growth	The proposal will facilitate economic growth in the IWSS and South West regions.	Communities with a diversity of economic enterprises tend to be more stable and less subject to economic cycles. They offer a wider range of employment opportunities leading to a more diverse business culture and richer society. This diversity maintains population levels and reduces outward migration. It may even attract inward migration. Approximately 36 GL/yr is currently drawn from this aquifer to service many of the town supplies as well as self-supplied enterprises, including agriculture.	Development of the proposed wellfield and allocation of 45 GL/yr to the Water Corporation does not preclude future use by the local water boards and other private users. The transfer pipeline brings a substantial source into the system and transports it across the region. This will facilitate local access rather than inhibit it for anyone seeking a public water supply of good quality water. Improved access to water will encourage business development, economic growth and economic diversity.	The Water Corporation has a responsibility to supply water to all customers on terms agreed by the Government. The Water Corporation commits to making water available from the new infrastructure to any consumer prepared to enter into the standard access arrangements that apply to water users in the State. New customers in the region will be eligible to apply for access to the proposed pipeline on the standard terms.	The proposal will contribute to the maximisation of economic output for the State. The proposal will enhance economic diversity and provide opportunities for economic growth through increased business activity in the South West region and areas served by the IWSS.
Economic diversity	The proposal will enhance economic diversity in the IWSS and South West	As above	As above	As above	As above
Business and industry development	The proposal will provide opportunities for increased business activity	As above	As above	As above	As above
Economic efficiency	The proposal will provide the most cost-effective water supply source for the State.	Economic (allocative) efficiency relates to maximising the economic output by selection of the most efficient water supply option.	The South West Yarragadee water development is the most cost effective approach to meet the forecast need of 45 GL/yr within a practically achievable timeframe. Public water supply is one of the highest value water uses, which maximises the economic output from the resource.	As above	The proposal will provide cost-effective water supplies to those communities serviced by the IWSS.

Factor	Objective	Existing environment	Potential impact (+ve/-ve)	Proposed management	Expected outcomes
SOCIO-ECONOMIC PRINCIPLE – Public water supply					
Water use efficiency	The Water Corporation will encourage the efficient usage of water.	The State Water Strategy requires efficiency targets as a condition of water allocation licences. The Water Corporation has implemented several measures to encourage the efficient use of water including: • Rebate Scheme for water efficient items and practices • Higher prices for high water consumers • Education program.	The proposal will meet increasing demand in the IWSS that is due to expansion of the system and population growth. The proposal will not affect the Water Corporation commitment to reducing per capita water use.	The Government has set a target of reducing per capita water use from the current unrestricted level of 180 kL/person/yr to 155 kL/person/yr by 2012. The Water Corporation has committed to the achievement of that strategic objective.	Increasing efficiency in water use in the IWSS through progressive implementation of a demand management program.
Existing and future needs	The proposal will contribute to meeting the existing and forecasted demand for public water supply in the IWSS and the South West under a range of possible future climate scenarios. Water will be available to meet reasonable regional public water supply needs.	The Water Corporation supplies water to most South West towns with the exception of Busselton and Bunbury, which are supplied by separate independent statutory water boards. Harvey, Waroona, Binningup, Myalup and Hamel are already connected to and supplied from the IWSS.	As a result of the internal sustainability evaluation process, the proposal to abstract water from the South West Yarragadee aquifer for the IWSS has developed into a plan to extend the IWSS into the South West region. The proposal will contribute directly to achievement of the public water supply sustainability objective of meeting existing and forecasted demand for public water supply in the IWSS through extension of the IWSS into the region.	The proposed South West Public Water Supply Future Planning study will develop a plan for future public water supply needs in the South West and how they will be met. The plan would provide certainty to the South West, and would help to resolve some of the concerns associated with futures foregone, benefit and equity, and accommodating reasonable regional needs.	The proposal will: • provide a major increase in the supply capability and reliability of the IWSS • provide major infrastructure to support the development of high value economic development in the region through the provision of an integrated public water supply system • result in a comprehensive plan to provide for the future development of regional public water supplies.
South West town supplies	This proposal will increase supply security for South West towns	As above	As above	As above	As above

Factor	Objective	Existing environment	Potential impact (+ve/-ve)	Proposed management	Expected outcomes
Quality of supply	To supply high quality water to consumers	Through its Customer Charter the Water Corporation has committed to provide the community with water that is safe to drink and that complies with directions on drinking water quality made by the Minister for Health.	The South West Yarragadee aquifer is of a quality highly suited for public drinking water supplies. The water is well within guideline values for all constituents, with the exception of iron, which will need to be treated for removal. The Yarragadee aquifer occurs at depth and is confined over most of its area by overlying formations. Land use over the majority of the recharge zone is State forest. This results in a water source with a high degree of protection against potentially contaminating activities that may be carried out on the land surface.	The proposal for development of the South West Yarragadee aquifer includes a filtration based treatment plant. The water will also be chlorinated to remove any pathogens that may enter the water after pumping from the aquifer, and fluoridated in accordance with Government policy. The Water Corporation commits to working with the relevant agencies to arrange declaration of a public water supply catchment area over the relevant portions of the Yarragadee aquifer recharge zones.	The outcome of use of the Yarragadee aquifer as proposed, is expected to be a high quality water supply suitable for use as a public water supply with minimal treatment. The administration of catchment protection under the *Country Areas Water Supply Act 1947* will assist in ensuring the quality of water is maintained for the future.
Drinking water source protection	The Water Corporation will work with the Water and Rivers Commission, Conservation Commission and CALM to protect recharge areas.	As above	As above	As above	As above
SOCIO-ECONOMIC PRINCIPLE – Regional needs					
Regional needs for private water supplies	The proposal will be developed such that reasonable regional needs for water, including social, recreational and projected future development needs are not compromised by the proposal.	The State Water Strategy requires that all reasonable regional needs for water, including social, recreational, projected future development and environmental water provisions will be satisfied before transfers can take place. The State Water Strategy also indicates that the South West Yarragadee source should be developed "for the benefit of communities in the South West and those serviced by the Integrated Water Supply Scheme".	While the source is being investigated at this time to meet strong growth in the existing IWSS, once connected these new assets would also be available to deliver water to high value uses in the South West. Based on current information, it is not anticipated that competition between the proposal and regional needs will occur in the near future and may be up to several decades away. However, it is apparent that expansion of usage in localised areas of the Scott and Swan Coastal Plains may be limited by environmental constraints, even in the absence of the IWSS abstraction.	The Water Corporation proposes to monitor the trends in water usage from the Yarragadee aquifer and potential future reasonable regional needs for water from this aquifer and report to Government.	The proposal is not anticipated to significantly constrain water availability from the Yarragadee aquifer to meet reasonable regional needs. The proposal has the potential to enhance overall water availability from the aquifer

Factor	Objective	Existing environment	Potential impact (+ve/-ve)	Proposed management	Expected outcomes
Impact on current key water users	The Water Corporation will seek to understand and articulate the impact of the proposal on current key water users, to ensure that existing water users are recognised and protected from unreasonable impact.	The requirements of the RWI Act are that existing water users are recognised and protected from unreasonable impact.	The Water Corporation proposal has been deliberately located in the State forest area of the Blackwood Plateau to minimise impact on water availability to other users, and to maximise overall water availability from the resource. The proposal will not result in any reduction in water availability to existing users in the region, in terms of existing water allocations and levels of use. However, there is some potential for drawdown interference or seawater intrusion.	The freshwater/saltwater interface will be monitored to ensure that appropriate planning can be in place if saltwater intrusion is likely to occur. The Water Corporation has committed to directly make good any impacts of seawater intrusion on public water supply wells (unless such impacts can be clearly attributable to abstraction by a third party).	The proposal will not result in any reduction in water availability to existing users in the region, in terms of existing water allocations and levels of use. Any impact due to seawater intrusion will be mitigated.
SOCIO-ECONOMIC PRINCIPLE – Community well being and heritage					
Lifestyle, amenity and recreational use and access	The Water Corporation will determine, through community consultation, whether community members anticipate changes to lifestyle, amenity, or recreational use and access as a result of the proposal, to ensure that negative impacts do not occur from this project and to explore potential positive outcomes.	The dominant social values of the Blackwood Plateau and its surrounds are: • Aboriginal sites of cultural significance (dealt with under Indigenous issues factor) • historic features and cultural sites of early settlement (dealt with under Sense of place factor) • tourism and recreation values • areas of high scenic quality. Collectively these contribute to a strong “sense of place”, and the latter two particularly relate to lifestyle, amenity, and recreational use and access.	All communities included in the scoping phase of the social impact assessment study were concerned about potential changes to their enjoyment of the area as a result of the proposal. Concerns related to potential changes to the environment, especially the Blackwood River. No significant impact is expected on the environment of the Blackwood Plateau. There will be a small reduction in summer baseflow of the Blackwood River. This change is minor and is not expected to affect the social values of enjoyment or amenity in the river.	The Water Corporation proposes to establish a South West Yarragadee Monitoring Review Group composed of people from the South West to participate in the assessment of monitoring programs.	No changes to amenity, lifestyle and recreational use in the area will occur. The benefit will come from increased community involvement in monitoring and reporting of results, leading to better safeguards of community amenity.

Factor	Objective	Existing environment	Potential impact (+ve/-ve)	Proposed management	Expected outcomes
Direct and indirect job creation	The proposal will create employment opportunities	The project would create employment directly in the building and maintenance of the infrastructure. Reliable water supply would also stimulate economic growth and industry with indirect benefits for employment.	Job creation both in the South West and the IWSS regions	Local employment preferences in construction contracts in accordance with Water Corporation contract and employment policy and practice. Employment of Indigenous people in monitoring programs in accordance with the Water Corporation Involvement and Indigenous Employment Opportunities Policy	Some employment opportunities through direct involvement in the project construction and operation. Increased regional job creation potential through provision of integrated water supply to support high value economic development with associated employment opportunities.
Sense of place	The Water Corporation will determine, through community consultation, whether community members with strong attachments to places and heritage values anticipate changes to those places and values as a result of the proposal, to ensure that negative impacts do not occur from this project and to explore potential positive outcomes.	Landscapes, people, and cultural or environmental 'icons' (such as the Blackwood River or a National Park) can contribute to 'sense of place'.	The South West communities expressed concerns related to potential changes to the environment. Sense of place in the South West is strongly linked to the Blackwood River. As the changes expected in the Blackwood River are minor, they are not expected to have a significant impact on sense of place.	The Water Corporation proposes to establish a South West Yarragadee Monitoring Review Group composed of people from the South West to participate in the assessment of monitoring programs. This will allow the community to be involved in decision-making about the project and its impact on sense of place.	No change in the sense of place values of the South West is expected to occur.

Factor	Objective	Existing environment	Potential impact (+ve/-ve)	Proposed management	Expected outcomes
Indigenous communities	The Water Corporation will undertake to protect and avoid disturbance of Aboriginal heritage sites. The Corporation will explore potential positive outcomes for and with the Indigenous communities.	The Blackwood River retains significant heritage and cultural value for the Aboriginal community. There are numerous sites near the Blackwood River on the Department of Indigenous Affairs (DIA) Register of Aboriginal Sites. This includes sites such as the Hardy Inlet (archaeological deposit, camp), Blackwood River Ochre Deposit, Sues Bridge (meeting place, camp, hunting place), Blackwood Riverbank (mythological), and Barrabup Pool (mythological)), as well as the Blackwood River itself.	Some heritage sites may be affected by the proposal. The implications of these effects need to be discussed with the Indigenous communities, and will be the subject of a separate extensive consultation process that will be reported separately. The Water Corporation will discuss opportunities for employment of Aboriginal people on aspects of the project with representative groups.	Monitoring, management and reporting of impacts on heritage sites will be undertaken within the requirements of the AH Act.	The Water Corporation has undertaken the preliminary infrastructure design to minimise any disturbance to Aboriginal heritage sites, which includes avoiding all sites on the current Department of Indigenous Affairs register, except in the case of linear features such as listed rivers. Further consultation will establish the protocols for further field surveys to identify any sites not currently on the register. Where possible, opportunities will be provided for Aboriginal people to be employed on aspects of the project.
Development footprint	The construction and maintenance of infrastructure will cause minimal permanent disturbance to the community	The final pipeline alignment through agricultural land is yet to be determined. A notional route has been identified but an intensive engagement process with potentially affected landholders will need to be undertaken.	The wellfield and treatment plant are not near residences and are unlikely to cause an impact. Impacts on individual landholders whose land is on the pipeline route. Impacts include disturbance to summer cropping, access, dust, noise, increased traffic on site, and the effects of a work team of up to 20 people on site.	Access to private land and appropriate compensation will be negotiated with each landholder before commencement of construction.	The outcome will be positive overall, but may be negative in the short term for farmers whose properties are along the pipeline route. The potential benefits of employment and economic activity will be enhanced through the Corporation “buy local” policy.

Factor	Objective	Existing environment	Potential impact (+ve/-ve)	Proposed management	Expected outcomes
STRATEGIC PRINCIPLE – Government policy					
Equitable access to water	The Water Corporation will ensure fair and equitable access to water for domestic use for all Water Corporation customers.	Water is a shared resource that should be available to all through equitable distribution. To ensure this, the cost of reasonable domestic water requirements should be affordable to all.	The Government uniform pricing policy will ensure that there is equity in the water supply costs. The Water Corporation commitment to prepare a South West Public Water Supply Future Plan would facilitate connection of centres to the IWSS or directly to the Yarragadee aquifer.	Through the South West Public Water Supply Future Planning Study, the Water Corporation will determine the future public water demand in those towns and centres in the South West that may be able to connect to the IWSS or be directly supplied from other sources.	Equitable access to public water supply schemes will be maintained through continued implementation of both Government Policy on uniform tariff policy and Water Corporation Customer Charter. Equitable access will be enhanced through the preparation and implementation of the South West Public Water Supply Future Plan.
Government plans	The proposal will be consistent with the following Government agency plans and policies where they are appropriate and congruent: • Environmental protection • Regional development • Forest management • Regional planning • Allocation planning and licensing	The State Water Strategy makes specific reference to development of the South West Yarragadee resource "for the benefit of communities in the South West and those served by the Integrated Water Supply Scheme". The State Sustainability Strategy (Government of Western Australia 2003a) indicated that the next new major source for meeting future water supply needs for Perth should be subject to a sustainability assessment. The South West Yarragadee project is being subjected to such an assessment, in compliance with the strategy.	The development of this proposal has identified a range of gaps in Government policies and proposed ways of addressing those gaps.	Two key policies that the proposal draws from are the State Water Strategy and the State Sustainability Strategy. The project specific sustainability principles developed for this proposal are based on the State Sustainability Strategy. The proposal is consistent with both the foundation and process principles of the strategy, and is an example of how these principles have been applied in a major public project	The proposal will comply with relevant Government plans and policies. Proposals to address policy gaps will enhance the development of Government policy to facilitate the consideration of this proposal and proposals for groundwater abstraction in other areas of the State.
Regional development	The proposal will provide opportunities for regional development	As for *Regional needs* factor and *Business development* factor.	-	-	-

Factor	Objective	Existing environment	Potential impact (+ve/-ve)	Proposed management	Expected outcomes
STRATEGIC PRINCIPLE – Climate change					
Climate change	Determine the impact of likely climate change scenarios on the sustainability of the proposal.	Winter rainfall in the South-West of Western Australia has decreased substantially since the mid-20th century, with a series of years of lower than average rainfall since the mid-1970s. The decrease in rainfall appears to be partly the result of changes in large-scale global atmospheric circulation associated with an enhanced greenhouse effect.	Climate change will have an impact on recharge to the Yarragadee aquifer, which may result in changes to the watertable in areas where there are groundwater dependent ecosystems. The change in the watertable may, in time, induce changes within that system. Under the scenario where climate in the south-west of Western Australia will become drier, the proposal may cause a further lowering of the watertable in areas where the drawdowns in the Yarragadee aquifer are transmitted to the watertable.	The issue of climate change has been recognised throughout the proposal development and a 9% reduction in the long-term rainfall average has been included in the base modelling scenario. The Water Corporation will conduct a major biodiversity study of the groundwater dependent ecosystems of the Scott and Swan Coastal plains and the Blackwood River area that will potentially be affected by the proposal, and other selected areas not affected, to establish a baseline against which climate-and proposal-induced changes may be assessed. The acceptability of the development impacts in the context of climate change will be judged against a set of defined principles.	The proposed key principles for determining the acceptability of change induced by the proposal in the context of climate change, and the proposed adaptive management framework, will ensure that the effects of climate will be comprehensively considered in the environmental management of the proposal.
STRATEGIC PRINCIPLE – International and national competitiveness of water users					
Cost of water	The proposal will facilitate the competitiveness of local and regional industries in the national and international context.	The cost of the various source options is an important consideration in progressively developing the water sources that form the basis of the IWSS as it expands to meet growing demand, and to provide higher levels of security. Overall, the IWSS has been built up within a program primarily based on developing the viable and environmentally acceptable sources in order of cost.	The South West Yarragadee aquifer is the most economical large scale source of water available to the IWSS in the required timeframe. Preferentially developing lower cost water sources for the IWSS maintains the lowest possible water pricing to customers. This in turn supports the national and international competitiveness of water users taking water from the system.	The Water Corporation will continue to execute all components of its Security Through Diversity strategy and update its source development plan based on the latest information available. The Water Corporation will undertake a review of public water supply planning in the South West that examines expected growth in the need for public water supplies and the potential options for meeting those demands.	A rational planning base for the future development of public water supplies that will support the development of high-value regional enterprises and, consequently, the competitive contribution of the region to the State and national economies.

Factor	Objective	Existing environment	Potential impact (+ve/-ve)	Proposed management	Expected outcomes
STRATEGIC PRINCIPLE – Improved knowledge and skills					
Environmental risk	Reduce environmental risk by Improving the scientific certainty of the South West Yarragadee characteristics and the ecosystems that it interacts with.	As for the *Precautionary principle.*	–	–	–
Supply security	Increase supply security by improving the scientific basis for decision-making and planning regarding the use of the South West Yarragadee as a water source.	The groundwater investigation program undertaken to support this proposal is one of the largest such programs undertaken in Western Australia. Approximately $12 million has been expended since 2002 in improving our knowledge of the groundwater resources of the region and their relationships with environmental and social values.	The increased knowledge from the proposal will assist in maximising water availability from the Southern Perth Basin. The model developed has been made available to the Department of Water for use in the management of water resources in the region. This should reduce the amount of information required to be supplied by applicants for water licences.	The Water Corporation is proposing to implement a South West Yarragadee Sustainability Initiative, intended to enhance the information base to provide for maximisation of water availability in the region. This initiative will provide information on key social and ecological aspects, and risk areas, to complement the information already made available through the proposal and monitoring programs.	Information on the groundwater resource, its hydrogeology, environmental dependencies and social values will assist in maximising water availability from the Southern Perth Basin. This information will be enhanced through the proposed Sustainability Initiative.

Factor	Objective	Existing environment	Potential impact (+ve/-ve)	Proposed management	Expected outcomes
PROCESS PRINCIPLE – Precautionary principle					
Precautionary approach	Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the Precautionary principle, decisions should be guided by: • a careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and • an assessment of the risk-weighted consequences of the options. This definition is taken directly from the EP Act.	The nature of groundwater is such that there is always an element of uncertainty when making decisions about water availability, and predicting the drawdown impacts of particular developments. Under these circumstances the options are: to make conservative decisions that limit the stress and allow a knowledge base to be developed as the stress is progressively allowed to increase under monitored conditions or, where the potential benefits of the proposal might be high, to adopt an approach that addresses risk and uncertainty through adaptive management and contingencies.	The Precautionary principle has been applied in this proposal through improving the knowledge of the resource, risk assessment, design and implementation of the proposal to minimise risk, mitigation, adaptive management and contingencies.	The project will be managed through an adaptive management process that consists of: • management objectives and performance measures • management response choices • monitoring and evaluation of outcomes • feedback of new information into the decision-making process • stakeholder engagement, specifically through the Monitoring Review Group. The South West Yarragadee Sustainability Initiative is a key element of the proposed adaptive management framework for improving the knowledge of water availability in the region for all users.	The application of an approach of adaptive management and ongoing risk assessment will ensure a precautionary approach will be applied in implementation of the proposal. This approach will substantially reduce the risk of serious or irreversible impacts on social and environmental values dependent on the Yarragadee aquifer.

Factor	Objective	Existing environment	Potential impact (+ve/-ve)	Proposed management	Expected outcomes
PROCESS PRINCIPLE – Stakeholder Engagement					
Comprehensive and regular communication	Water Corporation will maintain a comprehensive and regular information flow to the community about the project and the process throughout the sustainability assessment process.	Stakeholder engagement provided the foundation for community input to the design and implementation framework for the proposal. Stakeholder engagement was strongly focused on local communities in the South West Region including Nannup, Augusta, Margaret River, Busselton, Capel, Bunbury, and farmers on the Scott Coastal Plain. Water consumers in the Perth region also formed a key stakeholder group that was consulted in the evaluation process.	Stakeholder engagement through the development of the proposal has consisted of: • Community Reference Group from the SW that met regularly to provide input into the proposal • two sets of public information sessions and "walk-ins" • market research • focus group in the Perth region • technical information progressively made publicly available • public review of the draft Scoping report • interviews with stakeholders for the social impact assessment.	The stakeholder engagement phases yet to be completed are: – the public review of the Sustainability Evaluation /ERMP – the continued involvement of stakeholders in the adaptive management of the resource through the South West Yarragadee Monitoring Review Group.	The stakeholder engagement process has resulted in changes to the design and intent of the South West Yarragadee Water Supply Development. This process has also: • identified issues of concern • influenced the mitigation measures and enhancements of the proposal • influenced the extent and content of formal sustainability commitments • enhanced community awareness of the proposal and its potential consequences. • provided a social baseline for the implementation of the development.
Relevant, balanced and inclusive consultation	The Water Corporation will engage with key stakeholders and the broader community to discuss issues, and potential impacts and benefits of the project.	As above	As above	As above	As above
Openness and transparency	The Water Corporation will conduct investigations and proposal development processes in an open and transparent manner	As above	As above	As above	As above

Factor	Objective	Existing environment	Potential impact (+ve/-ve)	Proposed management	Expected outcomes
Closed loop process	The Water Corporation will respond to issues and queries raised by the community and will provide feedback about how those issues have been dealt with and how they have influenced the process.	As above	As above	As above	As above
PROCESS PRINCIPLE – Accountability					
Define performance targets	The Water Corporation will define economic, social and environmental performance targets that reflect achievement of the objectives set out herein	The Water Corporation has implemented a comprehensive stakeholder engagement program and social impact assessment during the preparation of this Sustainability Evaluation/ERMP. This engagement has led to changes to the proposal and the development of the accountability framework.	Key stakeholders, including the community will be involved in the setting of management objectives, performance measures and targets for the development. The Water Corporation will be held accountable for achievement of these objectives and performance measures through an open and transparent process.	A South West Yarragadee Monitoring Review Group will be formed to assist implementation of the adaptive management framework	The proposed accountability framework and Water Corporation commitments for an open, transparent and accountable process during the implementation of the proposal will continue to promote and enhance stakeholder engagement. This engagement will enhance the empowerment of stakeholders in the implementation and management of the proposal.
Reporting performance on achievement of targets	The Water Corporation will report regularly and publicly on performance of sustainability measures	As above	Public reporting of results will provide an informed and independent review of the monitoring results and performance.	An annual Sustainability Report will be published to describe monitoring results, any environmental incidents and changes in management. The advice of the Monitoring Review Group and the Water Corporation response will also be made publicly available.	As above

2 BENEFICIARIES OF THE PROPOSAL

The beneficiaries of the proposal are extensive and are listed in Table 5.15 together with the specific primary benefits expected to flow from implementation of the proposal.

Table 5.15 Beneficiaries and benefits

Beneficiary	Primary benefit
Water Corporation	Ability to improve the volume of water available to meet growth in demand in the IWSS and the need for an improved level of security for customers through the addition of a cost-competitive water source.
Existing IWSS customers	Improved level of security of water supply.
South West region	Extension of the IWSS into the South West region to provide access to a major integrated public water supply system with consequential opportunities for regional economic growth. A South West Public Water Supply Futures plan to provide certainty for the provision of public water supplies to centres in the region. Information to assist the assessment of future project proposals for major self-supply water resource developments.
Department of Water	Provision of substantial additional information on the hydrogeology of the Southern Perth Basin to assist future decision-making. Provision of a comprehensive numerical 3D regional scale model of the southern Perth Basin for use in assisting the impacts of future major water resource development proposal.
Environmental Protection Authority/Department of Environment	Provision of substantial information on the ecological systems of the South West region.
State of Western Australia	Further development of a sustainability evaluation model to assist consideration of future major project proposals. Substantial contribution to knowledge of the water resources of the State.

Chapter 6 Assessment against State sustainability principles and Gibson trade-off rules

1 INTRODUCTION

The Sustainability Evaluation/ERMP of the South West Yarragadee Water Supply Development proposal has involved only a limited comparison with alternatives, as the fundamental proposal is not an alternative to other major sources of water such as desalination, water trading, water use efficiency gains, or other surface water or groundwater sources. The decision being requested is whether this source can be considered for development as part of a broader source development program.

In this context, the issues to be addressed by the sustainability evaluation are:

- the contribution of the proposed development to sustainability in Western Australia
- the acceptability of the final proposal within a sustainability context.

To assist the decision makers in assessing the contribution of the proposal to sustainability in Western Australia, and its acceptability within a sustainability context, the outcomes and processes for the development were evaluated against the sustainability principles of the State Sustainability Strategy. They have also been evaluated against a sustainability decision-making tool emanating from some very recent work from Canada, termed here the "Gibson trade-off rules" (Gibson 2005).

Evaluation of the overall proposal in the context of the Western Australian sustainability principles is vital to the assessment process, since sustainability assessment should be a process for determining whether a proposal can be considered to make the best possible contribution to sustainability (Gibson 2005). The principles are an articulation of what sustainability means in Western Australia. This evaluation looks at the proposal as a whole, and also at the level of the three accounts of sustainability – the environmental, social and economic aspects of sustainability. It asks whether the proposal as a whole can be considered to make a positive contribution to sustainability overall, and to each of the three accounts.

Assessment against the Gibson trade-off rules plays an important supplementary role in the sustainability decision-making process. As already stated, the aim of sustainability assessment should always be to achieve mutually beneficial outcomes with respect to sustainability objectives, since to begin with an assumption that trade-offs are unavoidable will compromise the assessment and limit opportunities to find these win-win-win outcomes. The Gibson trade-off rules arise from the acknowledgement that despite the best efforts of planners and decision-makers, almost every decision offers both advantages and disadvantages and, therefore, the process of making any decision inherently involves trade-offs since gains are rarely achieved in one area without some losses in another. The question then is whether the losses (which we may also term as adverse impacts or trade-offs) are acceptable. It is important to bear in mind that finding ways to manage trade-offs is a "last resort" option and should not be the starting point of the assessment.

In applying the Gibson trade-off rules to this proposal, it is acknowledged that a decision to approve this proposal will involve making trade-offs, just as a decision not to approve it would also involve trade-offs. The trade-offs equate to the adverse impacts, as well as the lost opportunities for positive impacts, that would result from a decision to approve, or not approve, the project.

The Gibson trade-off rules provide the basis for dealing with tensions and conflicts that may be identified in the process of applying a well considered set of sustainability principles. They can be used to guide the evaluation of the acceptability of a proposal within a sustainability context by examining the acceptability of the inherent trade-offs that would be made in approving the process. They are therefore an extremely valuable tool to aid sustainability decision-making. They also have the advantage of having being developed outside Western Australia, which effectively allows cross-checking our decision-making processes in an international context.

2 ASSESSMENT AGAINST STATE SUSTAINABILITY PRINCIPLES

The Government of Western Australia has prepared the *State Sustainability Strategy* (Government of Western Australia 2003a) as the State's response to the sustainability agenda.

The resulting Sustainability Framework includes principles that reflect the core values of sustainability including:

- seven foundation principles that align with the economic, social and environmental bottom lines
- four process principles that describe the way in which the foundation principles should be applied.

An evaluation of the proposal against each of the State sustainability principles follows below.

2.1 FOUNDATION PRINCIPLES

Long-term economic health

> *Sustainability recognises the needs of current and future generations for long-term economic health, innovation, diversity and productivity of the earth.*

The main objective of the proposal is to provide a high-quality public water supply to the current and future customers of the IWSS. These customers include the urban populations of the Perth metropolitan area, the Agricultural Region, the Eastern Goldfields and towns on the Swan Coastal Plain between Perth and Eaton–Australind. Some agricultural customers are also included in this service base. The scheme will extend further into the South West in the future to provide water supply opportunities and certainty to those additional urban populations.

Public water supplies support long-term economic health. Future economic development is reliant on a secure high-quality water supply as a primary input.

The proposal enables greater diversity and growth of economic activity in the South West through opportunities created by extension of the IWSS into the South West, and through proximity to a (new) major water pipeline. Increased security of supply in the South West will enhance industry and investment opportunities that rely on water. The economic development activity that would be generated has the potential to be sustained in the long term because the proposed abstraction is less than annual recharge.

The proposal will provide for management of environmental impacts and enable future regional water use in the South West to realise a greater potential than otherwise.

The economic benefits to the State and the South West and IWSS regions are much greater than if the resource was not available to meet public water supply demand.

Equity and human rights

> *Sustainability recognises that an environment needs to be created where all people can express their full potential and lead productive lives and that significant gaps in sufficiency, safety and opportunity endanger the earth.*

The proposal will provide the opportunity for more choice of economic pursuit, and improve the reliability and security of supply of public water to those communities that can connect to the extended IWSS. The proposal will also provide business opportunities for the Indigenous community during construction, rehabilitation and the biodiversity study.

The proposed South West Public Water Supply Future Planning study will determine public water supply needs, and potential water sources, leading to better and more secure public water supplies for the region.

This is expected to increase the opportunity for members of the community to express their full potential and lead productive lives.

Biodiversity and ecological integrity

> *Sustainability recognises that all life has intrinsic value and is interconnected, and that biodiversity and ecological integrity are part of the irreplaceable life support systems upon which the earth depends.*

The proposal has been designed to be environmentally sustainable and includes offsets (recognising that there will be adverse impacts) that are designed to provide net environmental benefits. The trade-offs proposed within the environmental account are in accordance with Government policies (including the EPA preliminary Position Statement on Environmental Offsets) and guidelines. The effect on critical assets is not considered significant, and the offsets provided are expected to lead to an overall enhanced biodiversity outcome. The proposed adaptive management approach is precautionary and involves empowerment of key stakeholders in the establishment of management objectives and acceptability of future impacts. Knowledge gained through the proposed biodiversity studies will assist with the sustainable management of the Yarragadee aquifer.

Settlement efficiency and quality of life

> *Sustainability recognises that settlements need to reduce their ecological footprint (i.e. less material and energy demands and reduction in waste), while they simultaneously improve their quality of life (health, housing, employment, community)*

The proposal has examined options for the siting of infrastructure to minimise the extent and significance of the development footprint. The proposed pipeline route has been chosen to avoid critical assets, and to keep to road sides and cleared land as far as feasible. Consequently, the resultant route is not the shortest or cheapest option. The treatment plant is sited in a pine plantation and does not involve clearing of native vegetation. The water storage facility, however, is located in State forest as no other alternative site was feasible. The highest available elevation was chosen for the storage site to take advantage of gravity and reduce energy consumption of the water transfer.

The wellfield has been located, and abstraction zones within the aquifer systems selected, to minimise overall impact on potentially affected areas in terms of both infrastructure footprint and drawdown impact on other users and groundwater dependent ecosystems.

The reduced footprint of the development has been achieved at a cost, but this has not substantially detracted from the economic benefits of the proposal. The Water Corporation commitment to a carbon neutral outcome will offset energy demand for the proposal.

The community enjoyment of the natural assets of the project area in State forest and conservation reserves, and recreational areas, will not be adversely affected by the proposal.

Community, regions, "sense of place" and heritage

> *Sustainability recognises the significance and diversity of community and regions for the management of the earth, and the critical importance of "sense of place" and heritage (buildings, townscapes, landscapes and culture) in any plans for the future.*

A comprehensive stakeholder engagement program was implemented to develop the proposal and mitigation measures. The aspects of the social and natural environment that contribute to sense of place for major communities in the South West were identified, and the proposal was modified and mitigation measures were developed during this process.

Community sense of place was strongly linked to the environment in the South West. No significant environmental impacts are expected and the proposed environmental offsets will improve the community's appreciation and enjoyment of their natural surroundings.

The proposal is not expected to compete with estimated future regional water use in the short – medium term and consequently does not reduce the opportunity for the South West community to maintain its diversity.

The proposal is of high economic value compared to non-public water supply uses of the water and as a result has been able to propose mitigation that is of benefit to other uses. In the absence of the proposal, it is doubtful whether estimated demands for future regional use would be able to be realised in some areas because of a lack of infrastructure.

Trust was recognised as a major requirement to address community concerns. A community-based South West Yarragadee Monitoring Review Group will be established to be involved in the adaptive management process, in a transparent manner, to build greater trust in both future decisions on the use of the resource, and in evaluation and interpretation of monitoring results.

Net benefit from development

> *Sustainability means that all development, and particularly development involving extraction of non-renewable resources, should strive to provide net environmental, social and economic benefit for future generations.*

The proposal has been developed to provide net environmental, social and economic benefits, and consequently net overall benefits. If the Yarragadee aquifer were not available for public water supply, economic growth opportunities would be lost in the South West.

The project has made a significant contribution to knowledge of the resource and the associated social, economic and environmental aspects which will provide future benefit to both the region and the State.

The proposal will have some adverse environmental impacts, but no significant adverse impacts on critical assets. However, offsets are proposed to achieve an overall net environmental benefit through enhancing biodiversity in the region.

The proposed South West Public Water Supply Future Planning Study (Chapter 8 Section 3.2.6) and possible consequent extension of the IWSS to un-serviced communities in the South West will provide significant social benefit through a secure public water supply.

Other benefits include propositions to assist in the development of Government policy to address both climate change and reasonable regional needs. Both of these will find application beyond the scope of this proposal.

Common good from planning

> *Sustainability recognises that planning for the common good requires equitable distribution of public resources (like air, water and open space) so that ecosystem functions are maintained and a shared resource is available to all.*

The proposal is based on the clearly stated position of the State Water Strategy, that water is a State resource and it is critically important that water can be accessed and transferred beyond regional boundaries. This strategy recognises that the common good requires equitable distribution of the State's water resources.

The proposed South West Public Water Supply Future Planning Study will ensure that local users will share in the benefits of an extended IWSS.

2.2 PROCESS PRINCIPLES

Integration of the triple bottom line

> *Sustainability requires that economic, social and environmental factors be integrated by simultaneous application of these principles, seeking mutually supportive benefits with minimal trade-offs.*

The integration of economic, social and environmental factors has been achieved to a substantial degree through the comprehensive consultative processes employed during the development of the proposal and mitigation measures. A number of social factors are reliant on environmental values. Their protection or enhancement provides both social and environmental benefits. Similarly, most of the social and economic factors are closely inter-related and have been treated jointly where possible.

The linkages between factors and proposed mitigation were recognised, and win-win outcomes were sought wherever possible. For instance, better environmental knowledge and management, and development of environmental mitigation creates enhanced economic opportunity and consequential community quality.

Integration of decision-making was encouraged through the creation of an independent Sustainability Panel to provide advice to Government on the overall social, economic and environmental sustainability of the proposal.

Accountability, transparency and engagement

> *Sustainability recognises that people should have access to information on sustainability issues, that institutions should have triple bottom line accountability, that regular sustainability audits of programs and policies should be conducted, and that public engagement lies at the heart of all sustainability principles.*

The process for the development of the proposal was transparent and inclusive. Information on the objectives and scope was discussed with representative groups and the community in general. The Water Corporation worked closely with a Community Reference Group and key stakeholders, and held open days and public forums to inform and provide opportunity for input from the broader community. As the various studies undertaken to support the project were completed, the results were communicated to the public through a variety of media. A suite of information notes on the major technical aspects of the proposal was included, intended as summarised information for informed and interested community members (Appendix 33).

Accountability during the construction and operational phase of the proposal will involve regular public reporting on sustainability performance.

The proposed South West Yarragadee Monitoring Review Group will report publicly to the Water Corporation on any assessments it makes, and this information will be made available to the regulatory agencies, relevant Minsters, and the Cabinet Subcommittee on Water through the State Water Council.

Precaution

> *Sustainability requires caution, avoiding poorly understood risks of serious or irreversible damage to environmental, economic or social capital, designing for surprise and managing for adaptation.*

The lack of full information on the environment relevant to the proposal is recognised. It is also recognised that full knowledge of a hydrological system, and its relationship to groundwater dependent ecosystems, can never be achieved, despite the decades of investigations that have already been carried out on the Yarragadee aquifer.

The approach taken has been to understand the risks and their consequences, and to propose development with an open and transparent, adaptive management approach that recognises the need for caution. Specific contingency plans have been nominated for aspects of the proposal where there is a possibility of adverse impacts. Commitments have been made to develop and implement appropriate contingency plans in a collaborative and transparent manner in the event of unforeseen adverse impacts.

This adaptive management approach ensures that the social, economic and environmental benefits of the proposal can be realised while providing for cautious implementation of the proposal.

Hope, vision, symbolic and iterative change

> *Sustainability recognises that applying these principles as part of a broad strategic vision for the earth can generate hope in the future, and thus it will involve symbolic change that is part of many successive steps over generations.*

The sustainability process applied to this proposal is a pioneering approach which will assist in the sustainability assessment of other projects. It has allowed consideration of strategic issues that will assist the development of other sustainable proposals in the State.

2.3 CONCLUSIONS

From the above discussion, it can be clearly concluded that the proposal conforms strongly with the full suite of State sustainability principles.

3 ASSESSMENT AGAINST GIBSON TRADE-OFF RULES

3.1 TRADE-OFFS AND SUSTAINABILITY ASSESSMENT

Since the purpose of sustainability assessment is to ensure that a proposed initiative makes a contribution to sustainability, then one of the main goals of sustainability assessment is to ensure that a proposal delivers mutually beneficial outcomes. This means that ideally each sustainability objective associated with the proposal should be met. A loss with respect to one objective should never be traded off to achieve a gain in another area. This is the intent of the Western Australian sustainability principle "net benefit from development", which embodies the concept of the "win-win-win" across the triple bottom line of sustainability.

While this should always be the aim in undertaking sustainability assessment (Gibson 2005), such mutually beneficial outcomes with respect to all sustainability objectives are extremely difficult to achieve in practice. As Gibson (2005) also points out, conflicts occur whenever there is a choice to be made. Since each available option is likely to offer certain advantages and disadvantages, the act of selecting one option over another implies both acceptance of any disadvantages of that option, and the forgoing of advantages associated with others. Therefore, making a decision involves making trade-offs.

There are decisions to be made and consequent trade-offs to be faced at every stage of a sustainability assessment process. For example, we must decide which proposals should be subject to sustainability assessment in the first place: assessing all proposals could result in better overall sustainability outcomes, but at what cost in time and resources? Similarly, the scoping stage of each assessment involves deciding which factors are the most important, what data is required, and what techniques are to be used in obtaining this data. The choices available for each of these decisions may offer particular advantages and disadvantages.

At the level of the proposal itself, there may be different ways of achieving the same ends, in which case the choice is between the competing alternatives. An example of this would be making a choice between different potential water sources to meet the demand of the IWSS, but this is not the purpose in this case. As explained in Chapter 1 Section 1.4.7, the decision to be made by the Government with respect to the South West Yarragadee Water Supply Development is whether to approve the proposal such that this water source may continue to be considered as part of the Water Corporation Source Development Plan. Therefore, the trade-offs that we need to consider relate to the impacts of the proposal, whether or not these are acceptable and how they compare with the impacts of the "no-go" alternative.

This is an important part of a sustainability evaluation. Even if a proposal is considered to make a positive overall contribution to sustainability, there may be discrete "pluses and minuses" embedded in different aspects of the proposal. It may not be possible to meet each individual sustainability objective simultaneously.

Conflicts between competing objectives resulting in trade-offs may occur either between the three accounts of the triple bottom line of sustainability, or within them.

For example, in the traditional development assessment paradigm, economic objectives may have been met at the expense of environmental ones, resulting in trade-offs that may no longer be acceptable.

Trade-offs within an account may be less obvious, yet even if the overall "account" is considered positive, the inherent trade-offs may not be acceptable.

Offsets are a deliberate form of trade-off within an account, in which a negative impact with respect to one factor may be compensated for by an enhancement in another, and a loss is traded off for a greater gain elsewhere. If applied in accordance with appropriate guidelines within a sustainability context, offsets may be more acceptable to regulators and the community than other forms of trade-offs.

3.2 GIBSON TRADE-OFF RULES

It is generally accepted that difficult decisions, conflicts, and therefore trade-offs, are an inherent, if undesirable, aspect of sustainability assessment. Assessment reports have tended not to acknowledge this, much less to identify, evaluate and justify the trade-offs embodied within a proposal or its ultimate approval decision. Until recently there has been little guidance available on how, within a sustainability context, trade-offs should be considered and managed, or how to determine which trade-offs might be acceptable and which ones not.

However, a book entitled "Sustainability assessment: processes and criteria" by Dr Bob Gibson[11] of the University of Waterloo in Canada, published late in 2005, provides just such guidance[12]. This contribution to the assessment literature represents a significant attempt to provide guidance for managing some of the particular challenges posed by sustainability assessment. Gibson (2005) points out that trade-offs should be considered as a "last resort" in an assessment process that aims to deliver mutually beneficial outcomes, but that if they occur, any trade-offs implicit in a sustainability assessment decision must be justifiable in the context of sustainability decision criteria and relevant guides and policies. He proposes comprehensive, robust, yet flexible trade-off rules by which the acceptability of a particular trade-off may be evaluated.

In accordance with Gibson's overall approach to sustainability assessment these trade-off rules should ideally be applied as part of an assessment process in which alternative ways of meeting the desired outcome are identified and compared, to aid the selection of the best alternative and to manage the conflicts and tensions that arise in the process of doing so. The process within this evaluation is somewhat different since it does not compare alternative water supply source options, and therefore application of these rules in this case does not strictly meet their original intent. However, it is believed that the fundamental philosophy behind the rules has application in this case.

The rules are listed below in their summary forms, together with the project-specific indicators used to measure achievement of the criteria:

[11] Dr Bob Gibson is a Professor in the Department of Environmental and Resource Studies at the University of Waterloo, Ontario, Canada. His research and writings have focused on issues of environmental policy, planning, assessment and regulation in various jurisdictions in Canada, and his most recent work examines the integration of sustainability concepts into decision-making. Through his work with the Canadian Environmental Assessment Agency and the Canadian International Development Agency, he has developed a particular interest and considerable expertise in sustainability assessment, as evidenced by his recent insightful and practical book.

[12] Dr Gibson's feedback on our application of his work to this proposal is gratefully acknowledged. His assistance should not, however, be seen as an endorsement of the approach taken in this evaluation.

Rule 1: Net gains

Any acceptable trade-off or set of trade-offs must deliver net progress towards meeting the requirements for sustainability; it must seek mutually reinforcing, cumulative and lasting contributions and must favour achievement of the most positive feasible overall result, while avoiding significant adverse effects.

- the sustainability of the proposal in comparison with the alternatives
- the proposal's overall contribution to sustainability, and its consistency with the State Sustainability Strategy
- the proposal's win-win-win outcomes
- the proposal's contribution to knowledge for the future
- measures taken to minimise adverse impacts and ensure they are acceptable (see also Rule 3)
- measures taken to maximise positive impacts.

Rule 3: Avoidance of significant adverse effects

No trade-off that involves a significant adverse effect on any sustainability requirement area (for example, any effect that might undermine the integrity of a viable socio-ecological system) can be justified unless the alternative is acceptance of an even more significant adverse effect.

- the nature of any adverse significant impacts as a result of the proposal
- the nature of any adverse significant impacts that may result from the "no-go" option
- mitigation measures applied to significant adverse impacts.

Rule 4: Protection of the future

No displacement of a significant adverse effect from the present to the future can be justified unless the alternative is displacement of an even more significant negative effect from the present to the future.

- the nature of any adverse impacts (after mitigation) on the future water users in the South West as a result of the proposal (especially considering reasonable regional needs)
- the nature of any adverse significant impacts on the future water users in the South West that may result from the "no-go" option.

Rule 6: Open process

Proposed compromises and trade-offs must be addressed and justified through processes that include open and effective involvement of all stakeholders.

- the role played by the community in identifying and evaluating trade-offs
- the overall acceptability of the trade-off to the community (identifying those parts of the community that might not find it acceptable, and analysing their reasons for this view).

Generally, no compromise or trade-off is acceptable if it entails further decline or risk of decline in a major area of existing concern (for example, as set out in official international, national or other sustainability strategies or accords, or as identified in open public processes at the local level), or if it endangers prospects for resolving problems properly identified as global, national or local priorities.

Similarly, no trade-off is acceptable if it deepens problems in any requirement area (integrity, equity, etc.) where further decline in the existing situation may imperil the long term viability of the whole, even if compensations of other kinds, or in other places, are offered. For example, if inequities are already deep, there may be no ecological rehabilitation or efficiency compensation for introduction of significantly greater inequities.

No enhancement can be permitted as an acceptable trade-off against incomplete mitigation of significant adverse effects, if stronger mitigation efforts are feasible.

Justifications will be assisted by the presence of clarifying guides that have been developed in processes as open and participative as those expected for sustainability assessments. For example, these guides may take the form of sustainability policies, priority statements, plans based on analyses of existing stresses and desirable futures, and guides to the evaluation of "significance".

Relevant stakeholders include those representing sustainability-relevant positions (for example, community elders speaking for future generations) as well as those directly affected.

While application of specialised expertise and technical tools can be very helpful, the decisions to be made are essentially and unavoidably value-laden. A public role is crucial.

3.3 APPLYING THE GIBSON SUSTAINABILITY DECISION MAKING PRINCIPLES TO THE PROPOSAL

While the proposal makes a significant contribution to sustainability and is consistent with the State Sustainability Strategy, some of the sustainability principles and objectives developed for this project have been met to greater degrees than others, and there are some adverse impacts associated with the proposal. The question is whether these adverse impacts and associated trade-offs are acceptable. The intent in this section is to highlight and evaluate the acceptability of trade-offs that would be associated with a decision to approve the proposal.

Several of the Gibson trade-off rules relate to process: specifically, Rules 2 and 5 require that any trade-off must be justified, and that the onus for arguing the acceptability of a trade-off should be on the proponent. This section sets out this argument. Rule 6 relates to the need for processes around trade-offs and their management to be open and consultative.

The other three rules are substantive. Rule 1 refers to "a trade-off or set of trade-offs" which must be shown to make a net contribution to sustainability. In this case, the "set of trade-offs" can be equated to the overall proposal package, and this rule has already been partly addressed by the discussion in the previous section, where the proposal was evaluated in the context of the Western Australian sustainability principles. This is therefore a high-level rule.

Rules 3 and 4 go into the detail of individual trade-offs embedded within the proposal that is, the negative impacts that remain even after mitigation and offset measures have been applied and that may prevent certain specific sustainability objectives from being met. These rules provide criteria by which the acceptability of these impacts or trade-offs can be evaluated.

- In the following sections the Gibson trade-off rules are applied to this proposal, noting that Rules 2 and 5 are met in the process of justifying trade-offs itself.

3.4 ASSESSMENT OF THE PROPOSAL AGAINST THE GIBSON TRADE-OFF RULES

As Gibson (2005) notes, there are no definitive measures to determine whether these criteria have been met. The only reasonable approach is to provide a detailed and open argument of the case through an evaluation of compliance with each of the rules, as is set out in the next sections.

3.4.1 Rule 1: Net gains

As already discussed, the Gibson trade-off rules cannot be applied strictly in accordance with their original intent, since the process adopted here did not include examination of alternative water supply options. This difference is particularly apparent in terms of Rule 1, which requires that to be acceptable, a trade-off, or set of trade-offs "*must favour achievement of the most positive feasible overall result"*. This raises the question: if we are not comparing alternative water supply options, then what does "most positive" mean?

This has been interpreted in two ways: firstly, two broad options are available: to approve or not approve the proposal. The first indicator below compares the sustainability of each of these options in broad terms.

Secondly, it is recognised that one of the questions that the sustainability evaluation process was designed to help to answer was "what is the most sustainable way of developing this water source?" Again, the approach taken in this case was not to identify a specific range of alternatives to be compared, but to apply an iterative approach of adjusting the proposal until a sustainable proposal is achieved. The discussion around the criteria below seeks to describe this iterative process, particularly with regard to maximising positive impacts and minimising adverse ones.

This approach does not permit the definitive claim that the proposal represents the most positive overall result that is possible. The issue then becomes whether the proposal as presented is acceptable within a sustainability context.

Indicator: *The sustainability of the proposal in comparison with the "no-go" option*

If this proposal is not progressed as proposed, other water sources would need to be developed to meet the demand for water supply in the IWSS and adjacent areas. The impact of this would be the accelerated development of the other source "alternatives."[13] The source likely to be brought forward as a replacement would be a second desalination plant, at considerable additional economic cost, and higher environmental cost in energy requirements. The social benefits of extension of the IWSS into the South West would be lost. The other contributions of project implementation to sustainability, discussed above, would be lost.

[13] Chapter 1 Section 1.4.7 notes that the consideration of alternatives for this proposal is not relevant as the potential alternatives are options that would be developed in the longer term to meet future demands in any event. Rejection of approval of the proposal would simply result in accelerated development of the overall source development program to ensure the demand for water can be met.

Indicator: *The proposal's overall contribution to sustainability, and its consistency with the State Sustainability Strategy*

The proposal contributes significantly, both directly and indirectly, to sustainability. The proposal is based on utilising a resource that is continually replenished at rates substantially higher than the proposed total rates of abstraction, and in the commitments to the suite of proposed impact mitigation and enhancement measures, will improve the overall environmental, social and economic outcomes for both the region and the State.

The environmental outcomes will be improved through actions such as:

- the proposed Sustainability Initiative providing information on the biodiversity of the region to assist future management
- the addition of land to the conservation estate as a means of offsetting the areas of vegetation and habitat impacted by the proposal, with the potential to enhance the outcome by contributing more land than is affected
- the commitment to supporting the management of threatening processes (feral animals, weeds, riverbank de-stabilisation) as an offset, with potential to result in an overall improved environmental outcome.

Chapter 6 Section 2 specifically discusses and demonstrates a strong consistency with the State Sustainability Strategy and the contribution of the proposal to sustainability.

Indicator: *The proposal's win-win-win outcomes*

The original proposal, prior to consultation and internal assessment, was to take water from one region to satisfy the needs of another, largely on the basis that the contributing region would not be disadvantaged. Through the internal sustainability assessment process, the proposal has developed into one that will extend major water supply infrastructure into the region, and will provide for the future public water supply needs of both the region and the existing IWSS customers. This is expected to have substantial economic and social benefits for both the State and the region, as discussed in Volume 2 Chapter 3. Other commitments, in particular the South West Yarragadee Sustainability Initiative, will contribute to improving information on availability of water in the region for all users, with the attendant positive social and economic outcomes.

Environmentally, the mitigation and enhancement proposals discussed above will result in overall improvements to the environmental values of the region. The main impacts being offset are gradual changes to the vegetation complexes in several areas (Poison Gully, Milyeannup Brook, St John Brook, and ironstone communities on the eastern Swan Coastal Plain and areas of the eastern Scott Coastal Plain).

Indicator: *The proposal's contribution to knowledge for the future*

The development of the sustainability evaluation process for this project will contribute substantially to improving the sustainability assessment process to be applied to Government decision-making in respect of other future major project proposals.

The proposal, the largest single groundwater investigation program undertaken in Western Australia, has resulted in an extensive increase in our knowledge of the groundwater resource, its hydrogeology, and its social, environmental and economic dependencies. This substantial expansion of the knowledge base is a direct contribution to sustainability in the region, and in the State.

It is acknowledged that the knowledge base is still less than complete in several aspects, but there is sufficient information available to enable decision-making to proceed on the basis of understanding the primary risk areas, their likelihood, and the need to adaptively manage. Implementation of the project will further add to the knowledge base through monitoring and review of the performance of the groundwater system and the primary dependent aspects, such as groundwater dependent ecosystem.

Indicator: *Measures taken to minimise adverse impacts and ensure they are acceptable*

Internal sustainability assessment of the proposal considered a range of optional configurations for the wellfield and associated infrastructure. Based on an evaluation of the relative impacts, the configuration considered to have the least impact has been selected as the preferred option. The measures involved:

- location of the wellfield remote from other users to minimise drawdown interference effects, competition for water resources, and potential for seawater intrusion
- location of the wellfield in an area with the potential for minimal environmental impact
- configuration the well abstraction zones to minimise environmental impacts in key risk areas
- location of infrastructure to minimise construction impacts on flora and fauna.

Other than the drawdown risks to the vegetation complexes in several small areas (Poison Gully, Milyeannup Brook, St John Brook, and ironstone communities on the eastern Swan Coastal Plain and areas of the eastern Scott Coastal Plain), the other residual impacts are related to clearing for infrastructure. Clearing will be managed to ensure the areas cleared are minimised, rehabilitated to the extent possible after allowing for operation al requirements, and located in areas avoiding rare or priority flora and fauna. The impacts are considered insignificant as they do not represent any loss of rare vegetation types, and the types affected are well represented elsewhere in the region. Impacts on faunal habitat will be limited to small areas and no rare or priority fauna will be affected (stream supplementation of Milyeannup Brook may be necessary to preserve habitat of the Priority Balston's pygmy perch).

Indicator: *Measures taken to maximise positive impacts*

The measures to enhance the positive outcomes of the project were:

- commitment to a South West Public Water Supply Future Planning Study to provide certainty to the region on its future public water supplies
- commitment to further contribute to knowledge of the hydrogeology and ecosystems of the South West through the monitoring program and the South West Yarragadee Sustainability Initiative
- the inherent economic benefit to the State of a cost-competitive water supply source to supplement the IWSS and the future regional economic benefit of extending a major integrated water supply scheme into the region.

3.4.2 Rule 3: Avoidance of significant adverse effects

Indicator: *The nature of any adverse significant impacts as a result of the proposal*

Some adverse impacts on critical environmental assets have been identified as being likely as a consequence of the proposal. However, none are considered to be significant, as discussed under Rule 1 (Section 3.4.1). This is demonstrated in Volume 2 Chapter 7, through presentation of the expected impacts. The significance of these is defined by the assessment framework, in particular the key EPA policies for environmental offsets (EPA 2005) and protection of native vegetation (EPA 2000). Other significance criteria include:

- change in representation or occurrence of vegetation communities (locally and regionally)
- change in species composition or abundance of vegetation communities, particularly of keystone species
- change of ecological function
- effect on ecosystem resilience
- change to faunal habitat
- effect on values other than ecological (enjoyment, recreation, aesthetics, usage) most relevant to national parks and conservation parks.

The ease and timescale in which impacts may be remedied also determines significance.

The EPA Vegetation Position Statement provides a number of principles which apply in the assessment of proposals that involve the clearing of vegetation in areas other than the agricultural area

It is important to acknowledge uncertainty when predicting impacts and their significance. The uncertainties in the judgment of significance are made clear in the discussion of the relevance and extent of the expected impacts. A key aspect is that the changes expected as a consequence of the proposal will be gradual, within the context of ecological systems that are dynamic in both the long and shorter term, irrespective of the impacts of the proposal. A factor that makes judgments on significance difficult is the potential ecological change that may result directly as a consequence of long-term climate change. The uncertainty associated with future climate change confounds assessment of what may or may not be significant, depending on what benchmark is set against which the significance (and acceptability) of impacts might be judged.

The proposal includes a draft set of principles (Chapter 7 Section 2.1.6) intended to provide a policy basis for consideration of the acceptability of impacts within the difficulty of an uncertain future and a potentially shifting climatic benchmark.

Indicator: *The nature of any adverse significant impacts that may result from the "no-go" option*

The significant adverse impacts that may result from the "no-go" option are acceleration of the source development program with the consequential impacts of implementation of that program, and the loss of regional and State benefits expected to result from the proposal as outlined in Section 3.4.1 (Rule 1).

Indicator: *Mitigation measures applied to significant adverse impacts*

There are no significant adverse impacts expected from the proposal.

A range of possible mitigation measures were developed during the internal evaluation process. These were discussed with the community, largely through the Community Reference Group whose assistance was sought to develop and consider optional measures for consideration. It is not possible to equivocally demonstrate that "all possible" measures have been applied, as it is not possible to demonstrate that all possible measures have been considered. However, it is believed that the range of measures considered and determined as being practical to apply are sufficient to provide substantial overall benefit. These measures are set out in full in the commitments listed in Chapter 5 Section 1.1.

All environmental mitigations and offsets have been specifically assessed against the *EPA Position Statement on offsets* (EPA 2005) to demonstrate compliance with the position statement (Volume 2 Chapters 7 and 8).

3.4.3 Rule 4: Protection of the future

Indicator: *The nature of any adverse impacts (after mitigation) on the future water users in the South West as a result of the proposal (especially considering reasonable regional needs)*

The proposal clearly demonstrates that there will be no significant negative effects on existing water users in the region (Volume 2 Chapter 3 Section 3). There may be competition for available water with future expansion in use of groundwater on the Scott Coastal Plain. This is not expected to occur in the shorter term and, when it occurs, it is proposed that the allocation decisions be made on the specific merits of the situation at that time. However, as an offsetting action, the proposed South West Yarragadee Sustainability Initiative will contribute to the knowledge base. The initiative is intended to maximise water availability in the region and reduce the potential for competition.

Commitments to monitor, plan for, and manage the impacts of possible future seawater intrusion impacts in the Bunbury area will ensure that future users in this area are not adversely impacted.

Indicator: *The nature of any adverse significant impacts on the future water users in the South West that may result from the "no-go" option*

The potential adverse impacts on future users in the South West would largely result from not extending the IWSS into the region, and limiting the opportunities for regional economic development though lack of access to water supplies.

If the proposal were not to proceed because the proposal is considered to be unsustainable, it is highly likely that water availability to future regional users would be limited for the same reasons. This would place further limits on regional economic development. The impact of estimated future regional use may be potentially significant in areas of the coastal plains, irrespective of the proposal proceeding. If the proposal does not proceed, it does not mean that the proposed 45 GL/yr would be available for regional use, as the proposed wellfield location is not available to other potential users. Regional uses would be expected to be confined largely to the coastal plains, and would result in concentrations of abstraction, and consequent concentrations of drawdown and the attendant impacts.

3.4.4 Rule 6: Open process

Indicator: *The role played by the community in identifying and evaluating trade-offs*

Chapter 8 Section 2 details the extensive consideration of the proposal by the community over the period from 2003 to 2005 and the extent to which that consideration has formed the proposal as it now stands. Key components were:

- ARCWIS (2003 at Appendix 21) surveys of community attitude
- issues scoping exercise undertaken by the Water and Rivers Commission (2003)
- extensive consultation in developing the Scoping Report (Strategen 2005a at Appendix 1) including public submissions
- social impact surveys undertaken by Synnott Mulholland Management Services (2005 at Appendix 3)
- a series of public information sessions undertaken by the proponent during 2005.

Further community input during the public review of this Evaluation will add to the community role.

Indicator: *The overall acceptability of the trade-off to the community (identifying those parts of the community that might not find it acceptable, and analysing their reasons for this view).*

That likelihood that the proposal might now be considered unacceptable by a significant part of the community is considered minimal. The residual parts of the community that may not find it acceptable (and their reasons) will be identified through the public review of this Sustainability Evaluation/ERMP, to be undertaken during late 2005 and early 2006. The response to submissions (to be prepared for consideration by the EPA and Sustainability Panel following the public comment period) will include an analysis of any reasons presented for any view that reflects unacceptability of the proposal.

4 SUSTAINABILITY CONCLUSIONS

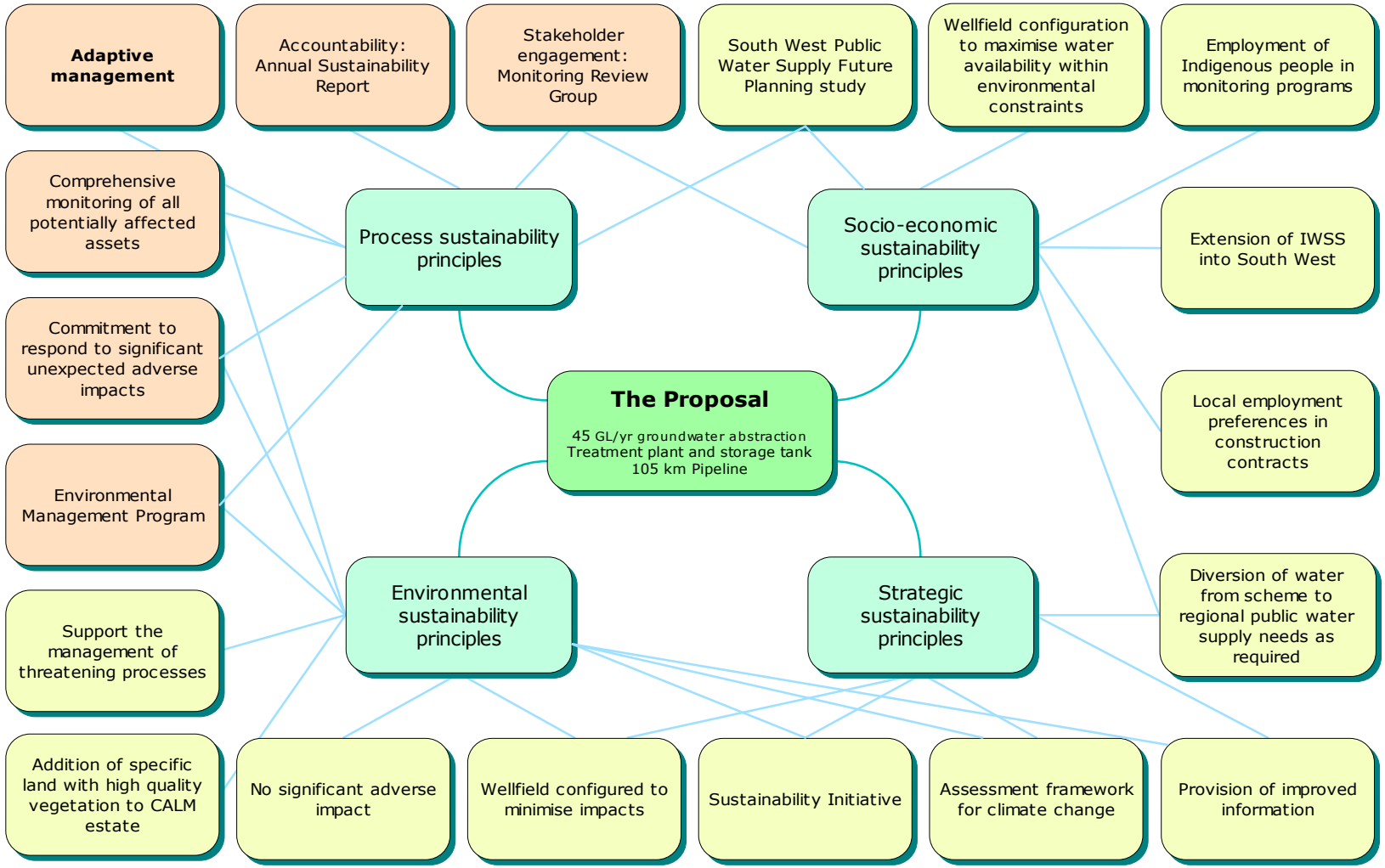
The evaluation has considered the substantial body of information previously available and gathered specifically for this project in developing an approach based on identifying potential risk areas and developing approaches to manage those risks in accordance with their likelihood of occurring.

In all cases, the objective of each of the sustainability factors is considered achievable through implementation of the project and the supporting commitments. Therefore, the proposal is considered to be sustainable in terms of providing a net social, economic and environmental benefit. This conclusion is supported by the evaluation of the proposal in terms of comparison with the principles of the State Sustainability Strategy and the Gibson trade-off rules (Sections 2 and 3) that is able to demonstrate practical compliance with those principles and rules.

The overall expected outcome of the proposal with the associated commitment to an adaptive management process with a high level of community involvement and accountability is highly positive in terms of providing net benefit social, environmental and economic outcomes.

Figure 6.1 presents a diagrammatic representation of the relationship between the proposal, the sustainability principles and key commitments and outcomes.

Figure 6.1 Key sustainability commitments and outcomes



Chapter 7 Strategic sustainability principles

The strategic principles associated with the South West Yarragadee Water Supply Development proposal and their linkages with other sustainability factors being considered within this Sustainability Evaluation/ERMP are addressed in this chapter. The strategic principles have been addressed together in one chapter as they cross the boundaries of the individual environmental, social and economic accounts.

The strategic sustainability principles, factors and objectives are summarised in Table 7.1.

Table 7.1 Strategic sustainability principles and factors

FACTOR	OBJECTIVE	DESCRIPTION
STRATEGIC PRINCIPLE – Government policy		
The proposal will facilitate the implementation of relevant government policies in local, regional and State context.		
Equitable access to water	The Water Corporation will ensure fair and equitable access to water for domestic use for all Water Corporation customers.	Water is a shared resource that should be available to all through equitable distribution. To ensure this, the cost of reasonable domestic water requirements should be affordable to all.
Government plans	The proposal will be consistent with the following Government agency plans and policies where they are appropriate and congruent: • environmental protection • regional development • forest management • regional planning • allocation planning and licensing	The relevant Government agency plans and policies are listed in the Objectives
Regional development	The proposal will provide opportunities for regional development	The South West has a rapidly growing population that relies on security of water supply for industrial and commercial growth and associated employment opportunities as well as for domestic water supply.
STRATEGIC PRINCIPLE – Climate change		
The current low rainfall period and possibility of future climate change should be taken into account in decision-making about the development of the Yarragadee aquifer as a water source.		
Climate change	Determine the impact of likely climate change scenarios on the sustainability of the proposal.	The South West of Western Australia has been experiencing a drier climate since the mid 1970's. The last seven years have been significantly drier again. The Water Corporation has re-assessed the amount of water that is available from existing water supplies due to the current low rainfall trend.
STRATEGIC PRINCIPLE – International and national competitiveness of water users		
The proposal will facilitate the competitiveness of local and regional industries in the national and international context.		
Cost of water	The proposal will facilitate the competitiveness of local and regional industries in the national and international context.	The supply cost of this proposal is less than other options such as desalination. This will enable the Water Corporation to supply competitively priced water with benefits for local and regional industries.

FACTOR	OBJECTIVE	DESCRIPTION
STRATEGIC PRINCIPLE – Improved knowledge and skills		
The proposal will enhance the knowledge of the resource to enable optimal use of the resources by self suppliers		
Environmental risk	Reduce environmental risk by Improving the scientific certainty of the South West Yarragadee characteristics and the ecosystems that it interacts with.	Extensive hydrogeological and environmental studies have been carried out as part of this proposal, increasing the knowledge base of groundwater and groundwater dependent ecosystems in the area.
Supply security	Increase supply security by improving the scientific basis for decision-making and planning regarding the use of the South West Yarragadee as a water source.	Increased knowledge of the aquifer will mean that better decisions can be made regarding its use as a water source. Better understanding of its yield potential will provide greater security for users of the resource.

1 STRATEGIC PRINCIPLE – GOVERNMENT POLICY

Sustainability principle and associated factors

The sustainability objective for the principle of Government policy is:

- The proposal will facilitate the implementation of relevant government policies in a local, regional and State context.

The following sustainability factors associated with this principle are addressed below:

- Government plans
- Regional development
- Equitable access to water.

1.1 GOVERNMENT PLANS

Sustainability objective

The proposal will be consistent with the following Government agency plans and policies where they are appropriate and congruent:

- environmental protection
- regional development
- forest management
- regional planning
- allocation planning and licensing.

Two important policies that the proposal draws from are the *State Sustainability Strategy* (Government of Western Australia 2003a) and the *State Water Strategy* (Government of Western Australia 2003b). The relationship with the Council of Australian Governments (COAG) Water Reform Agreement is also an important policy area, within which competition policy is particularly relevant to the project. Given the intention to transfer water out of the region, regional development policy is a further consideration.

1.1.1 Potential impacts and mitigation or enhancement

State Water Strategy

The *State Water Strategy* makes specific reference to development of the South West Yarragadee resource "*for the benefit of communities in the South West and those served by the Integrated Water Supply Scheme*". The source was identified in the strategy as potentially supplying 45 GL/yr to the Integrated Water Supply Scheme (IWSS). The context of the reference is for the development of programs for new water source development to ensure the provision of reliable supplies to meet demand in the IWSS. The strategy acknowledges that source development planning must take into account worst case scenarios for drought. The South West Yarragadee aquifer is identified as one of a range of new sources that may provide water to the IWSS to address the current dry climate situation and its attendant reduced source yields.

The Yarragadee aquifer is being investigated to meet strong growth in the existing IWSS and, once developed, these new assets will also be available to deliver water for public water supplies and other high value uses in the South West. The approach being taken with the proposal is in keeping with the historical development of Water Corporation inter-regional water systems, and is consistent with the *State Water Strategy* in considering regional needs for water. Consistent with vesting of the rights to the flow, control and use of water with the Crown, embodied in the *Rights in Water and Irrigation Act 1914*, the S*tate Water Strategy* acknowledges water as being a State resource and stresses the critical importance of being able to access and transfer water beyond regional boundaries.

The *State Water Strategy* notes the need to ensure that water management and allocation balances environmental and community water supply needs. It is understood that the Water and Rivers Commission will consider the acceptability of the impacts of the proposal in the context of environmental, social and economic outcomes. This Sustainability Evaluation/ERMP provides information on the expected environmental impacts on groundwater dependent ecosystems to allow the Commission to assess this aspect in concert with the EPA. Potential impacts on high-value ecosystems have been avoided, minimised or eliminated through considerations of wellfield development and management, and detailed information on the social and economic impacts and benefits have been provided to allow the Commission to consider the balancing of these interests.

A major plank of the *State Water Strategy* is water conservation and efficiency. The Government has set a target of reducing per capita water use from the previous unrestricted level of 180 kL/person/yr to 155 kL/person/yr by 2012. The Water Corporation has adopted this target as the planning basis for the future and has put initiatives in place to support its achievement (Water Corporation 2005 at Appendix 7).

State Sustainability Strategy

The *State Sustainability Strategy* (Government of Western Australia 2003a) indicated that the next new major source for meeting future water supply needs for Perth should be subject to a sustainability assessment. The South West Yarragadee project is being subject to such an assessment, in compliance with the strategy.

A key aspect of the Sustainability Framework proposed by the *State Sustainability Strategy* is a shift away from the approach that tends to be taken within "impact assessments" where the focus is on negative impacts, and on justifying and minimising them. Sustainability assessment is intended to focus on the positive aspects of impacts, and the means of creating net environmental social and economic benefits such as:

- improving biodiversity and ecological integrity, particularly at the regional level
- building life support systems
- providing conservation benefit and net social-economic benefit
- ensuring there are acceptable levels of risk with adaptive processes for the worst scenarios.

While the sustainability evaluation process is a new concept in many respects, it builds on established processes, principles and lessons learnt from previous work. This evaluation is intended to assist the Minister for the Environment, the Government, the Water and Rivers Commission and the EPA in the implementation of their legislative roles in accordance with the *State Sustainability Strategy*.

In undertaking this Sustainability Evaluation/ERMP, the *State Sustainability Strategy* was a key reference. It is anticipated that interpreting and employing the principles of the strategy in this assessment will provide a practical example that will strengthen understanding of the principles for future application.

Relationship with COAG water resource policy

In February 1994, the COAG agreed to implement a *"strategic framework to establish an efficient and sustainable water industry"*. The agreed framework is based on recognition that action is needed to halt degradation of our natural resources and to minimise unsustainable use of water resources. The framework sought to establish integrated and consistent approaches to water resource management throughout Australia, and includes provisions for water entitlements and trading, environmental requirements, institutional reform, public consultation and education, water pricing and research. Timeframes for implementation were set and subsequently extended to 2005 for certain aspects. Implementation and continued observance of the COAG water reforms is a requirement for States and Territories if they are to receive the tranche payments being made available under the National Competition Policy.

The components of the framework most relevant to this proposal are:

- allocation of water for the environment
- ecological sustainability of new developments
- incorporation of environmental costs in water pricing
- ecologically sustainable water trading to achieve "highest and best" use of water
- protection of groundwater.

The following sections demonstrate that this proposal complies with the COAG framework.

Allocation of water for the environment

The proposal recognises the need for the provision of water to the environment through a detailed consideration of the potential impacts of the proposal on groundwater dependent ecosystems (Volume 2 Chapter 7). This consideration conforms to the COAG framework in being based on the best scientific information available, and has regard for both the inter-temporal and inter-spatial water needs of these ecosystems required to maintain their health and viability. Evaluation of the proposal recognises the potential impacts of short-term climate variability as well as the longer term potential for climate change. Inter-spatial water needs have been considered though examination of the various areas where groundwater dependent ecosystems are understood to exist, and has considered each in terms of its individual characteristics and merits.

Ecological sustainability of new developments

A prime consideration within this evaluation is the ecological sustainability of the proposal, with this aspect being considered equally with economic and social sustainability. The proposal has been developed using the National, State and agency (EPA) framework to evaluate ecological sustainability.

Incorporation of environmental costs in water pricing

The specific issue of water pricing is beyond the scope of this evaluation, with the exception of justifying consideration of the South West Yarragadee source as an economically attractive option when compared to others. In approaching the project from the perspective of achievement of a net environmental benefit, the environmental costs will be taken into account in development of the project through the implementation of mitigating actions and achievement of net benefit outcomes. The financial costs of this will be borne by the Water Corporation and will be passed on to water service customers through Government water pricing arrangements that make subsidies transparent in accordance with the COAG framework.

Ecologically sustainable water trading

The levels of water availability and use in the region are currently such that extensive water trading is not expected to be in place in the short term. Trading in rights of access to water would normally only occur where water resources have been fully allocated. Further demands for water can then only be satisfied through an allocation redistribution mechanism such as a water market.

Protection of groundwater

The proposal is based on drawing groundwater that is largely recharged through rainfall over the forested areas of the Blackwood Plateau. This land use will ensure a high level of protection of water quality as is required for public drinking water supply systems. A draft water source protection plan for the wellfield and catchment will be prepared by the Water Corporation for administration by the Department of Water (DoW) under the *Country Areas Water Supply Act 1947.*

Environmental protection policy

The proposal is being assessed by the EPA under the EP Act as an ERMP. ERMP is the highest level of assessment and should ensure compliance with Government policy on environmental protection.

Forest management policy

Impacts on the State forest areas within which the proposal is to be constructed and operated will be undertaken in consultation with, and under approval from, the Conservation Commission to ensure compliance with forest management policy. A "water removal permit" will be required from the Department of Conservation and Land Management (CALM) to allow the proposed activity to be undertaken within the CALM estate. The water removal permit may be issued if the abstraction and associated infrastructure are not inconsistent with the conservation objectives of the CALM Act.

Allocation planning and licensing policy

Licensing of the proposed water allocation under the *Rights in Water and Irrigation Act 1914* (RWI Act) will be subject to approval by the Water and Rivers Commission to ensure compliance with the allocation plans and policies of that agency.

Competition policy

The State Government has no specific public policy position on competition. However, the *Policy Statement on Competitive Neutrality* (Government of Western Australia 1996) is the most contemporary and relevant public policy position. This policy statement complies with the requirements of the Competition Principles Agreement with the Federal Government, which states that:

> *"The objective of competitive neutrality policy is the elimination of resource allocation distortions arising out of the public ownership of entities engaged in significant business activities: Government businesses should not enjoy any net competitive advantage simply as a result of their public sector ownership."*

The key aspects of achievement of competitive neutrality are the application of:

- full Federal, State and Territory taxes or tax equivalent systems to Government agencies
- debt guarantee fees directed towards offsetting the competitive advantages provided by Government guarantees
- those regulations to which private sector businesses are normally subject, such as those relating to the protection of the environment, and planning and approval processes, on an equivalent basis to private sector competitors.

The Water Corporation is required by Government to be completely competitively neutral in compliance with this policy statement (Dept of Treasury and Finance, *pers. comm.* 14 July 2005).

The Department of Treasury and Finance *Public Interest Guidelines for Legislation Review* (Government of Western Australia 2001) have been developed to ensure the public interest is taken into account in National Competition Policy reforms. The guidelines acknowledge that economic efficiency from increased competition is not the only Government goal. The guidelines state that:

> *"A balanced consideration of a range of socio-economic factors through the public interest test must be taken into account in pursuing reform."*

While there are no specific reforms associated with the South West Yarragadee Water Supply Development proposal, the proposal reflects Government objectives in comprehensively evaluating the social and economic factors.

Regional development policy

The Government *Regional Development Policy* (Government of Western Australia 2003c) sets out the following principles and approaches it will follow to support strong and vibrant regions:

- identify and enable fair and just outcomes for regions
- maximise community consultation so that Government can understand and appropriately respond to regional needs
- facilitate effective partnerships between Government and regional communities
- encourage and support local decision-making
- recognise, respect and work with the diversity of regional communities
- improve the living standards of Indigenous people in regional areas

- invest in regional infrastructure to build and enhance regional strengths
- support creative solutions to regional needs based on quality research and development
- value and protect the environment
- measure and report on progress of regional development.

With the exception of the last listed, this Sustainability Evaluation/ERMP has included consideration of all these principles and approaches in development of the final proposal.

The *Regional Development Policy* acknowledges its compatibility with the *State Sustainability Strategy* as being "*important for regional Western Australia as it provides an integrated assessment framework for projects and programs, which allows the diversity of regions to be fully considered*". This implies that compatibility of this proposal with the *State Sustainability Strategy* will contribute to compatibility with the *Regional Development Policy*.

Gaps in government policy

This Sustainability Evaluation has identified a range of gaps in Government policy and has endeavoured to fill these gaps. A major policy gap encountered relates to the process of obtaining multi-agency approval for a project involving considerations of social, environmental and economic aspects within an integrated framework. The *State Sustainability Strategy* provided valuable guidance in developing the approach proposed for application to this proposal.

There are several policy aspects related to water allocation considerations where improvement should be considered. The DoW has a well-documented policy position on the provision of water to the environment (Water and Rivers Commission 2000). However, other than being mentioned in several generalised allocation policies, the agency policy position on social and economic considerations does not appear to have been documented to the same level as environmental water provisions. The extent to which environmental water has primacy in water allocation decision-making is consequently not clear. It is anticipated that the sustainability evaluation approach adopted for this proposal will assist the agency in developing its approach to consideration of future applications in an environmental, social and economic context.

A water allocation policy gap addressed by this project was the issue of "reasonable regional needs". While this was acknowledged at a high level within the *State Water Strategy*, translation into an outcome for this project provided significant challenges in reconciling the competing interests of all stakeholders. It is anticipated that the considerations involved in developing the position adopted by the Water Corporation for this proposal (Volume 2 Chapter 3 Section 3.1.2) will be useful to future decision-making where this issue needs to be addressed, in the South West as well as other areas of the State.

Decision-making in the light of the uncertainty of the expected magnitude of climate change, and how these effects will be considered, is a policy area with significant ramifications for this and a range of other climate-affected or climate-dependent project proposals. This aspect is discussed in detail in this evaluation (Chapter 7 Section 2.1.6) and an approach is proposed to undertake decision-making within this uncertainty. The basis of this approach could be considered in developing a universal approach to deal with this very significant issue.

1.1.2 Linkages to principles and factors

The matters considered above, under the strategic factor of *Government plans*, link to other sustainability principles and their associated factors being:

Biodiversity and ecological integrity

There is a high-level linkage to the full range of factors associated with the *Biodiversity and ecological integrity* principle through compliance with the *State Sustainability Strategy*, and most aspects of the COAG water resource policy. Compliance with Government policy will contribute to the achievement of objectives associated with *Biodiversity and ecological integrity* principle, particularly the factors related to groundwater dependent ecosystems.

Long-term economic health

Compliance with the *State Water Strategy*, regional development policy and competition policy will contribute to achievement of objectives associated with the *Long-term economic health* principle, particularly the *Economic growth*, *Economic diversity* and *Business development* factors.

Public water supply

Compliance with the COAG policy position on protection of groundwater quality will directly contribute to achievement of the *Public water supply* principle factors of *Quality of supply* and *Drinking water source protection*. Compliance with the water use efficiency response of the *State Water Strategy* will contribute to achievement of the objective of the *Water use efficiency* factor.

Regional needs

Compliance with the *State Water Strategy*, regional development policy and competition policy will contribute to achievement of objectives associated with both of the factors of the *Regional needs* principle – *Regional needs for private water supplies* and *Impact on current key water users*.

Accountability

Compliance with the water conservation response of the *State Water Strategy*, through having water use efficiency performance targets consolidated in licence conditions, will contribute to achievement of the *Define performance targets* and *Reporting performance on achievement of targets* factor objectives.

1.1.3 Proponent sustainability commitments

The Water Corporation will ensure the development and future operation of the proposal complies with Government policies as required.

1.1.4 Outcome

The proposal will comply with relevant Government plans and policies. Proposals to address policy gaps will enhance the development of Government policy to facilitate the consideration of this proposal and proposals for groundwater abstraction in other areas of the State.

1.2 REGIONAL DEVELOPMENT

Sustainability objective

The proposal will provide opportunities for regional development.

There are several aspects related to the impact of the proposal on opportunities for regional development:

- competition with local demands
- provision of basic infrastructure to the region
- equitable access to water for domestic uses
- increasing supply security
- improved information on regional water resources
- limits of water availability
- reducing environmental risk.

The first four aspects listed are closely inter-related and are considered under the socio-economic principle of *Regional needs* (Volume 2 Chapter 3 Section 3). The other aspects are discussed under the strategic principle of *Improved knowledge and skills* (Chapter 7 Section 4).

1.3 EQUITABLE ACCESS TO WATER

Sustainability objective

The Water Corporation will ensure fair and equitable access to water for domestic use for all Water Corporation customers.

1.3.1 Background

Access to water for domestic uses is available to people through two basic systems:

- reticulated public water supplies
- self-supply options available to individual households (e.g. rainwater tanks, domestic wells or local access to streamflow).

Towns throughout the region overlying or close to the South West Yarragadee Formation have reticulated water supplies based on local sources. Some coastal developments along the Leeuwin–Naturaliste Ridge such as Gracetown, Witchcliffe, and Hamelin Bay have limited local supplies and no reticulated system provided by the Water Corporation. Towns such as Margaret River are approaching the limits of existing supply sources and future growth will require the development of one or more major new sources.

The water quality in parts of the reticulated water supply to Augusta, while meeting the required water quality standards, contains naturally occurring dissolved salts that make the water hard, resulting in consumer complaints.

1.3.2 Potential impacts and mitigation or enhancement

Access to water is affected by proximity, and cost of connection, to a water supply, and a decision to allocate water from a particular resource (in this case the Yarragadee aquifer). Anyone may apply to the Water Corporation for connection to a public water supply system that is managed by the Corporation.

Equity of availability

South West communities were found to have a strong perception that people in Perth would benefit from the proposal, but there would be little or no benefit at their local community level (Synnott Mulholland Management Services 2005). Those with a regional perspective saw that the region as a whole could benefit from greater availability of water, but themes from those with a local perspective included:

- "this is our resource – you're taking it away and we get nothing"
- "any future benefit that we might derive from the use of the resource is being denied by taking the water away."

Strongly linked with this is the perception by some that the proposal is inequitable. The South West communities also feel powerless to influence what they see happening.

The above community perceptions will be addressed by the following:

1. Extension of the IWSS into the region will provide opportunities for greater access to public water supplies by country communities.
2. Recognition by the Water Corporation that regional public water supply demands are no more or less legitimate than current IWSS demands.
3. The uniform pricing of provision of public water supplies will ensure that a balanced (equitable) outcome is achieved in terms of availability for this purpose.
4. Community participation in the proposed South West Public Water Supply Future Planning Study (Chapter 8 Section 3.2.6).
5. Application of reasonable *Regional needs* principles (Volume 2 Chapter 3 Section 3.1.2).
6. Application of an adaptive management approach (Chapter 8 Section 3.2.1).

Equity of water quality

It is not practicable to ensure that all customers of public water supply systems across the State are supplied with exactly the same quality water. The water quality of the various sources varies considerably, both between sources and in some cases, within an individual source from time to time.

The Water Corporation approach to this issue is to comply with its Customer Charter, which makes the following commitments with respect to water quality:

- supply water that is safe to drink
- continuously monitor and assess the quality of drinking water supplied
- respond promptly to any reports of poor water quality
- provide information on water quality

- advise of any need to boil water prior to drinking, or make alternative supplies of drinking water available when necessary
- provide information on the chemical analysis of water supplied
- provide media bulletins on any planned changes to the system likely to affect the quality of the water supplied.

Water quality is an issue that will be considered in the South West Public Water Supply Future Planning Study.

Equity of water supply costs

The costs associated with various public water supply systems differ across the State, depending on the characteristics of the system and, in particular, the distance of the demand centre from the source. While costs vary significantly, the Government uniform pricing policy provides residential customers with up to 350 kL/yr at the same price across the State. Country consumption above 350 kL/yr is also provided at prices much lower than cost.

Affordability of connections to the extended IWSS

Decisions on the provision of water supplies to currently un-serviced centres (such as Gracetown and Witchcliffe) where the costs of supply would not be recovered by the Water Corporation under the uniform pricing policy, are matters for Government. The prime consideration is the willingness of Government to cover the financial loss through additional Community Service Obligation (CSO) payments to the Corporation.

The development of a regional water supply scheme could potentially reduce the cost of supply to such centres and consequently reduce the associated CSO payments. This would increase the incentive for Government to support the provision of such services

The cost of water supply development will be a major determinant in resolving the existing and potential future water supply issues for communities in the South West. While the immediate extension of the IWSS into the region through the connection of the proposed wellfield at Harvey is not expected to provide solutions for these centres in the short-term, the existence of major water supply infrastructure provides an additional option to be considered in future regional water supply planning.

The Water Corporation commitment to prepare a South West Public Water Supply Future Plan would facilitate connection of centres to the IWSS or direct to the Yarragadee aquifer.

1.3.3 Monitoring, adaptive management and accountability

Through the South West Public Water Supply Future Planning Study (Chapter 8 Section 3.2.6), the Water Corporation will determine the future public water demand in those towns and centres in the South West that may be able to connect to the IWSS or be directly supplied from other sources. The actual demand against projections will be reviewed annually and the results published in the annual Sustainability Report for the development. Future demands will be reviewed as part of the periodic reviews of the Water Corporation source development program.

1.3.4 Proponent sustainability commitment

The Water Corporation commits to:

1. The water from the proposal will be available to any consumer prepared to enter the standard access arrangements (user pays cost of connection or as otherwise supported by the Government) and the uniform tariff pricing policy that applies to other IWSS water users in the State.

1.3.5 Outcome

Equitable access to public water supply schemes will be maintained through continued implementation of both Government Policy on uniform tariff policy and Water Corporation Customer Charter. Equitable access will be enhanced through the preparation and implementation of the South West Public Water Supply Future Plan.

Participation of the community in the development of a public water supply plan for the South West, as well the proposed adaptive management approach, will empower the community in future decision-making on the extension of public water supplies in the South West.

2 STRATEGIC PRINCIPLE – CLIMATE CHANGE

Sustainability principle and associated factors

The sustainability objective for the *Climate change* principle is:

The current low rainfall period and possibility of future climate change should be taken into account in decision-making about the development of the Yarragadee aquifer as a water source.

Climate change is the only sustainability factor associated with this principle.

2.1 CLIMATE CHANGE

Sustainability objective

The sustainability objective for this factor is:

To determine the impact of likely climate change scenarios on the sustainability of the proposal.

2.1.1 Rainfall decline

Winter rainfall in the south-west of Western Australia has decreased substantially since the mid-20th century, with a series of years of lower than average rainfall since the mid-1970s. The decrease in rainfall appears to be partly the result of changes in large-scale global atmospheric circulation associated with an enhanced greenhouse effect. The Indian Ocean Climate Initiative (IOCI 2002) suggests that the changes do not indicate that the enhanced greenhouse effect is solely responsible, beyond reasonable doubt, for the rainfall decrease.

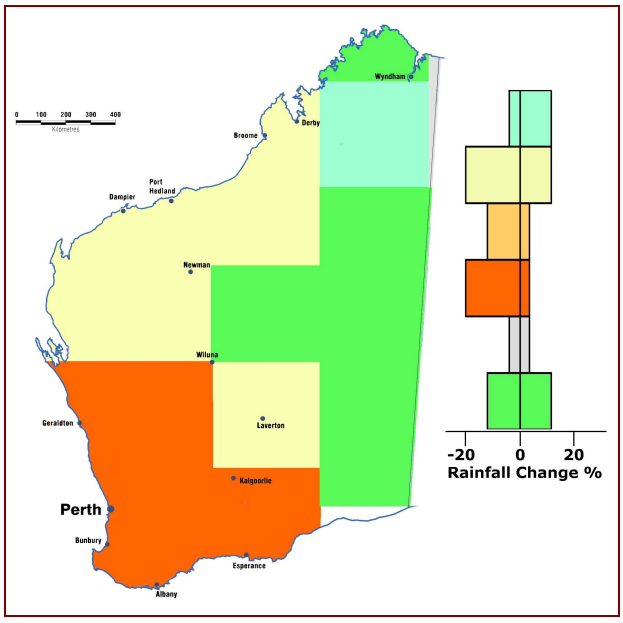
The IOCI suggests that the decrease may simply reflect natural climate variability and that it is most likely that both natural variability and the enhanced greenhouse effect have contributed. They conclude that the climate of the south-west of Western Australia will continue to exhibit wet and dry periods due to natural climate variability, overlaid by changes expected from enhanced greenhouse conditions, throughout the 21st century. These changes includes the likelihood of continued warming, coupled with a decrease of winter rainfall in the south-west of Western Australia.

The key issue is the extent to which rainfall will decrease. While there has been considerable research, there is currently no definitive position taken by the researchers. The range of prognoses for the South West range from a 5% increase to a 20% decline in annual rainfall by 2030, with the balance of opinion falling on the side of an overall decline (Figure 7.1).

2.1.2 Government response to climate change

The *Western Australian Greenhouse Strategy* (Government of Western Australia 2004) provides a comprehensive State level response to the greenhouse issue that acknowledges the Kyoto Protocol as a target, albeit with limitations and weaknesses. The Western Australian Government has committed to work to minimise its own contribution to climate change by demonstrating emission reductions as a means of helping industry and the community to determine and implement effective responses.

Figure 7.1 Ranges of modelled average annual rainfall change for around 2030[14]



Within this Government response, the Water Corporation has committed to using the best available technology to recover energy and minimise power use.

2.1.3 Impacts on water resources

Berti et al. (2004) details an investigation of the potential impact of a projected change in climate on the water yield of the Stirling Dam catchment, which is north of the primary study area. The daily rainfall series generated using a single Commonwealth Scientific Industry and Research Organisation (CSIRO) Mk 3 General Circulation Model simulation, based on a 1.7 times CO_2 climate (the Intergovernmental Panel on Climate Change SRES A2 emission scenario[15]) suggested an 11% reduction in annual rainfall by the middle of this century. This study indicated a potential reduction in reservoir yield at Stirling Dam of about 30% over longer term yields resulting from historical rainfalls.

Berti *et al*. (2004) did not consider the effect on surface runoff resulting from vegetation responses to climate change. Such changes may have an effect in reducing the amplified runoff response to reduced rainfall. However, the current experience of reduced winter inflows into Water Corporation reservoirs resulting from lower rainfalls is similar to the responses suggested by Berti et al. This is a primary motivation for the current acceleration of the Water Corporation source development program.

2.1.4 Impacts on groundwater recharge and vegetation

The impact of a lower rainfall on groundwater recharge and yields is not clear. Green et al. (1997) reported that the effects of changes in the amount and timing of rainfall on groundwater recharge can be amplified by the dynamic response of vegetation. While the short-term response of groundwater systems to lower than historic rainfall patterns is likely to be a significant reduction in recharge, the longer term response may reverse this to some extent. A key factor in this will be the biological response, as vegetation populations transition towards species that need less water. Water interception and transpiration by vegetation will tend to reduce, allowing higher net infiltration rates to groundwater.

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[14] Information taken from CSIRO brochure: "*Climate Change Projections for Australia*" available from www.dar.csiro.au/publications/projections2001.pdf [7 July 2005].

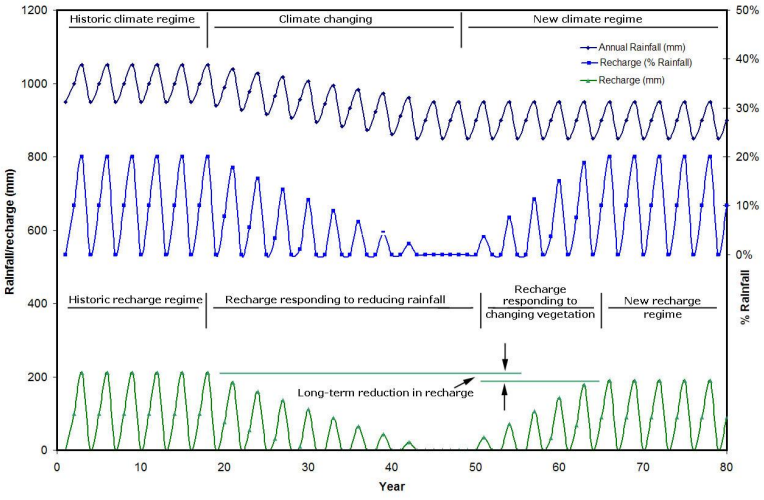
[15] The A2 scenario describes a very heterogeneous world with an underlying theme of self-reliance and preservation of local identities. Fertility patterns across regions converge very slowly resulting in continuously increasing global population. Economic development is primarily regionally oriented and per capita economic growth and technological change are more fragmented and slower than in other scenarios.

In general, when a variable climate is not subject to long-term changes, groundwater recharge tends to occur during the wetter than average years, and would be very low in the drier than average years. If the average climate moves to a drier regime, the vegetation is expected to respond, albeit with some lag, with a shift towards plants that require less water. While the climate is becoming drier and the vegetation is responding, average recharge rates (as a percentage of rainfall) would be substantially lower than prior to the climate change.

When the climate stabilises to a drier regime, average recharge rates (as a percentage of rainfall) would be lower than before the change, but would progressively increase towards the levels experienced prior to the change as vegetation responds in catching up to climate. The volume of average recharge would be lower under a stable lower rainfall regime, but recharge as a percentage of rainfall would not necessarily reduce.

By way of a simple example, if recharge was 10% of rainfall under historical climate conditions, it may well be 10% of a reduced rainfall regime after vegetation responses have stabilised. This effect is demonstrated in Figure 7.2.

Figure 7.2 Diagrammatic representation of recharge response to drying climate



The model demonstrates a relatively small reduction in the volume of recharge once the new equilibrium (vegetation regime and recharge threshold) is established.

In reality, the vegetation response would probably begin much earlier than shown, and would not take as long to reach a new equilibrium. The values used in the model underlying the diagram are for demonstration purposes rather than an attempt to reflect a reality. The real situation would be further complicated by system responses to higher atmospheric temperatures, changes in seasonal distribution of rainfall, and possible higher evaporation, all of which are important areas for further research.

2.1.5 Potential impacts and mitigation or enhancement

While the prognosis for future climate in the region is not entirely clear, it is prudent to plan for reductions in rainfall and a commensurate reduction in groundwater recharge, and to consider this as a possible scenario in evaluating the impacts of future water resource developments. The modelling of groundwater abstraction used for this evaluation (Volume 2 Chapter 5) is based on a rainfall sequence from 1971 to 2003, which is one of the drier periods since rainfall records have been collected. In effect, the use of this sequence takes into account a reduction in recharge of the order of 9% of the long-term average, which is close to the centre of the range of drier climate change forecasts for the South West by 2030, assuming that changes in rainfall will be proportionately reflected in changes to recharge.

For the purposes of this evaluation, scenarios assuming further reductions in annual recharge of 5% and 10% were modelled to demonstrate the potential effects of such changes on groundwater levels.

Climate change implications

The fundamental issue for decision makers is the assessment of the expected biological responses of ecological systems to climate change, and the potential resetting of environmental (and possibly social) benchmarks previously determined under a higher rainfall regime.

There are two major considerations when determining the acceptability of environmental impacts in the context of a drying climate:

1. Whether the acceptability of changes to the environment resulting from the proposal should be judged against historical and current environmental and social values, or against potential future values that may result from climate change without any human influence. This judgement should take into account that the system is in a state of change in any event, and that preservation of the existing state and values may not be possible. This will require judgement of what the potential future values might be. A prime aspect to be taken into account will be the effect of the proposal on the resilience of the ecosystems in adapting to climate change.
2. The uncertainty over the magnitude and form of the expected climate change means that predicting potential future values and ecological state, is difficult, and this consideration presents a major dilemma in determining acceptability of the imposed impacts of a proposal.

2.1.6 Proposed framework for the assessment of the proposal in the context of climate change

Given the difficulties and uncertainties in determining the future state (and even greater uncertainties in determining a desirable future state) of groundwater dependent ecosystems, the response to climate change should:

- be adaptive
- be based on monitoring and research
- recognise that there could be significant change to groundwater dependent ecosystems and associated values from climate change alone
- seek to manage the detected changes induced by the proposal within acceptable parameters.

The specifics of what constitute “acceptable parameters” will be a matter of ongoing judgement as information becomes available. However, basic principles may be established to guide future judgements that should be applicable to all areas with the potential for water resources and associated values to be affected by an uncertain climate change.

Some of the key principles that are proposed to form the framework for future judgements on changes induced by groundwater abstraction by the development include:

1. **Ecosystems are dynamic and respond to climate change**: Changes are most likely to occur to water dependent ecosystems in the context of a drying climate. It should be recognised that the ecosystems have shifted historically and preserving the current state of these ecosystems may not be feasible or possible. It is difficult to predict the exact future state of the ecosystem and the desirable future state.

2. **Change is not necessarily damage**: A key principle is the recognition and acceptance that change does not inherently constitute a form of damage and is not necessarily adverse. The characteristic composition, structure, and processes of water dependent ecosystems may change. However, the extent to which such change can be considered to be adverse will largely depend on the extent to which the full range of management principles are sustained. The rate of the change is a major factor influencing the resulting composition and structure of the ecosystems.
3. **Adequate levels of ecological productivity should be maintained over the region**: The change induced by the proposal should not be such that total ecological productivity levels fall significantly below that induced by climate change over the region.
4. **The resilience of the significant groundwater dependent ecosystems should be maintained**: The change induced in these systems (e.g. conservation category wetlands and threatened ecological communities) by the proposal should not significantly affect the ability of these ecosystems to adapt to climate changes and prevent reversal of these changes. The proposal should not lead to the loss of any keystone species in these ecosystems in addition to those that may be lost through climate change.
5. **The conservation status of groundwater dependent ecosystems types in the region should not be raised:** The proposal should not cause the regional conservation status of water dependent ecosystem types, or species within these ecosystem types (e.g. lakes, sumplands, damplands/palusplain, woodlands, and heathlands), to be raised substantially above that which would be induced by climate change alone. For instance, from vulnerable to endangered, or susceptible to vulnerable.
6. **Any substantial loss in groundwater dependent ecosystems should be offset**: Any substantial loss of water dependent ecosystems above that which would be induced by climate change should be offset by rehabilitation, or enhanced protection or management of other water dependent ecosystems.
7. **Monitoring and review to assess the extent of change and forecast future change is an imperative**: Adequate monitoring should be undertaken to assess change as it is occurring, and to provide for forecasting of future change as a means of identifying priority areas for management effort.
8. **Risk assessment of the consequences of the management options should provide guidance to decision-making**: This aspect of the *Precautionary* principle (Chapter 8 Section 1.1) will be an important part of decision-making on considering acceptable change.

These principles are preliminary proposals. Finalisation of the principles and development of an approach to their application would require consultation with a range of stakeholders.

To assess the achievement of several of the principles will require an understanding of the changes that will be induced by climate change alone. This will require the identification of appropriate control areas to enable this understanding to be developed, and will be an important aspect of any auditing of performance against achievement of the principles.

2.1.7 Linkages to principles and factors

The matters considered under the strategic principle of *Climate change* link to the following sustainability principles and their factors:

Biodiversity and ecological integrity

Climate change will potentially affect achievement of all the objectives of the *Biodiversity and ecological integrity* principle, except for the *Development footprint*, factor, irrespective of the impacts of the proposal. A key issue will be deciding on the acceptability of the impacts of the proposal against a changing environmental benchmark. Some uncertainty regarding the impact of climate change on water resources and, in particular, the long and short-term effects on recharge, and the biological responses are key issues to be addressed. An approach to dealing with the uncertainty has been developed that requires judgement within an understanding of the risks and how they can be managed.

Long-term economic health

The key impact on achievement of the objectives of the *Long-term economic health* principle relates to the ability of decision makers to consider the acceptability of the impacts of this proposal (and other proposals) within the context of changing environmental benchmarks. The approach proposed in Chapter 7 Section 2.1.6 is a means of enabling achievement of all objectives of these factors.

Public water supply

Climate change will directly affect achievement of objectives of the *Existing and future needs* and *South West town supplies* factors of the *Public water supply* principle. As for factors associated with the principle of *Long-term economic health*, the extent to which these objectives are affected depends on decision-making within the context of changing environmental benchmarks.

Regional needs

Climate change will directly affect achievement of the objectives of all the factors of the *Regional needs* principle in a similar manner to the factors associated with the *Public water supply* principles. This will apply to the Water Corporation proposal, and other proposals.

Community well being

Climate change will directly affect achievement of all factors related to the *Community well being* principle, except for the *Development footprint* factor. Similar to the factors of the *Long-term economic health* and *Public water supply* principles, the extent to which this objective is achieved will depend on decision-making within the context of changing environmental benchmarks. This will apply to the Water Corporation proposal, and other proposals.

International and national competitiveness of water users

Achievement of the objective of the *Cost of water* factor associated with the *International and national competitiveness of water users* principle will be affected by decision-making on water availability under a changed climate. This will apply to the Water Corporation proposal, and other proposals.

2.1.8 Monitoring, adaptive management and accountability

The Water Corporation will conduct a major biodiversity study of the groundwater dependent ecosystems of the Scott and Swan Coastal plains that will potentially be affected by the proposal, and the Blackwood River area and other selected areas not affected, to establish a baseline against which climate- and proposal-induced changes may be assessed. This work will be a component of the proposed South West Yarragadee Sustainability Initiative (Chapter 7 Section 4.1.1).

A monitoring program will be developed for areas of interest to enable the assessment of the significance of any proposal-induced changes in groundwater dependent ecosystems in the context of climate change. This monitoring program will include monitoring control areas and areas of interest for:

- changes of keystone and selected significant species in selected groundwater dependent ecosystems
- changes in the composition and abundance of flora species in potentially affected ecosystems
- meteorological parameters including rainfall, wind, evaporation and temperature at representative locations.

A key aspect to management under a regime of changing climate will be improving understanding of the relationships between groundwater dependent ecosystems and climate. The proposed monitoring program will add significant information to support research into those relationships.

The Water Corporation will support and participate in the Indian Ocean Climate Change Initiative to monitor and enable better forecasting of climate change in the South West.

2.1.9 Proponent sustainability commitments

The Water Corporation will continue to support and participate in the Indian Ocean Climate Initiative.

2.1.10 Outcome

Climate change will have an impact on recharge to the Yarragadee aquifer, which may result in changes to the watertable in areas where there are groundwater dependent ecosystems. The change in the watertable may, in time, induce changes within that system. Under the scenario where climate in the south-west of Western Australia will become drier, the proposal may cause a further lowering of the watertable in areas where the drawdowns in the Yarragadee aquifer are transmitted to the watertable.

The approach taken in this evaluation and the subsequent implementation of this proposal, will ensure that climate has been comprehensively considered by:

- modelling drawdowns under a range of drier climate scenarios
- monitoring and supporting climate research
- proposing an approach that will account for the uncertainty associated with predictions of future climate change in the region.

The proposed key principles for determining the acceptability of change induced by the proposal in the context of climate change, and the proposed adaptive management framework, will ensure that the effects of climate will be comprehensively considered in the environmental management of the proposal.

3 STRATEGIC PRINCIPLE – INTERNATIONAL AND NATIONAL COMPETITIVENESS OF WATER USERS

Sustainability principle and associated factors

The sustainability objective for this strategic principle is:

The proposal will facilitate the competitiveness of local and regional industries in the national and international context.

The only sustainability factor associated with this strategic value is *Cost of water*.

3.1 COST OF WATER

Sustainability objective

The sustainability objective for the *Cost of Water* factor is the same as for the principle.

3.1.1 Potential impacts and mitigation or enhancements

The expectation is that competitively priced water assists industries in being competitive in the national and international market.

The cost of the various source options is an important consideration in progressively developing the water sources that form the basis of the IWSS as it expands to meet growing demand and to provide higher levels of security. Overall, the IWSS has been built up within a program primarily based on developing the viable and environmentally acceptable sources in order of cost. That is, developing lower cost sources before higher cost sources, as this provides the lowest cost water. The cost considerations relate to both capital and operating costs through a comparison of the net present values[16] of the available options.

Other factors play a role in modifying the timetable for source development, such as timeframes, technical practicalities and supply security.

Preferentially developing lower cost water sources for the IWSS maintains the lowest possible water pricing to customers. This in turn supports the national and international competitiveness of water users taking water from the system. Extension of the IWSS into the South West will provide the region with access to this low cost water supply, and assist in the development of high-value regional enterprises. It will consequently make a positive contribution to competitiveness of South West industries, and to the State and national economies.

[16] Net present value analysis allows projects with different capital and operating costs to be normalised for comparison purposes. For example, the overall real cost of an option with a high capital cost and low operating cost can be compared with a low capital cost, high operating cost option to determine which is financially more attractive.

The current structure of the water supply tariff system encourages water use efficiency through higher charges for higher water consumers. Large non-domestic consumers under special contracts pay the full cost of supply.

3.1.2 Linkages to principles and factors

The matters considered under the strategic principle of *International and national competitiveness of water users* link to the following sustainability principles and their factors:

Long-term economic health

Competitively priced water will contribute directly to the *Economic efficiency* factor and will assist achievement of the objectives of the *Economic diversity* and *Business and industry development* factors.

Public water supply factors

The current water tariff structure contributes to achievement of the objective of the *Water use efficiency* factor.

3.1.3 Monitoring, adaptive management and accountability

The Water Corporation will continue to execute all components of its *Security Through Diversity* strategy and update its source development plan based on the latest information available.

The Water Corporation will undertake a review of public water supply planning in the South West that examines expected growth in the need for public water supplies and the potential options for meeting those demands. The resulting plan will require ongoing monitoring to ensure implementation of the plan is responsive to changing supply and demand.

3.1.4 Proponent sustainability commitments

The Water Corporation will prepare a South West Public Water Supply Future Planning Study (Chapter 8 Section 3.2.6).

3.1.5 Outcome

A rational planning base for the future development of public water supplies that will support the development of high-value regional enterprises and, consequently, the competitive contribution of the region to the State and national economies.

4 STRATEGIC PRINCIPLE – IMPROVED KNOWLEDGE AND SKILLS

Sustainability principle

The sustainability objective for this strategic principle is:

The proposal will enhance the knowledge of the resource to enable optimal use of the resources by self suppliers.

The sustainability factors associated with this strategic value are:

- *Environmental risk* (addressed under the *Precautionary* principle – Chapter 8 Section 1)
- *Supply security* (addressed below).

4.1 SUPPLY SECURITY

Sustainability objective

The sustainability objective for this factor is:

To increase supply security by improving the scientific basis for decision-making and planning regarding the use of the South West Yarragadee as a water source.

4.1.1 Potential impacts and mitigation or enhancements

Groundwater investigation programs

The groundwater investigation program undertaken to support this proposal is one of the largest such programs undertaken in Western Australia. Approximately $12 million has been expended since 2002 in improving our knowledge of the groundwater resources of the region and its relationships with environmental and social values. The results of this program are summarised in Volume 2 Chapter 5 Section 1. This work has built on the groundwater investigation information available from programs undertaken from the 1960s to the 1990s.

Prior to commencement of the investigations of this proposal in late 2002, knowledge of the groundwater resource in the central and southern parts of the Southern Perth Basin was limited to reconnaissance level work of the Geological Survey of Western Australia, and local investigations associated with sand mining on the Scott Coastal Plain. While it was understood that there were substantial good-quality groundwater resources associated with the Yarragadee Formation, availability had not been evaluated with any accuracy, and environmental interactions had not been examined in detail, with the exception of Lake Jasper where concerns over the potential effects of sand mining were investigated and modelled. In the absence of this information, conservative allocation policies apply which restrict availability of water from the resource.

This Sustainability Evaluation/ERMP has included development of a 3-D computer model of the groundwater systems to allow evaluation of alternative groundwater development and management scenarios under a range of possible future climates. This model has been made available to the DoW for use in management of the water resources of the region. The primary use of the model by DoW is expected to be as a tool in evaluating the potential water availability from the region[17], and for application in assessment of specific impacts of major abstraction licence applications.

The groundwater model provides a tool that will be available to assess regional-scale drawdown associated with:

- adaptive management strategies to deal with unforeseen drawdown impacts from the Water Corporation proposal
- new groundwater abstraction proposals by other users, including agriculture, industry, mining or town water supplies (e.g. Bunbury and Busselton).

As information on the future performance of the aquifer system is gathered (through a proposed extensive monitoring program) the model can be progressively refined and estimates of water availability improved.

The knowledge gained from the investigations associated with this project has been important in identifying key risk areas, and in developing an understanding of the risks and measures that can be employed to minimise and offset them. Considerable effort has been made to develop the configuration of the project to reduce the risks to as low a level as practicable. The knowledge base will increase as the system is further developed, and the monitoring results gathered and analysed, and responses developed and implemented to address any unforeseen impacts. This knowledge base can also be applied to considerations of impacts and environmental risk of future projects proposed by other parties. A major contribution to increasing the knowledge base is a commitment by the Water Corporation to implement the South West Yarragadee Sustainability Initiative.

South West Yarragadee Sustainability Initiative

The South West Yarragadee Sustainability Initiative will be an element of the proposed adaptive management framework and involves commitment to a range of actions to obtain information to refine the existing models of the groundwater system and associated dependent ecosystems, and to achieve net benefit outcomes.

Activities undertaken under the initiative would include:

1. A major biodiversity study of groundwater dependent ecosystems in the potentially affected areas that may include:
    - the occurrence, condition, spatial extent and groundwater dependence of floristic and vegetation communities at a local and regional scale
    - the occurrence, severity and spatial extent of forest disease

[17] It should be noted that this Sustainability Evaluation has not attempted to determine the maximum amount of water that might be available from the resources being considered. The approach has been based on an evaluation of the impacts of the proposed Water Corporation abstraction together with the potential impacts of predicted future growth in abstractions for local use, up to 2033. No attempt has been made to determine the limits of water availability from the resource outside these levels of abstraction or beyond this timeframe.

- the occurrence and spatial extent of significant aquatic fauna
- investigate the genetic diversity of significant aquatic fauna that use the tributaries as refugia
- the identification and spatial extent of terrestrial fauna habitat
- the occurrence and abundance of terrestrial vertebrate fauna, including specifically, threatened fauna as defined in the Wildlife Conservation Act 1950 and the EPBC Act, Priority fauna as defined and listed by CALM

2. Supporting investigations into the potential for acidification from acid sulphate soils, and potential means of management.
3. Sponsor an investigation into the magnitude and potential means of management of irrigation return water and the effects of changing land use on water demand, availability and quality.
4. Investigations into the effects of changing land use on water demand, availability and quality.

The biodiversity study will be steered by a technical committee of:

- two independent scientific experts
- two representatives of the Water Corporation
- one representative from CALM
- one representative from DoE
- one representative from DoW.

Annual progress reports on the study will be prepared by the Water Corporation as part of the annual Sustainability Report and will be made publicly available.

Sustainability evaluation model

Development of the Sustainability Evaluation model presented here has been highly innovative and has application to Government assessments of future major project proposals. The model is considered to be a substantial contribution to improved knowledge and skills that will have application for use by resource by self suppliers as well as by public water supply agencies.

4.1.2 Monitoring, adaptive management and accountability

The South West Yarragadee Sustainability Initiative will contribute to the overall monitoring program and provide the basis for adaptive management. Implementation of the initiative is a Water Corporation commitment.

4.1.3 Proponent sustainability commitment

The Water Corporation commits to implementation of the South West Yarragadee Sustainability Initiative.

4.1.4 Outcome

The direct benefit to the region of the improved knowledge and skill base is the opportunity to maximise future opportunities that might be available through use of regional water resources. These opportunities would be limited if a lack of information resulted in conservative decision-making on water availability for future development projects.

Information on the groundwater resource, its hydrogeology, environmental dependencies and social values will assist in maximising water availability from the Southern Perth Basin. This information will be enhanced through the proposed Sustainability Initiative.

Making the model available to DoW/Water and Rivers Commission for future assessment of licence applications from prospective self suppliers wishing to develop groundwater based projects in the region should reduce the amount of information required to be provided by applicants in support of their applications, and costs associated with those applications. Availability of the model and ongoing monitoring information should provide a considerable enhancement to the basis for water resource management in the area, with direct benefit to current and future landholders in the region.

The Sustainability Evaluation process model used for this project has application to assist Government assessments of future major project proposals.

Chapter 8 Process sustainability principles

The process principles associated with the South West Yarragadee Water Supply Development proposal are addressed in this Chapter.

Sustainability principles and associated factors

The process sustainability principles, factors and objectives are set out in (Table 8.1).

These principles and factors provide a basis for an evaluation of the processes that have been and will be applied to the design, construction and operation of the proposal.

Table 8.1 Process sustainability principles and factors

Factor	Objective	Description
Sustainability Process Principle – Precautionary principle		
Precautionary approach	Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the *Precautionary* principle, decisions should be guided by: • a careful evaluation to avoid, where practicable, serious or irreversible damage to the environment • an assessment of the risk-weighted consequences of the options. This is taken directly from the EP Act 1986 (amended 2004).	The following aspects of the *Precautionary* principle will be applied as needed: • risk management to predict and avoid unacceptable environmental harm • further knowledge to decrease scientific uncertainty • environmental monitoring to check performance against targets • adaptive management allows operations to be modified according to monitoring results • precautionary project design will avoid risks where possible • contingency planning to cater for unexpected outcomes • consideration of future legacy will ensure future generations are not disadvantaged by the proposal.
Sustainability process principle – Stakeholder engagement *The Water Corporation will seek participation by and views of stakeholders and take them into account in the development construction and operation of the proposal*		
Comprehensive and regular communication	Water Corporation will maintain a comprehensive and regular information flow to the community about the project and the process throughout the sustainability assessment process.	Regular, comprehensive and easily accessible information will include a website, newsletter and use of local and state media.
Relevant, balanced and inclusive consultation	Water Corporation will engage with key stakeholders and the broader community to discuss issues, and potential impacts and benefits of the project.	The Corporation has designed a complete consultation process that will be run in conjunction with project design and impact assessment. The consultation will include proposal design, risk management, monitoring and contingency planning, as well as mitigation measures and possible positive outcomes. The Community Reference Group will be strongly involved in the process.
Openness and transparency	The Water Corporation will conduct investigations and proposal development processes in an open and transparent manner.	The Water Corporation is committed to preparing the Evaluation in an open and transparent manner.

Factor	Objective	Description
Closed loop process (listen and respond)	Water Corporation will respond to issues and queries raised by the community and will provide feedback about how those issues have been dealt with and how they have influenced the process.	The closed loop process will ensure that community and stakeholder input is addressed in an open and transparent manner.
Sustainability process principle – Accountability		
The Water Corporation will report publicly on its sustainability performance and provide public access to information on the proposal. This includes monitoring, review and adaptive management responses, including mitigation		
Define performance targets	The Water Corporation will define economic, social and environmental performance targets that reflect achievement of the objectives set out herein.	Measures to reflect each of the objectives within this sustainability evaluation will be used as performance targets for subsequent comparative reporting to evaluate achievement of intended outcomes.
Report on achievement of performance targets	The Water Corporation will report regularly and publicly on performance of sustainability measures.	The Water Corporation will commit to a reporting schedule and report on its performance against agreed sustainability objectives.

1 PROCESS PRINCIPLE – PRECAUTIONARY PRINCIPLE

The *Precautionary approach* was the only factor that was developed for the *Precautionary* principle. The factor objective is a restatement of the principle itself.

Sustainability objective

Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the Precautionary principle, decisions should be guided by:

- *a careful evaluation to avoid, where practicable, serious or irreversible damage to the environment*
- *an assessment of the risk-weighted consequences of the options.*

The principle text is taken directly from the EP Act and includes concepts of:

- risk management
- further knowledge
- environmental monitoring
- adaptive management
- precautionary project design
- contingency planning
- future legacy.

1.1 POTENTIAL IMPACTS AND MITIGATION OR ENHANCEMENT

1.1.1 Sources of uncertainty

The nature of groundwater is such that there is always an element of uncertainty when making decisions about water availability, and predicting the drawdown impacts of particular developments. Uncertainties in accurately defining the ecological environment and its processes, and estimating influencing factors such as evapotranspiration, recharge, surface water – groundwater interactions, ecological dependencies, ecological responses to drawdown and future climate trends, provide a significant challenge to assessing the extent and character of environmental risks from the proposal.

This challenge is the most difficult in “greenfields” areas. Resource testing in these areas induces a minor stress on the system and the results are extrapolated to estimate the outcomes of proposed stresses many orders of magnitude higher than induced in the testing. Under these circumstances: the options are: to make conservative decisions that limit the stress and allow a knowledge base to be developed as the stress is progressively allowed to increase under monitored conditions, or, where the potential benefits of the proposal might be high, to adopt an approach that addresses risk and uncertainty through:

- adaptive management as knowledge of the water resource is obtained
- contingency actions when unforeseen events occur.

The key aspects of the *Precautionary* principle are still applied, namely:

- avoidance of serious or irreversible damage
- measures to prevent environmental degradation
- risk assessment.

This evaluation has applied this approach, given the potential benefits to the State and South West, and in light of the long time-frames required to understand the response of the resource, and ecological systems dependent on it, in the context of a climate change.

1.1.2 Risk management

Investigations and existing knowledge to identify risks

Notwithstanding the above acknowledged uncertainties and resultant risks, substantial information on the resource and groundwater dependent ecosystems has been obtained over the last three years. This information has allowed the likelihood and extent of potential impacts to be evaluated, and contingencies to be developed to respond to unexpected outcomes in areas of high environmental value. The knowledge gained from the investigations has also been important in identifying key risk areas, and in developing an understanding of the risks and measures that can be employed to minimise and offset them.

This proposal is not strictly a "greenfields" proposal. The South West Yarragadee Formation is currently subject to substantial levels of abstraction (about 35 GL/yr) and has consequently been stressed to a reasonable extent over a period of time. Regional groundwater abstraction currently totals about 72 GL/yr. There has also been substantial monitoring of impacts that has provided information on which to base the predictions of the impact of future stresses (through modelling). However, it is recognised that the proposed additional 45 GL/yr abstraction for the IWSS will be a significant one-step increase, in a locality that is distant from the existing abstractions.

Groundwater modelling and ecological assessment

A major tool used in this evaluation to assess potential risks is the development of a numerical model of the groundwater system based on a conceptual understanding of the hydrogeology. The model can be used to "predict" groundwater responses to a range of possible future scenarios (in terms of both climate and abstraction) and to identify areas of potential risk for groundwater dependent ecosystems.

Design and implementation of the proposal to minimise risk

Considerable effort has been made in developing the configuration of the project to minimise the risks to as low a level as practicable. The internal sustainability assessment process applied to the proposal involved application of the mitigation hierarchy outlined by the EPA (EPA 2005) and development of a range of mitigations and enhancements to provide positive benefits, the main elements of which are presented in Table 8.2. The location of the wellfield and the abstraction within the Yarragadee Formation was adjusted to avoid impacts in key environmental areas including the Reedia wetlands, and to minimise impacts on Swan Coastal Plain threatened ecological communities and the Blackwood River.

Table 8.2 Mitigations and enhancement

Action	Mitigation/enhancement actions
Direct mitigation actions	• Wellfield configuration to maximise avoidance of impact in sensitive areas • Comprehensive monitoring of all potentially impacted assets • Identification and investigation of potential contingency options, including water trading and development of surface water sources
Offsetting actions	• Addition of specific land and with high quality vegetation to CALM estate to offset impact on Poison Gully and other affected areas of vegetation • Support the management of threatening processes (feral animals, weeds, dieback) in the region • South West Yarragadee Sustainability Initiative (see Chapter 7 Section 4.1.1)
Enhancement actions	• Wellfield configured to maximise the regional water availability • Provision of investigation information and aquifer model to assist assessment of private licence applications • Diversion of water from scheme to regional public water supply needs as required • Local employment preferences in construction contracts in accordance with Water Corporation contract and employment policy and practice • Conduct South West Public Water Supply Future Planning Study (see Chapter 8 Section 3.2.6) • Employment of Indigenous people in monitoring programs in accordance with the Water Corporation Involvement and Indigenous Employment Opportunities Policy
Contingency actions	• Commitment to modify pumping regime in the event of unforeseen unacceptable significant adverse impacts that cannot be reasonably mitigated • Commitment to supplementation of flow in St John Brook to mitigate any significant unexpected pumping impacts on surface flow • Commitment to supplementation of flow in the Blackwood River to mitigate any significant unexpected pumping impacts on surface flow

Mitigation

Mitigation refers to a sequence of considerations designed to help manage adverse impacts, which includes (in order of preference):

- avoidance – avoiding the adverse impact all together.
- minimisation – limiting the degree or magnitude of the adverse impact
- rectification – repairing, rehabilitating or restoring the impacted site as soon as possible
- reduction – gradually eliminating the adverse impact over time by preservation and maintenance operations during the life of the action
- offsets – undertaking such activities that counterbalance an adverse, residual impact.

Avoidance, minimisation, rectification and reduction are categorised as direct mitigation actions (Table 8.2).

Enhancement

An enhancement is an action that increases the positive benefits or outcomes.

1.1.3 Offsetting environmental risks

The direct mitigation actions will be supplemented by offsetting mitigation actions designed to compensate for impacts that are unavoidable if the project is to proceed (Table 8.2). The direct mitigation and offsetting actions, designed to address foreseen significant impacts with the objective of ensuring that the impacts are acceptable, form the basic management program for the proposal.

1.1.4 Proposed adaptive management approach

Formal development of adaptive management as an approach for natural resources management can be traced back to the 1970s, and to research conducted at the International Institute for Systems Analysis in Laxenburg, Austria (Holling 1978). Adaptive management incorporates and integrates concepts such as social learning, operations research, economic values and political differences with ecosystem monitoring, models and science.

Adaptive management does not postpone actions until "enough is known" about a managed ecosystem, but rather is designed to support action in the face of the limitations of scientific knowledge and the complexities and stochastic behaviour of large ecosystems.

Adaptive management is intended to increase the ability to fashion timely responses in the face of new information, and in a setting of varied stakeholder objectives and preferences. It encourages stakeholders to impose boundaries on disputes and discuss them in an orderly fashion while environmental uncertainties are being investigated and better understood. Adaptive management can help reduce "decision-making gridlock" by making it clear that decisions are provisional, that there is often no "right" or "wrong" management decision, and that modifications are expected. Adaptive management should help stakeholders, managers and decision makers recognise the limits of knowledge and allow them to act on imperfect information (National Research Council 2004).

Key elements of the adaptive management approach that will be applied in the operation of the South West Yarragadee Water Supply Development are:

1. Management objectives and performance measures that are regularly revisited and accordingly revised. Adaptive management must have some level of agreement if it is to be useful. This agreement will be pursued through the proposed South West Yarragadee Monitoring Review Group (Chapter 8 Section 3.2.3) and the DoW/EPA.
2. Models of the system being managed: the Water Corporation has an explicit baseline understanding of the system being managed and will use this as foundation for learning. The system model(s) will be used to explain responses to management actions and help identify gaps and the limits of scientific and other knowledge.
3. A range of management response choices: for each decision on adaptive management responses, the range of possible choices would be developed and each evaluated in terms of the extent to which it would be likely to achieve the stated objectives. This evaluation would also consider the extent to which each alternative will generate new information or foreclose future choices.
4. Monitoring and evaluation of outcomes: monitoring will focus on significant and detectable indicators of progress toward management objectives. Monitoring will also help distinguish between natural perturbations and those caused by management actions. The proposed Monitoring Review Group will be involved in the assessment of monitoring programs and their results.
5. A mechanism(s) for incorporating learning into future decisions.

6. A collaborative structure for stakeholder participation and learning: the Water Corporation intends to achieve meaningful stakeholder involvement that will enable active learning.

This approach to adaptive management of the proposal will ensure both the potential benefits and the protection of ecological systems dependent on the resource.

The knowledge base will increase as the system is further developed, and as the monitoring results are gathered and analysed, and responses developed and implemented to address any unforeseen impacts. This knowledge base can also be applied to the considerations of impacts and environmental risk from future project proposals by other parties.

The South West Yarragadee Sustainability Initiative (Chapter 7 Section 4.1.1) is a key element of the proposed adaptive management framework, and involves commitment to a range of actions to obtain information to enhance knowledge on water availability in the region for all users.

1.1.5 Contingency planning

Contingency plans have been developed to address impacts in areas where they are considered unlikely, but possible, to the extent that such plans can be practically developed at this time. One of the key areas where there is some risk of potentially significant impact associated with the project is at St John Brook where summer flows in the Brook may reduce. Based on the understanding of the local hydrogeology, the likelihood of such an impact as a consequence of the proposal is considered very low. However, a contingency plan has been developed in the event of this occurrence (Volume 2 Chapter 7 Section 4.3.9). Other areas with high social value, and where the consequences of unforeseen or unlikely impacts are high (e.g. summer flow at the Blackwood River) have been treated similarly.

Contingency plans for the development of alternative regional sources to supply the IWSS will be investigated and prepared should the proposed abstraction from the Yarragadee aquifer need to be reduced in response to significant and unforeseen and unacceptable impacts that cannot be reasonably mitigated.

Adaptive management will effectively result in the development of contingency mitigation actions to address unexpected or unlikely significant adverse impacts if monitoring results indicate the potential for such impacts.

1.2 MONITORING, ADAPTIVE MANAGEMENT AND ACCOUNTABILITY

The application of the *Precautionary* principle through the adaptive management process will include comprehensive monitoring of the impacts of the proposal on environmental and social values. More information will be gained to facilitate adaptive management through the implementation of the proposed Sustainability Initiative.

1.3 PROPONENT SUSTAINABILITY COMMITMENT

The Water Corporation commits to application of the adaptive management process during the operation of the proposal. This will include:

1. The Water Corporation will establish and support a South West Yarragadee Monitoring Review Group (Chapter 8 Section 3.2.3) with the following functions:

- regular review and advice to the Water Corporation on monitoring programs, monitoring objectives and performance measures for the operation of the proposal
- review and provide public advice to the Water Corporation on monitoring results and provide comment on adaptive management measures
- review any changes to management of groundwater abstraction from the Yarragadee aquifer by the Water Corporation and provide advice on the acceptability of these changes.

2. Implementation of the South West Yarragadee Sustainability Initiative comprising a package of studies intended to enhance the information base, and to provide for maximisation of water availability in the region. This initiative will include a biodiversity study of groundwater dependent ecosystems on the Scott and Swan Coastal Plains (Chapter 7 Section 4.1.1).

1.4 OUTCOME

The application of an approach of adaptive management and ongoing risk assessment will ensure a precautionary approach will be applied in implementation of the proposal. This approach will substantially reduce the risk of serious or irreversible impacts on social and environmental values dependent on the Yarragadee aquifer.

2 PROCESS PRINCIPLE – STAKEHOLDER ENGAGEMENT

Stakeholder engagement principle and associated sustainability factors

Stakeholder engagement is one of the sustainability process principles applicable to this evaluation and reads as follows:

The Water Corporation will seek the participation and views of stakeholders and take them into account in the development, construction and operation of the proposal.

The key sustainability factors and objectives related to this principle are:

Relevant, balanced and inclusive consultation

The Water Corporation will engage with key stakeholders and the broader community to discuss issues, and potential impacts and benefits of the project.

Comprehensive and regular communication

The Water Corporation will maintain a comprehensive and regular information flow to the community about the project and the process throughout the sustainability assessment process.

Openness and transparency

The Water Corporation will conduct investigations and proposal development processes in an open and transparent manner.

Closed loop process (listen and respond)

The Water Corporation will respond to issues and queries raised by the community and will provide feedback about how those issues have been dealt with, and how they have influenced the process.

The following sections address all the above factors collectively and provide a summary of the overall consultation program being implemented.

2.1 STAKEHOLDER ENGAGEMENT

Stakeholder engagement provided the foundation for community input to the design and implementation framework for the proposal. This section provides a summary of the process and key outputs and observations, which were subsequently addressed under the various principles and factors of this evaluation.

The proposed stakeholder engagement, to follow approval of the development by the Government, is addressed under the *Accountability* sustainability principle (Chapter 8 Section 3).

2.1.1 Approach

Stakeholder engagement was strongly focused on local communities in the South West Region including Nannup, Augusta, Margaret River, Busselton, Capel, Bunbury, and farmers on the Scott Coastal Plain. Water consumers in the Perth region also formed a key stakeholder group that was consulted in the evaluation process.

The evaluation included consideration of issues relevant to Noongar communities. Heritage and cultural values associated with the proposal were identified from a Cultural Values Study commissioned by the Water and Rivers Commission (Goode 2003 at Appendix 23). However, the work to understand social impacts of the proposal on Indigenous communities is still being undertaken and will be reported separately.

Stakeholder engagement during the preparation of the Scoping Report (Strategen 2005a at Appendix 1) and this evaluation included:

- formation and meetings of the Community Reference Group
- issue identification studies
- market research
- public information sessions and "walk-ins" through major regional centres
- interviews with interest groups including business and community groups
- interviews with local residents and other identified stakeholders
- technical information progressively made publicly available
- focus groups
- public review of the draft Scoping Report, and response to comments.

The stages of the stakeholder engagement program that have been completed, and those outstanding are:

- before and during the preparation of the draft Scoping Report (completed)
- through review of the draft Scoping Report (completed)
- during preparation of the Sustainability Evaluation/ERMP (completed)
- public review of the final Sustainability Evaluation/ERMP
- following approval of the South West Yarragadee Water Supply Development (addressed under *Accountability* principle).

2.1.2 Engagement and response to stakeholders in preparation of the Scoping Report

The primary purpose of stakeholder engagement in preparation of the Scoping Report was to determine whether the factors identified in the draft Scoping Report would focus investigative effort on aspects of the project which were important to stakeholders.

Key issues emerging from previous work

During 2003, the Water and Rivers Commission undertook a substantial community involvement and social analysis process to identify issues, as part of its process to develop a management plan for the South West Yarragadee. The views of 400 – 450 people were gathered through a number of community mechanisms, culminating in an Issues Scoping Paper (Water and Rivers Commission 2003).

The paper identified the following five social issues (Table 8.3):

- social justice and equity issues
- swimming, fishing, and other recreational values
- impact on recreational reserves
- Aboriginal heritage and cultural issues
- European heritage values.

These social issues helped to scope subsequent investigations and develop the South West Yarragadee Water Supply Development proposal.

Table 8.3 Social issues identified by Water and Rivers Commission

Issue	Background
Social justice and equity issues	This relates directly to the philosophical notion of "our water" and the perception that water and wealth will be transferred out of the region. Numerous concerns relating to equity within this context were raised.
Swimming, fishing, and other recreational values	Recreation considered central to this region. The Nannup public briefing in particular noted the centrality of springs and waterways to the social structure. The community wants assurance that this proposal and the water allocation planning do not impinge on their social and recreational activities.
Impact on recreational reserves	Will there be direct impacts upon places of recreation?
Aboriginal heritage and cultural issues	Aborigines have lived here for 50 000 years without seeing man-made disasters. Water is sacred in Aboriginal culture. The impact on this sanctity in general, as well as the impact on Aboriginal heritage sites, requires investigation. Are there native title or Heritage Act implications that need to be addressed? This proposal is considered to be "mining" by Aborigines. Are there royalty implications?
European heritage values	What heritage implications for the non-aboriginal community exist?

As part of the Water and Rivers Commission community involvement and social analysis process, a Social Values and Impact Study was undertaken by the Australian Research Centre for Water in Society (ARCWIS 2003).

The aims of the study were to:

- identify the social values associated with the water resources of the Blackwood Groundwater Area and their importance
- assess how those values may be affected by human use of the water, both in situ and if withdrawn, including withdrawal and export from the region
- examine the attitudes people have towards the proposal, and the circumstances in which attitudes may change

The study comprised two separate surveys: a telephone survey of 414 South West residents, which was the primary focus of the study, and a short complementary telephone survey of 316 Perth residents.

The survey provided information on the ranked importance of the various uses of groundwater and attitudes toward export of water from the region, together with the factors that may influence those attitudes. Groundwater to maintain the natural environment was rated the most important, followed by use of groundwater for regional priorities (household use and provision for future use). Respondents identified aspects of the natural environment supported by groundwater, and activities that they personally thought were important. The results demonstrated the importance of both the groundwater itself and the environment generally.

The respondents from the South West voiced considerable opposition to the proposal to export water from the region. This was based on concerns associated with unknown environmental effects in the region, not enough water for future regional needs, and the possibility of wasteful use of water by Perth people. The issues were associated with certainty and efficiency.

The South West respondents indicated that their opposition could be modified by several factors, in particular:

- if local people had involvement in the management and monitoring of the aquifer
- if it could be shown that there was sufficient groundwater to meet future development needs in the region
- knowing that the decision could be reversed if shown to be detrimental to the region.

The Perth survey was a short complementary survey with findings consistent with those of the South West survey, but with a higher level of support to export of the water from the region.

Community Reference Group

The Water Corporation committed to consult with key stakeholders and the broad South West community throughout the evaluation process, and commenced the consultation process by establishing a Community Reference Group composed of key stakeholders groups in the South West (Table 8.4). This group has met ten times since September 2004 and has now been disbanded. The terms of reference for this group were:

1. To provide advice to the Water Corporation on the community engagement process.
2. To be a forum where issues related to the project and/or community engagement process can be brought forward for discussion.
3. To be a vehicle through which people can submit comments in relation to the project and the community engagement process.
4. To identify interests and individuals whose views should be brought into this process.
5. To be a representative Group which can validate community responses and recommendations about the proposal.
6. To support the community engagement process, and be a well-informed source of information on what's happening.

Table 8.4 Members of the Community Reference Group

Name	From	Affiliations
Graeme Baesjou	Collie	Bunbury Wellington Economic Alliance
Kerry Brown	Burekup	Community member
Barbara Dunnet	Nannup	Warren Blackwood Economic Alliance and President Nannup Shire
Nick Dornan	Witchcliffe	Margaret River Shire representative
Robin Flowers	Busselton	WA Farmers Federation (Vasse zone)
Helen Shervington	Busselton	Councillor, Shire of Busselton
Greg Norton	Capel	Whicher Water Resources Management Committee
Barry Oates	Busselton	Whicher Water Resources Management Committee
Keith Scott	Margaret River	Whicher Water Resources Management Committee
Dominique Van Gent	Bunbury	South West Development Commission
Dave Wren	Karridale	Pastoralist's & Grazier's Association
Susan Hill	Bunbury	SW Environment Centre and community member
Darryl Pearce	Victoria Park	South West Aboriginal Land and Sea Council
Fionnuala Hannon	Bunbury	Department of Environment
Chris Elliot	Bunbury	Water Corporation (Bunbury)

Areas in which the group contributed included:

- design of community involvement processes
- review of the principles, factors and objectives proposed in the draft Scoping Report
- development of risk management options
- development of mitigation measures and opportunities for positive outcomes
- development of reporting and monitoring requirements.

Market research

A comprehensive market survey of 300 respondents was undertaken by Market Equity (2005 at Appendix 22) during late November and early December 2004, to test the level of community awareness of the proposal and the completeness of the draft Scoping Report.

This research program provided a reliable and quantitative assessment, by the community, of the adequacy of the range of factors, principles, objectives and proposed investigations. The research helped determine the views of the broader population in addition to the views of people who had responded during the public comment period.

Objectives

The research project was undertaken in the Shires of Nannup, Augusta–Margaret River, Busselton, Capel and the City of Bunbury, with a sample of 300 respondents. This sample was considered sufficient to represent the views of the total South West population. The objectives of the research were to:

- establish the level of awareness in South West communities of the proposal and the investigations being undertaken
- determine if South West communities feel that the appropriate factors will be considered in the investigation

- determine whether any additional factors need to be added
- determine the level of confidence (in the South West Region) that the investigations will address the appropriate factors, issues and information
- understand what effects the South West communities believe the project would have if it proceeds.

Methodology

A two-stage methodology was adopted to satisfy the objectives of the research, and to ensure a representative and reliable sample of the South West population.

1. **Stage 1** involved the recruitment (by telephone) of a random sample of South West residents to take part in the research. Residents were asked some initial questions about the proposal to develop the Yarragadee aquifer, mainly to establish existing levels of awareness of the proposal and the investigation, and issues of interest.
2. A copy of the Scoping Document and instructions on how to make a submission were then mailed to respondents to ensure informed responses were received.
3. Allowing a few days for residents to read the information, they were contacted again by telephone for **Stage 2** of interviewing. The important results are provided below.

Results

Levels of awareness of the project

Respondents were asked: *"Have you heard of the proposal to consider using the South West Yarragadee aquifer as a new water source for Western Australia?"*

The majority of South West residents (70%) were aware of the proposal to use the Yarragadee aquifer as a new water source. Of particular interest were the high levels of awareness in Nannup (99%) and Augusta–Margaret River (89%), and the relatively low level of awareness in Bunbury (50%).

Levels of awareness of the proposed investigation

Respondents were asked: *"Have you seen, read or heard any information about an investigation that is being conducted by the Water Corporation to examine the effects of using the South West Yarragadee aquifer?"*

This question was asked to determine level of awareness of the Water Corporation involvement in the investigations. The majority (60%) had heard of the investigation being conducted by the Water Corporation, with the highest awareness from respondents from the Shire of Nannup (81%).

Are the right issues covered?

Respondents were asked: *"Do you feel the list of eight topics and factors in the brochure cover all the issues that need to be considered in the sustainability evaluation of the South West Yarragadee proposal?"*

This question was fundamental to the issues identified in the Scoping Report and would determine if the proposed investigations focused on the issues the community believed to be important. Most residents (78%) thought that the right issues were covered in the Scoping Report.

The health of the environment was the key issue that respondents felt needed to be considered in the investigation: in particular, sustainability of the water source, and biological and ecological factors.

Respondents who felt that key issues were not being considered identified issues that were in fact already covered in the Scoping Report, and were being covered by the investigations. The most common of these were:

- the sustainability of the water source
- whether alternative water sources have been, or will be, considered
- the long-term impact of the proposal
- whether 45 GL/yr is a fixed amount, or whether the abstraction would change with population growth and increased demand.

Level of confidence that the investigation will focus on the right material

Respondents were asked: *"How confident do you feel that the investigation addresses the appropriate issues, information and factors to be considered?"*

Three in five people (60%) were confident, to some extent, that the investigation would address the appropriate issues, information and factors, including 15% who were fully confident. Confidence was highest among respondents from the City of Bunbury (81%) and lowest amongst those over the age of 55 (47%) and those residents living in the Shire of Nannup (35%).

Reasons for being confident included the comprehensive nature of the Scoping Report and faith in the expertise of the Water Corporation and its consultants on this project. Those not confident in the investigation believed that the Water Corporation would go ahead with the proposal, regardless of the outcomes of the investigation.

Conclusions

With four out of every five residents believing that the proposed investigations covered all the necessary issues, major changes to the Scoping Report were not considered to be required. High levels of support existed for the topics and factors to be investigated (78%), and there was a 60% confidence level that the investigation addressed the appropriate issues, information and factors. The research highlighted the issues of most concern to respondents and provided further information on these high priority issues. These were considered in the preparation of this Sustainability Evaluation/ERMP.

2.1.3 Stakeholder review of draft Scoping Report

Before submission to EPA

A draft of the Scoping Report was released, before submission to EPA, for public review and comment during October and November 2004, with submissions closing on 30 November 2004. Thirty-five submissions were received from:

- twenty-one members of the general community
- seven Community Reference Group members (including notes generated at the November meeting)
- seven organisations (some of whom are represented on the Community Reference Group).

These 35 submissions generated 206 individual comments, all of which have been recorded and responded to individually. Some of the key issues raised in the public submissions are summarised below, and a detailed response to all stakeholder comments is provided in the Scoping Report. A number of changes were made to the draft Scoping Report based on the submissions received (Table 8.5). The most significant of these was the addition of a principle specifically addressing *Regional needs*, as this was shown to be a particular area of concern within the South West.

Table 8.5 Changes to Scoping Report

Issue	Response
Regional needs	A new principle was included specific to this issue
Accountability	The community wants involvement in reporting, and monitoring, and this has been incorporated into the management plans for the project.
Local government revenue	Reference to revenue to local government has been removed
Other configuration options	Surface water supplementation was raised as an option
Numerous issues related to material to be included in Sustainability Evaluation/ERMP	Recharge estimates Drawdown impacts
Process to develop the most sustainable proposal diagram	Diagram was amended to clarify the decision-making process for the proposal
Order of mentioning IWSS and South West with implied priority for IWSS	The Integrated Water Supply Scheme is the driver for the project. South West needs will be taken into account but are not the primary recipient for the development as proposed.

The public comment period was part of the consultation program which included community "walk-in" information sessions in seven South West towns, Community Reference Group input and written submissions.

The public comment and market research showed that the issues covered in the Scoping Report were comprehensive, and the planned investigations would address the issues, information and factors. The submissions and research also highlighted some residual concerns about the proposal. The Water Corporation included these issues in subsequent phases of the stakeholder consultation program.

Sustainability Panel comments and proponent response

The Sustainability Panel provided advice on a draft of the Scoping Report, which has since been incorporated into the final document.

The Panel generally agreed that the draft Scoping Report proposed a thorough approach to the issues that needed to be covered. Some of the key points made by the Panel were:

1. Environmental issues were well represented.
2. There needed to be more emphasis on the social value of the environment.
3. The strategic factors needed to be expanded, and the context of the proposal needed to be explained more thoroughly.
4. New economic factors were suggested to broaden the economic impact assessment, including: consumer welfare, economic efficiency, economic diversity and resource productivity.
5. Climate change was a key strategic factor that should be added to the Scoping Report factors.
6. Some questions were raised about the methodologies that would be used in the Sustainability Evaluation/ERMP.

The following changes were made to the draft Scoping Report in response to the Panel advice:

1. Further explanation was included regarding the strategic context which has led to the proposal being put forward by the Water Corporation.
2. Three additional principles (*Government policy*, *International and national competitiveness of water users* and *Improved knowledge and skills*) and seven associated factors addressing the strategic implications of the proposal were included.
3. The economic factors in the *Long term economic health* principle were refined to broaden the economic impact assessment.
4. The assessment methodology will be developed further as part of the next phase of the Sustainability Evaluation/ERMP.
5. A strategic principle now specifically includes a *Climate change* factor.
6. The social issues that were not clearly addressed are now included in the *Lifestyle, amenity and recreational use and access* and *Sense of place* factors.

After submission to EPA

The amended draft Scoping Report was submitted to EPA who subsequently released it for public review for a period of four weeks from 27 June 2005 to 25 July 2005. Eight submissions were received raising 33 issues. The most significant change required more detailed consideration of the potential impacts of acid sulphate soils than was originally proposed (Table 8.6).

Table 8.6 Submissions and responses[18]

Issue	Submitted by	Response
1. Potential effects on Margaret River and Hardy Inlet should be considered	Cape to Cape Catchments Group Margaret River Regional Environment Centre Dept of Conservation and Land Management Leeuwin Environment	Section 5.2.2 modified to discuss all areas being considered. This includes potential effects on Margaret River and Hardy Inlet.
2. Should provide assurances of no impact on values of Vasse–Wonnerup System	Dept of Conservation and Land Management	Section 5.2.2 modified to discuss all areas being considered. This includes potential effects on Vasse–Wonnerup System.
3. Impacts on Scott Coastal Plain wetlands should be considered carefully	Alan Hill	The area has been identified in the Scoping Report as a critical area for consideration.
4. Impacts of reduced groundwater discharge to surface waters must be addressed	Shire of Augusta–Margaret River	This is outlined in Sections 5.2.2 and 5.3.2.
5. Susceptibility to acid sulphate soils should be adequately considered	Shire of Augusta–Margaret River Dept of Conservation and Land Management Leeuwin Environment Alan Hill	Paragraph added to Section 2.4 to clarify proposed approach to ensure adequate consideration of acid sulphate soils.

[18] Section numbers referred to in Table 8.6 apply to section numbering of the Scoping Report.

Issue	Submitted by	Response
6. Potential for impacts on stygofauna should be addressed	Dept of Conservation and Land Management	Section 5.2.2 modified to discuss all areas being considered. This includes potential effects on stygofauna.
7. Impacts on Aboriginal cultural values must be adequately considered	Alan Hill	Indigenous communities and impacts on areas off Aboriginal significance are a factor included under the *Community well being and heritage* principle.
8. If habitats may be altered, impacts on fauna must be studied	Dept of Conservation and Land Management	Section 5.2.2 modified to include consideration of impacts on fauna from any affected habitats.
9. Environmental impacts due to combination of potential impacts must be thoroughly assessed	Leeuwin Environment	Environmental impacts related to all Water Corporation activities will be addressed, together with impacts of abstraction by other local users. Impacts of other non-Water Corporation activities will not be addressed.
10. Climate change to be taken into account	Margaret River Regional Environment Centre Leeuwin Environment	Acknowledged in Sections 5.2.5 and 5.3.2.
11. Potential pipehead dams need to be fully assessed if proposed	Dept of Conservation and Land Management	Potential pipehead dams, may be required as contingencies, and would be assessed in their own right. If required as contingencies, proposal will commit to their investigation, and their implementation would be subject to obtaining of the appropriate approvals.
12. Response to future environmental or social harm needs to be formulated	Leeuwin Environment	The proposal will consider the expected social, environmental and economic impacts of all groundwater abstraction in the region over the next 30 years.
13. Incorporation of environmental offsets is not supported	Shire of Augusta–Margaret River Leeuwin Environment	Offsets are expected to be proposed as they are the only means of obtaining a net positive outcome. Acceptance will be a matter for the regulatory decision makers.
14. Concerns over exporting water and consequent environmental impacts should be addressed	Shire of Augusta–Margaret River	This is a major aspect of the project acknowledged throughout the Scoping Report.
15. Issues warrant a public inquiry	Shire of Augusta–Margaret River Margaret River Regional Environment Centre Leeuwin Environment	This issue has been the basis of an appeal and has been determined by the Minister.
16. Power for pumping water should be from renewable sources	Leeuwin Environment	Greenhouse gas is a factor acknowledged under *Sustainability* principle 2 (Table 4).
17. Approach should be to extract lesser volume and incrementally increase if impacts acceptable	Cape to Cape Catchments Group Shire of Augusta–Margaret River Leeuwin Environment	This will be a matter for the regulating agencies to consider in determining approvals, and not a matter for the Scoping Report.
18. Peer review of investigations and resulting decisions	Cape to Cape Catchments Group Margaret River Regional Environment Centre Leeuwin Environment	Independent peer review of the conceptual hydrogeology, model development, modelling results and social values studies is being undertaken. This was committed to within the response to submissions incorporated within the Scoping Report. The Sustainability Evaluation/ERMP will also be reviewed by the DoW, EPA Services Unit, CALM and the Sustainability Panel, each of which has a range of specialist capabilities.
19. Precautionary approach should be taken	Cape to Cape Catchments Group	The *Precautionary* principle is acknowledged as *Sustainability* principle 11 in the scoping document (Table 4).
20. Confidence level for groundwater modelling should be high	Dept of Conservation and Land Management	Relates to item 18.

Issue	Submitted by	Response
21. Conservation Commission endorsement required for access within vested lands. CALM needs information to assess and respond to the proposal.	Dept of Conservation and Land Management	Access to vested land will be negotiated with the Conservation Commission and all information on potential impacts will be made available to CALM via the Sustainability Evaluation/ERMP and supporting documents. This information will all be made public.
22. CALM should be involved in discussion on quantification of impacts and development of methods to assess and monitor potential impacts	Dept of Conservation and Land Management	CALM has been identified as a key stakeholder and briefings/discussions will be held to achieve involvement.
23. Specialist consultants should brief CALM officers on biodiversity studies	Dept of Conservation and Land Management	Briefings on biodiversity studies by specialist consultants have been arranged.
24. Water Corporation should purchase remaining unprotected Scott Coastal Plain wetlands to be added to conservation estate.	Alan Hill	This is a proposed specific mitigation action and not a matter for the Scoping Report.
25. Distribution of licensed allocation between aquifers should be presented	Dept of Conservation and Land Management	This is a key aspect of the modelling and will be presented in the Sustainability Evaluation/ERMP.
26. Assessment of all infrastructure impacts should be included	Dept of Conservation and Land Management	The Sustainability Evaluation/ERMP will address all infrastructure impacts. The full extent of the infrastructure has been outlined within the overview of the proposal (Section 1.7)
27. Time delay between proposed abstractions and possible impacts must be evaluated	Leeuwin Environment	The groundwater modelling will take time delays into account, and this information will be used in assessing environmental impacts.
28. Potential environmental and social costs should be incorporated into price of water from the scheme	Leeuwin Environment	The full costs of management of environmental and social impacts will be borne by the Water Corporation. Water pricing is a matter for Government. The indicative costs of management will be included in the Sustainability Evaluation/ERMP.
29. Provide details of the recharge catchment and expected average rainfall	Dept of Conservation and Land Management	This detail will be provided in the Sustainability Evaluation/ERMP, in describing the groundwater systems and in assessing the impacts of potential future climate scenarios.
30. ERMP should include maps and cross sections of the study area showing the proposed wellfield and monitoring wells	Leeuwin Environment	This detail will be provided in the Sustainability Evaluation/ERMP.
31. Statements suggesting improvements to ecological values should be removed unless explained how possible to achieve	Shire of Augusta–Margaret River	The improvements to ecological values are included as objectives for the project. The extent to which they can be achieved and the acceptability of that will be considerations to be made when assessing the Sustainability Evaluation/ERMP.
32. Careful consideration should be given to regional water needs	Chamber of Minerals and Energy	Regional water needs are acknowledged in Sustainability principle 5 in the scoping document (Table 4).
33. Wellfield areas should avoid sterilizing mineral and basic raw material deposits	Chamber of Minerals and Energy	The Water Corporation will seek to avoid conflict between all of the project infrastructure and mineral and raw material deposits. Locations under consideration do not create any known conflicts.

2.1.4 Consultation during the sustainability evaluation and ERMP

During the Sustainability Evaluation/ERMP process, the Water Corporation continued to actively communicate about the project through a range of mechanisms including the Water Corporation website, media releases, plus one-on-one interactive briefings, group meetings, newspaper articles, newsletters and regular mail outs. The Water Corporation has published a website[19] (for the proposed development) which provides project information and proposal documents, technical reports, summaries and media statements as they become available.

The social impact assessment process (Synnott Mulholland Management Services 2005) involved extensive research at the community level. This provided an important mechanism for community views and issues to be represented in the evaluation process.

Social impact assessment

Phase one of the social impact assessment by Synnott Mulholland Management Services had three key components:

- definition of the existing environment in each community
- generic identification of the effects typically associated with this type of project
- on-the-ground community scoping and profiling to understand the relevant issues.

These were employed to identify the social impact issues for further analysis in Phase two.

Multiple data sources(both primary and secondary) have been accessed in Phase one, including:

- telephone and community surveys undertaken by the Water and Rivers Commission and Water Corporation
- more than 85 interviews with interest groups, business and community groups, local residents and other stakeholders in the South West
- presentation of findings at Community Reference Group meetings, and discussion to gather additional feedback
- reports from earlier studies related to this proposal
- literature reviews
- Australian Bureau of Statistics information (ABS 2002) on demographic and economic characteristics of the region
- planning reports generated by the communities themselves
- community submissions made during the public comment period for the Scoping Report (Strategen 2005a at Appendix 1).

Additional information sources included community submissions made during the public comment period related to the Scoping Report (Strategen 2005a at Appendix 1).

[19] http://www.watercorporation.com.au/water/water_sources_sw_yarragadee.cfm

A discussion-based methodology was used to gain information from approximately 85 interviewees in the South West about:

- their community – aspirations, current issues, current priorities, issues in relation to water in general and the Yarragadee proposal specifically
- community views about the proposal and what is driving those views
- risks and benefits of the proposal
- acceptability of the risk, and what might change their view of acceptability
- notion of reasonable regional needs
- how to safeguard community interests
- community views about how changes could be managed to optimise desired outcomes.

Additional information on community issues was sourced from community surveys undertaken by the Water and Rivers Commission and the Water Corporation, supplemented by statistical information from census data and planning studies.

Phase two of the social impact assessment involved additional studies to fully understand the social impacts identified in Phase one, in particular those related to sense of place and social values, futures foregone, and benefit and equity in relation to water access.

As Phase two proceeded, work was also progressing in the environmental and economic impact assessment studies, and aquifer modelling. Those results were critical inputs, helping to clarify:

- areas of likely drawdown
- extent of drawdown under a worst case scenario
- extent of likely environmental impact under a worst case scenario
- areas which appear unlikely to be affected.

In addition, the project team was developing a conceptual approach to addressing reasonable regional needs and extension of the IWSS infrastructure further into the South West. These were relevant to the assessment of issues of futures foregone, and benefit and equity in relation to water access.

Phase two involved more stakeholder contact to obtain specific information on social impacts, as well as a review of academic and research literature covering past studies of the tourism industry in the South West, studies from the Regional Forest Agreement process, heritage and cultural studies, regional planning studies, maps, government policies and management plans, and data from the Australian Heritage Database and the Heritage Council of Western Australia.

This phase also involved a more detailed study of Nannup, drawing on Australian Bureau of Statistics census data for the years 1991, 1996 and 2001, supplemented by interviews with several community development leaders in Nannup. Secondary data sources included regional planning documents (e.g. Warren–Blackwood Regional Planning Strategy; Warren–Blackwood Rural Strategy), social impact studies conducted for the Regional Forest Agreement, and literature on resource-dependent communities.

The views of Perth residents were also obtained through focus-group discussions. These group discussions were deliberately late in the process to take advantage of initial results from the Sustainability Evaluation/ERMP.

Phase three of the social impact assessment focused on developing mitigation and management options for impacts related to the proposal, and presenting them to the Community Reference Group for discussion and comment. Preliminary ideas about monitoring and mitigation, and community expectations in relation to these, came from the community interviews in Phase one. These ideas were then considered alongside the social impacts identified in Phase two, and drawing on experiences from other communities who have faced change.

Overview of social impact assessment results

Phase one

Phase one of the study concluded that there were three social variables of interest:

1. *Sense of place* – related to extent of environmental impacts, whether those impacts will affect environmental amenity and hence sense of place, and if so, whether they can be managed.
2. *Futures foregone* – related to water availability, how much is available, whether it can be sustainably taken, whether the communities who need it for growth have enough, and how much is enough.
3. *Benefit and equity in terms of accessing water* – this is about local communities benefiting from the resource, the fairness of the allocation decisions, about reasonable access to water in the region, who gets the water, and whether those currently using water will experience a change.

Phase two

Phase two of the assessment concluded that the social impacts of the proposal, within the variables of interest, are both positive and negative.

Sense of place

Environmental and ecological impacts on the Blackwood River, and in other specific locations, are expected to be minor and manageable, and are not expected to change sense of place, or impact on social values, enjoyment or amenity of the river. However, the community requires extensive monitoring following the principles of care, vigilance and transparency to confirm this.

The implications for cultural water values were explored with the Indigenous community and addressed separately in Volume 2 Chapter 4 Section 4.

Sense of place is addressed in detail in Volume 2 Chapter 4 Section 3.

Futures foregone

At the regional scale, the positive impacts relate to the increased access to water in the South West afforded by an extended IWSS (e.g. the Kemerton Industrial Estate, and the Busselton and Margaret River communities in the longer term), the protection to local water use in the South West afforded by the principles of *Reasonable regional needs*, (Strategen 2005b at Appendix 9), and the ability to maintain current water restrictions for IWSS users in the face of potentially more severe restrictions.

Communities in the towns in the region are unlikely to be affected by this proposal. Environmental and ecological impacts on the Blackwood River, and in other specific locations, are expected to be minor and manageable, and are not expected to impact on future aspirations. Again, extensive monitoring is a key community requirement.

Negative social impacts may arise in the longer term through competition for water on the Scott Coastal Plain. However, social impact would only occur if water use by the South West Yarragadee proposal had an impact on the longer term future development of this area. Such competition is not expected within the shorter term and it is likely to be several decades before groundwater use in the area expands to a level where this would become a significant issue.

Futures foregone are addressed in detail in Volume 2 Chapter 3 Section 3.2.1.

Benefit and equity

Community members with a regional perspective saw that the region as a whole could benefit from greater availability of water, but those with a local perspective believed the proposal was inequitable and water would be taken away at the expense of the region. As with "futures foregone", the protection of future local uses afforded by the principles of *Reasonable regional needs* (Strategen 2005b at Appendix 9) will contribute substantially to mitigating these concerns.

Two key factors which influence perceptions of benefit and equity are the stated lack of trust in the Water Corporation (Synnott Mulholland Management Services 2005) and the need for procedural fairness in terms of decision-making (Syme et al. 1999). These perceptions are strongly held across the community and highlight the need for transparency, independent involvement, and local representation in monitoring and operating the scheme.

These issues of benefit and equity are addressed in detail under the *Regional development* factor (Chapter 7 Section 1.2) and *Equitable access to water* factor (Chapter 7 Section 1.3).

Phase three

Phase three of the assessment considered how the social impacts could be managed. While many of the concerns raised by community members in Phase one have been addressed through the provision of accurate information during evaluation of the proposal, residual issues requiring specific actions have been addressed through the proponent commitments made within this evaluation. The key response is the proposal to form the community-based South West Yarragadee Monitoring Review Group (Chapter 8 Section 3.2.3).

2.1.5 Engagement before finalisation of the Sustainability Evaluation/ERMP report

Following completion of the draft Sustainability Evaluation/ERMP, and before submission of the final document to the EPA, Water and Rivers Commission and the Sustainability Panel, the Water Corporation conducted a series of "walk-in" sessions in South West communities to communicate and receive feedback on the following:

- the extent of environmental studies and the results obtained
- Water Corporation modelling and implications for the South West
- the economic impact study and findings
- the social impact study and findings
- proposed adaptive management plan including monitoring and mitigation
- Water Corporation commitments to the South West.

The walk-ins occurred during a two-week period in mid-September, and were advertised extensively in the South West media, and by direct advice to all people whose names are on the project database. Interest was high; more than 200 people attended the sessions.

The walk-in sessions were complemented by a number of stakeholder briefings beginning with a key briefing for the South West Local Governments Association in early September.

Comments received from community members and stakeholders during this consultation phase contributed to final editing of the Sustainability Evaluation/ERMP document.

2.1.6 Engagement proposed during the public review of the Sustainability Evaluation/ERMP

As described above, an extensive consultation and information dissemination program has been undertaken over the past three years, prior to submission of the draft Sustainability Evaluation/ERMP to the relevant agencies and bodies. The issues and concerns raised during that period have been addressed within the draft document, including substantial modification of the proposal in response to many of the matters raised.

During the 12-week public review period, all the relevant documentation and reports will be made publicly available through the Water Corporation website, and its availability advertised in both the metropolitan area and through the South West. The Water Corporation will advertise and present a display on the proposal at community venues in Bunbury, Busselton, Capel, Margaret River, Augusta and Nannup for a time during the public review period.

Contact details will be advertised for members of the community to discuss any matters of interest or concern with the proponent, or relevant supporting specialists as necessary.

2.1.7 Engagement following approval

The stakeholder engagement process following Government approval for the development is addressed in detail under the *Accountability* principle (Chapter 8 Section 3).

2.1.8 Proponent sustainability commitment

The Water Corporation is committed to ongoing engagement with key stakeholders during implementation of the proposal. Refer to commitments under the *Accountability* principle (Chapter 8 Section 3.2.7).

2.1.9 Outcome

The stakeholder engagement process has resulted in changes to the design and intent of the South West Yarragadee Water Supply Development. This process has also:

- identified issues of concern
- influenced the mitigation measures and enhancements of the proposal
- influenced the extent and content of formal sustainability commitments
- enhanced community awareness of the proposal and its potential consequences
- provided a social baseline for the implementation of the development.

The proposed stakeholder engagement following Government approval of the development will ensure that the community is empowered to contribute to the decision-making processes of the Water Corporation, and to provide effective input to water licensing by the Water and River Commission.

3 PROCESS PRINCIPLE – ACCOUNTABILITY

Sustainability principle and associated factors

Accountability is one of the sustainability process principles applicable to this evaluation and reads as follows:

The Water Corporation will report publicly on its sustainability performance and provide public access to information on the proposal.

The key sustainability factors and associated objectives related to this principle are:

Define performance targets

The Water Corporation will define economic, social and environmental performance targets that reflect achievement of the objectives set out herein.

Reporting performance on achievement of targets

The Water Corporation will commit to a reporting schedule and report on its performance against agreed sustainability objectives.

The above factors are addressed collectively below.

3.1.1 Background

The Water Corporation has implemented a comprehensive stakeholder engagement program and social impact assessment during the preparation of this Sustainability Evaluation/ERMP. This engagement has led to changes to the proposal and the development of the accountability framework outlined below.

3.2 PROPOSED ACCOUNTABILITY FRAMEWORK

The stakeholder engagement, *Precautionary* principle and adaptive management processes need to be entirely transparent and inclusive with effective participation by key stakeholders.

3.2.1 Adaptive management

Key stakeholders, including the community will be involved in the setting of management objectives, performance measures and targets for the development. The Water Corporation will be held accountable for achievement of these objectives and performance measures through an open and transparent process. Public reporting of results will provide an informed and independent review of the monitoring results and performance.

A South West Yarragadee Monitoring Review Group (Chapter 8 Section 3.2.3) will be formed to assist implementation of the adaptive management framework.

3.2.2 Key monitoring programs

The key monitoring programs associated with the proposal that will provide the basis for triggering the adaptive management process and responses, where required, are:

- groundwater abstractions by the proposed development
- groundwater levels at key indicator sites
- growth in regional groundwater use
- Blackwood River summer flows and water quality
- springflow in potentially affected tributaries and pools (St John Brook and Milyeannup Brook) and control locations
- ecosystem health at key sites, including control sites
- groundwater quality on coastal plains
- seawater interface movement.

3.2.3 South West Yarragadee Monitoring Review Group

A stakeholder-based South West Yarragadee Monitoring Review Group will be formed and will have a pivotal role in the adaptive management process. The proposed terms of reference for this group provide for the group to independently review the project and provide public advice and recommendations to the Water Corporation and other relevant Government agencies on:

1. Management objectives and social, economic and environmental performance indicators as proposed by the Water Corporation.
2. Monitoring programs and results including the South West Yarragadee Sustainability Initiative.
3. Proposed contingency measures in the event of unforeseen adverse impacts.
4. The performance of the Water Corporation in meeting objectives and performance standards as presented in the proposed Water Corporation draft annual Sustainability Report (Chapter 8 Section 3.2.4).

The group will be provided with administrative support, and financial resources to access independent technical support and expertise where necessary.

The membership of this group is to be determined in consultation with the stakeholders, but is proposed to be based on the following elements:

- maximum membership of 12
- independent chair from within region
- membership will be for three years on a rotation basis, with members able to apply for re-appointment
- membership based on interests and expertise rather than being representative of a constituency
- membership to have a majority of community members (agency membership limited to non-regulatory agencies).

Because the Monitoring Review Group will prepare reports to be considered by the regulatory agencies, it would be inappropriate for those agencies to be represented on the group (because of a potential conflict of interest). The need for and role of the committee will be reviewed after three years and modified if necessary. It is anticipated that the group will meet approximately two or three times per year.

The Water Corporation response to the Monitoring Review Group will form part of its annual Sustainability Report to Government.

The proponent also commits to establish a South West Yarragadee Interpretive Centre in the South West to provide information to the community and visitors about development of the aquifer. This centre could be utilised by the Monitoring Review Group as one of several avenues to make its advice public.

3.2.4 South West Yarragadee Sustainability Report

The Water Corporation will prepare and publish a Sustainability Report outlining the following:

- compliance with statutory conditions of environmental approval and the water abstraction licence
- assessment of performance against key performance indicators
- implementation of commitments
- summary of environmental and socio-economic monitoring information
- progressive results from the proposed biodiversity study
- stakeholder engagement.

This report will be submitted to the Stakeholder Monitoring Review Group for review before presentation to relevant Government agencies and the Water Corporation will respond to any resultant advice from the group. The report will be prepared annually during construction and for the first five years of operation of the project. The reporting frequency will then be reviewed in consultation with the DoE, DoW and the Monitoring Review Group.

3.2.5 South West Yarragadee biodiversity study

The Water Corporation has committed to the development and implementation of a comprehensive biodiversity study as part of the proposed Sustainability Initiative (Chapter 7 Section 4.1.1). This study will be steered by a technical committee of:

- two independent scientific experts
- two representatives of the Water Corporation
- one representative from CALM
- one representative from DoE
- one representative from DoW.

Annual progress reports on the study will be prepared by the Water Corporation and will be made publicly available.

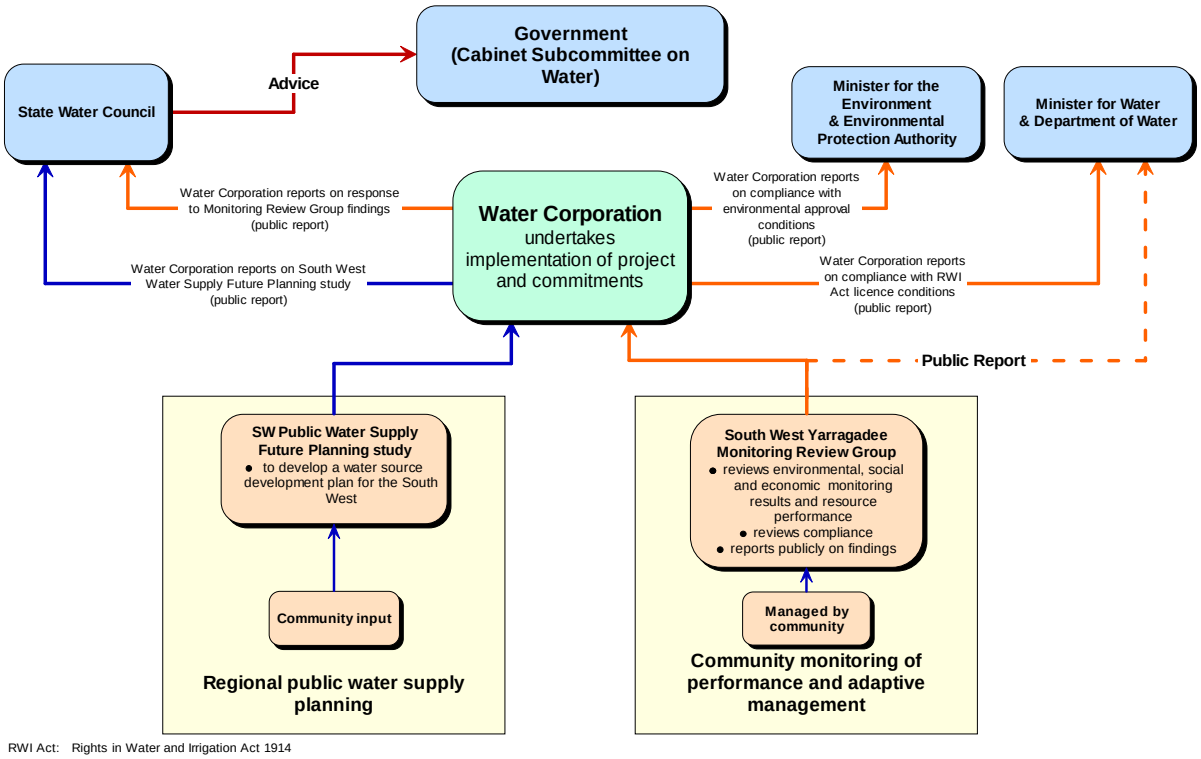
3.2.6 South West Public Water Supply Future Planning Study

A South West Public Water Supply Future Planning study is proposed as the means of establishing a plan and development program to meet future public water supply needs in the South West. This plan (similar to that prepared previously for the IWSS) would:

- consider all the public water supply demands in the broad region
- involve all interested and potentially affected stakeholders in a highly consultative process.
- address the following:
  - future public water supply demand
  - potential sources for public water supply
  - source development program for public supply
  - assessment of quality and security of existing public water supplies
  - program for upgrading existing quality and security of public water supplies where required
  - program for new connections to the extended IWSS or other sources.

This study will be conducted jointly with the Busselton and Bunbury Water boards and will involve extensive stakeholder engagement. The study will achieve the desired outcomes of clear expectations for water supply, assessment of alternative options, costing and feasibility and an implementation timeframe. The plan would provide certainty to the South West, and would help to resolve the concerns of futures foregone, benefit and equity, and accommodating reasonable regional needs.

Figure 8.1 Proposed roles and responsibilities for the implementation of Water Corporation commitments



RWI Act: Rights in Water and Irrigation Act 1914

Figure 8.1 shows the summarised roles and responsibilities for implementation of Water Corporation commitments made in this Sustainability Evaluation/ERMP, including the processes for reporting to the community and Government.

3.2.7 Proponent sustainability commitments

The Water Corporation commits to establishing an accountability framework which includes:

1. The Water Corporation will establish and support a South West Yarragadee Monitoring Review Group with the following functions:
   - regular review and advice to the Water Corporation on monitoring programs, monitoring objectives and performance measures for the operation of the proposal
   - review and provide public advice to the Water Corporation on monitoring results and provide comment on adaptive management measures
   - review any changes to management of groundwater abstraction from the Yarragadee aquifer by the Water Corporation and provide advice on the acceptability of these changes.
2. The proponent commits to establish a South West Yarragadee Interpretive Centre in the South West to provide information to the community and visitors about development of the aquifer. This centre could be utilised by the Monitoring Review Group as one of several avenues to make its advice public.
3. Prepare and publish in a Water Corporation Sustainability Report on the following relating to the South West Yarragadee Water Supply Development:
   - compliance with environmental conditions and commitments
   - assessment of environmental performance and environmental management response
   - summary of environmental monitoring information
   - summary of progressive results from the proposed biodiversity and acid sulphate soils studies
   - stakeholder engagement
   - Water Corporation response to the advice and recommendations on environmental issues from the Monitoring Review Group.
4. Undertake a South West Public Water Supply Future Planning Study to provide a plan for meeting the future public water supply needs in the South West. This plan would be undertaken in conjunction with Aqwest and Busselton Water Board and involve extensive consultation and market surveys of community satisfaction with the water planning and management. The plan would investigate and address the following:
   - future public water supply demand
   - potential sources for public water supply
   - source development program for public supply
   - assessment of quality and security of existing public water supplies
   - program for upgrading existing quality and security of public water supplies where required
   - program for new connections to the extended IWSS or other sources.

3.2.8 Outcome

The proposed accountability framework and Water Corporation commitments for an open, transparent, and accountable process during the implementation of the proposal will continue to promote and enhance stakeholder engagement. This engagement will enhance the empowerment of stakeholders in the implementation and management of the proposal.

Chapter 9 References and abbreviations

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2 ABBREVIATIONS

Table 9.1 Abbreviations

Abbreviation	Full Title
ARCWIS	Australian Research Centre for Water in Society
CALM	Department of Conservation and Land Management
COAG	Council of Australian Governments
CO_2e	Carbon dioxide equivalent
CSIRO	Commonwealth Scientific Industry and Research Organisation
CSO	Community Service Obligation
DIA	Department of Indigenous Affairs
DoE	Department of Environment
DoW	Department of Water
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMS	Environmental Management System
EP Act	*Environmental Protection Act 1986*
EPA	Environmental Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ERMP	Environmental Review and Management Programme
GDE	Groundwater Dependent Ecosystems
GL	Gigalitre
IOCI	Indian Ocean Climate Initiative
IWSS	Integrated Water Supply system
mAHD	metres above Australian Height Datum
RWI Act	*Rights in Water and Irrigation Act 1914*
SEA	Strategic environmental assessment
Sustainability Strategy	State Sustainability Strategy
SWALSC	South West Aboriginal Land & Sea Council
TEC	Threatened ecological community
UK	United Kingdom
WA	Western Australia