



WQPN 87, October 2007

Identification, assessment and protection of public drinking water source areas

Purpose

This note describes the issues and procedures involved in developing public drinking water source areas that are used to ensure the availability of safe, good quality drinking water to the Western Australian community.

Scope

The note discusses the identification, assessment and protection processes applied to drinking water sources, called Public Drinking Water Source Areas (PDWSAs), anywhere in WA.

PDWSAs include Catchment Areas, Water Reserves and Underground Water Pollution Control Areas (UWPCA) proclaimed and managed under the *Metropolitan Water Supply, Sewerage and Drainage Act 1909* or the *Country Areas Water Supply Act 1947*.

Background

Access to safe drinking water is something most people take for granted. Because of this, there is often a limited understanding of the processes used to identify, assess and protect drinking water. We simply expect our tap water to be safe, pleasant and available all the time. There is an 'absolute trust' by the community that this will be consistently achieved. This State Government and community trust relationship is shared responsibility by the Department of Health, the Economic Regulation Authority, water service providers and the Department of Water. Other government agencies also play a support role (e.g. Department for Planning and Infrastructure and the Department of Environment and Conservation) through various land management and planning processes.

PDWSAs in Western Australia are identified by gathering hydrogeological and hydrological data, assessed to ensure their quantity, quality, and sustainability, and then protected to provide safe good quality drinking water now and into the future. These three stages require a substantial commitment of resources (i.e. people and funding).

The development of a PDWSA may be complicated when conflicting interests arise between those affected. For example, community members may oppose a local waterbody becoming a public drinking water source because land use and water access restrictions to the catchment area may subsequently apply, including constraints on future land development and recreational activities.

In these instances the affected stakeholders often expect the Department of Water (or local water service provider) to find an alternative water source. However, this may not be practical if there are few safe, reliable sources available in the area or alternatives are too expensive to access (i.e. an alternative supply is not available, is distant from the community or requires extensive and costly treatment).

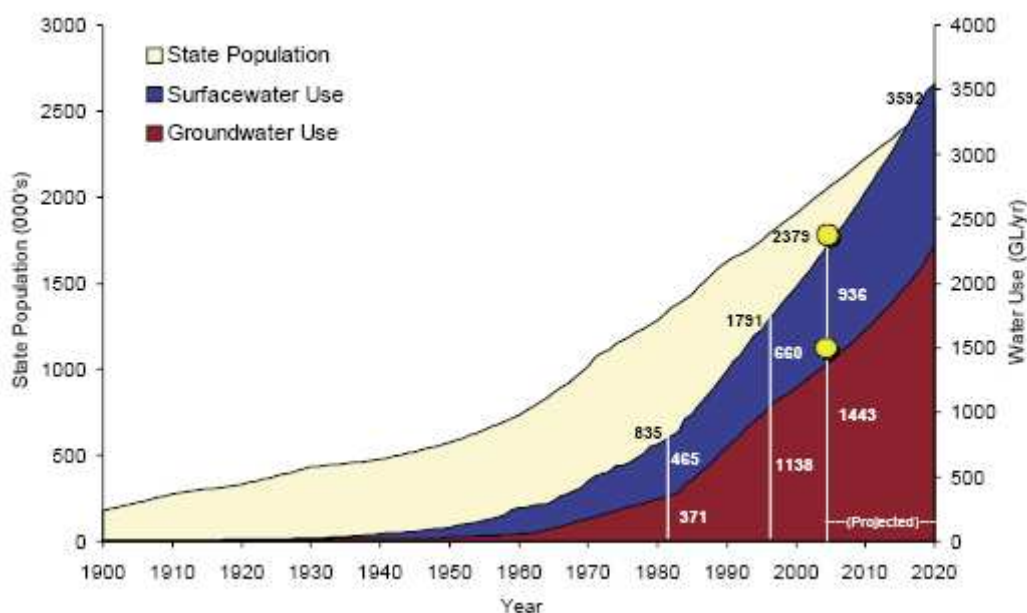
Importance of safe drinking water

A supply of safe drinking water is vital as water is necessary to sustain life. Household activities such as cooking, washing and bathing would be made difficult if the water had to be treated at home before use (such as filtering or boiling before use) or purchased commercially (such as in bulk supply containers).

Demand and supply of water in Western Australia

According to the Water Corporation's report, *Planning for Perth's water needs* (2002), domestic water use in Perth increased by 20 per cent over the preceding 20 years, with the present average household using about 920 litres a day (that would fill about 35 kitchen sinks). By 2031, total water demand in the Perth region is expected to increase by 150 GL a year, which is four times the capacity of Serpentine Dam. The projected increase of the State's water use and demand to the year 2020 is shown in Figure 1.

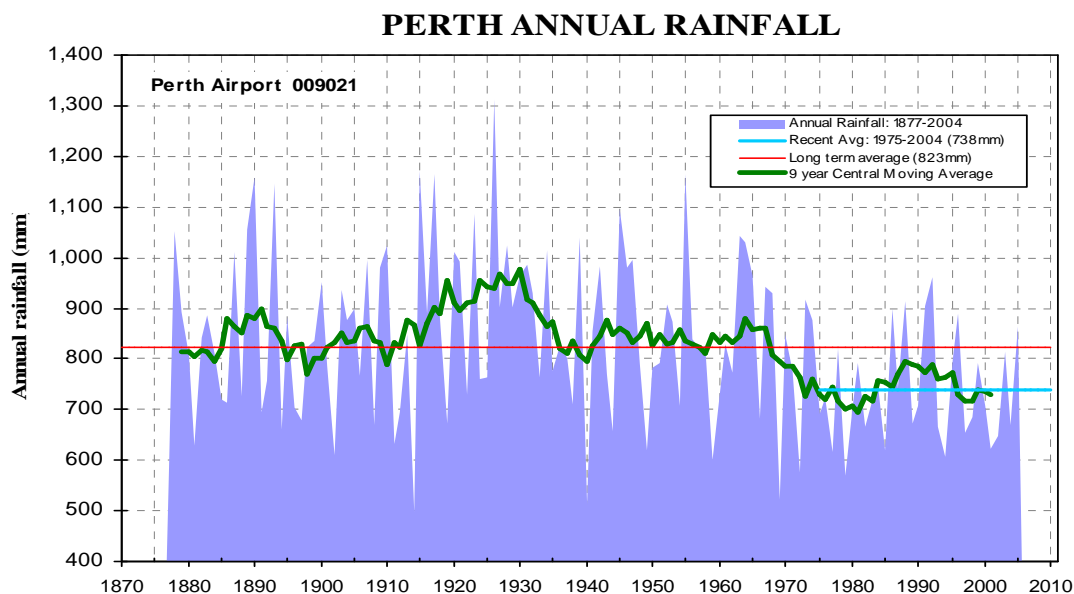
Figure 1. Historical water use and demand projections



(*Water Investigations and Assessments Branch, Department of Water, 2006*) Note desalination and recycled sources have not been included.

While there has been a dramatic increase in water demand, there has also been an equally dramatic decrease in water resource capacity (supply) due to rainfall variability. The significant rainfall decrease for the Perth metropolitan area is shown in Figure 2. In 2005, the Water Corporation published the *Integrated Water Supply Scheme Source Development Plan: Planning Horizon 2005 – 2050*. This document states that the 2001-02 winter rainfall sequence represented the worst two year drought on record for Western Australia, with 2001 inflow to the Darling range reservoirs being the lowest since 1914. Overall, from 1997 until 2004 average catchment stream flows were significantly lower than the long-term average streamflow, approximately 115 GL per year compared with the pre-1974 average of 161 GL per year. The reduction in streamflow is directly related to the decrease in annual average rainfall.

Figure 2. Perth annual rainfall



(Surface Water Assessment Branch, Department of Water 2006)

Identification, assessment and protection of PDWSA

Strategic nature of water source investigation

There are substantial lead times (up to 10 years) associated with the identification and assessment of new drinking water sources. This is the result of an increasingly complex regulatory environment; the challenges involved in provision of contemporary water supply such as the assessment of potential catchment yield and sustainable allocation limits; source development economics; environmental and social issues; catchment management risks; and (in a drying climate) competing uses of limited water resources.

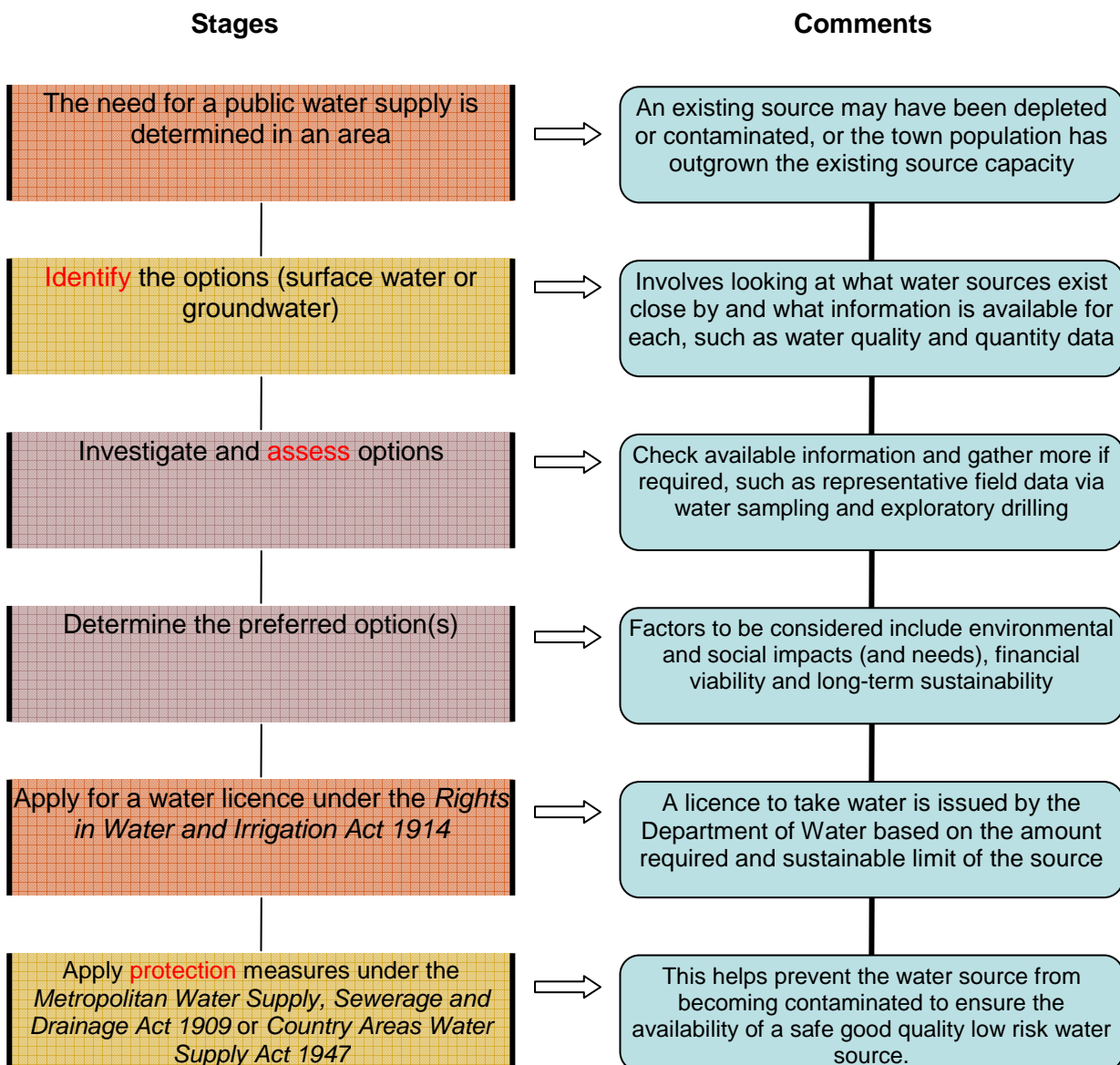
A number of key factors need to be considered before the development of a new drinking water source. These include:

- the rate of growth in water demand within the supplied area
- access to and reliability of the source
- catchment protection potential including the contamination risks already posed by established or approved land uses
- raw water quality and treatment requirements to meet national drinking water health and aesthetic criteria
- the cost of developing and operating the source
- the average volume of water yield from the intended source after providing for environmental water flows and other existing allocated water users.

In relation to the sequence and timing of source development, various factors are considered including technical viability, alternate source options, social and environmental acceptability, public health requirements and financial viability.

The complexity of these issues and the degree to which planning, investing and approval has been advanced for any of these factors, determines the timeline within which a potential source can be developed. The stages in developing a source are shown in Figure 3 below.

Figure 3. Stages in the development of a PDWSA



Cost factors for source development

The costs associated with source development are very high; however, the cost of groundwater source development can be substantially less than that required for surface water developments. This is due to the staged nature of groundwater developments. In addition, major capital expenditure is required in establishing dams and infrastructure for surface water storage and construction is often undertaken many years before consumption is likely to reach supply capacity.

The ongoing operating costs for surface water and groundwater sources are similar (dependent on treatment requirements and raw water quality).

A 15-year groundwater investigation program, initiated by this Department in 2006, is expected to require an expenditure of more than \$28 million. It sets priorities for projects that are of short-term importance such as the Gngangara borefield development, and those that are strategic for regional development such as Cowaramup in the south-west and Allanooka in the mid-west.

An indication of the costs associated with establishing an identified public drinking water source can be seen in Table 1 of the *Integrated Water Supply Scheme (IWSS) Source Development Plan 2005* (Water Corporation, 2005) (refer to [Appendix C](#)). This table looks at potential future water sources considered for inclusion in the IWSS, their estimated yield and associated indicative capital and operating costs. Notably, the surface water costs are for established dams.

By 2031 the Water Corporation is expected to invest about \$430 million in developing new sources to meet the predicted increase in water demand. This is in addition to the \$523 million invested into a program of water source development between 1993 and 2002. Other water service providers such as Aqwest (Bunbury Water Board) and the Busselton Water Board also spend considerable sums to ensure continued safe drinking water supplies to their customers.

Drinking water source protection assessments and plans

A Drinking Water Source Protection Assessment (DWSPA) is a document that gives an overview of a water supply system, existing and proposed land use and development, and a basic understanding of the risks to water quality in the catchment or water reserve. This includes a risk assessment of the catchment and information from key stakeholders including state and local government authorities, and water service providers.

A Drinking Water Source Protection Plan (DWSPP) is a document that provides a report on catchment land use activities and risks to water quality (based on the DWSPA), but also proposes management strategies and recommendations to address the risks to the established water sources. DWSPPs are prepared in consultation with the community, landowners, local Indigenous groups, local government authorities and state government agencies.

DWSPPs are important in providing protection for Western Australia's drinking water supplies as each plan establishes priority areas and protection zones and the catchment/recharge boundaries, in addition to providing guidance on proposed land uses and activities. Their importance is reflected in the Western Australian Government report *Securing our future – a State Water Strategy for Western Australia* (2003), which states that protection plans should be completed for all PDWSAs throughout the state. These plans are used to guide land use decision-makers such as the Western Australian Planning Commission and local government authorities when developing schemes and structure plans or in assessing proposals for subdivision and land development in a PDWSA.

For more information on the different types of protection areas and zones in a PDWSA, and the activities permitted in each, refer to the Water Quality Protection Note *Land use compatibility in Public Drinking Water Source Areas*, produced by this Department.

Copies of DWSPAs and DWSPPs can be viewed at <www.water.wa.gov.au> select *Water Management*> *Publications*> *Water Source Protection Plans and Assessments*.

Proclamation to protect PDWSAs

The Department of Water is responsible for protecting the catchment/recharge area of each proclaimed PDWSA. This protection is presently achieved by proclaiming the areas as Water Reserves, Catchment Areas or Underground Water Pollution Control Areas under the *Metropolitan Water Supply, Sewerage and Drainage Act 1909* or the *Country Areas Water Supply Act 1947*.

Once an area becomes a proclaimed PDWSA it is subject to by-laws used to protect water quality. For a list of gazetted PDWSAs, refer to the Department of Water's Water Quality Protection Note *Gazetted Public Drinking Water Source Areas*, or for location maps of gazetted PDWSAs, please use the Geographic Data Atlas available at <www.water.wa.gov.au> select *Maps, Data and Atlases*> *Geographic Data Atlas*> *Environment*> *Public Drinking Water Source Areas*.

Land and water use constraints

Areas that have been proclaimed as a PDWSA may have constraints placed on land use, development, public access and land/water-based activities. Where a land use was legally established in a PDWSA prior to its proclamation, it would generally be permitted to continue at the presently authorised form and scale. Where necessary, negotiations may be undertaken with land owners to buy land in source protection areas or land considered to be strategically important to the protection of the water supply. This process is based on a 'willing seller, willing buyer' philosophy. The compulsory purchase of land to protect a water source is a last resort that could be used to protect public health.

More Information

We welcome your views on this note. Feedback provided on this topic is held on file No: **WT476**.

This note will be updated periodically as new information is received or industry/activity standards change. Updates are placed on the Department's internet site <www.water.wa.gov.au> select *Water Quality*> *Publications*> *Water Quality Protection Notes*.

To comment on this note or for more information, please contact the Water Source Protection Branch at our Atrium office in Perth, phone (08) 6364 7600 (business hours), fax 6364 6516 or use *Contact us* at the Department's internet site, citing the note topic and version.



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Appendices

Appendix A. References and further reading

1. Australian Government

- *Australian Drinking Water Guidelines 2004*
- *Water Made Clear - A Consumer's Guide to the Australian Drinking Water Guidelines 2004*

For more information or a copy of these documents, please visit <www.nhmrc.gov.au>.

2. Department of Sustainability and Environment (VIC)

- Groundwater Note No 11 *Testing the Aquifer and Pumping Groundwater*

For more information or a copy of this document please visit <www.dse.vic.gov.au>.

3. Department of Water (WA)

- *Investigating Western Australia's Groundwater Resources 2006*
- Statewide Policy No 8 *Giving an Undertaking to Grant a Licence or a Permit under the Rights in Water and Irrigation Act 1914* (Water and Rivers Commission 2002)
- Water Quality Protection Notes:
 - *Australian Drinking Water Guidelines: An Overview*
 - *Protecting Public Drinking Water Source Areas*
 - *Land Use Planning in Public Drinking Water Source Areas*
 - *Land Use Compatibility in Public Drinking Water Source Areas*

For more information or a copy of these documents, see <www.water.wa.gov.au> then select *water quality > publications*.

5. Government of Western Australia

- *State Water Quality Management Strategy No 1 Framework for Implementation 2001*
- *Securing our future – a State Water Strategy for Western Australia 2003*

For more information or a copy of this document please visit <www.water.wa.gov.au> select *Planning and Reform > State Water Strategy*

6. Water Corporation (WA)

- *Planning for Perth's water needs 2002*
- *Integrated Water Supply Scheme Source Development Plan 2005: Planning Horizon 2005-2050*

For more information or a copy of these documents please visit <www.watercorporation.com.au>.

7. Western Australian Planning Commission

- Statement of Planning Policy 2.7 *Public Drinking Water Source Policy*
- Statement of Planning Policy 2.9 *Water Resources*

For more information or a copy of this document please visit <www.wapc.wa.gov.au> select *Publications*> *State Planning Policies*

Appendix B. Statutory requirements and approvals relevant to this note

Statutes	What it covers	Regulatory body/agency
<i>Rights in Water and Irrigation Act 1914</i> and <i>Rights in Water and Irrigation Regulations 2000</i>	<ul style="list-style-type: none"> • Licences to take water (water entitlement) • Permits to interfere with beds and banks of a watercourse • Licences to construct or modify a bore 	Department of Water
<i>Health Act 1911</i>	<ul style="list-style-type: none"> • Safety of community water supplies • Ensures the quality of water you drink meets the health guidelines of the Australian Drinking Water Guidelines 	Department of Health (Environmental Health) and Local Government Authorities
<i>Economic Regulation Authority Act 2003</i>	<ul style="list-style-type: none"> • Establishes consumer service standards • Issues operating licences to water service providers 	Economic Regulation Authority
<i>Environmental Protection Act 1986 (Part IV)</i>	<ul style="list-style-type: none"> • Protects the environment • Environmental impact assessment of major proposals 	Minister for the Environment advised by the Environmental Protection Authority
<i>Environmental Protection Act 1986 (Part V) and Environmental (Unauthorised discharges) Regulations 2004</i>	<ul style="list-style-type: none"> • Licensing of prescribed premises to prevent pollution • Establishes a legal authority to respond to unacceptable discharges into the environment 	Department of Environment and Conservation
<i>Country Areas Water Supply Act 1947</i> and <i>Metropolitan Water Supply, Sewerage and Drainage Act 1909</i>	<ul style="list-style-type: none"> • Establishes an area as a Public Drinking Water Source Area (PDWSA) to ensure long-term protection • Provides the power to manage development, operations and activities in PDWSAs to protect water quality 	Department of Water

Note: The above legislation is available from the State Law Publisher, <www.slp.wa.gov.au>.

Appendix C - Potential future water sources and associated costs

Table 1. Potential future water sources considered for inclusion in the Source Plan for the IWSS
(*Integrated Water Supply Scheme (IWSS) Source Development Plan, Water Corporation 2005*)

	Level of confidence	Source		Estimated yield (GL)		Indicative capital ^{1,2} cost (\$M at 2004/5)	Estimated operating ³ (c/kL at 2004/5)
				30 yr	8 yr		
SEAWATER DESALINATION	VERY HIGH	Seawater Desalination No 1		45		376 ⁴	40-44 ⁵
	HIGH	Seawater Desalination No 2	With pwr station	45		514 ^{6,7}	36 ⁵
			Without pwr station			424 ^{6,7}	56 ⁵
GROUNDWATER	HIGH	South West Yarragadee groundwater		45	383*	22	
	MEDIUM	Eglinton groundwater		17	15	54 ⁸	23
	MEDIUM	Yanchep groundwater		11	9	33 ⁸	23
	LOW	Gingin groundwater		30	20	439 ⁹	28 ⁹
	LOW	Karnup/Dandalup groundwater		up to 22			
	LOW	Gnangara groundwater – in conjunction with land use changes (over 20 years)		20	15		20
SURFACE WATER	HIGH	Water trading – Stage 1: piping of Waroona & Harvey Irrigation Districts		18	17	134*	5 - 13
	MEDIUM	Water trading – Stage 2: piping of Collie Irrigation District		19	16	253*	26
	MEDIUM LOW	Wellington Dam		15	12	87*	35
		<ul style="list-style-type: none"> Pumpback Desalination 		Up to 45	Up to 45	3rd party funding*	60 (subject to verification)
	MEDIUM	Catchment management – Wungong trial		6	5	R&D	25 NPV
	LOW	Additional water trading – Change to land use or on farm practices to reduce irrigation water needs.		To be determined.		*	
	LOW	Catchment management – other catchments		34	31	*	22 NPV
	LOW	Brunswick River		30 ¹⁰	25	275 ^{10*}	12
	VERY LOW	Water from the Kimberley		300		11,000 ¹¹	35 ^{11,12}
	VERY LOW	Cloud seeding		Technical viability, yield benefit and cost subject to further investigation.			
WASTEWATER REUSE	LOW	Aquifer storage & recovery		20+ GL and growing		Subject to ongoing analysis.	
		Alternative supply to industry		25GL via KWRP & KWRP-type expansion			
RECYCLING	LOW	Drainage water and storm water		Technical viability, yield benefit and cost subject to further investigation			

Explanatory notes for Table 1

- 1 The capital cost associated with source development is assumed to be the same regardless of yield reduction due to climate.
- 2 Unless otherwise stated, indicative cost estimates derived by escalation of planning estimates using Producer Price Index (Non-Residential Building Construction Index 4113 under General Construction Industry (a) Group and class indexes No 16). Corporate overheads have been applied to escalated cost estimates. Cost estimates for options with medium, low or very low levels of confidence will be reviewed as additional information becomes available and the source development concepts are defined with a greater degree of certainty.
- 3 Includes source operation costs only unless stated otherwise.
- 4 \$376M cost quoted for Desalination Plant No 1 is based on successful bid and expressed in \$2004/05. When costs are escalated for construction over the period 2004-5 to 2006-7, this equates to \$387M (in outturn \$). An additional \$24M (in \$2004-05) will be invested in bulk water transfer infrastructure to provide operational flexibility and to cater for integration of future sources into the IWSS.
- 5 Includes bulk water transfer operating costs.
- 6 Based on medium cost estimate.
- 7 These capital costs do not include the costs associated with bulk water transfer (i.e. Integration of product water into the IWSS).
- 8 Integration of these sources into the IWSS may also require provision of the north west corridor trunk main at an estimated capital cost of ~ \$65M.
- 9 Capital and operating cost estimates include provision for delivery of water to Mount Yokine reservoir. No allowance has been made for provision of peaking and bulkwater transfer from Mount Yokine reservoir into the IWSS.
- 10 Capital cost estimate assumes availability of bulk water transfer trunk main to Harvey. The cost for this trunk main is included in the estimate for the South West Yarragadee groundwater scheme.
- 11 Based on a conceptual scheme entailing three 1840 km pipelines from a dam on the Fitzroy River (GHD, September 2004). Does not include water treatment. Alternative development strategies may be possible.
- 12 Based on operating cost of \$105M for supply of 300GL of water (GHD, September 2004).
- 13 Integration of southern sources into the IWSS will necessitate upgrades to associated bulk water transfer infrastructure.