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PART I  RECOMMENDATIONS
I. CHAIRMAN’S STATEMENT

Since the 1970s, the world’s climate has been undergoing significant change. The Indian Ocean Climate Initiative has established that Western Australia’s southern rainfall has declined progressively. Furthermore, it is likely that this trend will continue.

The State Water Strategy encapsulates a fully integrated response to declining water availability and outlines a series of initiatives designed to ensure that we continue to have adequate water supplies well into the future. A key recommendation of the State Water Strategy was that a review of irrigated agriculture be undertaken. This report provides the findings and recommendations of the review.

Irrigated agriculture accounts for approximately 40 per cent of the State’s water consumption and contributes approximately $900 million per annum to the State economy. This review sought to establish how government, in partnership with other stakeholders, should collaborate to conserve water without having an adverse impact on the industry’s significant contribution to the State economy.

As part of its review, the Steering Committee spoke to numerous irrigators, investors, bankers, consultants, environmentalists, government agencies and the like. Fifty submissions were also received from a broad spectrum of interested parties. The messages were clear: Like domestic consumers, irrigators and other stakeholders are acutely aware of the need to use water efficiently. However, the main constraints to more investment in water savings by irrigators are the low value of water, and lack of security to their water entitlements. Though most irrigators do not intentionally waste water, there is little real incentive to save it.

Repeatedly irrigators called for more flexible licences, for longer licence tenure, for regulations designed to encourage and simplify water trading and for consumption to be metered. Stakeholders also felt the need for better definition of the State’s water resources, for more high-level strategic thinking and for better management by the water resource manager.

In framing its recommendations, the Steering Committee chose a deregulated market-based approach to water management in preference to greater regulation and tighter control. This was done with the objective of capitalising on what appears to be a current environment very receptive to change. Within this context, key elements of the Steering Committee’s findings include the need for a greater focus on strategic planning, a better understanding of the water resource, more clearly defined water entitlements and the establishment of an effective water market.

Finally, the Steering Committee was conscious of the need for a balanced set of recommendations. Obviously, not every recommendation will be seen as appropriate by every individual or stakeholder group; however, when implemented as a package, the recommendations will achieve much needed reform and an equitable result for irrigators, the environment, the government, domestic consumers and other interested groups.

Ross Kelly
Chairman, State Water Strategy Irrigation Review
2. HIGHLIGHTS

Water allocation and management are among the most challenging issues facing West Australians today. Moreover, the situation could become even more challenging given the trends of lower rainfall on the one hand, and increasing demand for water on the other. While domestic water restrictions have occupied the focus of most people’s attention, the reality is that 40 per cent of the State’s water is used by the irrigated agriculture sector, where users are not encouraged to use water efficiently by the current system of water resource management and regulation. (Not all of this water is potable or close enough to Perth to supplement the water supply to Perth.)

Irrigated agriculture contributes $800-900 million per annum to the State’s economy with the main contributors being fruit and vegetables, wine and table grapes, dairy and sugar. Horticulture and viticulture are expanding rapidly in response to export demand. Accordingly, growth in demand for irrigation water will be closely linked to these product groups, and also to the possible future expansion of cotton and sugar production in the Kimberley region.

The main irrigation supply schemes in Western Australia are the South West Irrigation Area (Harvey Water), the Ord Irrigation Area and the Carnarvon Irrigation Area. These schemes in combination use around 64 per cent of the State’s irrigation water. The efficiency of water use and the value of products produced per unit of water vary widely between schemes. In addition, the Harvey Water scheme offers opportunities for improving water efficiency through piping its distribution systems, and also, due to its proximity to Perth, for trading water to the government for use by the Water Corporation for domestic consumption.

KEY DIRECTIONS IDENTIFIED DURING THE IRRIGATION REVIEW AND RECOMMENDED BY THE STEERING COMMITTEE ARE AS FOLLOWS

1. **Create a new Ministry for Water Resources and a Department of Water Resources**
   The Steering Committee is pleased that its first recommendation has been partially implemented by the State Government’s recent decision to appoint a Minister for Water Resources with responsibilities for water resource management, water policy, strategy and planning, and water utilities. The Steering Committee also recognises the fact that the Premier is the new Minister for Water Resources, and sees this as an indication of the importance being placed on the need for water reform.

2. **Devise a Strategic Plan for Water**
   Although there is a State Water Strategy, at present Western Australia has no long-term overall strategic plan for water resource management. The Steering Committee sees the creation of increased capability to carry out strategic water planning as an urgent priority. A State Water Plan would evaluate the likely demands and management options for each sector of water use across the State and provide a holistic and integrated plan.

3. **Change water entitlement system**
   Water entitlements should be issued as a share of the resource available for use, and be granted in perpetuity. Entitlements to access water should be separated from the approval to use water on specific land. All new water allocations should be issued at market rates. Where allocations are reduced, compensation should be payable provided such reductions do not result directly from climate change. The policies of linking allocations to a particular use and ‘use it or lose it’ should be abandoned. The new water entitlement system should be similar to a Torrens Title system that gives title owners and licence holders the ability to register their interests.
4. **Integrate land and water planning**

Areas suitable for future irrigated agriculture need to be identified through more strategic and integrated land and water resource planning. In particular, horticultural precincts are required at Gnangara and Myalup. These will provide long-term certainty, benefit farmers and the State, and provide a basis for investment in water recycling and separate agricultural from residential areas. Current planning policies support the identification and establishment of horticultural precincts; however, existing planning practices do not reflect these policies.

5. **Increase self-management**

Opportunities and mechanisms for extending the self-management of water resources in areas of high density irrigated agriculture should be investigated. The creation of irrigation cooperatives appears to have greatly improved the prospects for efficient water resource management as well as benefiting irrigators in each of the four irrigation areas.

6. **Invest in water use efficiency**

There should be immediate investment in piping the South West Irrigation Area to reduce water distribution losses and make water available to the Integrated Water Supply Scheme. Government should also examine and, where appropriate, invest in opportunities to reduce distribution losses in other irrigated agriculture systems.

7. **Implement metering**

All irrigation water usage above five megalitres per year (or such amounts as determined by the regulator from time to time) should be metered. Information about each individual’s usage, together with usage patterns in the irrigation area should be made available online. The near absence of compulsory metering is a serious shortcoming in the State’s water resource management processes.

8. **Facilitate water trading**

The current water trading policy should be withdrawn. A new package of initiatives should be established to include perpetual licences, separation of water allocations from land use, the separation of the ‘right to take’ from the ‘right to use’, the implementation of water trading systems, and the preparation of water resource management plans.

9. **Introduce water resource management charges**

The Steering Committee supports the introduction of water resource management charges that recover the share of management costs attributable to water users. The public should fund that proportion of water resource costs associated with public benefits including environmental protection. The basis of charging must be transparent and the money raised should be used for agreed purposes. The first step should be to recover costs associated with licensing and compliance.

**CONCLUSION**

Management of water resources has not kept pace with the demands for water. In particular, there is an urgent need for an appropriately regulated framework to promote water-efficient and sustainable irrigation industries, and a market-based approach to water allocation which maximises the value created as a consequence of using water.

The reforms proposed by the Steering Committee need to be implemented as an integrated package. Significant strengthening of the management and regulatory regime across most functional areas is needed for this package to work. This is likely to require considerably more funding and significant improvements to water resource management practices.
3. EXECUTIVE SUMMARY

3.1 INTRODUCTION

Water management is one of the most challenging issues facing Western Australians today. Changing climatic and rainfall patterns, coupled with the rapid growth of the State’s population, have created an urgent need to plan effectively for future water demand and to balance a growing demand for water with the public’s expectations for a quality and resilient environment.

Water use across the State doubled between 1985 and 2000, and currently consumption is running ahead of predictions that it will double again by 2020. Despite this, Western Australia is in a favourable position to learn from the successes and the failures of other jurisdictions that have already had to contend with heavy pressure on their water resources.

Water Use by Use Group in WA in 2000

![Water Use by Use Group in WA in 2000]

Source: Western Australian Water Assessment 2000 (WRC 2000a)

The irrigated agricultural sector accounts for approximately 40 per cent of Western Australia’s total water demand (Figure 1). This proportion is less than that encountered in other states, where typically irrigated agriculture accounts for 70 to 80 per cent of total water use.

The 2003 State Water Strategy set out an integrated set of recommendations designed to address the State’s water issues. One of these recommendations was for a whole-of-government review of irrigation activities. The findings and recommendations of this review are presented in this report.

3.2 IRRIGATION REVIEW TERMS OF REFERENCE

The Terms of Reference for the review, approved in December 2003 by the Premier’s Water Resources Cabinet Sub-Committee, are as follows:

- Establish the amount of irrigation water supplied and used within Western Australia together with the economic and social benefits generated by such usage.
- Considering factors such as water availability, environmental impact, climate change, etc., identify the likely future forms, scale, locations, water needs and economic benefits of irrigated agriculture in Western Australia.
- Identify opportunities for improving the efficiency with which irrigation water is delivered and used together with the associated costs, benefits and beneficiaries thereof.
- Identify constraints (including but not limited to government policies and priorities) to improving the efficiency with which water is delivered and used. Explore the possibility and appropriateness of forming collaborative links between all levels of government, industry, researchers and the community.
- Review the potential for water trading to improve the efficiency with which water is delivered and used; identify policy and other constraints to water trading and if appropriate, recommend actions needed to facilitate water trading.
3.3 IRRIGATION REVIEW STAKEHOLDER CONSULTATION

Eight months of stakeholder consultation was carried out between March and November 2004. During this time, the Irrigation Review team received 50 submissions on behalf of 58 organisations and individuals including government agencies, agribusiness operations and consultancies, irrigation cooperatives, industry bodies and banks. Key irrigation issues, as well as a wide range of relevant water resource management issues, were raised and discussed. A detailed list of issues and submission comments is provided in Appendix 2.

3.4 OVERVIEW OF IRRIGATED AGRICULTURE IN WESTERN AUSTRALIA

The irrigated agriculture sector accounts for 40 per cent of the State's total water consumption. The sector includes horticulture (mainly fruit, vegetables and viticulture), the State's fastest growing primary production sector. Irrigated agriculture also includes the sugar, cotton and dairy industries.

The combined annual value of product produced by Western Australia's irrigated agriculture industries is approximately $800-900 million, or about 13 per cent of the State's Gross Value of Agricultural Production (GVAP) of $6.2 billion.

The four irrigation supply schemes in Western Australia are:

- South West Irrigation Area (Harvey Water);
- Ord Irrigation Area;
- Carnarvon Irrigation Area; and
- Preston Irrigation Area.

Around 64 per cent of water allocated to irrigated agriculture is consumed within the first three schemes. Most of the remainder of the State's irrigation is self-supplied, mainly through the pumping of groundwater and to a lesser extent through the diversion of surface water in the high rainfall areas of the South West region. Groundwater is a significant source of irrigation water in all but the Kimberley region. However, extensive unallocated reserves of groundwater with potential for future use in irrigation exist in the West Kimberley.

It is estimated that currently 520,000 megalitres of water are used by irrigation industries in Western Australia. Around 180,000 megalitres are used for irrigated cropping in the Kimberley and Gascoyne regions, and 340,000 megalitres are used in the south of the State. Fifty-five per cent of the State's irrigation water is directed to horticulture which generates a relatively high value of product per unit of water used. This pattern of use is dramatically different from the eastern states where only five per cent is used on horticulture.

A significant quantity of additional water is released for agriculture in irrigation scheme areas but lost due to leakage and evaporation from open distribution channels and on-farm delivery systems.

Brennan (2004) examined growth trends in irrigated agricultural production across a range of sectors and determined that water demand, particularly in the south west, will be driven by growth in horticultural products. Horticultural production within Western Australia has grown at around five per cent per annum for vegetables and 10 per cent for fruit, driven largely by export demand. Recently this growth rate has slowed due largely to an unfavourable exchange rate and increased international competition. Nevertheless, the good standing of horticultural production in the State (“clean and green”) together with a reputation as a reliable high quality supplier are expected to continue to deliver healthy growth.

Vegetable exports from the southern regions of the State are estimated to increase over 10 years by between 28 per cent and 64 per cent. Fruit exports are estimated to grow over the same period by between 62 per cent and 160 per cent. Water demand for cotton production could increase significantly should large-scale production eventuate in the West Kimberley, where studies have shown water and land resources will support a significant sustainable modern industry.

The manner in which growth in production impacts upon demand for irrigation water is complex. The value placed on water, the ability to trade water and improvements in the efficiency with which water is applied can all have a considerable impact as well. Hence, even if the above growth in production occurs, projected demand for irrigation water lies within a broad range. Ultimately, the future demand for irrigation water will depend upon the extent to which the recommendations of this report are implemented, the impact that they will have upon water trading and the consequent value assumed by water.
3.5 FINDINGS AND RECOMMENDATIONS

The findings and the recommendations by the Steering Committee are summarized under three broad categories, water use issues, policy and management issues, and governance issues.

3.5.1 WATER USE ISSUES

3.5.1.1 PLANNING AND DEVELOPMENT

A. The State-Wide Picture

Currently 50,000 hectares of land are under irrigation in Western Australia. The State also has an extensive amount of additional land which is suitable for irrigated agriculture. The main constraints to growth in irrigation in Western Australia are the availability of suitable water in quantity, and the access to suitable export markets for horticultural and other products (Table 1).

Table 1. Summary of Land Capability Estimates for Irrigated Agriculture by Region Assessed in Irrigation Review

<table>
<thead>
<tr>
<th>Region</th>
<th>Capable Land Area (Ha)</th>
<th>Current Area Irrigated (Ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metropolitan</td>
<td>155,200</td>
<td>5,620</td>
</tr>
<tr>
<td>Peel-Harvey</td>
<td>141,100</td>
<td>10,426</td>
</tr>
<tr>
<td>Whicher</td>
<td>153,900</td>
<td>5,331</td>
</tr>
<tr>
<td>Preston-Warren-Blackwood</td>
<td>504,100</td>
<td>5,966</td>
</tr>
<tr>
<td>Great Southern</td>
<td>2,309,100</td>
<td>3,212</td>
</tr>
<tr>
<td>Gingin</td>
<td>615,900</td>
<td>3,206</td>
</tr>
<tr>
<td>Mid-West</td>
<td>1,299,600</td>
<td>721</td>
</tr>
<tr>
<td>Gascoyne</td>
<td>17,600</td>
<td>950</td>
</tr>
<tr>
<td>West Kimberley</td>
<td>5,174,300</td>
<td>942</td>
</tr>
<tr>
<td>East Kimberley</td>
<td>59,000</td>
<td>9,878</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>10,429,800</strong></td>
<td><strong>46,252</strong></td>
</tr>
</tbody>
</table>

Source: Department of Agriculture WA 2004; ABS 2003

Of all the zones assessed in this review, the West Kimberley, with more than five million hectares, has the largest area of soils potentially capable of supporting irrigation (Wright 2004). Both the West Kimberley area and the Ord Stage 2 development have sufficient land and water available to equal or exceed the area currently irrigated throughout the State. This emphasizes the potential for future expansion of irrigated agriculture in the north of the State. It also highlights the need for further research into the economic, ecological and social opportunities and impacts of irrigated agriculture in these areas.

The Kimberley Case Study Summary, presented in Section 3.6.3, shows the potential for expanding irrigation in the north of the State, and establishes the need for a proper assessment of sustainability.

The economic value of water (within irrigation production systems) is high for most horticultural production, with the value of water for vegetables being in the range $2,500 to $13,500 per megalitre for typical crops and averaging $7,600 per megalitre in southern regions of the State (Brennan 2004). For fruit production in southern regions the value for water ranges from $3,000 to $9,000 per megalitre for typical crops. In contrast, the value for water for irrigated dairy production is around $300 to $600 per megalitre for typical dairy farms, with highly productive farms achieving up to $1,500 per megalitre. For irrigated beef production, the value for water is almost zero (Brennan 2004).

Larger scale production (irrigated area more than 200 hectares in one holding) is constrained in the south of the State by smaller holdings and lot sizes, and high land values exacerbated in some cases by proximity to rapidly expanding residential areas. In the south of the State, future growth in the area under irrigation as well as in the value of product produced by the industry will require land use planning issues to be resolved, more secure water entitlements, and the better definition of available water resources and environmental water requirements.

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1 Current area irrigated is as reported by ABS (2003) for 2001 census year.
2 For vegetables, Brennan (2004) modelled potato, carrot and cauliflower production in the South West, and for fruit modelled orchard fruit apples, plums and oranges.
B. The Need for Horticultural Precincts
Traditionally, horticultural enterprises located on the fringes of cities have been important sources of fresh fruit and vegetables. Examples with relevance to Perth include areas such as Wanneroo, Spearwood and Osborne Park.

As the urban population grows, the consequent expansion of the suburbs starts to impinge on horticulture with a number of serious consequences. Land values rise, making expansion expensive and difficult. Holdings become fragmented, thereby increasing operating costs. Restrictions are placed upon the activities of farms operating close to domestic dwellings to prevent them from becoming a nuisance. In extreme cases horticulture disappears entirely because all the land has been rezoned for urban use.

Current planning policies support the identification and establishment of horticultural precincts; however, existing planning practices do not reflect these policies. The Steering Committee believes that the existence of horticultural areas located reasonably close to Perth is beneficial to the community and State’s economy. Accordingly it recommends that the Department for Planning and Infrastructure in concert with other relevant authorities place greater emphasis on the identification and zoning of horticultural precincts.

The area immediately to the north of Wanneroo is regarded as a priority for such a development. The creation of a precinct on a greenfield site will permit suitable consideration to be given to environmental impacts, buffer zones, optimum lot sizes, water allocations, services and infrastructure, and possibly to the reuse of recycled water sourced from nearby suburban areas.

The possible relocation of producers from areas of the Gnangara Mound and the importance of this in relieving the stress upon the mound is discussed subsequently in this section.

C. Recommendations for Planning and Development:
• Identify and delineate areas with suitable land, water and infrastructure to facilitate future growth in irrigated agriculture.
• Give consideration to the impact of urbanization when planning for irrigated agriculture.
• Undertake a state-wide review of the potential impacts of climate change on irrigated agriculture both now and into the future.
• Incorporate climate change risk assessments into all Water Resource Management Plans.
• Further integrate water and land use planning by preparing guidelines for the planning of sustainable horticultural precincts.
• Require the Western Australian Planning Commission (WAPC) to identify and protect Priority Agricultural Areas in the Perth region under the Metropolitan Region Scheme.
• Establish horticultural precincts at Gnangara and Myalup.
• Support a comprehensive review and assessment of the scope to expand irrigated agriculture in the West and East Kimberley areas.
• Where suitable land and water resources coincide, investigate the potential to create other horticultural precincts.

3.5.1.2 WATER USE EFFICIENCY
The two areas with significant scope to reduce water consumption are:
• Open channel distribution systems in irrigation areas; and
• On-farm distribution systems.

A. Irrigation Scheme Areas
Half of the irrigation water delivered to agriculture in Western Australia is used in the Ord Irrigation Area and South West Irrigation Area (Harvey Water) combined. Both areas mainly use open channel distribution and delivery systems, from which between 20 per cent and 30 per cent of water is lost through leakage and evaporation. The recent piping of the Waroona irrigation district by Harvey Water has resulted in water savings of around 3,600 megalitres per annum, and as a result Harvey Water proposes to pipe the rest of its area.

The South West Irrigation Area/Myalup Case Study Summary (presented in Section 3.6.4) presents both the opportunities to invest in efficiency improvements and the need for more integrated land use and water resources planning in this area.

The Steering Committee supports the investment in piping the South West Irrigation Area, subject to further consideration being given to the merits or otherwise of piping the Collie Irrigation District.
B. On-farm Irrigation Practices
Currently, a number of conditions exist which militate against on-farm water savings. These include:

- the ‘use it or lose it’ policy;
- the short-term nature of water entitlements (which acts as a disincentive to investment in more efficient irrigation systems);
- the absence of a financial incentive to save water (the cost of water is low and water trading which results in an economic value being placed on water is virtually non-existent); and
- the gifting of water and the absence of metering, which creates a perception of unlimited supply.

The Carnarvon Case Study Summary, which appears in Section 3.6.1, focuses on the high efficiency of the Carnarvon Irrigation Area and also upon the conditions which led to this.

C. Recommendations for Water Use Efficiency
- Implement efficient water trading systems, thereby assigning a realistic value to water and hence driving improvements in efficient water use.
- Examine and where appropriate invest in opportunities to reduce distribution losses in irrigated agricultural systems (e.g. piping the Harvey Water irrigation system, as per the 2004 ACIL Tasman report on the South West Irrigation Area).
- Benchmark irrigation systems at the farm and industry level to create an important driver for improving productivity and the efficiency of water use.
- Expand the Waterwise on the Farm training program.

3.5.2 Policy and Management Issues
Current water resource management practices do not encourage water use efficiency. The main problems with the current management system are:

- The lack of a clear strategic framework for water resource management which addresses governance, legislative reform, state-wide planning and the improved administration of water entitlements.
- Although water licences are usually renewed by the Department of Environment upon request, they are only issued for a maximum of 10 years. In agricultural terms, 10 years is a short time. Accordingly, both farmers and financiers are deterred from investing in long-term projects and/or systems designed to save water.
- Water entitlements need to be more flexible in order to provide irrigators with more options. The current form of water entitlement also inhibits water trading.
- Current water resource policies and practices (‘use it or lose it’, ‘first in time’ allocation, an ineffective titling system, linking water entitlements to land ownership, ‘hidden’ water title information and lack of monitoring) give rise to uncertainty and act as deterrents to an open and effective water market.
- Generally water is undervalued, and hence there is little incentive to use it efficiently. In some areas, however, irrigators provide their own self-supply facilities at considerable expense.
- The vast majority of water users are not metered. Greater knowledge of water use and of the availability and quality of water resources is needed. Metering will assist irrigators to use their water efficiently and will enable water resources to be monitored and managed within sustainable yields, thereby providing increased security for all titleholders.
- Comprehensive water plans are needed for all groundwater and surface water systems used for irrigation, in order to identify sustainable yields and establish environmental water requirements.
- Land and water planning are largely divorced from each other. There is a need for land use planning to be integrated with the planning of water allocation.

The following recommendations are designed to stimulate the more efficient use of water as well as to encourage the onset of water trading carried out under a system which embodies the principles of the National Water Initiative. They will also align Western Australia with other states in embracing the National Water Initiative.

Recommendations for Policy and Management Issues

A. Nature of Water Entitlements
- Separate (or unbundle) the entitlement to access water from the approval to use water on a specific area of land.
- Discontinue the practice of allocating a water entitlement by reference to the purpose for which it is to be used (e.g. the irrigation of an area of a specific crop).
- Impose conditions relating to the use of water at particular locations as a separate instrument.
- Specify water entitlements as a share (converted to a volumetric allocation annually or periodically as actual supply conditions require) of the water resource available to consumptive users.
- Discontinue the practice of requiring access to land in order to hold or trade a water licence.
B. Security of Entitlement

• Grant perpetual water licences, subject to them also being specified as a share of the available resource. In the event that government is unwilling to adopt perpetual entitlements, licences should be granted for at least 40 years and made renewable at any time during the term subject to meeting the conditions of the licence.

• Abandon the ‘use it or lose it’ policy.

• Specify clearly the processes for making changes to the consumptive pool.

• Specify the various shares, including those allocated to the environment, public interest, domestic consumption and irrigation in comprehensive management plans.

• Adopt the risk allocation framework proposed in the National Water Initiative’s Inter-governmental Agreement.

• Pay compensation to users for changes which are not contemplated in statutory plans and which result in reductions to their allocation. An appropriate basis for compensation is contained within the NWI framework.

• Make long-term increases in the consumptive pool which result from unanticipated changes to the plan available for use at the government’s discretion (including the option of auctioning some or all of the extra water to new users).

• Adopt a ‘Torrens-based’ register of titles which incorporates the key features proposed in the Land and Water Australia Water Titling Report.

C. Allocation, Planning, Monitoring and Enforcement

• Accelerate the production of statutory-based management plans.

• Make statutory plans legally binding on both the water resource manager and water users.

• Amend the RIWI Act 1914 and/or other regulations to permit the water resource manager to place an embargo on the issuing of new licences in order to allow completion of management plans. The embargo should be permitted only for a limited time specified in the statutory management plan or, if a plan is not in existence, in Regulations.

• Issue all licences on a competitive basis at a minimum reserve price. Consideration should be given to adopting the practice recommended by the Natural Resource Management Standing Committee of holding auctions over time with an appropriate proportion of the remaining resource being introduced on each occasion.

• Require all water use above a threshold of five megalitres per annum to be metered. The threshold should be reviewed regularly and adjusted as required.

• Implement enforcement procedures for non-compliance of licence conditions.

• Make the amount of water used by each licensee, and the conditions of its use, a matter of public record. Publish instances where licence conditions are breached together with any action taken as a consequence.

• Continue government agencies’ current work on water conservation and use of recycled water.

• Maintain a public use reserve and, in cooperation with the Water Corporation, monitor this closely.

D. Facilitation of Water Trading

• Withdraw the water trading policy, Water and Rivers Commission 2001, Statewide Policy No.6 - Transferable (Tradeable) Water Entitlements for Western Australia and prepare a new policy for water trading which complies with the nationally agreed best practice guidelines for water markets and water trading. This will include but not be limited to:

  • Minimising transaction costs including the turnaround time for processing and approving trades by pre-testing in advance and then specifying conditions under which trades will receive automatic approval. Unbundling water entitlements from use conditions will remove the necessity to consider the impact of water use in the assessment of an application to trade.

  • Requiring the water resource manager to facilitate the disclosure of information on water ownership and availability to the market.

  • Considering amending the legislative framework to allow individual irrigators to trade with water users outside their particular scheme. This assumes that a means of transporting water between both parties exists.

E. Water Resource Management Charges

• Reconsider the introduction of water resource management charges that recover the share of management costs attributable to water users. The basis of charging should be transparent and the money raised used for agreed purposes. The first step should be to recover costs associated with licensing and compliance.

• Establish mechanisms by which water users can both monitor the efficiency of water resource management service delivery and have an influence over service delivery standards.

3.5.3 Governance Issues

Until recently, the portfolios of seven State Government Ministers impacted on water management and policy (Premier, Treasury, Government Enterprises, Environment, Planning, Agriculture, and State Development). With the exception of the Minister for Agriculture, these Ministers are all members of the Water Resources Cabinet Sub-Committee which coordinates water management across government.

The State Water Council (SWC), formerly the State Water Strategy Task Force (SWSTF) has been successful in coordinating projects and government responses to water issues. For this reason, it should continue to operate in its current form. An important new role for the SWSTF will be to oversee the preparation of a State Water Plan. This should be in a form that permits the future demand on the State’s water resources to be predicted and then managed strategically.

Given the importance of water in Western Australia, there is considerable support for the creation of a Department for Water Resources.

A separate, but important governance issue is the real potential for conflict of interest within the Department of Environment over matters relating to environmental water provisions. While water resource management has an important environmental component, water also has significant social, economic and cultural value which must be reflected in water management. Currently the Department of Environment has responsibility for both environmental protection and water resource management and allocation. There is a widespread perception that water resource management is currently dominated by environmental considerations. The Irrigation Review Steering Committee has identified broad support for these two roles to be split between separate agencies.

The following inter-related changes are recommended:

Recommendations for Governance Issues:

A. Government and Organisational Structure

• Create a new Ministry for Water Resources with responsibility for water resource management, water policy, strategy and planning and the water utilities. (The Steering Committee is pleased that its first recommendation has been partially implemented by the State Government’s recent decision to appoint a Minister for Water Resources with responsibilities for water resource management, water policy, strategy and planning, and water utilities.)

• Establish a new Department of Water Resources (DWR) by combining
  - the water resource management activities of the Department of Environment,
  - the State Water Strategy Unit, and
  - relevant functions within the Water Corporation
  into a single department that is completely separate from the DoE (See Figure 8).

• Structure the proposed DWR so that Operational Management and Strategy, and Policy and Planning are carried out in two distinct divisions with each function having its own management structure and dedicated budget.

• Use the SWC to oversee the implementation of these recommendations.

• Develop a State Water Plan and so establish a strategic framework within which the future demand on the State’s water resources can be determined and managed effectively.

B. Water Resources Stakeholder Reference Group

• Realign the Water Resources Stakeholder Reference Group as an advisory group to the Minister for Water Resources.

• Ensure that the members of the Water Resources Stakeholder Reference Group not only understand the views of their stakeholders, but also are knowledgeable about modern water management and the issues associated with water reform.

C. Water Resources Cabinet Sub-Committee

• Regularly review the need for the Water Resources Cabinet Sub-Committee.
Centrestar Pivot
Source: Harvey Water

Lake Argyle Main Dam
Source: Gabrielle O’Dwyer
D. Extension of Self-Management by Users

- Investigate how self-management might be applied to self-supply areas with a high density of irrigated agriculture. The final option may or may not involve creation of new cooperatives.

- Investigate appropriate mechanisms for community, industry and other stakeholder partnerships in water resource management, including a review of the role and effectiveness of water resource management committees in providing community, water user and industry input into the water allocation and planning process.

E. Operation of the Proposed Department of Water Resources

- Ensure that the DWR is funded to an appropriate level and that at all times at least equal emphasis is placed on strategic matters as is on operational issues.

- Establish within DWR a group of experts with the appropriate skill sets to evaluate and determine a long-term water strategy and plan for the State.

- Give a high priority to water resource planning within the DWR.

- Continue to work on the development of a positive, customer oriented and participative culture within the DWR.

F. Water Resource Management Capacity Building

- Develop and implement programs specifically aimed at building a competent water resource management capability within relevant government agencies, water resource management committees and stakeholder groups.

3.6 PAPERS - IRRIGATION AREAS

3.6.1 CARNARVON IRRIGATION AREA

3.6.1.1 BACKGROUND

The Carnarvon Irrigation Area is located near the mouth of the Gascoyne River, approximately 900 kilometres north of Perth. In the 1920s, plantations utilising riverbed aquifers were established on the banks of the Gascoyne River. The irrigation area now extends inland from the town of Carnarvon for approximately 19 kilometres.

Currently, Carnarvon has around 170 plantations and a total of 950 hectares of land under irrigation. Irrigated agriculture is responsible for 10-15 per cent of Carnarvon’s gross production and five-10 per cent of the Gascoyne Region. The Carnarvon Irrigation Area contributes 11 per cent of the value of Western Australia’s irrigated horticultural product.

Usually the Gascoyne River flows between February and August. River flows recharge the aquifers and are essential for the continuity of water supplies to Carnarvon for irrigation, public water supply and other purposes.

As aquifer recharge only occurs intermittently, and sometimes not for several years, water use must be managed carefully and new allocations for irrigation have been limited for many decades. Over pumping during dry spells can cause saline water to be pulled into an aquifer, damaging crops in the short-term and potentially damaging the aquifer for future use. Many irrigators in Basin A have access to self-supply as well as scheme water, and switch to scheme water provided by the Gascoyne Water Cooperative when self-supply is no longer possible. Carnarvon Scheme water is much more expensive than self-supply water and is the most expensive water provided for irrigation in the State.

For these reasons, irrigators have been actively involved in water management since the first advisory committee was established in the 1960s. Over the last 40 years growers, government and the Cooperative have worked together to progressively develop a set of “Rules of the River”. These rules include decision rules for sharing water during dry spells and for closing down bores before salinity problems occur.
3.6.1.2 WHAT CAN WE LEARN FROM THE CARNARVON EXPERIENCE?

In the past, saline aquifers and inequity between growers during dry periods posed real threats to irrigation at Carnarvon. These were driving forces for the industry to both understand and become actively involved in the management of its water resources. Importantly, the contribution that irrigated agriculture makes to Carnarvon is recognised by the broader community, which strongly supports the sector’s continued existence.

Carnarvon water is scarce and growers pay the highest price for water delivered for irrigation. It is also no coincidence that based on output value per megalitre, Carnarvon is the most efficient irrigation area in Western Australia. A rough estimate prepared for the Steering Committee suggests that the Carnarvon Irrigation Area produces $6,333 per megalitre ($57 million GVAP from 9,000 megalitres of water), compared to the South West Irrigation Area at $1,157 per megalitre ($124 million GVAP from 107,207 megalitres) and the Ord River Irrigation Area at $272 per megalitre ($57 million GVAP from 209,000 megalitres). It should also be noted that figures for individual properties may be higher or lower.

The scarcity and relatively high cost of water, coupled with the good understanding that growers have of the impact on the aquifers of their actions have led to the widespread adoption of efficient irrigation techniques (e.g. the replacement of flood irrigation by dripper systems, mini-sprinklers and sub-surface tape).

Technological advances which allow computers, irrigation engineering and agronomics to be integrated to provide more sustainable and efficient farming systems are becoming increasingly important. The Martinez Open Hydroponic Technology (MOHT) approach is one example of this. MOHT uses sophisticated software and engineering to control all plant inputs, thereby maximising the available energy and providing optimal daily requirements for each phenological phase as the plant under irrigation matures and produces.

The adoption of this new technology has provided significant benefits to growers, who now have greater control over their on-farm water use and other inputs. This control has resulted in the increasing use of advanced fertigation techniques, while at the same time reducing water use. As a result, large gains in production and higher gross margins are starting to be achieved.

3.6.1.3 WHAT DOES THIS MEAN FOR IRRIGATED AGRICULTURE AND WATER RESOURCE MANAGEMENT STATE-WIDE?

The relevance of the Carnarvon case study to irrigated agriculture and water resource management across the State is that scarcity and price drive improvements in efficiency and control, which in turn drive improvements in productivity. These improvements are most rapid when water users understand the potential impacts of their water use and are actively involved in managing these impacts at the local level.

This case is covered in more detail in Appendix 3 Papers – Irrigation Areas and Districts, Carnarvon Irrigation Area, which was prepared for consideration by the Steering Committee.

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*Estimates for Carnarvon and Ord River Irrigation Areas are calculated by the Department of Agriculture, Western Australia based on the ABS figures in December 2004. Estimates for the South West Irrigation Area are calculated on the basis of figures provided by Harvey Water in April 2005.*
3.6.2 GNANGARA MOUND

3.6.2.1 BACKGROUND

The Gnangara Mound (the Mound) is a large groundwater resource located north of Perth, bounded by Gingin Brook and Moore River to the north, Ellen Brook to the east, the Swan River to the south and the Indian Ocean to the west. Pine plantations dominate the northern part of the Mound while much of the southern part is urbanised. Horticulture and other industries are prominent to the south around Wanneroo, and horticulture is dominant east and north-east of pine plantations in Chittering, Gingin and in Upper and Middle Swan.

The principal groundwater resources of the Mound, contained in the Superficial, Leederville and Yarragadee aquifers, are the most important water sources in Western Australia.

The Mound provides about 60 per cent of Perth’s potable scheme water supply, and sustains a thriving horticulture industry that provides Perth with a significant proportion of its fresh vegetables. It is also a major source of water for home gardens, and supports valuable ecosystems including iconic cave systems at Yanchep and numerous wetlands and lakes on the coastal plain.

The Mound is under great stress from climate-induced declines in rainfall, together with the combined water demands for public supply, irrigation, forestry and the environment. Water levels are declining in many areas and some water users are also reporting a decline in water quality including increasing salinity, iron and nitrates.

The problems on the Mound are not new. Numerous reviews, studies and committees have been commissioned to investigate and propose solutions to the problem that not only remains, but is increasing. Discussions on possible solutions have been marked by ongoing debates about the proportional contributions to the problem from public water supply, pine plantations, irrigation and a drying climate. The most significant action taken to date has been to shut down a number of Water Corporation bores in those areas of greatest concern.

3.6.2.2 WHAT CAN WE LEARN FROM THE GNANGARA EXPERIENCE?

Until recently, when the State Government provided $6 million of additional funding for metering water use on the Mound at the recommendation of the Steering Committee, there has been no commitment to widespread measurement of water use on the Mound. Only those using 500 megalitres per year or more are required to meter and report their consumption. The lack of information on water use has hindered attempts to manage the problems on the Mound. With a more innovative approach and better-integrated solutions the Steering Committee believes Gnangara could provide a model for approaching similar problems in the future.

Discussions between the Steering Committee and irrigators indicate that there is recognition of the need for action to take pressure off the Mound. Quantifying how much water needs to be saved and by whom is important. However, the absence of this knowledge should not prevent action to save water from being taken now. An adaptive management approach is required where objectives are set, actions planned and taken, and the effects monitored and evaluated. If necessary, sensible adjustments can then be made to the plans and future actions.

The integration of land use planning and water resource management is critical to resolving the problems on the Mound. Increasing urbanisation around Wanneroo is reducing the long-term security for irrigators and other intensive land users, which in turn reduces the incentive to invest in water-efficient technology. The lack of long-term security also impedes the investment required for capital-intensive integrated solutions such as reusing treated wastewater for irrigation.

The establishment of a new horticultural precinct to the north of Wanneroo on land currently occupied by pine plantations should be investigated. A new precinct should provide the necessary security for growers to relocate from existing areas where their future is uncertain and to invest in irrigation efficiency. The precinct will also provide the circumstances required for a treated wastewater scheme and also ensure the long-term supply of fresh produce to Perth.
An integrated solution to problems on the Mound would require:

- The creation of a new horticultural precinct on land currently occupied by pine plantations.
- Encouragement for ‘large horticultural enterprises’ and broiler/egg producers (which require large lot sizes) to transfer to the precinct. Intensive horticultural enterprises (e.g. nurseries, strawberry providers) can remain in existing areas to maintain diversity.
- The creation of buffers around wetlands and rezoning of other areas to ‘urban’. Urbanization will increase recharge and reduce nutrient and pesticide intrusion into the aquifer. Note: Much of the transport infrastructure needed to support urbanization is close by.
- Change of the controlled burning regime to facilitate groundwater recharge.
- Adjustment of water allocations to match the new land use patterns and if necessary further reduce water use in critical areas by ‘buying back’ water from irrigation for allocation to the environment or domestic use.
- Adopting an approach to water allocation which recognises the impacts that various allocations have on recharge. For example, until they are removed, pine plantations may need to be granted a water allocation.
- Providing ‘fit for use’ recycled water to the horticultural precinct to reduce the draw on groundwater. Secure access by growers to recycled water will be a prime requirement.
- Metering of all groundwater extraction to enable the condition of the aquifer to be monitored and managed; licence conditions to be enforced and water trading to be introduced.
- Establishing a statutory supervisory group to manage the implementation and resolve demarcation issues between departments.

3.6.2.3 WHAT DOES THIS MEAN FOR IRRIGATED AGRICULTURE AND WATER RESOURCE MANAGEMENT STATE-WIDE?

It is a simple but accurate adage that ‘you can’t manage what you don’t measure’; therefore, all significant licensed water extraction around the State should be metered and reported publicly.

A lack of long-term security of water, land or both will hinder investment in water efficiency and stifle water trading, thereby constraining productivity. Integration of land use planning and water resource management is important to the long-term security of irrigated agriculture and, therefore, to maximising productivity. While already documented in planning policies, this integration is not occurring in practice. The need for clear objectives or targets for water resource condition and the use of them as drivers for land use planning is critical. Such objectives need to be endorsed at high levels within government.

The integration of land use planning and water resource management is also critical to resolving water resource management problems. Authority to oversee the resolution of conflicts to achieve government objectives needs to be clearly established at high levels within the government.

This case is presented in greater detail in Appendix 3.2 Irrigation Areas and Districts, Gnamgara Mound, which was prepared for consideration by the Steering Committee.

3.6.3 KIMBERLEY REGION

3.6.3.1 BACKGROUND

The state-wide review of land and water resource use by the Steering Committee confirms the widely held view that the Kimberley region has significant potential for additional irrigation development.

The Ord Stage 1 irrigation scheme at Kununurra contributes around $57 million in farm gate output to the State economy. Ord Stage 2, if implemented and fully developed, would increase the total area under irrigation in the East Kimberley to more than 50,000 hectares, which exceeds the area currently under irrigation for the whole State.

More than five million hectares of land suitable for irrigation have been identified in the West Kimberley. Detailed studies indicate that around 200,000 hectares of this land located near the Fitzroy River floodplains and the sandplain areas south of Broome are capable of immediate development.
Significant volumes of both groundwater and surface water are available in this region, and the climate is suitable for a range of crops, which includes sugar cane, cotton, tropical fruits, vegetables, pulse crops, seed and tree crops. The availability of suitable land and abundant water presents opportunities that are not available to most other regions of Australia.

The Ord Irrigation Scheme is managed and controlled by an irrigation cooperative. The cooperative is proving to be successful in managing the distribution of water as well as monitoring the environment.

Future large-scale irrigation developments need to be economically viable as well as environmentally sustainable. A preliminary comparison of the economics of investing in the East and West Kimberley shows that large-scale cotton production in the West Kimberley appears preferable to the full development of the Ord Stage 2 (See Appendix 3). Key drivers in this economic analysis are the world market for cotton, higher crop yields in the West Kimberley, and the availability of groundwater which permits self-supply operations, thereby causing the cost and time needed for development to be less than required for Ord Stage 2.

### 3.6.3.2 What can we learn from the Kimberley experience?

The irrigation industry in the Kimberley region will grow only if there is a high degree of certainty over the future availability of land and water. The growth in tourism and recreational pursuits on the lower Ord River have created an expectation in some quarters that the current river flows (which are in excess of the environmental allocation) will be maintained or even increased. Environmental water provisions for the lower Ord River should be based on clear criteria developed through best practice community consultation. The final agreed outcome must strike a balance between the economic, social and environmental needs of the region and be encapsulated in a binding document which sets out the proportions of the resource allocated to each purpose. Until this is done, the future of investment in the Ord will remain uncertain.

To ensure long-term sustainability and hence effective use of water resources, economic viability must be a key criterion for determining whether or not public funds are to be invested in the expansion of irrigation areas in the Kimberley region.

All new irrigation developments in the Kimberley must be economically, environmentally and socially sustainable. This requirement in turn has implications for the irrigation systems and farming methods to be used. The future performance demanded of both irrigation and farming systems should be incorporated into the guidelines for project assessment and also into the Kimberley Regional Sustainability Strategy which has yet to be developed.

Finally, to date much more emphasis has been given to the possible future development of Ord Stage 2 (East Kimberley) than to the West Kimberley. The Steering Committee believes that equal emphasis needs to be given to the potential of the West Kimberley, thereby ensuring that the future development of the whole region is optimised.

### 3.6.3.3 What does this mean for irrigated agriculture and water resource management state-wide?

Statutory water management plans, which are binding upon all parties including the resource manager, create greater certainty for the environment and users alike. They do this by defining the available water resource; by making provisions for the environment that are acceptable to government, communities and stakeholders; by establishing processes for the allocation of water entitlements and for sharing the risks of downturns in water availability; and by establishing ongoing rules for the re-allocation of entitlements through water trading or other means. More effort must be devoted to preparing water management plans for all regions of the State, including the Kimberley.

Given the assistance of the Western Australian government, irrigators and the community, the Northern Australian Irrigation Futures Project (Land and Water Australia and National Program for Sustainable Irrigation/CSIRO) will help to identify the requirements for large-scale sustainable irrigation development in the north of the State. While the opportunities for expanding irrigated agriculture across the rest of the State may not be of the same scale, the concept of developing sustainability indicators for other areas within Western Australia should be considered.

This case is presented in greater detail in Appendix 3.3 Irrigation Areas and Districts, Kimberley Region, which was prepared for consideration by the Steering Committee.
3.6.4 THE SOUTH WEST IRRIGATION AREA AND MYALUP

3.6.4.1 BACKGROUND

The South West Irrigation Area (SWIA), which is located just over 100 kilometres south of Perth, is comprised of 112,000 hectares of land in the shires of Waroona, Harvey and Dardanup. The irrigation area is 75 kilometres long, up to 15 kilometres wide and has a north/south orientation.

The water to supply the SWIA is sourced from hills catchment dams operated by the Water Corporation under licence from the Department of Environment. Harvey Water, the cooperative responsible for managing the SWIA, delivers water to members of the cooperative through gravity fed channels and pipelines.

Recently, Harvey Water replaced most of the open channels in the Waroona district with piping. This reduced distribution losses by about 3,600 megalitres per annum and provided more control for growers by delivering water under pressure.

Subsequently, Harvey Water put a proposal to the State Government for further investment in piping to free up 18 gigalitres of water currently lost through the open channel distribution network. The water saved by this initiative would be made available to the Integrated Water Supply Scheme for domestic use. An assessment of the options for improving irrigation water use efficiency within the SWIA was subsequently undertaken for the Irrigation Review by ACIL Tasman (2004).

The Steering Committee believes that investment into piping the areas with capable soils and other factors suitable for high value horticultural crops should be supported. It may not be appropriate to pipe some parts of the Collie Irrigation District where certain areas have soils not suited to high-value production.

There is also a need to consider the development of a horticultural precinct at Myalup. This would require the SWIA boundaries to be realigned to include the existing Myalup horticultural area and the Myalup pine plantation. Potentially this precinct would use water from the Harvey Diversion Drain. In addition there is potential for water to be traded into the Myalup area for use on higher-valued crops to some of those currently produced within the SWIA.

3.6.4.2 WHAT CAN WE LEARN FROM THE SOUTH WEST IRRIGATION AREA EXPERIENCE?

Developments such as the Myalup Horticultural Precinct will support significant increases in horticultural production, exports and employment. These outcomes will in turn be facilitated by the recommendations presented in this report.

The lack of a strategy covering all options available (including reducing water losses, realigning the SWIA boundaries and creating a Myalup Horticultural Precinct) in order to better use water, highlights the need for a more strategic approach to planning and management.

At present no single group is responsible for looking into issues such as land and water resource planning in the SWIA and/or the impact that major investments such as piping the Collie Irrigation District might have. As a consequence, opportunities such as buying back all Wellington Dam water from irrigators for domestic use are neither identified nor evaluated.

Currently, individual cooperative members cannot trade water to entities and individuals external to the SWIA. All trades must take place through Harvey Water. Allowing individuals temporarily to trade their entitlements outside of the SWIA is likely to increase the economic value of water to irrigators and encourage further investment in activities which lead to improved on-farm water use efficiency. The Steering Committee supports this course of action.

3.6.4.3 WHAT DOES THIS MEAN FOR IRRIGATED AGRICULTURE AND WATER RESOURCE MANAGEMENT STATEWIDE?

The South West Irrigation Area/Myalup example highlights the need for an overarching strategic plan for the State’s water resources. Such a plan should identify the State’s major water resources, determine the likely future sectoral and regional demands for water, including those for the environment, and establish how the State intends to utilise its water resources for maximum community benefit.

This case is presented in greater detail in Appendix 3.4 Irrigation Areas and Districts, Harvey/Myalup Horticultural Precinct, which was prepared for consideration by the Steering Committee.
4. IMPLEMENTATION

The actions required to implement the Irrigation Review recommendations are:

- Create a new Ministry for Water Resources.
- Mandate the State Water Council to oversee the implementation of water reform.
- Implement a new Water Resources Management Act.
- Create a new Department for Water Resources.
-立法更改RIWI Act 1914。
- Make changes to water resource management policy and practices.
- Implement Case Study recommendations and priority water resource management initiatives.
- Implement initiatives related to Water Use Efficiency.

Reforms need to be implemented as a package and responsibility for implementing the plan should be vested in the State Water Council. It is also recommended that the Steering Committee be retained to assist with the implementation and to provide further advice as required.

The State Water Council should give priority to preparing a detailed cost estimate and schedule against which the implementation of the Steering Committee’s recommendations can be monitored.

Desirably, full implementation will be completed no later than June 2006.
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Part 2 Irrigation Industry
5. NEED FOR A REVIEW OF IRRIGATION

5.1 OVERVIEW AND NEED FOR A REVIEW

Irrigated agriculture contributes $800-900 million to the State economy annually and consumes approximately 40 per cent of the water used in the State. This compares favourably with other states and internationally where water use in agriculture typically is up to 80 per cent of the total.

The 2003 State Water Strategy recommended that irrigation activities within Western Australia be reviewed. The review (now completed) provides a basis for understanding how water is used within irrigated agriculture. It also sets out what needs to be done to ensure that water is used efficiently and sustainably by this important industry.

Better systems for allocating, managing and applying water are needed because the gap between the known resources and the sum total of the competing demands for water is narrowing. Managers and users alike are challenged also by the need to strike a balance between the growing demand for water and the expectation of a clean and healthy environment. Finally and most importantly, all of the above are occurring at a time when rainfall (and hence the supply of water) is declining due to long-term climate change. It is small wonder that water allocation and management rank among the most contentious issues facing Western Australia today.

The State has a remarkable and perhaps unique opportunity because pressure on water resources is generally less than that experienced in many other parts of Australia. Western Australian water managers have been typically cautious in allocating water resources. Consequently, Western Australia is in a very favourable position to learn from the successes and the failures of those jurisdictions that have already had to contend with heavy pressure on their water resources.

But the window of opportunity is closing fast. Water use across the State doubled between 1985 and 2000, and current use is running ahead of predictions that it will double again by 2020. Most models are predicting a continuation of climate change and an additional decline in average rainfall and run-off in the south-west of the State. As more of the State’s water resources approach the limit of sustainable use, symptomatic increases in competition and disputes over water are becoming more common. The challenge for Western Australia is to take the great opportunity it has to get its water resource management right (Camkin 2003).

5.2 TERMS OF REFERENCE

The Terms of Reference for the Irrigation Review were approved in December 2003 by the Premier’s Water Resources Cabinet Sub-Committee. The Steering Committee was appointed to:

- Establish the amount of irrigation water supplied and used within Western Australia together with the economic and social benefits generated by such usage.
- Considering factors such as water availability, environmental impact, climate change etc., identify the likely future forms, scale, locations, water needs and economic benefits of irrigated agriculture in Western Australia.
- Identify opportunities for improving the efficiency with which irrigation water is delivered and used together with the associated costs, benefits and beneficiaries thereof.
- Identify constraints (including but not limited to Government policies and priorities) to improving the efficiency with which water is delivered and used. Explore the possibility and appropriateness of forming collaborative links between all levels of government, industry, researchers and the community.
- Review the potential for water trading to improve the efficiency with which water is delivered and used; identify policy and other constraints to water trading and, if appropriate, recommend actions needed to facilitate water trading.
5.3 COMMUNITY CONSULTATION

During eight months of stakeholder consultation from March to November 2004, the Steering Committee received 50 submissions on behalf of 58 organisations and individuals that operate in Western Australia. Among those who made submissions to the Irrigation Review were seven government agencies (12 per cent), thirty-six agribusiness operations and consultancies including several individuals (62 per cent), four irrigation cooperatives (seven per cent), seven industry bodies (12 per cent) and four banks (seven per cent). Key irrigation issues as well as a wide range of relevant water resource management issues were raised and discussed. A detailed list of issues and comments is provided in Appendix 2.

The results of this consultation are summarised as follows:

- Eighty per cent of stakeholder submissions urged the government to introduce secure water entitlements.
- Sixty-six per cent of these preferred perpetual water entitlements and argued that this could be paid for by simple administration fees that did not cover environmental externalities. These water users also supported the risk assignment proposals in the National Water Initiative Discussion Paper.
- Seventy per cent of submissions supported allocating water to highest value and best use, 52 per cent supported water trading, and 50 per cent urged the government to remove barriers to water trading by separating the ‘right to take’ water from the ‘right to use’ it.
- Sixty-two per cent of submissions were in favour of the metering of commercial water use state-wide.
- A large proportion of submissions stressed the need for a more strategic perspective within government and improvements to the funding, efficiency and service standards of the water resource manager.

Issues raised by contributors have been considered by the Steering Committee and are addressed throughout this report. Submission details are shown in this section under the headings: water entitlements, water resource management, water trading, and overall strategy and planning.

5.3.1 SUBMISSIONS ON WATER ENTITLEMENTS

- Duration of Entitlements – An overwhelming majority of stakeholders urged the government to introduce secure water entitlements, but views varied on the form of security. Sixty-six per cent suggested perpetual water entitlements and 14 per cent suggested non-perpetual entitlements. The remaining 20 per cent did not comment on the issue.
- Volume of Entitlements – 60 per cent supported entitlements that were specified as a share of the resource instead of volumetric entitlements; 40 per cent did not comment.
- Exclusivity – 52 per cent supported ‘exclusive’ entitlements that can be sold, given, bequeathed or leased; 48 per cent did not comment.
- Unbundling – 50 per cent of the submissions supported separation of the ‘right to take’ from the ‘right to use’ water; the other half did not comment. Fifty-two per cent supported separation of water entitlements from land titles, two per cent disagreed and 46 per cent did not comment (refer also to Water Trading).
- Torrens System – 46 per cent supported the adoption of a Torrens registration system, two per cent recommended a similar system; 52 per cent did not comment.
- Risk Assignment – 46 per cent supported the concept that the party who causes a water entitlement to change should bear the cost; 54 per cent did not comment.
- Compensation for Change – 42 per cent supported compensation being payable for water withdrawals because of changes in government policy; 58 per cent did not comment.
5.3.2 Submissions on Water Resource Management

- **Metering** – 62 per cent supported state-wide metering of commercial water use; 38 per cent did not comment. Forty-six per cent supported metering of commercial water use on Gnangara Mound; 54 per cent did not comment.
- **Funding to Department of Environment** – 58 per cent supported increasing funding to Department of Environment for water resource management; 42 per cent did not comment.
- **Allocation Limit** – 54 per cent felt that knowledge of allocation limits is insufficient; six per cent disagree; 40 per cent did not comment.
- **Consultation and Links** – 52 per cent supported stakeholder consultation and links between government, industry and the community; 48 per cent did not comment.
- **Water Licence Administration Fees** – 50 per cent supported water licence administration fees, provided users were granted perpetual/long-term water entitlements and conditional upon such fees not being considered government revenue. The purposes for which fees were used must also be agreed in advance and transparent. Four per cent were opposed to licence fees; 46 per cent did not comment.
- **Government Water Resource Investigation** – 50 per cent felt that government water resource investigation is insufficient; two per cent disagreed; 48 per cent did not comment.
- **Sustainability** – 48 per cent recommended considering sustainability in water resource management; 52 per cent did not comment.
- **Water Resource Management Committees** – 42 per cent supported promotion of local water resource management committees; 52 per cent supported a State water resource management committee; six per cent did not comment.
- **Department of Environment Systems and Processes** – 38 per cent suggested that the DoE update and streamline systems and processes; 62 per cent did not comment.
- **Monitoring of Licence Conditions** – 36 per cent supported monitoring conditions for all commercial licences.
- **Water Corporation** – 34 per cent felt that the Water Corporation has undue influence over state water management issues; 66 per cent did not comment.

5.3.3 Submissions on Water Trading

- **Allocation of Water to Highest Value Use** – 70 per cent supported allocating water to highest value and best use; six per cent disagreed; 24 per cent did not comment.
- **Support of Water Trading** – Generally, 52 per cent supported water trading, two per cent did not support it; 46 per cent did not comment.
- **Trading Across Jurisdiction/Irrigation Areas** – 52 per cent supported trading across jurisdictions or irrigation areas; four per cent disagreed; 44 per cent did not comment.
- **Unbundling** – 50 per cent supported separation of the ‘right to take’ from the ‘right to use’ water; the other half did not comment. Fifty-two per cent supported separation of water entitlements from land titles; two per cent disagreed; 46 per cent did not comment (refer also to Water Entitlements).
- **Impacts on Regional Communities** – 40 per cent supported analysis of likely impacts on regional communities.
- **Water Market Benefit** – 34 per cent felt that government lacks understanding of the benefits which flow from a free water market; 66 per cent did not comment.
- **Trading on the basis of Efficiency Gains** – 14 per cent supported trading based on efficiency gains; 86 per cent did not comment.
- **Concerns about Speculation** – 12 per cent were concerned about water trading speculation; 88 per cent did not comment.

5.3.4 Submissions on Overall Strategy and Planning

- **National Water Initiative** – 54 per cent supported the full adoption of NWI principles with minimal adjustments.
- **Water Conservation** – 38 per cent encouraged water conservation, including better use of stormwater and recycled water.
- **Triple Bottom Line** – 26 per cent suggested a triple bottom line approach to water resource management; 74 per cent did not comment.

5.4 Issues within the Irrigation Environment

The way water is used by irrigators varies in efficiency and effectiveness across the wide range of crops irrigated in Western Australia. Efficiency of use refers to how well water is distributed and used (minimal losses and wastage). Effectiveness refers to the extent to which it is used to deliver a valuable outcome (maximum productive output) (Fairweather et. al. 2003). Water use is evaluated according to these criteria in this section of the report.
5.4.1 Issues Related to Water Use

The Irrigation Review has identified a number of key issues relating to the use of water for irrigation.

- Half the irrigation water delivered to agriculture is used within the Ord Irrigation and South West Irrigation Areas. Both of these areas primarily use open channel systems and flood irrigation. Losses (leakage and evaporation) as the result of using open channels are estimated to be in the range of 20 to 30 per cent of water delivered. This result is consistent with the results measured on similar irrigation schemes in the eastern states. The recent piping of the Waroona Irrigation district by Harvey Water has resulted in water savings of about 3,600 megalitres per annum. Piping also enables improvements in on-farm efficiency to be made by delivering pressurized water which can be used in sprinkler systems etc.

- Flood irrigation systems are inherently inefficient in delivering water to crops. Management of delivery also has a significant influence on water distribution efficiency. For example, pastures at Harvey use 15 to 27 per cent less water per hectare if flood irrigation systems are replaced with centre pivot systems (ACIL Tasman 2004). For some vegetable crops, drip tape systems can reduce water use by up to 50 per cent in comparison to centre pivot systems (Thomas 2004).

- Even in areas where flood irrigation systems are not used, many of the systems are outdated. In addition, the transition to modern efficient systems (e.g. from centre pivot to drip tape) has been slow, due to the costs of adopting new technology and the low value attributable to the water savings made.

- Over-irrigation can lead to significant water losses through subsurface drainage and then to contamination of groundwater. For example, research into vegetable production on coastal sands reveals that when crops are watered twice a day by overhead sprinklers, up to 70 per cent of the water and 50 per cent of the nitrogen applied is transported beyond the plant root zone. While considerable work has been done on improving on-farm water distribution uniformity, there is still significant potential for irrigators to adopt irrigation systems that apply water more efficiently. Again, irrigators in some sectors are reluctant to adopt more efficient technologies and practices probably because there is no incentive for them to change.

- Very efficient use of water has been achieved in wine grape production (less than 0.5 megalitres per hectare in cool climate areas of the lower south-west, and two or more megalitres per hectare in the northern parts of the South West region). Perennial orchard fruit production which uses well-managed mini-sprinkler systems and soil moisture monitoring to schedule irrigation is also efficient.

- The cost of Western Australian irrigation water is generally low, reflecting the fact that water is readily available in most areas. Self-supply irrigators construct their own dams or groundwater bores and install pumps and piping systems at considerable cost.

- Low cost irrigation water results in irrigators placing little emphasis on using water efficiently and also gives them little reason to invest in new equipment to reduce the amount of water used.

The Steering Committee believes that an improved water resource management framework, and in particular one which facilitates water trading, will raise the value for water, thereby creating the impetus for irrigators to save water on-farm.

5.4.2 Need to Bring Water Resource Management in Line with National Best Practice

Despite the fact that the adoption of improved irrigation technologies by irrigators is an important and ongoing requirement, the efficient use of water within the irrigation industry is constrained largely by the bureaucratic approach adopted towards the management and allocation of water resources and also by the policies and practices of the water resource manager. Western Australia's current water management framework does not place an appropriate economic value on water; hence there is little incentive for irrigators to improve their water use efficiency or to invest in water-saving technologies. Institutional and policy constraints that maintain the value of water at artificially low levels also result in ineffective water usage since there is no motivation for water users to transfer water from low value to higher value uses. The Steering Committee believes that the current 'command-and-control' approach constrains the application of market forces and militates against the widespread application of water trading.

In 1994, the Council of Australian Governments (CoAG) agreed to reform water policies in Australia through means such as the better definition of water rights and increasing the reliance on water markets to allocate water. CoAG reiterated these objectives in the National Water Initiative in 2003, emphasising the importance of fully functioning water markets as a mechanism for underpinning investment in water-efficient systems and initiating a transition by water to higher value uses (CoAG 2003). Most CoAG requirements were incorporated into the 2001 reforms to the Rights in Water and Irrigation Act 1914 (RIWI Act 1914); however, they have not yet been implemented effectively and it is the view of the Steering Committee that only minimal benefits have, to date, been achieved (see also Section 7 – Improved Governance of Water Resources in Western Australia).

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2 In the Frankland region, however, water for irrigation is generally scarce and trades are occurring at values that reflect the scarcity (pers. comm. N. Dekroy). These trades are not supported by the water resource management framework in WA, because the catchment areas are not proclaimed, and no water resource management (and water licensing) occurs in this area.
5.4.3 Governance Issues

Until recently, the portfolios of seven ministers had an impact upon water management and policy (Premier; Treasury, Government Enterprises, Environment, Planning and Infrastructure, Agriculture, and State Development). With the exception of the Minister for Agriculture, all these Ministers are members of the Premier’s Water Resources Cabinet Sub-Committee which coordinates water management across government agencies.

- The importance of the Water Resources Cabinet Sub-Committee is recognised. However, water is such an important and integral part of our social, economic and environmental fabric that it warrants a separate ministerial portfolio in a similar way to Energy, the Environment and State Development.

- It is important that agencies with responsibilities or interests in water resource management and allocation work together effectively. The State Water Council has been reasonably successful in coordinating projects and government responses to the recent drought in Western Australia, and therefore should continue to operate in its current form.

- The Department of Environment is responsible for environmental protection as well as water resource management and allocation. The DoE is operating under an interim arrangement whereby the Department of Environmental Protection and the Water and Rivers Commission are amalgamated to improve operational efficiency. However, these entities are still separate in a legislative sense. Also, potential for conflict of interest exists where Ministerial conditions set under the \textit{Environmental Protection Act 1986} conflict with water resource management programs established under the \textit{Rights in Water and Irrigation Act 1914}. These issues are discussed in more detail in Section 7 Improved Governance of Water Resources in Western Australia.

5.4.4 Policy and Management Issues

Currently, there are very few drivers that deliver efficient water use.

- Water entitlements do not give irrigators the flexibility they need to manage their water consumption efficiently or to develop their enterprises. A water entitlement provides a volumetric allocation for a particular purpose and ties the water use to an area of land. This arrangement creates constraints on how water is used, and on irrigation enterprise development. It also prevents water trading from operating effectively.

- Security of entitlement is a matter of considerable concern. The \textit{RIWI Act 1914} allows a water licence to be granted for an indefinite term; however, under the Department of Environment policy, licences are issued only for a maximum of 10 years. Short-term licences and uncertainty over how licences can be amended by the resource manager create uncertainty over whether water needed by an enterprise will continue to be made available in the long-term. This in turn can inhibit initial investment, impede further investment and even reduce the value of the entitlement itself (ACIL Tasman 2003).

- The State water resource management system only partly reflects the intent of the 2003 CoAG agreement related to market mechanisms for water. There is a high degree of government intervention which in turn gives rise to high transaction costs. The reserved rights through the ‘use it or lose it’ policy inhibits the development of an effective trading market. The establishment of a user pays approach to water resource management is also precluded even though this would fund many of the reforms needed.

- The ‘first come first served’ water allocation policy is sub-optimal because water allocated on this basis might be used more effectively by later applicants. In addition, agricultural and other industries do not pay a resource rent for the water they use; consequently the full cost of water is not revealed to the user, and hence the real costs of wasteful use have no impact. Research over a number of years has shown that the current use (and sometimes over-use) of water by irrigators is rational because irrigation water constitutes only a small part of the production cost and/or the true cost is not brought to account through a suitable value-creation mechanism.

- The failure to realise the full market value of water within irrigation industries together with the lack of security of entitlements results in a lack of incentive to invest in efficient technology and practices. Where water allocation is based on a tender or auction system, the ‘highest and best’ use of water is encouraged. Where water is used for low value production, margins are insufficient to encourage irrigators to invest in new technology or equipment in order to save water.

- The planning of land use and water use are separated from each other. There is a need for these to be integrated and coordinated.
The increasing demands on (and competition for) water resources requires a better approach to water resource management. The Steering Committee recommends more emphasis be given to the following aspects:

- The knowledge of the use, availability and quality of water resources needs to be improved. Water systems need to be managed closely as they approach full allocation, in order to protect both consumptive uses and environmental provisions. In areas currently under stress due to over allocation or overuse (e.g. Gnangara) there is an urgent need for all parties to cooperate in finding appropriate solutions.

- More effort needs to be applied to the determination of sustainable yields. In addition, systems need to be monitored effectively in order to facilitate management and the maintenance of sustainable patterns of use. These practices will increase the degree of certainty associated with water entitlements.

- The failure to monitor resources, together with the limited metering of water use, creates uncertainty as to whether water will continue to be made available to new users. Better monitoring of water resources leads to better planning and creates greater certainty over the ability to manage water in a sustainable manner. The issues covered in this section are presented in greater detail in Section 8 – Laws, Policies and Practices Impacting on Management of Irrigation Water in Western Australia.

### 5.5 PRINCIPLES FOR WATER RESOURCE MANAGEMENT

The Steering Committee has identified a set of principles which should underpin the future direction of water management in the State. The Steering Committee believes that improvements are needed in the definition of water resources. In addition, there is need for water entitlements which provide investment security, maximise the economic value derived from water use, and ensure that sufficient water is devoted to the maintenance of healthy rivers and aquifers.

The need for caution when allocating water (as expressed recently by the Department of Environment) is accepted, particularly in those instances where the performance of a groundwater system under development stress has yet to be established, and/or the impacts on it of climate change are unclear. Despite this acceptance, the Steering Committee believes that a more proactive approach to water resource management is needed and that a new system based upon the following principles is required:

- Institutional separation of the 'right to take' from the 'right to use' and from conditions of use to provide a sound framework for water allocation and planning.

- The creation of an effective water trading market within an overall strategic management framework. This will place a value on water and act as a key driver of improved water use effectiveness and efficiency.

- The use of perpetual or ongoing water entitlements together with the clear assignment of responsibility for risks to provide investment certainty, hence sustainability, in the event that water availability is reduced in the future.

- Decision-making processes which are based upon sound science, together with sufficient system capacity to permit the timely determination of Environmental Water Provisions (EWPs) and sustainable yields for all of Western Australia’s water systems.

- A system of transparent EWPs that is expressed in the same terms as those of normal entitlements.

- Input from community consultation in water planning, in setting environmental allocations, and in determining regional economic needs.

- Fair burden sharing, with the impacts associated with resource availability or non-availability being shared equitably between government, industry and the community.

The recommendations presented in Sections 8 and Appendix 3 are based on these principles.
6. IRRIGATED AGRICULTURE IN WESTERN AUSTRALIA

6.1 THE CURRENT INDUSTRY

6.1.1 LOCATION

Irrigated agriculture is carried out widely across the State and particularly within the Metropolitan, South West, Kimberley and Gascoyne districts. The analyses of irrigated agriculture presented in this section are based on the regional zones shown in Figure 2.

Western Australia’s three main schemes are:

- the South West Irrigation Area (Harvey Water) which supplies the Waroona, Harvey and Collie irrigation districts;
- the Ord Irrigation Area; and
- the Carnarvon Irrigation Area.

A fourth and smaller scheme, the Preston Valley Irrigation Scheme, supplies water from the Glen Mervyn Dam to irrigators along the Preston River Valley.
6.1.2 Water Consumption

Much of the water used on-farm is not metered, hence it is difficult to provide estimates of usage with a high degree of accuracy. Allowing for this constraint, it is estimated that 520,000 megalitres of irrigation water is consumed within Western Australia each year. Of this, 340,000 megalitres is consumed in the South West of the State while the remaining 180,000 megalitres is used in the Kimberley region.

Around 64 per cent of the water allocated (as opposed to consumed) is covered by the three major irrigation schemes. The remainder of the State’s irrigation allocation is self-supplied – mainly by pumping groundwater and to a lesser degree by diverting surface water in the high rainfall areas in the South West.

Groundwater is a significant source of water used in all areas except the Kimberley. Despite this, the West Kimberley has extensive unallocated resources of groundwater which would be suitable for use in irrigation. The irrigation water allocation by region to such irrigation activity is presented in Table 2. Table 3 presents the quantity of water actually used in each region by type of crop. Figure 3 shows the proportions of Western Australia’s water consumed by each product group for the year 2000.

**Figure 3. Water Use by Group in Western Australia**

<table>
<thead>
<tr>
<th>Estimated Water Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pastures</td>
</tr>
<tr>
<td>1996 - 97</td>
</tr>
<tr>
<td>Pastures</td>
</tr>
</tbody>
</table>

Source: Western Australian Water Assessment 2000 (WRC 2000a)

Overall, it can be calculated that:
- 40 per cent of the State’s water is devoted to irrigated agriculture; and
- 55 per cent of irrigation water is directed towards horticultural crops.

Both of these outcomes are very different from the situation which exists in the eastern states where:
- 80 per cent of water is devoted to agriculture; and
- Much smaller proportions are used on horticulture (e.g. five per cent of irrigation water within the Murray-Goulburn scheme).
Table 2. Irrigation in Western Australia

<table>
<thead>
<tr>
<th>Region</th>
<th>Irrigation area or district</th>
<th>Area irrigated (Ha)</th>
<th>Irrigation supply system</th>
<th>Water allocation7 (ML)</th>
<th>Main irrigation industries</th>
<th>Key issues for irrigators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metro North</td>
<td>Wanneroo /Carabooda</td>
<td>5,620</td>
<td>Self-supply</td>
<td>83,693</td>
<td>Vegetable crops; some perennial horticulture (e.g. avocados)</td>
<td>Water availability; environmental impacts</td>
</tr>
<tr>
<td>Metro East</td>
<td>Hills area</td>
<td></td>
<td>Self-supply</td>
<td></td>
<td>Perennial horticulture (fruit);</td>
<td>Land use conflict</td>
</tr>
<tr>
<td>Metro South</td>
<td></td>
<td></td>
<td>Self-supply</td>
<td></td>
<td>viticulture, Vegetables</td>
<td>Water availability; land use conflict</td>
</tr>
<tr>
<td>Peel-Harvey</td>
<td>Harvey Water (SWIA)</td>
<td>10,426</td>
<td>South West Irrigation Management Cooperative, trading as Harvey Water</td>
<td>180,379</td>
<td>Traditionally dairy pastures; more recent growth of horticulture and viticulture</td>
<td>Wellington Dam salinity; dairy industry-related market drivers</td>
</tr>
<tr>
<td></td>
<td>Myalup</td>
<td></td>
<td>Self-supply</td>
<td></td>
<td>Mostlly annual vegetable crops</td>
<td>Land use systems</td>
</tr>
<tr>
<td>Whicher</td>
<td>Busselton Margaret River Scott River</td>
<td>5,331</td>
<td>Self-supply</td>
<td>33,864</td>
<td>Viticulture, vegetables</td>
<td>Water availability; water quality</td>
</tr>
<tr>
<td>Preston-Warren-Blackwood</td>
<td>Donnybrook Manjimup</td>
<td>5,966</td>
<td>Preston Valley Irrigation Scheme; Self-supply</td>
<td>41,958</td>
<td>Perennial horticulture (fruit inc. grapes); vegetables</td>
<td>Water availability; water quality</td>
</tr>
<tr>
<td>Great Southern</td>
<td>Frankland Mt Barker</td>
<td>3,212</td>
<td>Self-supply</td>
<td>756</td>
<td>Viticulture</td>
<td>Salinity; water availability</td>
</tr>
<tr>
<td>Gingin</td>
<td>Mid-West</td>
<td>3.206</td>
<td>Self-supply</td>
<td>84,419</td>
<td>Vegetables; fruit (inc. olives, grapes)</td>
<td>Water availability</td>
</tr>
<tr>
<td>Gascoyne</td>
<td>Carnarvon Irrigation Area</td>
<td>950</td>
<td>Self-supply</td>
<td>10,800</td>
<td>Fruit; vegetables</td>
<td>Water availability</td>
</tr>
<tr>
<td>West Kimberley</td>
<td></td>
<td>942</td>
<td>Self-supply</td>
<td>2,845</td>
<td>Pasture, vegetables tropical fruit</td>
<td>Land and water allocation; native title</td>
</tr>
<tr>
<td>East Kimberley</td>
<td>Ord Stage I (Kununurra)</td>
<td>9,878</td>
<td>Ord Irrigation Cooperative</td>
<td>335,000</td>
<td>Sugar; tropical fruit; vegetables; pasture; cotton; seed crops; trees</td>
<td>Ord Stage II planning under way, potentially water could be a constraint</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>46,252</strong></td>
<td></td>
<td><strong>782,089</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7 Water allocation figures are drawn from DoE licensing records, estimated by Wright (2004). Formal allocation and licensing is based on proclaimed areas under the Rights in Water and Irrigation Act 1914. Some surface water areas are not proclaimed. Water licensing (and allocation) is not carried out for all areas, hence some areas use more water than is officially recorded as allocated. In addition, some records are not clear on whether they are for irrigation or not, so the data is open to some interpretation and estimation (Wright 2004).
Table 3. Water Used by Key Commodity Groups in Irrigation in Western Australia (estimated crop water use in megalitres)

<table>
<thead>
<tr>
<th>Region</th>
<th>Pasture</th>
<th>Vegetables (inc. grapes and olives)</th>
<th>Fruit and Cotton</th>
<th>Sugar</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metro North</td>
<td>939</td>
<td>17,238</td>
<td>8,402</td>
<td>0</td>
<td>2,721</td>
<td>29,300</td>
</tr>
<tr>
<td>Metro East</td>
<td>733</td>
<td>568</td>
<td>25,077</td>
<td>0</td>
<td>2,874</td>
<td>29,253</td>
</tr>
<tr>
<td>Metro South</td>
<td>2,119</td>
<td>12,360</td>
<td>5,081</td>
<td>0</td>
<td>1,468</td>
<td>21,027</td>
</tr>
<tr>
<td>Peel-Harvey*</td>
<td>81,161</td>
<td>10,713</td>
<td>4,881</td>
<td>0</td>
<td>1,578</td>
<td>98,333</td>
</tr>
<tr>
<td>Whicher</td>
<td>2,974</td>
<td>7,637</td>
<td>11,295</td>
<td>0</td>
<td>2,022</td>
<td>23,928</td>
</tr>
<tr>
<td>Preston-Warren-Blackwood</td>
<td>4,638</td>
<td>20,086</td>
<td>35,191</td>
<td>0</td>
<td>1,450</td>
<td>61,365</td>
</tr>
<tr>
<td>Great Southern</td>
<td>519</td>
<td>2,274</td>
<td>12,974</td>
<td>0</td>
<td>717</td>
<td>16,485</td>
</tr>
<tr>
<td>Gingin</td>
<td>790</td>
<td>23,380</td>
<td>23,904</td>
<td>0</td>
<td>6,538</td>
<td>54,611</td>
</tr>
<tr>
<td>Mid-West</td>
<td>1,562</td>
<td>1,346</td>
<td>1,499</td>
<td>0</td>
<td>3,166</td>
<td>5,753</td>
</tr>
<tr>
<td>Gascoyne</td>
<td>143</td>
<td>2,406</td>
<td>6,209</td>
<td>0</td>
<td>213</td>
<td>8,970</td>
</tr>
<tr>
<td>West Kimberley</td>
<td>8,247</td>
<td>2,110</td>
<td>605</td>
<td>0</td>
<td>29</td>
<td>10,991</td>
</tr>
<tr>
<td>East Kimberley*</td>
<td>7,945</td>
<td>24,257</td>
<td>10,670</td>
<td>93,312</td>
<td>22,656</td>
<td>158,840</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>111,769</strong></td>
<td><strong>124,375</strong></td>
<td><strong>145,788</strong></td>
<td><strong>93,312</strong></td>
<td><strong>45,432</strong></td>
<td><strong>520,676</strong></td>
</tr>
</tbody>
</table>

Note: Estimates based on irrigated area from ABS Agstats 2001, and calculated using crop water usage estimate per hectare for each region.

- Actual water releases to agriculture for irrigation scheme areas are higher than crop water use estimates provided here, accounting for conveyance losses through seepage, evaporation etc.
- SWIA total water received into the scheme 2000/01 - 120,118 ML (ACIL Tasman 2004).
- OIA total water received into the scheme 2000/01 - 209,000 ML (OIC email 23/12/04).
- One megalitre (ML) = one million litres. One gigalitre (GL) = one thousand megalitres.

6.1.3 **Value of Irrigated Agricultural Production**

Agriculture with an estimated Gross Value of Agricultural Production (GVAP) in 2003-04 (Graham Anna, Department of Agriculture Western Australia, December 2000) of $6,174 million is Western Australia’s largest renewable industry. Between $800 million and $900 million (13 per cent) of this amount was generated by irrigated agriculture. Most of the value generated by irrigated agriculture can be attributed to horticultural products such as fruit, vegetables and viticulture. This segment is also the State’s fastest growing primary production sector.

6.1.4 **Growth**

In recent years, horticultural production has grown rapidly with growth being driven by the rapid development in export markets. More than 40 per cent of horticultural production is exported. Vegetable exports have grown by five per cent per annum over the past eight years while fruit exports have grown by 10 per cent per annum over the same period.

The growth in irrigated agricultural industry across southern Western Australia is presented in Figure 4. It can be seen that expanded olive and grape plantings accounted for most of the change in irrigated land use. The corresponding growth in irrigated agriculture in the north of Western Australia is presented in Figure 5. Growth in sugar production is the dominating influence with 3,140 hectares of sugar cane under cultivation in the year 2001.

* Around 90,000 ML of this total is used in sugar cane cropping (Wright 2004).
It is notable that, vegetable and grape irrigation uses proportionally less water per area of land than other agricultural activities, yet account for the greatest value of production (Figure 6). Wine exports are expected to grow considerably over the next 10 years. This has implications for irrigation development in the southern part of the State, where it is expected that much of the wine industry growth will originate, and where there was increasing competition for water for all uses over the period 1996-2001. Growth in the vegetable industry in the south of the State was also significant. When combined with growth in the fruit industry it is clear that the future demand for irrigation water in the south of the State will be strong.
6.1.5 The Value of Water to Different Industries

The economic returns to water (the asset value of water within the production system) is high for most horticultural production in Western Australia. The asset value of water for vegetables lies within the range $2,500 to $13,500 per megalitre for typical crops and averages $7,600 per megalitre in southern regions of the State (Brennan 2004). For fruit production in southern regions, the asset value for water ranges from $3,000 to $9,000 per megalitre for typical crops (Brennan 2004). In contrast, the asset value for water for irrigated dairy production is around $300 to $600 per megalitre for typical dairy farms, with highly productive farms achieving up to $1,500 per megalitre. For irrigated beef production, the asset value for water is almost zero (Brennan 2004). The asset value for water within horticultural industries is high enough to be competitive with most other consumptive uses in the State, particularly where water sources and irrigation are located away from the main Water Corporation system, which is the main competitor for agricultural water.

Additional water will be required by irrigated agriculture if it is to continue to meet export and domestic production demands. The options for securing additional water include:

- more efficient use of existing water;
- transfer from low value to high value uses, and
- the development of new water sources.

None of these activities (either alone or in combination) will deliver the optimum value of agricultural production per unit of water used unless a sound institutional water management framework can be established in Western Australia.

6.2 Future Irrigation Development

The development of future irrigation areas in Western Australia will be driven by the economics of the agricultural industry in combination with a sound water management framework (as discussed above). The Steering Committee believes that there is a need to identify and quarantine areas with suitable land, water resources and infrastructure in order to protect current levels of production, and to facilitate the future growth of irrigated agriculture.

6.2.1 Identifying Areas with Capability for Irrigated Agriculture

Identifying areas of land capable of sustaining irrigated agriculture, particularly horticulture, is important for both the planning of land use for future growth and for the allocation of water resources. For an area to be truly suitable for irrigated agriculture, land of the required suitability and capability must coincide with ample water supplies. The area must also satisfy a number of other critical criteria.

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10 Brennan (2004) modelled orchard fruit apples, plums, and oranges in the South West.
The ‘capability’ of an area of land refers to its ability to support a specified use without causing undesirable on-site or off-site effects. Land ‘suitability’ takes into account other factors affecting its use for agriculture (e.g. climate, water supply and labour availability).

Table 4 presents an estimate of the total area capable of supporting horticulture or irrigated agriculture by region.

**Table 4. Summary of Land Capability for Irrigated Agriculture by Region**

<table>
<thead>
<tr>
<th>Region</th>
<th>Capable Land Area (ha)</th>
<th>Current Area Irrigated (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metropolitan</td>
<td>155,200</td>
<td>5,620</td>
</tr>
<tr>
<td>Peel-Harvey</td>
<td>141,100</td>
<td>10,426</td>
</tr>
<tr>
<td>Whicher</td>
<td>153,900</td>
<td>5,331</td>
</tr>
<tr>
<td>Preston-Warren-Blackwood</td>
<td>504,100</td>
<td>5,966</td>
</tr>
<tr>
<td>Great Southern</td>
<td>2,309,100</td>
<td>3,212</td>
</tr>
<tr>
<td>Gingin</td>
<td>615,900</td>
<td>3,206</td>
</tr>
<tr>
<td>Mid-West</td>
<td>1,299,600</td>
<td>721</td>
</tr>
<tr>
<td>Gascoyne</td>
<td>17,600</td>
<td>950</td>
</tr>
<tr>
<td>West Kimberley</td>
<td>5,174,300</td>
<td>942</td>
</tr>
<tr>
<td>East Kimberley</td>
<td>59,000</td>
<td>9,878</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>10,429,800</strong></td>
<td><strong>46,252</strong></td>
</tr>
</tbody>
</table>

Note: Current area irrigated is as reported by ABS (2003) for 2001 census year.
(Source: Department of Agriculture WA 2004; ABS 2003)

It is significant that an extremely small proportion of the State’s ‘capable’ land (approximately five per cent) is irrigated currently. It can also be seen that all regions possess extensive areas of land capable of supporting irrigated agriculture. The West Kimberley with more than five million hectares has half the land identified (Wright 2004). Larger-scale production (defined as requiring single lot sizes in excess of 200 hectares) is constrained in the south of the State by small lot sizes, high land values and in certain instances by proximity to rapidly expanding residential areas.

6.2.2 **The Significance of Large Scale Production**

To remain competitive in export markets, irrigated agriculture will increasingly need to be carried out on larger scale enterprises. Within this context, both the West Kimberley and the Ord Stage 2 development are potentially significant. Ord Stage 2 alone has sufficient land and water available to irrigate up to 50,000 hectares (equal to the current irrigated area of the State) (Wright 2004). The important potential for expansion possessed by areas in the north of the State is therefore abundantly clear. The potential scale of irrigation development also highlights the need for future research to focus on the economic, ecological and social opportunities and impacts of irrigated agriculture in these areas (Cordner 2004).

The assessment presented in Table 4 is approximate and any areas proposed for development will need to be surveyed in greater detail. The determination of the suitability and comparative advantage of a horticultural development requires assessments of productivity factors (water availability and accessibility, climatic conditions and water quality), environmental factors (land degradation risk and off-site environmental impacts), and development factors (transport infrastructure, services and facilities, processing facilities and available skilled labour) (Kininmonth 2000). Pressures associated with urbanisation pose a real threat to irrigated horticulture in Wanneroo and other areas near Perth, and this must also be considered in future policy and investment planning.

6.2.3 **Climate Change**

Future plans for the development of agricultural areas should also recognise the opportunities and threats posed by climate change. The Steering Committee considers that a state-wide review of the potential impacts of climate change upon the future of irrigated agriculture will assist in future irrigation planning. The Steering Committee also acknowledges the importance of incorporating climate change risk assessments into all water resource management plans that impact upon irrigation.
6.2.4 **Forecasting Future Demand for Irrigation Water**

Clearly the adequate management of the State's water resources requires a sound understanding of the future growth in demand for irrigation water. Water demand scenarios for Western Australia from 1999-00 to 2020-21 were prepared in August 2000 as part of the National Land and Water Resources Audit (WRC 2000b). Annual growth rates in demand for water are forecast to be within the range 2.2 per cent to 4.9 per cent over the period 2000 to 2020. Similarly, the WRC report (2000a) estimated State growth rate in water demand to be 3.2 per cent, with regional growth rates in the range 2.3 to 5.2 per cent.

6.2.4.1 **Water Demand - South West Region**

Brennan (2004) examined growth trends in irrigated agricultural production across a range of sectors (vegetables, fruit, viticulture and dairy) and attributed future changes in growth and forecast demand for water to factors including the exchange rate and international competition for export markets. Estimated ranges for growth in agricultural industries are presented in Table 5. Future demand for irrigation water will be determined predominantly by export demand for produce. Horticultural production within Western Australia is growing at around five per cent per annum for vegetables and 10 per cent for fruit and is progressively becoming more export-oriented. While the favourable exchange rate of several years ago has contributed to this, the good standing of horticultural production in the State (“clean and green”) is expected to continue to deliver healthy growth (Brennan 2004).

**Table 5. Projected Industry Growth at End of 10 Years (Brennan, 2004)**

<table>
<thead>
<tr>
<th>Products</th>
<th>Growth estimate range</th>
<th>Products</th>
<th>Growth estimate range</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low (%)</td>
<td>High (%)</td>
<td>Low (%)</td>
</tr>
<tr>
<td>Domestic</td>
<td></td>
<td>Export</td>
<td></td>
</tr>
<tr>
<td>Vegetables</td>
<td>7.3%</td>
<td>16.6%</td>
<td>Vegetables</td>
</tr>
<tr>
<td>Fruit</td>
<td>7.6%</td>
<td>17.2%</td>
<td>Fruit</td>
</tr>
<tr>
<td>Dairy</td>
<td>6.9%</td>
<td>15.7%</td>
<td>Dairy</td>
</tr>
<tr>
<td>Wine</td>
<td>20.9%</td>
<td>45.8%</td>
<td>Wine</td>
</tr>
</tbody>
</table>

**Productivity Growth**

All activities 0-1% per annum

Note: “High” estimates are from ABARE. They are five-year projections and may be high for 10 years. Impacts of exchange rates upon export demand must also be taken into account – estimates provided may be high due to recent exchange rate trends. Domestic estimates are based on recent per capita consumption trends and low population growth assumptions (ABARE 2004).

As well as being influenced by growth in production, the future demand for water will also be impacted by the value of water and the efficiency with which water is applied. A possible interaction between these factors for the south-west of the State is illustrated in Table 6.

**Table 6. Impact of Water Value and Product Growth Assumptions on Total Water Demand by Irrigated Agriculture in the South West Region over 10 Years**

<table>
<thead>
<tr>
<th>Assumption</th>
<th>Change in total water demand relative to current figure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market Growth</td>
<td>Current Low</td>
</tr>
<tr>
<td>Water Value **</td>
<td>Current</td>
</tr>
<tr>
<td>$0/ML *</td>
<td>0</td>
</tr>
<tr>
<td>$1,000/ML</td>
<td>-25%</td>
</tr>
<tr>
<td>$500/ML</td>
<td>-20%</td>
</tr>
<tr>
<td>$200/ML</td>
<td>-14%</td>
</tr>
</tbody>
</table>

* The current scenario, where there are no effective limits to growth.
** Water is currently trading in the Victorian market at $1,450-1,500/ML.

11 Brennan 2004, Demand Curve Projections.
It can be seen that:

- Under the current value for water (approximately $0/megalitre), growth in demand over 10 years could lie in the range of seven per cent to 44 per cent.
- At the value of $1,000/megalitre (assuming opportunities exist to trade water at this value out of the irrigation sector), demand would be 25 per cent lower than it is currently. Under most optimistic growth scenarios (maximum production and zero productivity improvement) growth over 10 years would be only 14 per cent.
- At the relatively low value ($200/megalitre), both current and future demand would be dampened considerably.

The above serves to illustrate the complex nature of demand forecasting and the impact that pricing strategies and/or water trading can have on final projections.

### 6.2.4.2 Water Demand - Kimberley Region

Water demand in the Kimberley region is likely to be driven by growth in two main products – sugar and cotton.

**A. Sugar**

Seventy-seven per cent of Australia’s sugar production is exported. The outlook for sugar is impacted by low world sugar prices and an adverse exchange rate for export commodities (ABARE 2004). At the currently low world prices, resulting from a combination of increased competition from Brazil (Hildebrand 2002), and protectionism and trade policies in Russia, Europe and the United States (ABARE 2004), Australian sugar producers are struggling to cover their cost of production. Consequently, there are few drivers for expanded sugar production in Australia.

**B. Cotton**

All Australian cotton lint production is exported. The world cotton price is forecast by some to decline in the short-term due to an increase in world supply of raw cotton. In contrast to this ABARE (2004) also forecast an increase in world demand for textiles and an increase in China’s demand for raw cotton in line with its strong domestic economic growth. Australian cotton production is forecast to reduce as a consequence of reduced plantings of cotton in the eastern states due to reduced water availability (ABARE 2004). The ability of Australian growers to command a price premium over the Cotlook ‘A’ index is dependent on maintaining high quality fibre (ABARE 2004). The availability of irrigation water of suitable quality in quantity contributes to fibre quality. In relation to these factors, the prospects for large-scale cotton production in the Kimberley appear good. This is covered in more detail in Appendix 3.3.

### 6.2.4.3 Water Demand Driven by Exports

Apart from the slow growing local market (which is linked to population growth and to some extent to changes in dietary preferences), future growth in the demand for irrigation water is linked directly to export growth. Table 11 indicates that most of this growth will be driven by the southern horticultural industries, and dominated by the riskier export markets for fruit and vegetables and wine. In the event that cotton becomes established in the Kimberley region, water demand could increase far more significantly.

### 6.2.4.4 Water Sources

The avenues for sourcing such water for the expansion of irrigation and other uses are:

- trading within existing water schemes;
- the implementation of efficient on-farm and scheme management practices which maximise production per unit volume of water used and minimise water losses;
- additional exploitation of water sources that are currently under utilised; and
- the development of new water sources in areas that are suitable for irrigated agriculture.
6.3 WATER RESOURCE PLANNING AND WATER CONSERVATION PLANS

6.3.1 WATER RESOURCE PLANNING

6.3.1.1 THE NEED FOR INTEGRATED WATER AND LAND PLANNING

Water resource planning is primarily the role of the Department of Environment under the Rights in Water and Irrigation Act 1914. This requires the DoE to assess water resources and determine how much water should be retained within natural systems for environmental purposes and also how the remaining water should be shared between industry, agriculture and public water supply.

The Department for Planning and Infrastructure has prime responsibility for land use planning in Western Australia. It is essential that water and land use planning become more integrated. Future investment in irrigated agriculture will be determined by competition for water, access to capable land at scale, and by how the risks imposed by climate change are managed. The integration of land and water planning in concert with the implementation of a sound policy framework such as that offered by the National Water Initiative will foster an environment which is conducive to investment in large scale irrigated agricultural projects.

Significant planning documents which to some extent consider water resource issues include the Department for Planning and Infrastructure Planning Bulletin No. 26 (which considers the provision of an adequate water supply for subdivisions intended to support intensive horticulture) and the WA Planning Commission (WAPC) Statement of Planning Policy No. 2.5, which contains provisions for local authorities to plan for the protection of priority agricultural areas.

The WAPC also released a draft Statement of Planning Policy: Water Resources for public comment ending early December 2004. The draft policy requires land use decision-makers to take into account water resource issues in their decision-making and has the potential to be a major advancement in the integration of water resource issues and land use planning. The document also highlights the need to ensure that land use decision-makers have access to water resource information. A higher level of investigation and understanding of our water resources together with the plans relating to their future use will be critical to achieving a satisfactory degree of integration.

6.3.1.2 PRIORITY AGRICULTURAL AREAS

Priority Agricultural Areas may be secured by zoning them under regional and/or local planning schemes (Statement of Planning Policy 2.5 – Agricultural and Rural Land Use Planning Policy – WAPC).

Over the past decade, most of the areas of significance to agriculture between Perth and Augusta have been identified and zoned as Priority Agricultural Areas. This has not occurred in the Perth region where uncertainty still exists. For example, part of Wanneroo has been identified by local government planners as a Rural Resource Zone. Under a draft land and water strategy for East Wanneroo proposed by the Department for Planning and Infrastructure, parts of the same area are zoned urban and rural residential. This creates great uncertainty among growers and deters landowners from investing further in the development of their properties and irrigation systems.
6.3.1.3 Horticultural Precincts

Horticultural precincts are priority agricultural areas which are devoted specifically to horticulture. Horticultural precincts promote production efficiency. They also facilitate the efficient use of water, minimise unplanned environmental impacts and allow services (power, water, roads etc.) to be supplied in an optimum manner. Large horticultural precincts also encourage local processing, thereby creating new industries and hence jobs for the region.

The Steering Committee recommends that the scope for creating horticultural precincts be investigated with highest priority being given to Wanneroo and Myalup (west of Harvey).

Both of these areas have great potential since they have:
- suitable soils and available water;
- appropriate climates;
- access to well-developed infrastructure; and
- suitably skilled labour.

The precinct proposed for Wanneroo is a special case. Currently, horticulture in Wanneroo is under pressure. Urban development is encroaching on farming areas and water supplies are being restricted as wetlands are impacted by a declining water table. The creation of a precinct on land currently occupied by the Gnangara pine plantation north of Old Yanchep Road would provide an opportunity for existing growers to relocate. The creation of a large precinct would also allow treated waste water sourced from the northern suburbs to be used for irrigation. It would also utilise existing transport and other infrastructure. These topics are discussed further in Appendix 3.3 Paper – Gnangara Mound. The case for a Myalup Horticultural Precinct is covered further in Appendix 3.4.

6.3.2 Water Conservation Plans

The State Water Strategy requires all applications for licences (new as well as renewals) to be accompanied by an acceptable Water Conservation Plan.

Water Conservation Plans include, among other things, targets for improving the efficiency with which water is used. These targets, once approved, form part of the conditions under which a licence is issued and are therefore enforceable. The Steering Committee supports the use of Water Conservation Plans subject to the provision that plans are realistic and give due consideration to the needs of all parties.

6.4 Water Use Efficiency

Considerable potential exists to save water by improving the efficiency with which water is distributed within irrigation schemes. There is also scope for savings to be made ‘on-farm’.

Both of these matters are considered in this section. The importance of benchmarking and the desirability of water achieving a realistic value are also canvassed.

6.4.1 Improving Irrigation Scheme Efficiency

As discussed previously in this report more than 50 per cent of the State’s irrigation water is distributed by the Ord Irrigation and South West Irrigation Schemes. Both of these areas use mainly open channel systems to deliver dam water to farms. As a result, losses in the form of leakage and evaporation from open channels are estimated to be within the range of 21-30 per cent of water delivered (ACIL Tasman 2004; OIC 2004). Thus approximately 70,000 megalitres per annum are lost compared with 260,000 megalitres consumed by crops.

Harvey Water has demonstrated that there is significant potential to save water by piping the Waroona district distribution system and by so doing, saving 3,600 megalitres per annum. The possible extension of the piping program to other districts has been investigated and supported in a report prepared for the Steering Committee Options to improve efficiency of Irrigation Water Use in WA (ACIL Tasman 2004).

The Steering Committee supports the findings of the ACIL Tasman report subject to further consideration being given to the merits of piping the Collie Irrigation District where soil types may make it preferable for water to be traded out of the District to other uses. This topic is covered further in Appendix 3.4.
6.4.2 On-Farm Water Use Improvement

The potential to save water on-farm is also high. For example, the conversion from “flood” to centre pivot irrigation can reduce water consumption by between 15 and 27 per cent (ACIL Tasman 2004). Similarly, some vegetable crops irrigated with drip tape systems use half the water that they would were they irrigated by centre pivot (Thomas 2004).

A number of important factors influence the rates at which improved on-farm systems and practices are adopted. One of these is the cost of changing to a new system compared with the benefits that accrue from saving water. The “opportunity cost” or “value of water” is very important in this context and is discussed subsequently in Section 6.4.3.

Costs and benefits aside - and with the qualification that best management practices and technology vary with crop type, planting density and farm layout - the following general principles apply:

- Systems should be designed to minimise water losses, and be used with effective irrigation scheduling which ensures that watering occurs only when necessary. Irrigation scheduling should be based on measurement of local evaporation rates and soil moisture monitoring.

- Dripper systems and mini-sprinklers in combination with irrigation scheduling should be used for most perennial and annual crops. (Drippers are not suitable for surface feeders such as avocados and are not suitable for apple trees. Mini sprinklers are preferred for many perennial crops in Mediterranean climates.)

- Systems designed for annual crops should distribute water uniformly thereby avoiding waste. Leafy vegetables which require humidification in hot summer months should be produced in cooler areas of the State.

- Pasture and fodder crops should use centre pivots in preference to flood irrigation (ACIL Tasman 2004).

6.4.3 Benchmarking

Benchmarking between irrigation schemes and on-farm practices helps identify opportunities to improve efficiency and also provide a basis against which future improvements can be assessed. Work undertaken for the Australian National Committee on Irrigation and Drainage (ANCID) establishes that benchmarking on-farm:

- Provides an objective appreciation of the status of on-farm irrigation performance broadly defined to include the irrigation system, the environment and farm management practices.

- Influences farmers to adopt better practices and thereby improve sustainability, productivity and profitability.

- Acts as a measure to monitor change. (Hydro Environmental Report to ANCID/LWRRDC, 2000).

As mentioned elsewhere in this report, little progress will be made while there is no requirement to meter usage and/or little or no economic value is assigned to water as an input to production. Benchmarking between irrigation schemes is also highly beneficial. The South West Irrigation Area, Ord Irrigation Area and Carnarvon Irrigation Area are all involved in the national benchmarking project managed by ANCID. This project tracks performance in the areas of operations, environment, finance, water access arrangements, customer service and social impacts.
6.4.4 The WaterWise On the Farm Program

WaterWise on the Farm (WWOTF) is an extension program aimed at measuring the capacity of irrigators to increase productivity by improving on-farm water management, and adopting practices that sustain land and water resources on and off the farm. The Department of Agriculture has adapted the course for use in Western Australia and programs have been conducted in a number of areas including Wanneroo and Myalup. An evaluation of the first two years of WWOTF in Western Australia revealed that the program was useful in training and providing irrigators with information on best practice and that 74 per cent of participants intended to make changes to their systems over the next 12 months. The Steering Committee supports the WaterWise on the Farm program but notes that the adoption of more efficient irrigation systems depends on much more than the provision of information and training (see comments elsewhere in this report on metering, market-placed policy reforms, security of title etc.).

6.4.5 Establishing a Market Value for Water

The current low (or zero) value placed on water clearly influences the efficiency with which it is used. The Department of Agriculture Western Australia (2000b) and Brennan (2004) among many others emphasise the need to change pricing policies in order to influence water use. The legislative and policy changes needed to impact the value placed on water are covered comprehensively in a report prepared by Freehills and Gardner for the Irrigation Review Steering Committee. The findings and recommendations of this report are presented in Section 8. The Steering Committee is of the view that until water is assigned (or achieves) a realistic value, the impacts of most (if not all) of the initiatives discussed previously in Section 6.4 will be minimal.

Currently, members of irrigation cooperatives cannot trade their water to entities or individuals outside the cooperative. Allowing water to be traded to outside entities on a temporary basis is likely to increase the economic value of water to irrigators and thereby increase the investment in activities which improve on-farm efficiency.

In practice, the possibility of this form of trade is restricted to members of Harvey Water since this is the only area with a suitable connection to other entities outside the area.

6.5 Recommendations for Improving Water Use in Irrigation Industries

6.5.1 Future Irrigation Development

- Identify and delineate areas with suitable land, water and infrastructure to facilitate future growth in irrigated agriculture.
- Consider urbanisation impacts in planning for future irrigated agriculture.
- Undertake a state-wide review of the possible impacts of climate change on irrigated agriculture.
- Incorporate climate change risk assessments into all Water Resource Management Plans.

6.5.2 Integrated Land Use and Water Resource Planning

- Further integrate water and land use planning by preparing guidelines for sustainable horticultural precinct planning.
- Implement Priority Agriculture Zones as horticulture precincts in Gnangara and Myalup.
- Support comprehensive review and project assessment for irrigation expansion in the West and East Kimberley areas.
- Investigate, as a matter of urgency, other potential horticultural precincts where suitable land and water resources coincide.
- Assess socio-economic impacts of inter-sectoral trade of water away from agriculture, proposed for the South West Irrigation Area.

6.5.3 Water Use Efficiency

- Examine and, where appropriate, invest in opportunities to reduce distribution losses in irrigated agricultural systems (e.g., support for system piping of Harvey Water, as per ACIL Tasman 2004 report, subject to reconsideration of Collie Irrigation District piping described in the Paper – Harvey/Myalup Horticultural Precinct presented in Appendix 3).
- Require the preparation of Water Conservation Plans as part of future water use approvals and renewals.
- Require on-farm metering of water use for allocations of more than five megalitres per annum.
- Research and establish water use benchmarking within irrigation industries in Western Australia.
- Permit temporary trading outside existing irrigation schemes as a minimum policy approach and over time consider allowing permanent trades.
- Expand the WaterWise on the Farm training program to provide technical support to irrigators state-wide, access to information and increase level of knowledge.

13 Freehills, in association with Alex Gardner, Aspects of Laws Relating to Irrigated Agriculture in Western Australia 2004.
7. IMPROVED GOVERNANCE OF WATER RESOURCES IN WESTERN AUSTRALIA

7.1 AN URGENT NEED TO IMPROVE WATER GOVERNANCE

The Department of Environment has responsibilities for managing all water resources within the State (surface water and groundwater) to achieve sustainable economic development, while protecting ecosystems and the environment. Water use in Western Australia doubled between 1985 and 2000, and is expected to double again by 2020 (GoWA 2003). This situation occurred over a period when climate change caused a significant reduction in runoff into south-west storage dams, and when predictions were (and are) for this to persist for 100 years.

Management of water resources has not kept pace with the demands for and pressures being placed on water resources. Specifically:

- Growing demand from a number of sectors has resulted in competition for increasingly scarce water resources.
- There is insufficient detailed scientific knowledge to ensure that management, allocation, water market trading, and protection of environmental systems are carried out properly. Monitoring of water use through metering and the collation and use of metering/monitoring data has been limited. The inadequacy in data leads to an inability to manage the resource properly.
- The framework for water entitlements is deficient in that it does not include mechanisms for correcting over-allocated systems and therefore creates uncertainty among users.
- In certain policy areas the water resource manager is allowed to exercise too much discretion over the allocation and re-allocation of water entitlements.
- There is no high-level strategic plan for water.
- Water resource management policy is not as clear as it should be.
- Information on the status of water resources is not readily available to the public.
- Some of the water manager’s systems and processes are inadequate.

7.2 ROLE OF DEPARTMENT OF ENVIRONMENT IN WATER RESOURCE MANAGEMENT

The Department of Environment was created in 2002 by amalgamating the environmental regulator (Department of Environmental Protection - DEP) with the water resource manager (Water and Rivers Commission - WRC).

As water resource manager, the DoE:

- evaluates water resources and determines quantities available for allocation;
- balances the sometimes conflicting needs of disparate user categories (e.g. environment and agriculture);
- allocates shares of a given water resource and issues licences to applicants;
- monitors the state of the resource; and
- ensures compliance by licensees with their licence conditions.

The DoE, in its other role of environmental regulator, takes responsibility for all water allocated to the environment and is, in effect, a de facto licensee. Clearly a potential conflict exists between these roles.

This is recognised in the report on the management and structure of the DoE (Carew-Hopkins 2003). When referring to potential for conflict of interest, the report states:

“Cases could occur where the WRC is the proponent and the Director General has compliance audit responsibilities for Ministerial conditions set on the Commission. These cases relate primarily to water allocation.”

There is also a strong perception among a significant number of irrigators that a conflict does exist and this detracts from the credibility of Department of Environment as an independent water manager. There is also a view that the WRC is influenced unduly by the environmental regulator; has developed a “command and control” mentality and is reluctant to embrace water reforms of the type advocated by CoAG in the National Water Initiatives. This perception is detrimental to the WRC’s operation.

The Steering Committee considers the dual roles of the DoE to be inappropriate and similar to the situation that existed prior to 1996 when water resource management was the responsibility of the (then) Water Authority of Western Australia. The situation eventually led to the creation of an independent Water and Rivers Commission. Therefore, the Steering Committee believes the Department of Environment’s dual roles to be inappropriate.
7.3 MANAGEMENT STRUCTURE FOR WATER RESOURCE MANAGEMENT

The relations which existed between the various entities involved in water management in 2004 are presented in Figure 7. Apart from the existence of the new Minister for Water Resources, the current situation is a close approximation to that shown.

The features of the structure are:

- Four ministers (Treasury, Government Enterprises, Environment, Planning) are involved in water decision-making and management, making the coordination of the various aspects of governance and management difficult.
- The existence of a Water Resources Cabinet Sub-Committee, chaired by the Premier, demonstrates the commitment from the government to better coordination and management of water-related issues.
- The need for a Water Taskforce responsible for the State Water Strategy (this in part reflects the importance the government places on water, but it also reflects the difficulty of creating effective strategies within the existing structure).

Additionally, although the Department of Environment is an operating entity, the legislation which authorises it to operate has yet to be passed by Parliament. Carew-Hopkins (2003) notes that this has some detrimental impact on operating efficiency in the areas of Corporate Services and Divisional Management. A similar situation exists for the Water Corporation where, under the current structure, ultimate responsibility is vested in the Minister for Government Enterprises. Legally, however; the Minister for the Environment is responsible for the management of water resources in Western Australia. Consequently, decision-making and communications are more complicated than is desirable.

The Steering Committee considers the current governance structure to be complicated, cumbersome, open to accusations of conflict of interest and therefore in need of change.

7.4 EFFECTIVENESS OF WATER RESOURCE MANAGER

The effectiveness of water resource management within Western Australia as well as the effectiveness of the Department of Environment as a manager have been the subject of extensive comment and of a number of reviews and reports. All reports are consistent in asserting that water resource management in the State and the DoE’s performance falls short of what is required.

It is also accepted that over a period of growing demand and water shortage due to climate change, funding for water resource management has fallen by approximately one-third in real terms.

Following the preliminary response by the Department of Environment to the Auditor General’s report, the State Government has provided additional funding for the DoE to address specific issues ($1.136 million for 2003-04, $2.3 million for 2004-05, $3.82 million for 2005-06, $3.364 million for 2006-07, and $3.446 million for 2007-08). A further $1.97 million of additional funding has been provided to the DoE for 2004/05 and subsequent years. The Steering Committee understands that, as a consequence, backlogs in the processing of licence applications and in processing technical data are being reduced.

While recognising and applauding the steps taken to date, the Steering Committee also notes that much remains to be done before the DoE’s performance and water resource management in Western Australia can be considered satisfactory. For example, irrigators in the Gnangara area continue to cite instances where licence renewals and transfers are delayed, although this in part may be due to the fact that the aquifer is under stress and managers are therefore reluctant to act expeditiously. It also indicates that water resource management systems have largely failed over an extended period of time. Hence, a comprehensive improvement in the efficiency and effectiveness of management systems and organisational processes is needed.

Carew-Hopkins (2003) stated:

“There is a general view that there has been some ‘deskilling’ of the DEP and WRC over a number of years, particularly in the areas of water resource investigation and planning ……”

He also identified the need for a “cultural rescue” and called for changes in style which:

“………influence how the Agency responds to the community and how staff within the Agency work together.”

The Steering Committee was also presented with anecdotal evidence of this during the community and industry consultation for the Irrigation Review. Clearly the correction of this situation will take time and be dependent on factors additional to funding.

Work has started on addressing this issue; however, irrigators’ perceptions of the DoE suggest that this work needs to be ongoing and if anything intensified.
7.5 **IRRIGATION COOPERATIVES**

Irrigation cooperatives, although separate from government, play an important role in the management of water in this State. Between them, the Harvey, Gascoyne and Ord Irrigation Cooperatives control two-thirds of the water allocated to irrigation and service almost half the land under irrigation in Western Australia.

Irrigation cooperatives are closed cooperatives owned by the irrigator members and managed by a board elected from and by irrigators. Typically, at least one additional board member (an independent director who has specific expertise in an area such as finance, engineering or corporate governance) is also appointed.

Cooperatives operate under a two-tiered structure:

- An entity which owns, maintains and upgrades the distribution system (asset cooperative).
- A second entity that distributes and charges for water and ensures members comply with the cooperative's regulations (management cooperative).

Charges are set to cover operating and maintenance costs, future replacement of distribution assets and their progressive upgrading.

Although the four cooperatives are at different stages of maturity (Harvey was formed in 1996), all have had a positive impact on their areas of responsibility. In particular, the Irrigation Review has found that:

- Well-planned ongoing maintenance programs are now in place, and maintenance costs for scheme areas are declining.
- Distribution assets have been upgraded.
- Operating efficiency and compliance by irrigators have both improved.

The Steering Committee believes the concept of self-management by irrigators to be successful and where appropriate should be applied elsewhere within the State.

7.6 **THE PLANNING ROLE IN WATER RESOURCE MANAGEMENT**

7.6.1 **WATER RESOURCE PLANNING**

Water resource planning is carried out by the DoE to establish the availability and status of the resource, and to facilitate management and allocation of water. Water resource planning provides a mechanism for government and the community to understand and balance economic, social and environmental objectives (Freehills – Gardner 2004). Allocation takes place within a planning framework that determines the sustainable yield for consumptive usage from a water source after accounting for important environmental and social water requirements. Allocations for purposes such as public water supply, mining, industry and agriculture are made from the estimated sustainable yield.

7.6.1.1 **THE NEED FOR BETTER INFORMATION IN PLANNING**

These water allocation and planning processes need to be based on detailed scientific knowledge which pertains to the availability and status of the water resource (Freehills-Gardner 2004), and allocation plans should be prepared with comprehensive community input in order to ensure fairness and equity in allocation decision-making. Efficient allocation and management of water requires a robust and consistent water allocation system (Young and McColl 2003). Water resource plans also need to be statutory-based in order to support a market-based system for water trading. (Freehills – Gardner 2004)

7.6.1.2 **THE NEED FOR MORE CONSISTENCY IN ALLOCATION**

The DoE’s preliminary response to the Auditor General’s Report notes that immediate action is required in the area of water resource planning. This involves setting:

“......sustainable allocation limits, determined with appropriate certainty for all of the State’s groundwater and surface water resources in the Department’s water allocation database......”

This is a priority which the Steering Committee supports strongly. The Steering Committee notes the words “appropriate certainty” in the above response. At times the DoE has used insufficient understanding of certain aquifers as a reason for not moving towards the general principles of good water resource management as outlined in the principles of the National Water Initiative (as agreed by CoAG, including Western Australia, in August 2003).

While the amount and detail of information needed is a matter of judgement, the Steering Committee notes that the DoE’s policy of ‘err on the side of caution’ will have significant associated costs in the form of loss of the benefits which would otherwise have resulted had reforms been introduced sooner.

7.6.1.3 The Value of Partnership

Partnerships between government and water users in water resource planning are essential in order to capture community and industry values in resource management plans, and in decision-making on resource allocation. Water resource management committees are one mechanism for achieving this partnership between government and community. However, only two committees (Whicher and Gingin) have been established to date, with no comprehensive water resource management plans completed through these groups. An increased focus on developing these comprehensive water management plans is needed, with possibly increased resources and funding to support this work.

7.6.2 Strategic Planning for Water

Although the needs to improve water resource planning and to better determine sustainable allocation limits are both critically important, the absence of adequate strategic planning for water is even more critical. An important role of the water resource manager is to:

- Take a state-wide strategic view of the future demand for water;
- Evaluate the range of reasonable options for meeting each sector’s demand for water;
- Establish, from an overall State perspective, how best each segment of demand will be satisfied or managed.

Unless this is done, competition will develop between industry sectors trying to optimize their own outcomes. As a result, the outcome from the State perspective will be sub-optimal.

There is evidence that this situation has occurred in Western Australia as illustrated by:

- The Gnangara Mound, where competition exists between irrigators, the Water Corporation, the DoE and the forestry industry. In the absence of a clear strategy, it is hard to find a definite solution.

- The failure to recognize in time the true potential for excess water from the Harvey/Wellington dam area to be a viable source of water for Perth.

- The continuing debate over the Kimberley as a potential source of water for Perth together with the progressive emergence of new ways of transporting water from Kimberley to Perth.

- The inability to evaluate and prove the potential of the South West Yarragadee in time to possibly defer the desalination plant.

The Steering Committee recommends that the capability to carry out strategic water planning be increased substantially.

7.6.3 Coordination of Land Use Planning with Availability of Water

The further development of irrigated agriculture within Western Australia will require areas which possess suitable land and adequate water to be identified. This implies the need for the planning of land use and the planning and management of water to be integrated closely.

During the review, the Steering Committee was presented with clear evidence of the need to improve the degree of co-ordination between the water resource manager, industry and planning authorities both at State and Federal level.
7.7 RECOMMENDATIONS FOR GOVERNANCE AND MANAGEMENT OF WATER RESOURCES

7.7.1 STRUCTURE

- Create a new Ministry for Water Resources with responsibilities for water resource management, water policy, strategy and planning and the water utilities.

- Establish a new Department of Water Resources (DWR) by combining
  - the water resource management functions of the Department of Environment;
  - the State Water Strategy Unit;
  - the Office of Water Policy; and
  - relevant functions within the Water Corporation
  into a single department which is completely separate from the environmental protection component of the DoE (See Figure 8).

- Structure the proposed DWR so that Operational Management and Strategy, and Policy and Planning are carried out in two distinct divisions with each function having its own management structure and dedicated budget.

- Retain the SWSTF to oversee the implementation of these recommendations.

- Develop a State Water Plan and so establish a strategic framework within which the future demand on the State’s water resources can be determined and managed effectively.

7.7.2 WATER RESOURCES STAKEHOLDER REFERENCE GROUP

- Realign the Water Resources Stakeholder Reference Group as an advisory group to the Minister for Water Resources.

- Ensure that the members of the Water Resources Stakeholder Reference Group not only understand the views of their stakeholders but also are knowledgeable about modern water management and the issues associated with water reform.

7.7.3 WATER RESOURCES CABINET SUB-COMMITTEE

- Regularly review the need for the Water Resources Cabinet Sub-Committee. As the new ministry becomes effective, it is anticipated that the need for the Sub-Committee will diminish, and possibly disappear.

7.7.4 EXTENSION OF SELF-MANAGEMENT BY USERS

- Investigate how self-management might be applied to self-supply areas with a high density of irrigated agriculture. The final option may or may not involve creation of new irrigation cooperatives.

- Investigate appropriate mechanisms for community, industry and other stakeholder partnerships in water resource management, including a review of the role and effectiveness of water resource management committees in providing community, water user and industry input into the water allocation and planning process.

7.7.5 OPERATION OF THE PROPOSED DEPARTMENT OF WATER RESOURCES

- Ensure that the DWR is funded to an appropriate level and that at all times at least equal emphasis is placed on strategic matters as on operational issues.

- Establish within the DWR a group of experts with the appropriate skills to evaluate and determine a long-term water strategy (and plan) for the State.

- Give a high priority to water resource planning within the DWR.

- Continue to work on the development of a positive, customer-oriented and participative culture within the DWR.
7.7.6 **Integration of Water Resource Planning with Land Use Planning**

- Require the proposed DWR to effectively engage industry, community, planning authorities and other agencies to ensure land and water resource planning are integrated.
- Investigate opportunities to encourage the development of long-term, large-scale, sustainable, and water-efficient agricultural enterprises by creating horticultural precincts.

7.7.7 **Water Resource Management Capacity Building**

- Develop and implement programs specifically aimed at building an efficient and competent water resource management capability within relevant government agencies, water resource management committees and stakeholder groups.

*Figure 8. Recommended Organisation Structure*
8. LAWS, POLICIES AND PRACTICES IMPACTING ON THE MANAGEMENT OF IRRIGATION WATER IN WESTERN AUSTRALIA

8.1 INTRODUCTION TO LAWS AND POLICIES FOR WATER MANAGEMENT

This section of the report presents:

• an overview of how the significant laws, policies and practices impact on the management and use of water for irrigation within Western Australia;

• an evaluation of their appropriateness or otherwise in supporting the objective of water reform in Western Australia; and

• a series of recommendations designed to improve those areas considered by the Steering Committee to be deficient.

In presenting this section of the report, the Steering Committee has drawn heavily upon and used abstracts from a report prepared for it by Freehills in association with Alex Gardner, Environmental Law Consultant. The report, entitled *Aspects of Laws Relating to Irrigated Agriculture in Western Australia* is available upon request.

At present, water management in Western Australia relies on the Department of Environment using its discretion to allocate water to competing users. The conditions under which a licence is granted, together with the duration of a particular licence, are also discretionary.

This approach may have been appropriate in an environment where there was little demand on water resources. However, at a time when water availability is declining and demand increasing, the current approach suffers from the major disadvantage of failing to provide users with sufficient incentive to save water. Indeed, in certain situations the Steering Committee believes that current policies act as a disincentive to effective and efficient use. In addition, the current system does not allow market forces to facilitate the movement of water to higher value usage.

The Steering Committee strongly recommends the use of an appropriately regulated market to promote a water-efficient sustainable irrigation industry. The recommended reforms need to be developed as a package, but it should be acknowledged that for them to work the management and regulatory regime would need significant strengthening across most functional areas.

8.2 ESSENTIAL FEATURES OF A WATER MANAGEMENT SYSTEM

In 1994, the CoAG Water Reform Framework Agreement committed the Commonwealth, states and territory governments to reform the Australian water industry. The main reforms required by CoAG were for legislation and policies related to irrigation which:

• more formally defined private rights to water use;

• promoted competition in order to increase the value placed on water;

• established tradeable entitlements;

• permitted effective trading by separating rights to water from land titles; and

• provided water for the environment.

More recently, CoAG announced its intention to refresh the 1994 reforms with the National Water Initiative (NWI) (CoAG 2003). The NWI emphasises the importance of fully functioning water markets as a mechanism for underpinning investment in water-efficient systems and initiating a transition by water to higher value uses.
Within this context the Steering Committee believes that the following principles should guide reforms to water resource management policies and practices in Western Australia:

• Creation of wealth and increased efficiency of water use is dependent on investment - the lower the level of risk the higher will be the level of investment for a given return on capital. Hence, secure and “bankable” water entitlements are critically important to a healthy irrigation industry. Ideally, entitlements to water should be granted in perpetuity. CoAG, through the NWI, promotes investment by increasing the confidence of potential investors in the water industry. It does this by providing secure access entitlements, better registry arrangements, improved monitoring, reporting and accounting and better access to information.

• Provided that an appropriate strategic water management framework exists, the market determines best where water is used and what it is used for. CoAG promotes water trading to set an economic value on water. It also recommends charging for water at a price which at least recovers the full cost of providing it.

• Water users should be accountable for impacts on the environment. The efficient use of water is usually consistent with the delivery of improved environmental outcomes. For example, moving from flood to trickle irrigation saves water which may have benefits for the environment. The investment required for this will be facilitated by secure water entitlements coupled with a robust system of water trading.

• All decisions relating to water resources and their management should be based on an adequate level of sound technical knowledge. As noted before, compromises will always need to be reached between what is considered “commercially adequate” as opposed to “scientifically adequate”.

• Where adjustments to allocations are needed, any burden should be shared in an equitable manner among all parties. CoAG recommends that entitlements relate to a share of a resource rather than to an absolute volume of water. A key element of the NWI framework for water entitlements is “the clear identification and assignment of risks between governments and water users over possible future reductions in water availability.” Under this framework, guidelines are needed on how the risks of resource availability are shared, including the risks of changes to water access entitlements created by changes in government policy. In this situation, the risk is borne by government and fair compensation should be paid in accordance with established guidelines.

8.3 CURRENT LEGISLATION, PROCEDURES AND CONSTRAINTS

Water resources are controlled in Western Australia under the Rights in Water and Irrigation Act 1914. Significant review of this Act was undertaken during 1999 to 2001, resulting in amendments to the Act in 2001. These amendments were intended to establish tradeable water entitlements, to improve the nature of water entitlements from CoAG 2003, and to enhance the protection of environmental water. Submissions to the Irrigation Review have identified constraints that still exist within the water legislation and policies in Western Australia and that prevent the full extent of the CoAG objectives for water from being achieved.

8.3.1 NATURE OF ENTITLEMENTS

• **Statutory Specification**
  Under the RIWI Act 1914 the right to water, together with the right to use and control it are vested in the Crown. The Act also empowers the water resource manager to issue licences for the private use of water. The RIWI Act 1914 does not clearly specify the nature of the entitlement granted. Clear specification of entitlements is needed in order to facilitate trade in water and water-related products, and the unbundling of water rights is critical to this process (ACIL Tasman 2003).

In addition, the water resource manager has the power to specify such terms and restrictions as it thinks fit on a licence entitlement. This ‘reserved power’ contravenes an essential characteristic of an efficient market, i.e. that all parties to a particular transaction know what they are trading or investing in. Separating the water access entitlement from the licence to use will reduce the need for a ‘reserved power’.
• **Current Practice**

The Department of Environment issues licences which specify a volumetric allocation together with the purpose for which the water may be used. Allocations are determined by applying a standard volume per hectare for the particular crop to the number of hectares to be irrigated. A number of instances have been drawn to the attention of the Steering Committee which suggest that this method gives rise to anomalies between the amount of water granted and the amount required.

Water is generally allocated on a first come first served basis (gifted), hence there is no requirement that the user achieves an effective outcome. Water trading is a mechanism for moving water towards a higher value use but this is not operating effectively in Western Australia.

Changes to cropping areas, crop types or crop locations and potentially rotational cropping (an essential prerequisite to growing vegetables successfully) may cause the irrigator to be in breach of licence conditions (Freehills – Gardner 2004). While irrigators can apply to change the purpose of their water use, this unnecessarily constrains those who have already proved they are legitimate water users. It is also administratively inefficient.

There has been no effective monitoring of water use against the area under irrigation by the Department of Environment, which means this mechanism is not working and could therefore easily be changed. A system under which a share of the available resource is auctioned and usage metered is preferable. Under such a system the user would bear the supply risks and be able to apply the water to any practical, efficient and legal use.

The current practice also ties water rights to land as well as to land use and by so doing contravenes a key element of the CoAG reforms - the separation of water entitlements from land titles. As a consequence the development of an effective water trading market is inhibited and licensees are constrained unnecessarily.

• **Eligibility for a Licence**

Although it is no longer necessary to own or occupy land in order to hold a licence, an applicant still needs to demonstrate the legal right to access the land from which water will be taken. The ability to trade is also linked to the land as licences can be traded only between people eligible to hold a licence. This deters brokers from entering the market and facilitating secondary market trades. It also restricts the rights of financiers in cases of default and accordingly diminishes a licence’s “bankable” value.

• **Irrigation Schemes**

In the case of irrigation cooperatives, the cooperative, rather than its members, is granted the entitlement to water. Water is then allocated to individual members by the cooperative under the conditions set out in its articles of association. Irrigators can also trade their entitlements in accordance with the cooperative’s rules provided both parties are members of the scheme. Irrigators are prevented from trading water directly with parties outside the scheme. However, in the case of Harvey Water, the cooperative trades bulk water with the Water Corporation. This is permitted because the Water Corporation is a member of the cooperative.

8.3.2 **Security of Entitlements**

The Freehills–Gardner (2004) report notes:

“Rights covering only a short time or which have significant risk of uncompensated reductions in the share of the available resource provided for the duration of the entitlement mean that water users, and financiers, are more uncertain about whether they will have access to the water in the future. Uncertainty about the individual right-holder’s security of tenure can reduce the value of the water entitlement, impede investment and impact on the efficiency of trade.”

• **Duration of Licences**

Under the RIWI Act 1914 licences may be granted either for a fixed or indefinite period. Normally licences are issued for the life of a project up to a maximum of 10 years.
The Steering Committee received numerous representations to the effect that this practice inhibits investment and detracts from the value of a water entitlement. Water entitlements should be treated as equivalent to a ‘lease in perpetuity’ balancing the desire of water users for a secure entitlement and the needs of the community to adaptively manage our natural resources. Under an efficient and fair system, the licence holder is entitled to continuing access to the entitlement; however, the reliabilities and other parameters of that entitlement may be amended.

• **Renewal of Licences**
Under current practice, licences are almost always renewed for a further term provided licence conditions are met. Where the volume of water under a licence has not been taken consistently, the licensed volume may be reduced.

It is the practice of the Department of Environment to permit licences to be renewed prior to their expiry date, thereby avoiding the situation where the value of a licence expires with the licence. This to some extent improves the value of a water entitlement as a security against borrowing. However, many projects require more than 10 years to justify the original investment, hence financiers downgrade the security rating of a water entitlement, even though it is capable of being renewed before its expiry date.

• **“Use it or lose it” Policy**
The Department of Environment is empowered to amend a licence when, in its opinion, the quantity of water granted under the licence has not been used consistently. The current policy relating to the exercise of this power is set out in the *Statewide Policy Number 11 – Management of Unused Water Entitlements*. The Steering Committee understands that the “use it or lose it” policy arose out of widespread irrigators’ concerns over the possibility of speculation in water entitlements.

It is apparent that *Statewide Policy Number 11* embodies some protection for users and the intention is for it to be applied cautiously and with discretion by the DoE. This notwithstanding, it is the Steering Committee’s view that the powers:
- act as disincentive to investment by users to save water;
- sometimes encourage irrigators to waste water to ensure the licensed volume of water is used;
- reduce the worth of a water licence as security; and
- provide too much discretion to the resource manager.

Furthermore, though ‘speculation’ is always a possibility, the Steering Committee was unable to identify any significant evidence of this within jurisdictions possessing an efficient water trading market. In fact, the case was put that the possession of a reasonable quantity of water by ‘non users’ facilitated trade and made sure that genuine users in need of water could always obtain it at a price determined by the market. Moreover, speculators bear downside as well as upside risk, which can be beneficial to genuine users wanting to expand their business.

• **Rights to Compensation**
Compensation is not payable where the right to water is removed under the “use it or lose it” policy. The DoE also has the right to amend a licence in the public interest (e.g. to provide water for domestic consumption or to promote recreational fishing etc.). Under these circumstances compensation is payable.

Licensed volumes can also be reduced for a number of other reasons which include:
- prevention of detrimental impacts on other users;
- protection of the environment; and
- protection of the resource where it is insufficient to meet the demand.

Under the current *RIWI Act 1914*, compensation under these occurrences is payable only if the water use was “reasonable”, if the reduction is permanent, and if a particular licence holder suffers a greater impact than do other licence holders. *Freehills – Gardner (2004)* state that, in practical terms, payment of compensation is therefore limited to water reclaimed for ‘public purposes’.

On balance, the Steering Committee believes that the conditions under which licences can be amended, together with the provisions under which compensation is payable, are detrimental because of the uncertainty they engender and the adverse consequences which result.
8.3.3 **Registration Systems**

The *RIWI Act 1914* provides for the establishment of a Register of Instruments including licences granted under the Act.

It is widely held that a modified Torrens-based titling system is preferred for water titling (Freehills – Gardner 2004; ACIL Tasman – Freehills 2004). The features of such a system would include:

- a State guarantee of the accuracy and integrity of the register;
- indefeasible titles;
- the ability for transfers and encumbrances affecting the water right to be registered;
- the ability for lenders to register their interest independently of the licensee;
- notification to registered interest holders of any dealings in respect of the entitlement;
- public accessibility in every aspect.

The current system is not government guaranteed, can be of a form determined by the Department of Environment, and falls short to varying degrees of all the desirable attributes itemised above. The Steering Committee therefore considers the current registration system to be inadequate.

8.4 **Allocation, Planning, Monitoring and Enforcement**

Sustainable water management must be based on reliable water allocation processes which cater not only for the needs of irrigation and domestic consumers and other industries, but for environmental and social needs as well. Sound allocation processes require accurate knowledge of the current availability of water as well as knowledge of the status of the source from which it is drawn. The acquisition and dissemination of such knowledge is, in turn, dependent upon the existence of reliable planning, monitoring and reporting systems. These aspects are addressed subsequently in this section.

8.4.1 **Allocation Limits**

The allocation limit is the maximum amount of water that the Department of Environment will make available for consumptive use. In keeping with the *RIWI Act 1914*, the limit is set after meeting the needs of the environment.

Where insufficient technical data exists to permit a reliable estimate, the amount allocated may be set below the estimated sustainable yield.

The setting of reliable allocation limits and ability to adapt to changing conditions is being hampered by a lack of technical data and feedback from effective monitoring. The shortfall in management and the need for additional funding have been addressed above in Section 7.
8.4.2 WATER RESOURCE PLANNING

Water resource planning is the mechanism through which the Department of Environment provides secure water entitlements to users while meeting its social and environmental obligations.

The 2001 amendments to the *RIWI Act 1914* introduced a requirement for statutory planning by the regulator. The Act provides for a hierarchy of planning (regional, sub-regional and local) and, among other things, specifies in considerable detail the content, processes for completion and amendment, and the form and nature of consultation.

Prior to 2001, all plans were non-statutory in the sense that the need for planning was not a requirement of the Act. Similarly, the content of any plan together with the manner and frequency with which plans were amended were also discretionary.

The *RIWI Act 1914* is silent on the legal effect to be given to the implementation of an approved statutory plan. Accordingly, the resource manager only has to ‘consider’ the relevant plan when exercising its powers. Moreover, licences can be granted even though the granting of these would be in contravention of a plan. The Steering Committee believes that an approved statutory plan under the *RIWI Act 1914* should be binding on the water resource manager.

The Act also appears deficient because it does not give the Department of Environment the power to defer the issuing of a licence pending further investigation. Under the Act, the water manager must consider licence applications even where a particular resource is fully allocated. These two shortcomings sometimes lead to licences being granted against the better judgement of the water resource manager, or to its decision being overturned on appeal.

The need for the DoE to raise the priority afforded to water resource planning is covered previously. It is noteworthy that as at the date of this report, no statutory plans have been completed (although two are under preparation).

8.4.3 METERING AND ENFORCEMENT

The Steering Committee is of the view that metering of all significant water use is necessary for a water resource to be managed properly and furthermore that metering should also be linked to water system monitoring. Metering is also an essential prerequisite for regulating water markets and water trading.

Almost no self-supply irrigation water is metered in Western Australia, although the water resource manager has the power under the Act to require meters to be installed by licensees. Also the Auditor General’s report (OAG 2003) found that a relatively small proportion of the State’s water licences had been checked for compliance.

The Steering Committee believes that the absence of compulsory metering is a serious shortcoming in the State’s water resource management processes.

8.4.4 WATER RESOURCE MANAGEMENT CHARGES

Significant changes are needed to the water resource management structure, and in particular increased resources are required for the investigation and planning of water resources. While it is acknowledged that there may be some resistance from irrigators, the additional funding required for this work should come from those who benefit from access to water and participation in the proposed water market. The funding should include a public contribution to the management of the environmental water allocation.

It is not new that beneficiaries contribute to meeting water management. It happens in many places including most states of Australia (Freehills – Gardner 2004). Some water users contribute to water resource management costs by undertaking groundwater studies and monitoring. Any proposed fee structure should take account of this private contribution.
8.5 ADMINISTRATIVE IMPACT ON WATER TRADING

8.5.1 PERMISSIBLE TRADES UNDER THE RIWI ACT

Licences may be permanently transferred to another person who holds or is eligible to hold a licence of the same kind.

Temporary trades are affected by allowing a third party to operate under the terms of the licence for a period of one year. Where extenuating circumstances can be proven, periods of less than one year may also be allowed. No other form of temporary trade is permitted.

The water resource manager has absolute discretion to approve or disapprove all trades. If a trade is deemed environmentally adverse, it may either be refused or referred to the Environmental Protection Authority for assessment.

The process is not ideal because:
- Only a limited number of trade types are permitted.
- The approval process slows down the trade process and increases transaction costs.
- The discretionary powers or ‘reserved power’ currently residing with the regulator/manager creates a high level of uncertainty over whether a trade is likely to be permitted or not. These reserved powers would be unnecessary with clearer specification (unbundling) of entitlements, and separation of land title from water access entitlement.
- The role of the Department of Environment in removing unused individual entitlements (under Policy 11) and re-issuing these to other users at a later date is similar to the ‘warehousing’ of water by a participant in the market. There is no evidence that the regulator/manager increases market efficiency by acting in this way.

8.5.2 CONSTRAINTS IMPOSED ON WATER TRADING

Under the current trading policy, licensed entitlements which have never been used are not tradeable. The Steering Committee views this policy as tantamount to encouraging the wasting of water in a manner similar to the “use it or lose it” policy.

The Steering Committee supports the approach that water which is saved as a result of improved efficiency can be traded.

8.5.3 POLICY ON RELEASE OF NEW LICENCES

Under current policy, the Department of Environment releases new licences at zero cost, generally on the basis of “first come first served” until a particular source of water is fully allocated. The onset of water trading which improves efficiency by revealing the value of water is therefore delayed until the resource is fully allocated.

The Steering Committee is of the view that this practice promotes the attitude that water has zero value and is in abundant supply. As a result it runs contrary to the objectives of the State Water Strategy.

8.5.4 ACCESS TO INFORMATION

The current titling and registration systems are discussed in section 8.3.3.

Water trading is enhanced when information is readily available. Hence, the current titling and registration systems serve to inhibit trading because the systems do not present all the essential information needed. The situation is compounded by the Department of Environment’s current practice that only permits a copy of a title to be released with the prior consent of the licensee.

8.5.5 BROKERING

Brokers play a valuable role in promoting market efficiency by:
- facilitating the interaction between buyers and sellers; and
- standing in the market, thereby ensuring water can always be traded.

Under the current policy, water trading is restricted to those who have the right to access land. This poses a restriction on brokering. The situation is compounded by the DoE’s trading policy which prevents it from engaging in brokering.
8.6  RECOMMENDATIONS

8.6.1  NATURE OF ENTITLEMENTS

• Separate (unbundle) the entitlement to access water from the approval to use water on specific land.
• Discontinue the practice of specifying a water entitlement by reference to the purpose (i.e. the irrigated area of specific crops) for which the entitlement is allocated.
• Present conditions relating to the use of water at particular locations as a separate instrument.
• Specify water entitlements as a share (converted to a volumetric allocation annually or periodically as actual supply conditions require) of the water resource available to water users18.
• Discontinue the practice of requiring access to land in order to hold or trade a water licence.

8.6.2  SECURITY OF ENTITLEMENT

• Grant perpetual water licences, subject to them also being specified as a share of the available resource. In the event that government is unwilling to adopt perpetual entitlements, licences should be granted for at least 40 years and made renewable at any time during the term subject to meeting the conditions of the licence.
• Abandon the “use it or lose it19 policy.
• Specify clearly the processes for making changes to the consumptive pool.
• Specify the various shares in comprehensive management plans, including those allocated to the environment, public interest and domestic consumption as well as irrigation.
• Adopt the risk allocation framework proposed in the National Water Initiative’s Intergovernmental agreement.20
• Compensate users for changes to water management plans which are not contemplated in these plans and which result in reductions to allocations to users. An appropriate basis for compensation is contained within the NWI framework.
• Make long-term increases in the consumptive pool (which result from uncontemplated changes to water management plans) available for use at the government’s discretion. Such discretion should include the option of allocating some or all of the water from the pool to new users.
• Adopt a “Torrens-based” register of titles which incorporates the key features proposed in the Land and Water Australia Water Titling Report.

8.6.3  ALLOCATION, PLANNING, MONITORING AND ENFORCEMENT

• Accelerate the formulation of statutory-based management plans.
• Make statutory plans legally binding on the water resource manager to ensure that these plans are implemented.
• Amend the RIWI Act 1914 to allow the water resource manager to place an embargo on issuing new licences to allow for the completion of management plans. The embargo should be permitted only for a limited time specified under the Act.
• Issue all licences on a competitive basis at a minimum reserve price.21 Consideration should be given to adopting the practice recommended by the Natural Resource Management Standing Committee22 of holding auctions over time with an appropriate proportion of the remaining resource being introduced on each occasion.
• Implement a policy whereby all consumptive use above a threshold of five megalitres per annum is metered. The threshold should be reviewed regularly and incrementally reduced if there is less water available.
• Implement enforcement procedures for non-compliance.
• Make the amount of water used by each licensee a matter of public record and highlight instances where licence conditions are breached.

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18 Freehills – Gardner 2004 contains the qualification “at least in respect of where resources are considered to be 70 per cent allocated.” The Committee does not endorse this qualification.
19 Freehills – Gardner merely states that a policy decision is needed on whether or not to retain this practice. The Committee does not have this reservation.
20 Freehills – Gardner recommends consideration only.
21 Freehills – Gardner only recommends consideration of this in situations of more than 70 per cent allocation and alludes to the possibility of it being done in all cases.
8.6.4 Facilitation of Water Trading

- Withdraw the water trading policy, Water and Rivers Commission 2001, Statewide Policy No.6 - Transferable (Tradeable) Water Entitlements for Western Australia and prepare a new policy for water trading which complies with the nationally-agreed best practice guidelines for water markets and water trading. This will include but not be limited to:
  - Minimising transaction costs, including the turnaround time for processing and approving trades by pre-testing in advance and then specifying conditions under which trades will receive automatic approval. Unbundling water entitlements from use conditions will remove the necessity to consider the impact of water use in the assessment of an application to trade.
  - Requiring the water resource manager to facilitate the disclosure of information on water ownership and availability to the market.
  - Considering amending the legislative framework to allow individual irrigators to trade with water users outside their particular scheme. This assumes that a means of transporting water between both parties exists.

8.6.5 Water Management Charges

- Reconsider the introduction of water resource management charges which recover that share of the cost attributable to users.23 The basis of charging should be transparent and the money raised used for the agreed purposes. As a starting point, licence fees should be introduced immediately to cover licence and compliance administrative costs.

- Establish mechanisms by which water users monitor the efficiency of service delivery and have the opportunity to influence the services that are delivered.

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23 Freehills – Gardner suggests that this course be implemented for “certainty in respect of water service providers and most likely in respect of all licensees”.

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Part 3 Appendices
APPENDIX 1. BIOGRAPHIES

Russell Anderson, Steering Committee Member
Russell Anderson has more than 56 hectares of crop under irrigation and is a managing partner of Nowergup Poultry. He is a member of the Department of Environment’s Wanneroo Advisory Committee and has farmed on the Gnangara Mound for more than 30 years.

Jeff Camkin, Steering Committee Member
Jeff Camkin is Strategy Manager, Water Resources at the Department of Environment. He has considerable experience in water resources and fisheries policy, including a recent period as a senior adviser on water resources to the Minister for the Environment. In 2004 Jeff was awarded a Churchill Fellowship to study strategic approaches to water management in South Africa, the United States of America and Brazil.

Neil Delroy, Steering Committee Member
Neil Delroy is the Managing Director of Agribusiness Research Management. He runs a horticultural business based in Busselton. The business includes management and ownership of viticulture enterprises across the south west and Victoria with more than 10,000 hectares under irrigation. In addition he has interests in vegetables, avocados and a grape vine nursery in Western Australia. He is a director of a number of private and unlisted public companies in Western Australia and Victoria.

David Hartley, Deputy Chairman of Steering Committee
David Hartley is the Executive Director of Agricultural Resource Management at the Department of Agriculture. In his capacity as Commissioner of Soil and Water Conservation, David is on National and State steering groups for natural resource management, salinity impacts and water reform. David has qualifications in regional management, strategic planning and economic analysis.

Ross Kelly, Chairman of Steering Committee
Ross Kelly is a professional Engineer and Company Director. He is the Chairman of Wood and Grieve Engineers and Otraco International, and a Director of Clough Limited and Imdex Limited.

Michael Lowe, Steering Committee Member
Michael Lowe is a fourth generation farmer in Harvey. A former economist with the Department of Agriculture, Michael was involved in the privatisation of the South West Irrigation Area and served as Deputy Chairman of Harvey Water for seven years.

Ivan McLeod, Steering Committee Member
Dr Ivan McLeod is a Senior Environmental Consultant and Discipline Leader with RPS Bowman Bishaw Gorham and Director of EnviroAg Research Services Pty Ltd. Dr McLeod has more than 14 years of professional experience in large scale irrigated agriculture involving production, research, training and policy development. He has a strong background in irrigated agriculture in both northern and southern Australia and has worked as consultant Project Manager on the proposed West Kimberley irrigation project. Throughout the 1990s he was a cotton agronomist in northern New South Wales and a Lecturer in Cotton Production at the University of New England.

Jos Mensink, Steering Committee Member
Jos Mensink is the Project Director of the State Water Strategy and has been involved with the Western Australian water industry for more than 30 years. He was a member for eight years of the boards responsible for the Carnarvon and Harvey irrigation districts.

John Roberts, Steering Committee Member
John Roberts is a Senior Consultant at the Perth office of ACIL Tasman. He was involved with the transfer of the Ord Stage I and Carnarvon Irrigation schemes to grower-owned cooperatives. More recently, he has advised the Western Australian government on a series of water-related issues.

Jordan G Li, Irrigation Review Executive Officer
Jordan Li is the Project Manager of the Irrigation Review. He has been involved in management of various projects for governments and businesses. Jordan also has qualifications in business administration and experience in diplomatic services.
# APPENDIX 2. SUMMARY OF STAKEHOLDER SUBMISSIONS TO THE IRRIGATION REVIEW

<table>
<thead>
<tr>
<th>Stakeholder Submissions to Irrigation Review (March-November 2004)</th>
<th>Total Submissions</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ISSUES RAISED - ON TERMS OF REFERENCE</strong></td>
<td>Yes</td>
<td>No Comment</td>
</tr>
<tr>
<td><strong>TOR1 Water use and benefits</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supports state-wide metering of commercial water use</td>
<td>31</td>
<td>19</td>
</tr>
<tr>
<td>Supports metering of commercial water use on Gnangara Mound</td>
<td>23</td>
<td>27</td>
</tr>
<tr>
<td>Supports expanding proclaimed, licensed areas</td>
<td>5</td>
<td>45</td>
</tr>
<tr>
<td>Supports licensing of all water users other than stock or domestic use</td>
<td>2</td>
<td>48</td>
</tr>
<tr>
<td><strong>TOR2 Predicting future of irrigation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consider sustainability in Water Resource Management</td>
<td>24</td>
<td>26</td>
</tr>
<tr>
<td>Water and associated land use should be considered together</td>
<td>4</td>
<td>46</td>
</tr>
<tr>
<td>Recommends State strategic water resource plan</td>
<td>2</td>
<td>48</td>
</tr>
<tr>
<td>Recommends Regional/Sub-regional/Local Area Water Resource Plans</td>
<td>2</td>
<td>48</td>
</tr>
<tr>
<td>Retain all of the irrigation areas due to the concerns of &quot;stranded assets&quot;</td>
<td>1</td>
<td>49</td>
</tr>
<tr>
<td><strong>TOR3 How to increase efficiency, cost/benefits</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Support Water Conservation Plan (WCP)</td>
<td>1</td>
<td>49</td>
</tr>
<tr>
<td>Benchmark efficiency with agricultural practice, not city water market price</td>
<td>1</td>
<td>49</td>
</tr>
<tr>
<td><strong>TOR4 Constraints &amp; opportunities to improvement in WRM</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supports stakeholder consultation &amp; links between government industry and the community</td>
<td>26</td>
<td>24</td>
</tr>
<tr>
<td>Feels government water resource investigation is insufficient</td>
<td>25</td>
<td>24</td>
</tr>
<tr>
<td>Water Corp has undue influence over State water management issues</td>
<td>17</td>
<td>33</td>
</tr>
<tr>
<td>Access to land for exploration is hampered</td>
<td>2</td>
<td>48</td>
</tr>
<tr>
<td><strong>TOR5 Water Trading</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supports water allocation to highest value and best use</td>
<td>35</td>
<td>12</td>
</tr>
<tr>
<td>Supports water trading generally</td>
<td>26</td>
<td>23</td>
</tr>
<tr>
<td>Supports trading across jurisdictions/irrigation areas</td>
<td>26</td>
<td>22</td>
</tr>
<tr>
<td>Analyse likely impacts on regional communities</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td>Government lacks understanding of water market benefits</td>
<td>17</td>
<td>33</td>
</tr>
<tr>
<td>Supports trades based on efficiency gains</td>
<td>7</td>
<td>43</td>
</tr>
<tr>
<td>Concerns about speculation</td>
<td>6</td>
<td>44</td>
</tr>
<tr>
<td>Supports water law reform to speed up assessment</td>
<td>3</td>
<td>47</td>
</tr>
<tr>
<td>Supports water law reform to ensure environmental protection</td>
<td>2</td>
<td>48</td>
</tr>
<tr>
<td>Supports water law reform to ensure stakeholder protection</td>
<td>1</td>
<td>49</td>
</tr>
<tr>
<td>Concerns about high degree of government intervention</td>
<td>1</td>
<td>49</td>
</tr>
</tbody>
</table>
### Stakeholder Submissions to Irrigation Review (March-November 2004)

#### ISSUES RAISED - ON NWI/SWS

<table>
<thead>
<tr>
<th>Issue</th>
<th>Yes</th>
<th>No Comment</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suggested duration of entitlements (analysis is based on perpetual or non-perpetual)</td>
<td>33</td>
<td>10</td>
<td>7</td>
</tr>
<tr>
<td>Supports entitlements that are a share of the resource (i.e. not volumetric)</td>
<td>30</td>
<td>20</td>
<td>0</td>
</tr>
<tr>
<td>NWI - supports full adoption with minimal adjustments</td>
<td>27</td>
<td>23</td>
<td>0</td>
</tr>
<tr>
<td>Supports separation of water entitlement from land titles</td>
<td>26</td>
<td>23</td>
<td>1</td>
</tr>
<tr>
<td>Supports an “exclusive” entitlement that can be sold, given, bequeathed or leased</td>
<td>26</td>
<td>24</td>
<td>0</td>
</tr>
<tr>
<td>Promotes a State water resource management committee</td>
<td>25</td>
<td>25</td>
<td>0</td>
</tr>
<tr>
<td>Supports separation of water entitlement and allocation licences</td>
<td>25</td>
<td>25</td>
<td>0</td>
</tr>
<tr>
<td>Supports water licence admin fees (Conditional: perpetual /long-term water entitlements, licence admin fees not for govt. revenue and are transparent)</td>
<td>25</td>
<td>23</td>
<td>2</td>
</tr>
<tr>
<td>Supports the adoption of a Torrens registration system (see ACIL/Freehills report)</td>
<td>23</td>
<td>26</td>
<td>1</td>
</tr>
<tr>
<td>Supports a risk assignment perspective for “who pays” for entitlement change</td>
<td>23</td>
<td>27</td>
<td>0</td>
</tr>
<tr>
<td>Supports compensation for withdrawn water because of policy changes/adjustments</td>
<td>21</td>
<td>29</td>
<td>0</td>
</tr>
<tr>
<td>Promote local Water Resource Management Committees</td>
<td>21</td>
<td>29</td>
<td>0</td>
</tr>
<tr>
<td>Supports water resource management fees</td>
<td>2</td>
<td>43</td>
<td>5</td>
</tr>
<tr>
<td>Specifically, security holder should be able to note interest on licence register</td>
<td>1</td>
<td>49</td>
<td>0</td>
</tr>
<tr>
<td>Recommends water allocation hierarchy - environmental, public and private</td>
<td>1</td>
<td>49</td>
<td>0</td>
</tr>
<tr>
<td>Supports fees that go into Consolidated Revenue</td>
<td>0</td>
<td>27</td>
<td>23</td>
</tr>
<tr>
<td>NWI - supports WA companion paper argument</td>
<td>0</td>
<td>25</td>
<td>25</td>
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</tbody>
</table>

#### ISSUES RAISED - BY AUDITOR GENERAL

<table>
<thead>
<tr>
<th>Issue</th>
<th>Yes</th>
<th>No Comment</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supports increasing funding to DoE for water management</td>
<td>29</td>
<td>21</td>
<td>0</td>
</tr>
<tr>
<td>Feels knowledge of allocation limits is insufficient</td>
<td>27</td>
<td>20</td>
<td>3</td>
</tr>
<tr>
<td>WRC needs updated &amp; streamlined systems &amp; processes</td>
<td>19</td>
<td>31</td>
<td>0</td>
</tr>
<tr>
<td>Recommends monitoring conditions for all commercial licences</td>
<td>18</td>
<td>32</td>
<td>0</td>
</tr>
<tr>
<td>Recommends greater analysis of monitoring data by DoE</td>
<td>3</td>
<td>47</td>
<td>0</td>
</tr>
<tr>
<td>Recommends greater compliance audits for monitoring by DoE</td>
<td>2</td>
<td>48</td>
<td>0</td>
</tr>
<tr>
<td>Lack of compliance audits by DoE &amp; WRC for artesian bore construction &amp; licences</td>
<td>1</td>
<td>49</td>
<td>0</td>
</tr>
<tr>
<td>Recommends removing licensing responsibilities from DoE/set-up water ministry</td>
<td>1</td>
<td>49</td>
<td>0</td>
</tr>
</tbody>
</table>
### Stakeholder Submissions to Irrigation Review (March-November 2004)

<table>
<thead>
<tr>
<th>Issues Raised - Other</th>
<th>Yes</th>
<th>No Comment</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>Encourage water conservation, including better use of stormwater &amp; recycled water</td>
<td>19</td>
<td>38%</td>
<td>31</td>
</tr>
<tr>
<td>Focus on Triple Bottom Line (explicit or implied)</td>
<td>13</td>
<td>26%</td>
<td>37</td>
</tr>
<tr>
<td>DoE should enable monitoring and reports to be submitted online</td>
<td>5</td>
<td>10%</td>
<td>45</td>
</tr>
<tr>
<td>Supports ongoing research (climate change, water resource, etc.)</td>
<td>4</td>
<td>8%</td>
<td>46</td>
</tr>
<tr>
<td>Transfer assets/water quality/recreation/catchment protection need further consideration</td>
<td>2</td>
<td>4%</td>
<td>48</td>
</tr>
<tr>
<td>Expand Steering Committee Membership</td>
<td>1</td>
<td>2%</td>
<td>49</td>
</tr>
<tr>
<td>Water Bank is supported</td>
<td>1</td>
<td>2%</td>
<td>48</td>
</tr>
<tr>
<td>Committee research and recommendations should be shared</td>
<td>1</td>
<td>2%</td>
<td>49</td>
</tr>
<tr>
<td>Consultation on review should be shared</td>
<td>1</td>
<td>2%</td>
<td>49</td>
</tr>
<tr>
<td>Start improving water resource management now</td>
<td>1</td>
<td>2%</td>
<td>49</td>
</tr>
<tr>
<td>Concerns about the issue of inappropriate bore construction techniques</td>
<td>1</td>
<td>2%</td>
<td>49</td>
</tr>
<tr>
<td>Wish that current &amp; future industry developments have sufficient water</td>
<td>1</td>
<td>2%</td>
<td>49</td>
</tr>
<tr>
<td>Supports desalination plant</td>
<td>1</td>
<td>2%</td>
<td>49</td>
</tr>
<tr>
<td>Maximise on-farm storage of water</td>
<td>1</td>
<td>2%</td>
<td>49</td>
</tr>
<tr>
<td>Support fast tracking the removal of pine plantation on Gnangara Mound</td>
<td>1</td>
<td>2%</td>
<td>49</td>
</tr>
<tr>
<td>The community should be aware of cost of retaining wetlands/preserving the environment</td>
<td>1</td>
<td>2%</td>
<td>49</td>
</tr>
<tr>
<td>Recommends more research/monitoring/improvement of salinity in irrigation areas</td>
<td>1</td>
<td>2%</td>
<td>49</td>
</tr>
<tr>
<td>Recommends continuous reviewing of water allocation limits</td>
<td>1</td>
<td>2%</td>
<td>49</td>
</tr>
<tr>
<td>Supports extracting groundwater from aquifers</td>
<td>0</td>
<td>0%</td>
<td>49</td>
</tr>
</tbody>
</table>
APPENDIX 3. PAPERS - IRRIGATION AREAS AND DISTRICTS

3.1 CARNARVON IRRIGATION AREA

The Carnarvon irrigation district represents a model of using water efficiently and shifting water to higher-value usage. Groundwater usage for horticulture in the region began more than 80 years ago. For many years water was delivered through flood distribution methods. Now the irrigators in the region use some of the most up to date technologies including drip and micro sprinklers to minimise water losses and maximise economic returns per unit of water used. Water was sourced from irrigators’ own bores and a government managed scheme, with constant “run-ins” between government agencies and farmers over water allocation, water quality and river health. Currently the government irrigation supply is managed (and soon to be owned) by an irrigator-owned cooperative with full stakeholder consultation relating to allocations and river health issues.

3.1.1 BACKGROUND

The Carnarvon irrigation district produces $56 million of horticultural produce, supplying more than 60 per cent of Perth’s vegetable requirements in winter (GWC submission 2004).

The climate is semi-arid with an annual rainfall of 233 mm. Temperatures are high as is evaporative demand. Rainfall and river flows are either generated by summer tropical cyclone activity (January to March) or by mid-winter storms produced by cold front systems originating from the south-west (May to September).

Water supply for Carnarvon town and the Irrigation District is obtained from the Gascoyne River alluvial aquifer. This aquifer system comprises an upper alluvial aquifer (also known as the “first” or “top” water) which overlies the lower, older alluvial aquifer (the “second” or “lower” water). The upper alluvial aquifer is coarse grained and high yielding with a maximum thickness of 12 metres. By contrast, the lower alluvial aquifer is finer grained, geologically variable and more laterally extensive, with a thickness of between 51 metres and 65 metres. The two aquifers are generally separated by a clay horizon which is reported to be continuous over most of Basin A (GHD, 1993).

Recharge occurs during river flow events. The upper aquifer is directly recharged as soon as the river starts to flow while recharge to the lower aquifer is slower as it relies on leakage from the upper aquifer. Although most flow events will result in full recharge of the upper aquifer, the lower aquifer is unlikely to be fully recharged by short-lived flows.

The groundwater supply consists of public and private water supply areas for which the Department of Environment (with the function of the Water and Rivers Commission) licenses the allocation and use. The resources have been subdivided into:

- **Basin A**, where groundwater is abstracted by private bores; and

- **Basins B – L**, a public water supply area currently operated by the Water Corporation in accordance with a licence issued by the Department of Environment, where water is distributed by the Gascoyne Water Cooperative.

Groundwater abstraction from Basin A is from both the upper aquifer (riverbed sand) and the older alluvium, whereas abstractions in Basin B-L are predominantly from the older alluvium.
3.1.2 STRUCTURAL CHANGE

The way groundwater is allocated to users has changed significantly as a result of the privatisation of scheme supply (Basins B - L) and the implementation of the recommendations from the report Managing the Groundwater Resources of the Lower Gascoyne River (Carnarvon) WA Groundwater Management Study completed in January 2004.24

A dual cooperative structure similar to that of Harvey Water is proposed for Carnarvon, i.e.

- A Management Cooperative (GWC) which manages the cooperative’s assets and delivers water to irrigators who are also its shareholders.

- An Asset Cooperative (GWAMCO) which owns the assets and leases them to the Management Cooperative.

The dual cooperative structure was chosen for the benefits it gives shareholders in terms of asset protection, taxation and overall efficiencies. The process of privatising the irrigation scheme began in 1998 with the creation of the Carnarvon Business Unit by the Water Corporation. In 1999, the Carnarvon Irrigation Steering Committee (CISC) was formed with 12 grower members representing various water users including scheme users, mixed users and private bore only users. After much investigation and consultation the Gascoyne Water Cooperative was incorporated in August 2001. The cooperative then entered into a 12-month Operations and Management contract to run the irrigation distribution on behalf of the Water Corporation.

At the same time, the Department of Environment announced the abolition of the conjunctive allocation system. Growers previously held a conjunctive licence that gave them access to groundwater from Basin A and scheme water from Basins B – L, up to a combined limit of 72 megalitres per annum per property. Instead, growers will be issued with a groundwater licence to abstract water from Basin A only and will need to apply to the Gascoyne Water Cooperative to access the scheme supply. The 72 megalitres would now be applied only to private bores for each property with a prolongation into the riverbed (Basin A). Furthermore, this allocation is under review by the DoE.

Licences for the scheme distribution system allow it to take a bulk water entitlement of 5,000 megalitres and for this to be distributed equitably among the 176 growers. Grower meetings were held and the proposed allocation system demonstrated and discussed. The proposed system was based on the history of use over the previous five years. The new allocation of water entitlements was 1.5 times the average annual scheme use for all growers. This meant that growers would be allocated more water than they had ever taken from the scheme, with a minimum base entitlement set at five megalitres.

At this point GWC was managing the distribution system on behalf of the Water Corporation, effectively as a subcontractor. The next step is for the cooperative to acquire the “business” and distribution assets.

In September 2002, irrigators met and voted to form the Gascoyne Water Asset Management Cooperative (GMAMCO). The intention was to have the agreements signed and the business transferred by December 31, 2002. However, the Water Corporation’s construction of a dedicated town water supply main was delayed, resulting in the transfer being deferred to July 1, 2003.

On July 1, 2003 GWC commenced trading in its own right, leasing the assets, operating the business and raising revenue on behalf of its members (including raising funds held in trust, on behalf of the yet to be incorporated GWAMCO).

In February 2004, GWC was able to offer additional water entitlements. When the allocations were calculated initially, the actual scheme losses were unknown. GWC and the Water Corporation made conservative assumptions that 14 per cent was the upper bound for all calculations. After running the system for a year, GWC determined that the actual water losses were in the order of five to six per cent, i.e. well within the margin allowed in the bulk entitlement. It was also decided to release a proportion of the company allocation of 750 megalitres which had been reserved for new members.

As a result, in February 2004 GWC announced an additional share and water entitlement issuance. Every grower member of GWC was sent a letter explaining the issue, together with an application for additional water entitlements. At the same time, an application to dispose of unwanted shares and entitlements was also attached in case some shareholders had been issued with more water than they needed or wished. No member applied to dispose of any water entitlements; while some members, with properties in excess of 40 hectares, applied for as much as 200 megalitres as they had the opportunity to secure water for full development of their properties.

However, the transfer of assets has been delayed. The Minister for Government Enterprises and Minister for the Environment signed the Transfer Order in November 2004, but three Motions of Disallowance have been lodged by members of Parliament. The boards of both GWC and GWAMCO are deeply concerned that no prior consultation was initiated. The Chief Executive Officer and the board have received no official complaints about their management from any member of GWC or prospective member of GWAMCO and the latest operational return to the Economic Regulation Authority showed no written complaints from cooperative shareholders during the previous 12-month reporting period. At this stage the Transfer Order has been deferred for a period of three months to allow for more public consultation.

3.1.3 **PROPOSED CHANGES TO OPERATION OF BASIN A**

The water allocation from Basin A is 5,800 megalitres. Individual irrigators have an annual allocation of 72 megalitres. During periods of river flow, licensees in Basin A are provided with unrestricted access to both groundwater and surface water. During no-flow periods, licensees are restricted to their licensed annual entitlements. These operating rules and the individual licensed allocation are under review. The review will reassess the allocation on the basis of the irrigator’s “capacity to draw” (infrastructure and water quality) and increased knowledge of the aquifer.

3.1.4 **GROWER WATER USAGE AND EFFICIENCY GAINS**

The irrigators in this region use some of the most up to date technologies including drip and micro sprinklers to minimise water losses and maximise economic returns per unit of water used. However, as part of the development of the Lower Gascoyne Management Strategy, the Department of Environment engaged PIRSA Rural Solutions in June 2001 to investigate water use practices and determine best practice in water use efficiency. In the report25 several areas were identified where further on-farm improvements could be made including:

- Soil: Growers need to assess soil types across their properties and determine water management regimes for each soil/crop scenario.
- System Design: Most systems appear to be designed by experience not by any calculation. Without actual system testing it is not clear whether systems are operating to industry standards. All designs should be prepared by an accredited irrigation designer.
- System Operation: While some growers monitor system operations by monitoring pressures at pump or filters, very few actually test their systems to see if the correct pressure or discharge is achieved at the emitter (dripper or sprinkler).
- Irrigation Management: While some growers have used tensiometers, most irrigate by experience and crop appearance (crop stress). This method may indicate time to irrigate but not how much to apply. Knowledge of soil type, rooting depths and system application rate is required.

While some individual irrigators are advanced in running their irrigation systems and irrigating crops, there is potential for further improvements for more irrigators. These improvements will be mainly in small enhancements rather than dramatic changes (Table A3.1).

<table>
<thead>
<tr>
<th>Year</th>
<th>Scheme (Gigalitre)</th>
<th>Private Bore (Gigalitre)</th>
<th>Total (Gigalitre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan 99 to Dec 99</td>
<td>1.6</td>
<td>5.6</td>
<td>7.2</td>
</tr>
<tr>
<td>Jan 00 to Dec 00</td>
<td>2.0</td>
<td>4.7</td>
<td>6.7</td>
</tr>
<tr>
<td>Jan 01 to Dec 01</td>
<td>2.4</td>
<td>6.2</td>
<td>8.7</td>
</tr>
<tr>
<td>Jan 02 to Dec 02</td>
<td>4.6</td>
<td>4.4</td>
<td>9.0</td>
</tr>
<tr>
<td>Jan 03 to Dec 03</td>
<td>5.4</td>
<td>4.2</td>
<td>9.6</td>
</tr>
</tbody>
</table>

There are also opportunities for the GWC to improve delivery system efficiency. At the moment water from the GWC is pumped to the irrigators and then held in tanks on the individual farmer’s property. This amount of water is then re-pressurized by the farmer to ‘push’ it through the on-farm irrigation system (Table A3.2). This “double handling” is expensive in terms of power. It would be of great benefit if the system could be pressurized and the individual irrigator could use the delivery pressure to irrigate on demand with perhaps only a small booster pump in operation.

Table A3.2. Average Monthly Water Utilization (GL) by Carnarvon Irrigators 1999-2004

<table>
<thead>
<tr>
<th>Month</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scheme</td>
<td>0.29</td>
<td>0.27</td>
<td>0.25</td>
<td>0.24</td>
<td>0.21</td>
<td>0.20</td>
<td>0.16</td>
<td>0.21</td>
<td>0.29</td>
<td>0.37</td>
<td>0.37</td>
<td>0.39</td>
<td>3.19</td>
</tr>
<tr>
<td>Bore</td>
<td>0.44</td>
<td>0.45</td>
<td>0.46</td>
<td>0.42</td>
<td>0.37</td>
<td>0.35</td>
<td>0.29</td>
<td>0.37</td>
<td>0.46</td>
<td>0.49</td>
<td>0.52</td>
<td>0.45</td>
<td>4.99</td>
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<tr>
<td>Total</td>
<td>0.73</td>
<td>0.72</td>
<td>0.71</td>
<td>0.66</td>
<td>0.57</td>
<td>0.55</td>
<td>0.45</td>
<td>0.58</td>
<td>0.75</td>
<td>0.86</td>
<td>0.89</td>
<td>0.84</td>
<td>8.18</td>
</tr>
</tbody>
</table>

Unfortunately, the scheme pipeline is not suitable for high-pressure operation. To overcome this barrier, the GWC proposes a long-term (10 years or longer) project to replace the current low-pressure pipes and broken pipes with higher specification pipes.

3.1.5 CONCLUSION

The Carnarvon irrigation district has gone through some dramatic changes over the past few years. The structural reform associated with the privatization of the irrigation scheme has empowered the growers and community, giving them “ownership” and responsibility for the operation of the scheme (Table A3.3).

Table A3.3. Water Charges for Gascoyne Water

<table>
<thead>
<tr>
<th>Entity</th>
<th>Type of Charge</th>
<th>2004</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asset Cooperative</td>
<td>Fixed Charge</td>
<td>$1,900</td>
<td>n/a</td>
</tr>
<tr>
<td>Management Co-operative</td>
<td>Fixed Charge</td>
<td>7.6c/kilo litre</td>
<td>8.0c/kilo litre</td>
</tr>
<tr>
<td></td>
<td>Consumption</td>
<td>14.7c/kilo litre</td>
<td>15.0c/kilo</td>
</tr>
</tbody>
</table>

Whereas in the past the irrigators would ‘blame’ government agencies for any problems with the scheme and rivers, as operators they now appreciate a more balanced approach to arriving at a solution.

All parties involved in the privatization, including irrigators, the Water Corporation, the Department of Environment and other State and local government departments and agencies are to be congratulated for how they have handled the process, especially the consultative phase and communication. This case represents a great outcome for the State.

The only disappointment is that the Transfer of Assets has been delayed because local politicians appear to have reacted to a single complaint without consulting with either the GWC or the Department of Environment to ascertain all sides to the issue.

The region produces high value horticultural produce from its water resource. Irrigators’ control of the distribution of water, increased adoption of irrigation “best practice” on-farm, coupled with market opportunities should see Carnarvon continue to thrive as an example of irrigated agriculture at its best.
3.2 GNANGARA MOUND

3.2.1 BACKGROUND

Gnangara Mound is the most important water source in Western Australia, generating and supporting significant wealth for Perth and the greater metropolitan area.

It provides more than 60 per cent of Perth’s water and supports a thriving horticulture industry which provides Perth with a significant proportion of its fresh vegetables and injects around $240 million, in value-added terms, into the local economy. The Mound also serves vital and valued eco-systems such as the iconic caves system at Yanchep and the numerous wetlands and lakes of the coastal plain.

However, the Mound is under stress due to an historic run of low rainfall, which is highly likely the result of permanent climate change. Extensive planting of pines has also significantly reduced recharge and exacerbated the stress. On the demand side, the Mound is also under great stress due to competing uses by agriculture, forestry, domestic water and the environment. All want to maintain their current access. This has resulted in:

- progressive and ongoing decline in water levels with impacts on wetlands, cave systems and abstraction infrastructure; and
- a decline in water quality with certain areas experiencing increased salinity, iron and nitrates.

The regulator’s response has been restrictive, including measures such as:

- shutting off public water supply bores in order to maintain environmental flows; and
- trying to ‘claw back’ water through administrative means, for example making it difficult to renew licences.

The Department of Environment has acted in a holding pattern attempting to quantify the behaviour of the Mound together with the extent of the water deficit. Until recently it was trying to do this without knowledge of usage (metering). Six million dollars have been provided for metering, but this does not seem to have resulted in the rapid deployment of meters.

Though coordinating committees and other structures have been formed, these have not been able to make the decisions necessary to ensure action to redress the current problems. This is symptomatic of many such coordinating mechanisms that seem to be designed to diffuse rather than focus responsibilities. This is of great concern as there is more than sufficient evidence to show the Mound is in deficit and water needs to be saved.

Quantifying how much needs to be saved is important, but the absence of this knowledge should not prevent action to save water from being taken now. An adaptive management approach is required where objectives are set, actions are planned and taken and the effects are monitored and evaluated to enable sensible adjustments to be made to plans and actions.

Solutions to the problems of the Gnangara Mound need to be more innovative and can be a model for approaches to similar problems in the future. It is proposed that an approach where land use planning and re-structure be driven by the needs of water management. And that water management and allocation are used as drivers for restoring sustainability of the mound. An integrated approach, which integrates economic, social and environmental development, requires close collaboration from the responsible authorities and leadership at a high level to ensure cooperation is maintained and that difficult decisions are made in a timely and fair manner.

It is suggested that such a solution would need to implement the following actions:

- Replacing the pines with a horticultural precinct suited to “extensive horticulture” (requiring large areas to be viable) and broiler/egg production units, and retaining the more intensive horticultural enterprises (requiring smaller areas), such as nurseries and strawberry growing, to maintain diversity in existing rural living areas.
- Rezoning areas near the wetlands to urban (with suitable buffers) to reduce water use and protect environmentally sensitive areas. Urban areas tend to increase recharge and may help reduce the nutrient and pesticide inputs. Much of the urban and transport infrastructure already exists within a short distance.
• Implement management changes to the controlled burning regime to increase groundwater recharge.
• Rationalise water allocations to conform to land use re-allocation and further adjust allocations, as necessary, through strategic buy-back of water for potable or environmental usage.
• Consider an overall allocation approach that recognises the impacts of different land uses on recharge. For example, water required for forestry activities must be considered as part of development controls to ensure bottom line requirements such as environmental flows are met. The harvesting of pines needs to be fast-tracked near and around the over-allocated areas.
• Provision of ‘fit for use’ reclaimed water to horticultural areas to help achieve reuse targets, substituting reclaimed water for the abstraction of primary Mound water. Security of growers’ access to reclaimed water will be paramount.
• Upgrade of the existing regulatory regime to include rigorous monitoring of abstraction by all users so that management criteria can be established, orderly adjustments made through water trading and on-going aquifer condition better understood and managed.
• Establishment of a supervisory group at Cabinet level, to oversee project management, monitor implementation and resolve conflicts where they cannot be resolved at officer level.

3.2.2 KEY CONSIDERATIONS

Balancing competing demands for groundwater from the Gnangara Mound to meet ecological, domestic/urban and agricultural requirements is the challenge for water allocation in the Wanneroo area. Environmental considerations, such as wetland protection, are fundamental to water allocation planning. Securing the future of horticultural production to supply fresh vegetables and fruit for the growing urban market is also essential. It is a further challenge for planning in areas of Perth, which have traditionally supported horticulture and other intensive agricultural activities, to balance competing demands for land use and minimise potential land use conflicts between agriculture and urban pursuits. These factors combine to provide an urgent need to consider options for the future of horticultural production in the northern metropolitan area.

Sound water and land use planning must be undertaken in unison if the needs of irrigated agriculture are to be met in a manner which secures horticultural production for the longer term (e.g. 50 to 100 years). A key recommendation of this proposal is the delineation of a Gnangara Horticultural Precinct, dedicated to irrigated vegetable and fruit production and complementary industries such as intensive poultry production. This is to be isolated from urban competition for water, and from areas zoned for land and environmental amenity. The zoning of land in this way is analogous to zoning land for ‘industrial’ purposes and thus not a new concept.

Implementation of this integrated water and land management approach will require significant coordination among the responsible agencies, including the Forest Products Commission, the Department of Environment, Department of Agriculture, Department for Planning and Infrastructure, and the City of Wanneroo.

Key aspects of the proposal include:
• Establishing large-scale market gardens and horticulture in the pines area north of Yanchep road, (e.g. horticultural precinct). Movement of the less intensive horticulture to the pines area and possibly retaining the more intensive businesses such as nurseries and high-value crops, such as strawberries, in the existing areas of Carabooda.
• Allowing rezoning of areas near the wetlands to urban usage to reduce water usage. This may require that water licences are sold to the government or transferred to the pines area. Urban areas will have better recharge, and nutrient and pesticide issues will be reduced. Much of the urban infrastructure required (roads, train lines and facilities) already exists nearby.
• Consideration of the need to change the controlled burning regimes to increase recharge.
• Consideration of the need to possibly buy back water from growers and other users.
• Recognition of the need to meter all users so water use issues in the Gnangara Mound can be better understood and managed.
3.2.3 Outcomes

This integrated proposal, if assessed as feasible and implemented accordingly in conjunction with the recommendations contained within the Irrigation Review report, will provide a number of advantages for the State. Development of a Gnangara Horticultural Precinct in the existing pines area will:

- Return the over-allocated Gnangara Mound to a more sustainable state.
- Secure land at scale and facilitate long-term investment in horticultural production in the north-east Wanneroo area.
- Secure water entitlements for irrigators in an area with comparatively less immediate environmental and social consequences, encouraging investment in horticultural development at scale.
- Increase recharge to the Gnangara Mound through the progressive removal of pine plantations in the north-eastern Wanneroo Shire pine plantation area.
- Provide a long-term use option for treated wastewater from the Alkimos and Beenyup Wastewater Treatment Plants, utilising water recharged to the superficial aquifer by the treatment plants.
- Secure fresh vegetable and fruit supplies for the domestic Perth market and increase possibilities of increased export of Western Australian horticultural products.
- Enable establishment of horticultural ventures which permit economies of scale, within areas accessible to a large labour force (e.g. metropolitan Perth). New horticultural ventures with security of land and water tenure would invest in best available irrigation technologies and management practices, with associated high water use efficiencies.
- In the medium to longer term, potentially reduce demand for water in the immediate vicinities of the lakes areas around Nowergup and Carabooda areas.
- Provide an option for complementary intensive agricultural industries from within the Wanneroo Shire to be relocated to the new horticultural precinct. The poultry industry is the prime example of a complementary industry under pressure from urban development and associated lifestyle conflicts in Wanneroo. Security of land use tenure and protection from encroaching urban/lifestyle development would facilitate the relocation of such industries.
- Maximise buffer zones between the horticultural precinct and rural lifestyle and urban developments, thereby minimising land use conflict issues.
- Potentially allow for redevelopment of land currently used for horticulture in areas adjacent to urban/rural lifestyle developments in the Wanneroo Shire as irrigators choose to relocate to the Gnangara Horticultural Precinct.

3.2.4 Gnangara Horticultural Precinct

Figure A3.1 outlines the general location of current horticultural development within the Wanneroo Groundwater Area. This proposal recommends the delineation of an appropriate area of land within the current pine plantation areas, to become the Gnangara Horticultural Precinct. Figure A3.2 provides a guide to the possible location of this precinct.

The pines area is preferential to Nowergup/Carabooda as an option for horticultural precinct development. The Nowergup/Carabooda area currently has a mix of land uses, with some smaller lots and adjacent wetlands. Establishment of a dedicated horticultural precinct in the pines will prevent many of the potential land use conflict issues and environmental impacts which could arise within Nowergup/Carabooda. These issues are discussed below.
Figure A3.1  Current Location of Horticulture in Wanneroo

Source: Agri-business Research & Management 2004
Figure A3.2 Location of the Proposed Horticultural Precinct at Gnangara

Proposed area horticulture could be located
### 3.2.4.1 Water Issues

Fundamental to the potential success of this proposal is the security of water for irrigators. It is estimated that an increase of 5,000 to 10,000 megalitres per annum in recharge can result from the gradual thinning of the pines in the area in the short term (e.g. five to seven years), increasing to 40,000 megalitres per annum increased recharge in 25 years (Delroy and Anderson, 2004).

Approximate estimates of potential water savings from undertaking the changes recommended here have been provided by Delroy and Anderson (2004) and are provided in Table A3.4.

**Table A3.4. Summary of Short and Long Term Water Savings Resulting from the Integrated Planning Proposal**

<table>
<thead>
<tr>
<th>Action</th>
<th>Short Term Savings</th>
<th>Long Term Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3 – 7 Years</td>
<td>25 Years</td>
</tr>
<tr>
<td></td>
<td>Gigalitres/annum</td>
<td>Gigalitres/annum</td>
</tr>
<tr>
<td>Pines (thinning &amp; eventual removal)</td>
<td>Burning</td>
<td></td>
</tr>
<tr>
<td>(increase frequency of burning from 12 yrs to 3-4 yrs)</td>
<td>10</td>
<td>40</td>
</tr>
<tr>
<td>Water Corp Reduction in Pumping</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Horticulture Reduction in Pumping</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>65</strong></td>
<td><strong>80</strong></td>
</tr>
</tbody>
</table>

Source: Delroy & Anderson 2004

It is conservatively estimated that an additional five to six gigalitres could be saved through the enforcement of metering on horticultural licensees.

Development of the horticultural precinct would also provide a potential purchaser (i.e. the horticulture industry) for reclaimed water from metropolitan Perth. Using reclaimed water to artificially recharge the superficial aquifer should assist in balancing the draw of water from the Mound and increase the volume of water available to other uses.

### 3.2.4.2 Land Use Conflict and Urban Development

A major risk for the horticultural industry and its performance in peri-urban areas is the encroachment of incompatible land uses that impinge on farm operations and create the impression that horticulture is a ‘temporary’ land use until it can be allocated for some other ‘higher value’ use. Pressures from within the industry do not help this situation. Retiring growers look to the increased capital value of their land to support their retirement. Lately an attitude has developed whereby urban development is encouraged in some quarters because it causes the relinquishment of water licences.

This proposed greenfields approach to horticultural development provides flexibility to planning and sends the signal that horticulture is there for the long-term. The new precinct site will enable high-value horticultural cropping through security of access to land and water. Larger operations will be encouraged to move to the dedicated precinct to obtain this security, which will be complemented by the confidence that long-term land use planning will not result in pressures from unplanned urban or semi-rural developments. Existing horticultural operations could continue at their current locations and relocate over time as desired.

The inclusion of poultry production (and possibly other intensive animal industries) as permitted land uses within the precinct could have positive outcomes for areas and communities in Wanneroo currently impacted by adjacent egg and broiler production farms. Feed supply facilities could also be relocated, where possible, to service intensive animal industries. This could have very positive implications for the City of Wanneroo where such industries are the source of significant employment but increase the risks of land use conflict and nuisance disputes.
3.2.4.3 Environmental Issues

Groundwater contamination issues related to the increased use of fertilisers and pesticides in the proposed horticultural precinct (the Mound's recharge area) will need to be carefully considered and managed should this precinct eventuate, particularly in relation to nitrate contamination.

Existing horticultural areas around wetlands could be rezoned for urban use to reduce water use, improve recharge, and reduce environmental problems from nutrients and pesticides near the wetlands.

However, the development of the precinct as a greenfields site will provide the opportunity to strengthen regulation and plan appropriately for environmental values, locating horticulture and associated water demand in areas where least impact on the Gnangara Mound's caves and wetlands will occur.

3.2.5 Recommendations

It is proposed that a joint working group with relevant knowledge and expertise be developed to progress this proposal. The working group should be convened by a member of the Irrigation Review Steering Committee who is independent of the agencies involved and report initially to the Steering Committee.

The outputs of the working group will be as follows:

• report reviewing the analysis and feasibility based on the best available data and knowledge.

• A draft Cabinet Minute for endorsement by the Water Resources Cabinet Sub-Committee for Cabinet endorsement. This is to outline the program (including stakeholder consultation) and the benefits, provide costing, and specify agency commitments and a timeline for completion.

• Submit a revised Cabinet Minute for whole-of-government sign-off and implementation.

3.2.6 Conclusion

The proposed Gnangara Horticultural Precinct provides options for increased and more efficient agricultural production, security of water and land tenure for producers, and a potentially more sustainable water future for the Gnangara Mound. The precinct approach would assist in minimising land use conflict and securing metropolitan vegetable and fruit supplies for the longer term (e.g. 50 to 100 years). This integrated approach considers agricultural production and urban development as potentially synergistic by providing access to locally produced fresh food, allowing for the recycling of water resources, increasing horticultural production, and reducing competition with environmental water requirements. The approach to be taken will require integration and cooperation from a range of agencies and organisations, but could result in positive triple-bottom-line outcomes for Western Australia, and in particular for the Gnangara area.

References:


3.3 KIMBERLEY REGION

3.3.1 BACKGROUND

The state-wide review of irrigation and land and water resource use by the Irrigation Review Steering Committee confirms the widely held view that the Kimberley region has significant additional potential for irrigation development.

The irrigation area at Kununurra currently contributes around $57 million in farm gate output to the State economy. With further sustainable development in sugar and cotton at East Kimberley and West Kimberley respectively, the contribution to the State economy from irrigation in the Kimberley region could rise to between $200 million and $400 million within 10 years.

The existing and planned additional irrigation areas of the East Kimberley Ord River Irrigation Area (Stages 1 and 2), when fully developed, could equal or exceed the State’s current total irrigation area of around 50,000 hectares. In excess of five million hectares of land suitable for irrigation has also been identified in the West Kimberley. Detailed planning studies indicate that around 200,000 hectares of this land located in the vicinity of the Fitzroy River floodplains and the sandplain areas south of Broome is capable of immediate development.

Significant volumes of both groundwater and surface water flow in this region, and the climate is suitable for a range of crops including sugar cane, cotton, tropical fruits, vegetables, pulse crops, seed and tree crops. The availability of suitable land and abundant water presents opportunities for large-scale irrigation development for both East and West Kimberley that are not available to most other regions of Australia. The Ord Irrigation Scheme is managed and controlled by an irrigation cooperative. The approach is providing a coordinated and efficient system for managing water distribution, trade, measurement and environmental monitoring.

Future large-scale irrigation developments need to be economically viable and environmentally sustainable. A preliminary comparison of the economics of investing in the East and West Kimberley shows a distinct advantage for large-scale cotton production in the West Kimberley, over the full development of Ord Stage 2. Key drivers in this economic advantage are the world market for cotton, higher crop yields in the West Kimberley, and the availability of groundwater to self-supply irrigation operations, thereby avoiding the cost and time needed to fully develop the publicly-funded irrigation scheme of Ord Stage 2. These large-scale developments need to incorporate sustainable production systems that meet social and environmental sustainability criteria.

For example, Hart (2004) and Cordner (2004), in identifying the pressure for a shift of irrigation in Australia from the south to the north, caution on the need to avoid repeating the mistakes made in the south. They identify an urgent need for scientific research to support the sustainable management of Australia’s under-allocated water resources in the north. Hart characterises ‘modern’ irrigation systems as having pressurised supply, trickle feed lines and minimum drainage. Moreover, they will not be stand-alone schemes, but would combine irrigation, post farm processing, tourism and grazing.

The land and water resources in the Kimberley region with irrigation potential are significant compared with the rest of the State for specific crops and market opportunities. Future development of large-scale commercial irrigation in the Kimberley will depend on a sustainable modern approach to irrigation development and practice that meets economic, social and environmental criteria, longer terms for water entitlements that better match investment periods, and access to land with suitable security of tenure.
3.3.2 **Situation Analysis East and West Kimberley**

The Kimberley region has significant potential for large-scale irrigation production for a range of crops (Wright 2004; Yeates 2002; Sherrard 2004). Climate, land and water resources of the region are suitable for irrigated cropping of sugar cane, cotton, tropical fruits including mangoes and bananas, vegetables and melons, pulse crops, seed and tree crops. Research into cotton production in the Kimberley region has shown that the region has significant potential for large-scale production using modern drip irrigation systems (Yeates 2002). Cotton production in the Kimberley will require a comprehensive Environmental Management System, Integrated Pest Management, and approval from the Office of the Gene Technology Regulator for the use of pest resistant GM cotton.

The irrigation industry at Kununurra contributes between $57 million and $67 million in farm gate output to the State economy, and employs 437 people directly and a further 340 people indirectly (Sherrard 2004). With large-scale irrigation development for sugar and cotton, the economic contribution from irrigation in the Kimberley could rise to between $200 million and $400 million in farm gate output within 10 years (Department of Agriculture WA 2004). Large areas of land exist in both West and East Kimberley with suitability for irrigation. As mentioned previously, the importance of these large areas is reinforced by the availability of water resources for irrigation.

Water resources in the West Kimberley described by the Kimberley Water Resources Development Office (KWRDO 1993) include surface water from the Fitzroy River; and groundwater resources of the Canning Basin. This study identified large quantities of surface water potentially available from the Fitzroy River; however; flooding and development approvals have proved problematic. Groundwater can be sourced from the Canning Basin, a large sedimentary basin extending from central Western Australia to the coast of the West Kimberley. The groundwater areas with most potential for large-scale agriculture in the West Kimberley are the Broome, Derby, Wallal, La Grange, Willare and Fitzroy sub-basins with up to 700 gigalitres potentially divertible from these particular areas (Allen et al. 1992).

In the East Kimberley, the Ord Irrigation Cooperative has a water allocation of 335 gigalitres per annum for distribution and use of water within the ORIA, and sourced from the Lake Argyle dam. Currently around 209 gigalitres of this amount is distributed to irrigators within the scheme area with around 159 gigalitres of crop water use on-farm (Wright 2004), allowing for evaporation and drainage losses through the distribution network.

### 3.3.2.1 East Kimberley Cropping

Currently around 13,000 hectares can be irrigated within ORIA Stage 1. There has been significant planning for the expansion of the ORIA, with a further 43,000 hectares net irrigable area identified as suitable for irrigation and connection to the Ord scheme water within Stage 2 (Sherrard 2004; Dixon 1996). Additional areas on the Carlton Plain downstream of the Diversion Dam, and on the Weaber Plain, Keep River Plain, and Knox Plain north-east of Kununurra are included in the Ord Stage 2 proposal currently being evaluated by government and local communities.

Irrigated production within Ord Stage 1 currently supports a wide range of crops. There were 10,121 hectares of irrigated crops in the East Kimberley region in 2001 (ABS 2003). The majority of this cropping exists in the ORIA, and includes more than 3,500 hectares of sugar cane, 2,426 hectares of vegetables including melons, and additional areas of irrigated pasture and cereals, tropical fruits and cotton.

Ord Stage 2 involves further infrastructure development and on-farm development to suit mainly channel distribution systems and on-farm flood irrigation systems, servicing an additional area which could yield approximately 43,000 hectares net irrigation farmland. Some 30,500 hectares on the Weaber, Keep and Knox Plains would be gravity fed by a channel system with most of the remaining area served by a number of pump stations downstream from the diversion dam. On-farm development to support the application of surface water from the scheme includes construction of feeder channels and head ditches, drainage channels, bridges and crossovers, and laser levelling of paddocks. The infrastructure development to establish Ord Stage 2 is estimated to cost around $200 million (McLeod, 2005). The major crop analysis to support Ord Stage 2 has been for sugar cane and cotton, and the scale of production needed to support the sugar mill at Kununurra.
Feasibility studies funded by Western Agricultural Industries for the West Kimberley region during the 1990s confirmed that irrigated farming systems using sub-surface drip irrigation can produce high yielding and quality crops including cotton, lucerne, maize, sorghum, chickpeas, and other horticultural crops reliably in an economically and environmentally sustainable manner (I. McLeod pers. comm. 2004). The climate of the area is semi-arid tropical with a long dry season. Hot dry conditions with high radiation during the dry season make the West Kimberley environment ideal for a wide range of crop production options, particularly cotton. Cotton and other crops planted in the dry season take advantage of this ideal cropping window that avoids the effect of wet weather; allowing high quality cotton and other products to be produced (Yeates 2002; I. McLeod pers. comm. 2004).

Building on the land capability for irrigated cropping and the climate, there is strong potential for a large-scale irrigated agricultural industry to be established within a 200 kilometres strip to the south of Broome based on groundwater from the La Grange sub-basin and surface water from the Fitzroy River system (I. McLeod pers. comm. 2004). Sufficient land has been identified to develop up to 20,000 hectares for cotton production using groundwater reserves south of Broome (Yeates 2002).

The proposed farming systems for West Kimberley cropping would access groundwater resources within 30 metres of the ground surface, and be self-supply autonomous areas with privately developed power and groundwater bore infrastructure (I. McLeod pers. comm. 2004). On-farm development to support the application of groundwater includes bore and pumping equipment, piping to irrigation fields, and installation of drip-tape water delivery systems.

Development of irrigation in the Kimberley is dependent upon meeting community and regulators’ requirements for sustainable production, linked to community and environmental objectives. The Northern Australia Irrigation Futures (NAIF) project funded through Land and Water Australia – NPSI and hosted by CSIRO will investigate how sustainable irrigation can be developed across northern Australia.

Northern production of tropical fruits and vegetables in Western Australia mainly targets off-season domestic markets in the south of the State. Profitability in horticulture and other irrigation production in the Kimberley is dependant on commodity prices and market access, timeliness and transport systems to meet market windows, and having competitive costs of production.

For emerging crops with developed markets, the gross margins can be high, which can provide important cash flow during the period of high capital expenditure in the early stages of development.

Nationally, 77 per cent of sugar production is exported. The sugar outlook is currently influenced by low world sugar prices and an adverse exchange rate for export commodities (ABARE 2004). Australian sugar producers are struggling to cover the cost of production with current world sugar prices, and increased competition from Brazil in recent years (Hildebrand 2002), protectionism and trade policies in Russia, Europe and the United States (ABARE 2004). Consequently there are few drivers for expansion in sugar production in Australia.
3.3.3.2 Cotton

Nationally, all cotton lint production is exported. Although the world cotton price is forecast to decline in the short-term due to an increase in world supply of raw cotton, ABARE (2004) also forecasts an increase in world demand for textiles and an increase in China's demand for raw cotton in line with its strong domestic economic growth. The cotton production forecast for Australia is for reduced planting of cotton due to reduced water availability in the eastern states (ABARE 2004). The ability of Australian growers to command a price premium over the Cotlook ‘A’ index is dependent on maintaining high quality fibre (ABARE 2004), and suitable quality and quantity of irrigation water. The Kimberley region has significant potential for large-scale cotton production, where the combination of climate, land and water resources provides an ideal opportunity to produce high yielding quality cotton.

3.3.3.3 Conclusion

Brennan (2004) has identified that future growth in water demand within irrigation industries in Western Australia is related directly to growth in industry markets. This growth is mainly within southern horticultural industries, and dominated by the riskier export markets for fruit and vegetables. Should cotton become established in the Kimberley, growth in water demand could increase significantly. Further investigation is needed into the requirements for large-scale sustainable irrigation development in this region, and support should be provided for the NAIF project, involving Western Australian agencies and industries.

3.3.4 Economic Analysis East (Ord) and West Kimberley

The critical differences between the economics of irrigated cropping at Ord Stage 2 and in the West Kimberley are that yields for some major crops are likely to be higher in the West Kimberley, and the cost of infrastructure development will be lower, both in terms of capital invested, and the time taken to achieve a return. The importance of these factors is illustrated in Table 1, which presents the comparative cropping analysis for cotton.

The assumptions regarding differences in yield were based on yield differentials simulated from OZCOT-APSIM. Based on the climatic potential at the two sites, the maximum potential yield at Broome was estimated to be 11.5 bales per hectare, whereas in Kununurra it was 10.4 bales per hectare (Yeates 2002). In this analysis it was assumed that growers achieve 80 per cent of this maximum potential yield at each location.

Prices and costs of production are based on five-year average figures obtained from cotton grower surveys (Boyce Chartered Accountants 2003). The difference in the gross margin per hectare attributed to yield advantage in the West Kimberley is $405 per hectare. This estimate does not account for the relatively lower yield risk in the West Kimberley, nor the greater potential for economies of scale. Thus, it is likely to be a conservative estimate on the gross margin premium achievable at the West Kimberley site.

Two rates of return calculations are provided in Table A3.5, based on assumed development cost of $10,000 per hectare at West Kimberley (Ivan McLeod, pers comm.), and $12,000 at Ord Stage 2 (Marsden Jacob, 2004). A simple return on asset calculation is based on dividing the annual return by the value of invested capital, but this figure does not account for the differences in the timing of investment. In the case of Ord Stage 2, a significant part of the investment cost per hectare is off-farm, large-scale and on public infrastructure. This type of investment would require several years of capital expenditure before the commencement of farm production. In contrast, the development expenditure at West Kimberley is largely private expenditure for development of on-farm infrastructure and the time to achieve production is likely to be shorter. An internal rate of return was calculated for a 20-year period of farm production, based on the assumption that West Kimberley production commences in year two, with all expenditure in year one; and Ord Stage 2 production commences in year five with capital expenditure spread evenly over the first four years of the project. Internal rates of return are almost three times higher for the West Kimberley project.
Table A3.5. Comparative Economics of Cotton Production at Ord and West Kimberley

<table>
<thead>
<tr>
<th>Assumptions</th>
<th>Ord</th>
<th>West Kimberley</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield, Bales per ha</td>
<td>8.5</td>
<td>9.40</td>
</tr>
<tr>
<td>Cotton Price $ per bale*</td>
<td>450</td>
<td>450</td>
</tr>
<tr>
<td>Gross revenue per ha</td>
<td>4,145</td>
<td>4,550</td>
</tr>
<tr>
<td>Operating Cost $ per ha*</td>
<td>2,941</td>
<td>2,941</td>
</tr>
<tr>
<td>Gross Margin $ per ha</td>
<td>1,204</td>
<td>1,639</td>
</tr>
<tr>
<td>Difference $ per ha</td>
<td></td>
<td>435</td>
</tr>
<tr>
<td>Development Cost $ per ha**</td>
<td>12,000</td>
<td>10,000</td>
</tr>
<tr>
<td>Simple return on asset</td>
<td>10.0%</td>
<td>16.4%</td>
</tr>
<tr>
<td><strong>Internal rate of return</strong></td>
<td>5.1%</td>
<td>15.3%</td>
</tr>
</tbody>
</table>

* Boyce Chartered Accountants (2003), five-year average.
** West Kimberley cost, Ivan McLeod, pers comm.; Ord from Marsden Jacob report.

3.3.5 RECOMMENDATIONS

Key directions and recommendations to achieve regional economic potential from irrigation in both the East and West Kimberley include:

- It is recommended that guidelines for sustainable irrigation farming systems be prepared for the Kimberley region, and that the government immediately commits to developing a Regional Sustainability Strategy for the Kimberley region.

  New irrigation development in the Kimberley needs to be environmentally, socially, and economically sustainable. A well-developed modern irrigation farming system suited to large scale northern irrigation development is needed that meets sustainability guidelines for the region, and minimises drainage from the crop area. This modern irrigation farming system would be incorporated into project assessment guidelines and a Regional Sustainability Strategy for the Kimberley Region when such a strategy is prepared.27

- It is recommended that investment of public funds into the expansion of irrigation areas in the Kimberley should be justified economically to ensure long-term sustainability.

  Economic viability should be a key driver in determining public funding for expansion of irrigation areas in the Kimberley region to ensure long-term sustainability and effective use of or wealth creation from water.

- It is recommended that environmental water provisions for the lower Ord River be based on clear criteria formulated on and negotiated against the balanced economic, social and environmental needs of the region.

  The irrigation industry in the East Kimberley currently represented by the Ord River Irrigation Area (ORIA) needs a high level of certainty over water availability for future expansion. Expectations for environmental water provisions have grown in the past few years with growth in tourism and recreational interests on the Ord River. Formulating EWPs for the Ord River should recognise historical water requirements for ecological systems and incorporate best-practice community consultation that negotiates a water regime that meets the balanced economic, social and environmental needs of the region.

- It is recommended that the State Government facilitate negotiations with traditional owners in the West Kimberley to support access to land and suitable security of land tenure for irrigation development in this region.

  Access to land for irrigation development, and negotiating suitable arrangements with traditional owners and Indigenous communities, are requirements for further irrigation development in the Kimberley.

- It is recommended that the State Government place additional emphasis on regional planning and project assessment for the West Kimberley, combining social and economic sustainability assessment, to ensure sustainable development can occur in a timely manner.

  Feasibility studies by Western Agricultural Industries show water availability and integrated land planning and management can be combined successfully in the West Kimberley to support large-scale irrigation development.

- It is recommended that there be ongoing or perpetual licence terms for water entitlements to facilitate long-term investment in irrigation infrastructure.

  Water allocation policies need to support long-term investment in large-scale agricultural operations with longer terms for water licence entitlements, greater than 40 years.

References:


3.4 HARVEY / MYALUP HORTICULTURAL PRECINCT

3.4.1 BACKGROUND

The purpose of this paper is to consider integrated options for developing a horticultural precinct in the Myalup district in the Shire of Harvey. The proposal is based on consideration of agricultural, environmental and water use trends and the implementation of principles and recommendations from the Irrigation Review. A thorough analysis of options for establishing a Myalup Horticultural Precinct has been undertaken by the Department of Agriculture WA (2002). In addition, an assessment of options for improving irrigation water use efficiency in the South West Irrigation Area (SWIA) was undertaken for the Irrigation Review by ACIL Tasman (2004) and provides significant supporting documentation to this proposal. A pre-feasibility study of options for reusing Myalup drainage water for horticultural production has been undertaken by GHD for the Department of Agriculture (GHD, 2004, draft). This provides further information investigating opportunities for the expansion of horticultural production in the Myalup area.

This proposal recommends that Harvey Water and the State Government consider redefining the boundaries of the SWIA, in particular the Harvey Irrigation District, to include existing Myalup horticultural areas and the Myalup pine plantation within the SWIA boundaries. The aim is to protect productive land, within reasonable proximity to Perth to enable fresh produce supply, with potential for large-scale horticultural production and access to large volume quality water required to maintain year-round cropping regimes. The proposal redefines the irrigated area to include land resources that have potential for intensive horticulture, hence high value creation potential for water. In addition, it will also allow Harvey Water to potentially move water to the coastal plain to recharge the superficial aquifers which in some cases are experiencing rising salinities due to over-pumping, concentrating salt levels in the superficial aquifer.

The development of the Myalup Horticultural Precinct is based on the premise that it is logical to access quality water from the Harvey Irrigation District for local horticultural production purposes, and consider other sources for current and proposed trades to the Water Corporation for (non-localised) public supply purposes. Secondary to the main focus of this proposal, but essential in addressing multiple water demands in Western Australia, is the decommissioning of the bulk of irrigation supply to the Collie Irrigation District and potentially the removal of the Collie Irrigation District from the SWIA boundary. Water from Wellington Dam, which currently supplies the Collie Irrigation District at restrictive salinity levels, could then be allocated to the Water Corporation for public supply purposes. In addition, there is potential for including water from the Harvey Diversion Drain as part of the overall allocation to Harvey Water; for use in the Myalup area. An estimated 14,000 to 15,000 megalitres per annum could be available to irrigators from this source (GHD, 2004).

It is recommended that sensible consideration of this proposal be undertaken before significant investment in piping the Collie Irrigation District is committed. The comparative advantage of developing irrigation infrastructure in the Myalup area in preference to further investment in the Collie Irrigation District requires thorough analysis and consideration in an integrated manner which addresses multiple outcomes. At present, there exists no overall planning group whose role it is to consider land and water resource planning in the SWIA in conjunction with proposed major investments, such as the piping of the Collie Irrigation District. There is an urgent need for integrated planning to occur before major investments are made in areas with limited futures for irrigated agriculture.

3.4.2 OUTCOMES

This integrated proposal, if assessed as feasible and implemented accordingly, will:

• Maximise horticultural potential of high capability land in western parts of the Shire of Harvey (i.e. Myalup) and protect highly productive land from urban encroachment, to enable large-scale production efficiencies.

• Convert a relatively low return production area (Myalup pine plantation: $150 per hectare per annum) into high return per hectare horticulture ($14,500 per hectare per annum) (Department of Agriculture WA, 2002).

• Secure fresh produce (vegetable) supplies for the Perth metropolitan community.

• Allow for the purchasing of water from Wellington Dam from low value (pasture growth) to higher value usage (pending salinity amelioration), potentially providing 105,000 megalitres for public water supplies.

• Minimise environmental consequences of applying high salinity water to clay (waterlogging) soils in the Collie Irrigation District.

• Reduce groundwater draw from Myalup groundwater (through removal of the pine plantation), thereby reducing impacts on local wetland areas and reducing the risk of saltwater intrusion into local groundwater aquifers from the adjacent Indian Ocean.

• Potentially provide an option for reuse of water from the Kemerton Wastewater Treatment Plant, to the immediate south of the proposed Myalup Horticultural Precinct.
3.4.3 MYALUP HORTICULTURAL PRECINCT

As shown in Figure A3.3, there are currently significant areas of horticultural production within the Myalup District, utilising self-supplied groundwater, predominantly from the superficial aquifer. Land capability assessment has shown that the soils underlying the Myalup pine plantation, adjacent to existing horticultural areas, have high capability for annual horticulture. It has been estimated that approximately 2,000 hectares of additional horticultural development could occur in the area should the pines be removed. Access to sufficient water to maintain year-round horticultural production becomes the limiting factor; thus the extension of the Harvey Water supply area to include the Myalup horticultural production can offset this factor.

Figure A3.3 Myalup Horticultural Areas & Proposed SWIA Boundary Re-definition

Proposed Myalup Horticulture Precinct and Associated Boundaries

Note: This is a conceptual diagram only. Actual proposed boundaries to be determined following thorough feasibility assessment and community consultation.
3.4.3.1 WATER SUPPLY

It is proposed that additional water for the expanded Myalup Horticultural Precinct be sourced from the Harvey Irrigation District and supplied by Harvey Water. An additional 2,000 hectares of horticulture would require an estimated 32,000 megalitres per annum (16 megalitres per hectare per annum based on continuous cropping regimes for a range of vegetables), or less than 100 megalitres per day in total. This has been identified as being within Harvey Water’s current physical supply capacity (Department of Agriculture WA, 2002). Infrastructure requirements to access Harvey irrigation water, which currently extend to four kilometres east of the Myalup pines area, require determination. One option is to utilise the Harvey River Diversion Drain, which extends from the Harvey townsite to the ocean at Myalup.

Supplying water to the Myalup area from current Harvey Water allocations in the Harvey Irrigation District will require an integrated solution to secure water for irrigated agriculture in the northern part of the Harvey Shire. This is where cooperation with the State Government (Water Corporation, Forest Products Commission and Department for Planning and Infrastructure) is essential and it is imperative to consider realistically the future of the Collie Irrigation District and the Wellington Dam reservoir.

3.4.3.2 LAND ZONING CHANGE

The proposal to include the Myalup area within the SWIA will enable the Myalup area to be classified as a Priority Agricultural Zone under Statement of Planning Policy 2.5. Current State Forest reserve tenure for the pines area can be changed through a resolution passed by both Houses of Parliament, with planning and environmental approvals required (Department of Agriculture WA, 2002). Should this occur, the land could either be leased to proponents or converted to freehold. Either way, land security of tenure will be essential to warrant the level of private investment that will be required to develop the horticultural precinct.

3.4.4 COLLIE IRRIGATION DISTRICT

One hundred and five thousand megalitres of water from Wellington Dam are currently allocated to irrigation within the Collie Irrigation District. This water exhibits prohibitive salinity levels (at least 900 milligram per litre) which restrict both suitability and demand for use in irrigation. Compounding the salinity risk is the heavy (clay) and poorly drained nature of the bulk of irrigable soils within the Collie Irrigation District. These soils have low capability for horticulture, and are used generally for low-return pasture grazing systems (dairy and beef). As a result, the irrigation infrastructure and the available volume of water within the Wellington Dam reservoir are under-utilised due to water quality and land capability issues.

Economic issues associated with the predominant land uses (dairy and beef) also contribute to the under-utilisation of irrigation water within the Collie Irrigation District. Returns to water from beef and dairy grazing are low and the soils within that District cannot capably support other forms of irrigated agriculture on a large scale. This fact means that proposals to eventually pipe the Collie Irrigation District (subject to water quality improvements) may not necessarily result in increased agricultural productivity. Higher capability soils within the Collie Irrigation District, such as those along the foothills of the Darling Scarp, could retain irrigation supply through a strategically placed water supply main. Irrigators within the Collie Irrigation District who wished to retain their water allocation could potentially do so by linking to this supply main.

3.4.5 WATER TRADING POSSIBILITIES

A number of steps are proposed to ensure that sufficient water is available within the Harvey Irrigation District to support the Myalup Horticultural Precinct. Firstly, water from Wellington Dam should be re-allocated to the Water Corporation for public supply purposes. Water allocations could be purchased from irrigators at an agreed rate per megalitre. It is anticipated that the Water Corporation could then access water from the Wellington Dam reservoir at a cost lower than that of new supply from other sources, provided that appropriate treatment is undertaken to ameliorate salinity levels. For example, if 50,000 megalitres were purchased from irrigators at a cost of $500 per megalitre (permanent trade to Water Corporation), this could be treated and used within the public water supply at a cost of $25 million, plus treatment and piping costs. This cost would be substantially cheaper than establishing alternative supplies, such as the new desalination plant and the proposal to access the South West Yarragadee/Blackwood Groundwater Area to augment the Integrated Water Supply Scheme. Up to 105,000 megalitres of water could be available for allocation from Wellington Dam should all irrigators agree to trade their allocation. This would provide a substantial source of water for high-value domestic consumption, with minimal reduction of agricultural production anticipated.
Other trades within the Harvey Irrigation District could also be facilitated such that available water is secured for local horticultural production. As noted earlier, there may be options for the retention of part of the Wellington Dam water allocation for irrigated agriculture for high capability sections of the Collie Irrigation District; for example, in areas of high capability for horticulture soils along the Ridge Hill Shelf (foothills). Where existing irrigators wish to retain allocations, negotiation is required and options for the piping of water need to be considered for specific irrigation purposes within the Collie Irrigation District.

Piping of the entire Collie Irrigation District to maintain (low return) pasture irrigation appears to be a poor investment. Better return for public investment could be achieved by considering Wellington Dam as a future public water supply rather than irrigation water for an area with limited future potential for irrigated agriculture.

If this proposal eventuates, there will be implications for the management of the Wellington Dam catchment as a public drinking water source area and for the short-term adaptation issues within the Collie Irrigation District. However, the comparative advantages of converting the Collie/Wellington system to public water supply may outweigh the economic, environmental and social costs of securing new public water supplies, such as the new supplies from the South West Yarragadee/Blackwood Groundwater Area.

Finally, temporary water trading to entities outside the Harvey Water scheme should be encouraged. This in turn will encourage investment within the Harvey Water area in activities leading to improved water use efficiency on-farm and hence increase the economic value attributed to water.

### 3.4.6 POLICY REQUIREMENTS

Implementation of the following recommendations resulting from the Irrigation Review will be essential to the success of this integrated approach:

- **Security of water entitlements in perpetuity**
  Essential if large-scale investment in Myalup horticulture is to be achieved.

- **Water markets should be encouraged**
  Water trading should also include the potential for “external” trades from individual irrigators (including those scheme supplied) to entities outside the scheme (e.g. Water Corporation), subject to physical accessibility.

- **Use conditions on irrigators**
  Use conditions for both self-supplied and scheme-supplied water within the Myalup Horticultural Precinct must be separated from water allocation licences due to annual variations in cropping regimes practised by irrigators.

- **Separation of water licence eligibility from land access requirements**

### 3.4.7 RECOMMENDATIONS

Specific recommendations in relation to this proposal are:

- The government supports the Harvey Water proposal that it will transfer an allocation of about 18 gigalitres of water per annum to the Water Corporation in exchange for the construction of the piped irrigation system in the Harvey/Logue District by the Water Corporation.

- Consider buying back water from irrigators using Wellington Dam water and dedicating the same amount to IWSS rather than piping the system in the Collie River to deliver savings of 23,000 megalitres as per the ACIL Tasman report, thereby potentially providing up to 105,000 megalitres of water to the public supply system.

- Re-define the Harvey irrigation area to include the potential high-value production areas of Myalup, and include the Harvey Diversion Drain water in Harvey Water allocation so that over time, with water trading, water in the Harvey scheme can move to high value-creation intensive horticultural enterprises.

- Allow all licence holders in the Harvey Scheme to trade water outside the scheme on an annual basis, as temporary trades, subject to criteria to be developed in conjunction with irrigators and Harvey Water, to drive the introduction of water-efficient systems.
3.4.8 Conclusion

Should a sound water policy environment be created in Western Australia, opportunities from the Myalup Horticultural Precinct proposal could result in significant increases in horticultural production, exports and employment. The benefits to the public water supply outlined in this paper could provide positive triple-bottom-line impacts and secure water for both agricultural and public usage for the medium to long-term.

References


GHD, November 2004 draft, Myalup Drainage Water Reuse Pre-feasibility Study report, prepared for the Department of Agriculture.
APPENDIX 4. OTHER REPORTS AVAILABLE UPON REQUEST


Eric Wright, Department of Agriculture Western Australia (2004). Forecasting Water Use in Agriculture in Western Australia – A Land and Water Resource Perspective.

Eric Wright, Department of Agriculture Western Australia (2004). Water Use for Irrigated Agriculture in Western Australia.

Eric Wright, Department of Agriculture Western Australia (2004). Land Capability and Availability for Irrigated Agriculture in Western Australia.

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Andy McCrea, Department of the Premier and Cabinet (2004). Self-Supply Agricultural Irrigation in Western Australia.