

WHEATBELT SNAPSHOT SERIES: POTABLE WATER

DISCUSSION PAPER OVERVIEW

Water supply is fundamental for supporting and sustaining community and industry development in the Wheatbelt.

Figure 1 Wheatbelt Region



Given the geographic and environmental diversity the Wheatbelt is serviced by three main supplies:

System	Wheatbelt Sub-Region	Other Regions
Goldfields Agricultural Water Supply Scheme (GAWSS) which links to the Integrated Water Supply System (IWSS)	Avon Central East Central Midlands (part) Wheatbelt South (part)	Perth Goldfields South West
Great Southern Towns Water Supply Scheme (GSTWS)	Wheatbelt South	Great Southern
Groundwater aquifers	Central Coast Central Midlands (part)	Perth Midwest

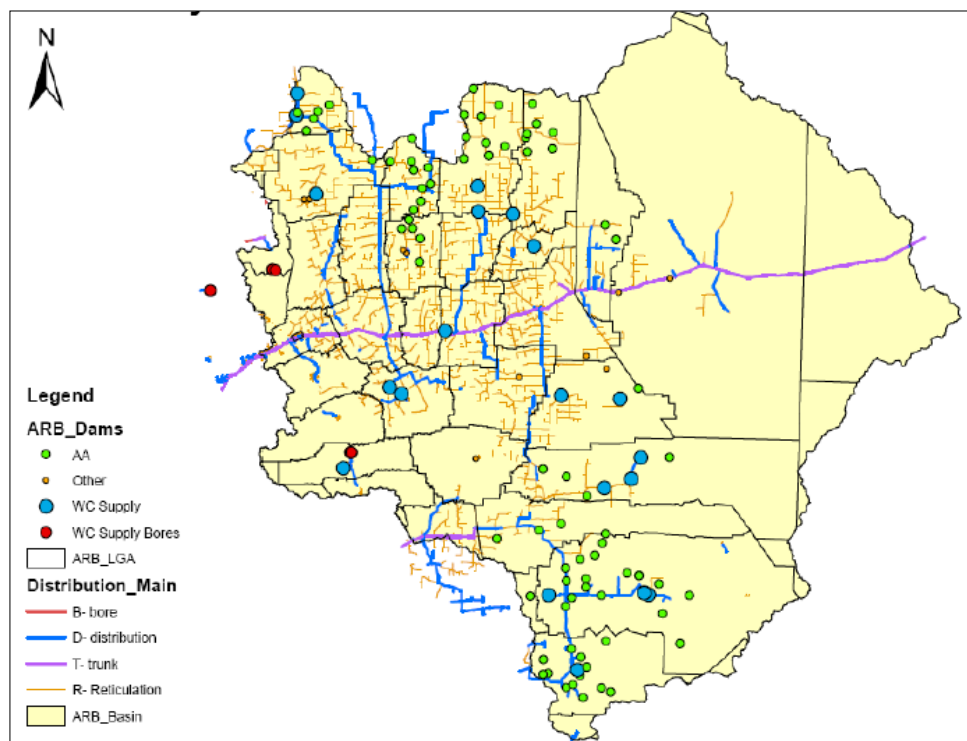
Outside of the schemes, settlements are dependent on a range of independent water sources primarily from:

- Strategic community water supply facilities (including surface water capture)
- Non-strategic Agricultural Area (AA) Dams
- Rainwater collection
- Groundwater

The function of these independent water supplies includes:

- Improvement of town water supplies
- Watering of playing fields and town gardens
- Provision of water for emergency use by farm livestock when on-farm supplies fail
- Provision of emergency public water supply capacity at public standpipes

Figure 2 Major Dams and Water Sources in the Avon River Basin (GHD 2007)



Key development issues in the Wheatbelt region include:

- Ability to address cost barriers for connection to scheme infrastructure for new developments and remote locations
- Upgrades to ageing water infrastructure
- Staged, trigger point investment plans for capital investment in water supply in the Wheatbelt endorsed by government for out-year State budget allocation
- Integrated planning for population growth and industry expansion in the Wheatbelt *alongside* metropolitan water allocation planning
- Importance of planning for changes in climate including rainfall variability and increased temperatures
- Unknown capacity for a number of systems in the Wheatbelt
- Infrastructure and development should be designed to encourage efficient and more sustainable water use
- Security of supply and upgrade of infrastructure with particular regards to Chittering to prevent the proliferation of un-serviced rural lots that will create longer term unsustainable servicing issues.

GOLDFIELDS AGRICULTURAL WATER SUPPLY SCHEME (GAWSS) AND INTEGRATED WATER SUPPLY SYSTEM (IWSS)

Supply:

Via the 566km long Goldfields pipeline that runs from Mundaring to Kalgoorlie, with extensions north and south. Water is sourced from Mundaring Weir near Perth, and supplemented with other IWSS sources when required. The majority of reticulated pipe network use is located north of the Great Eastern Highway and west of Merredin (see Figure 3).

Capacity and Consumption:

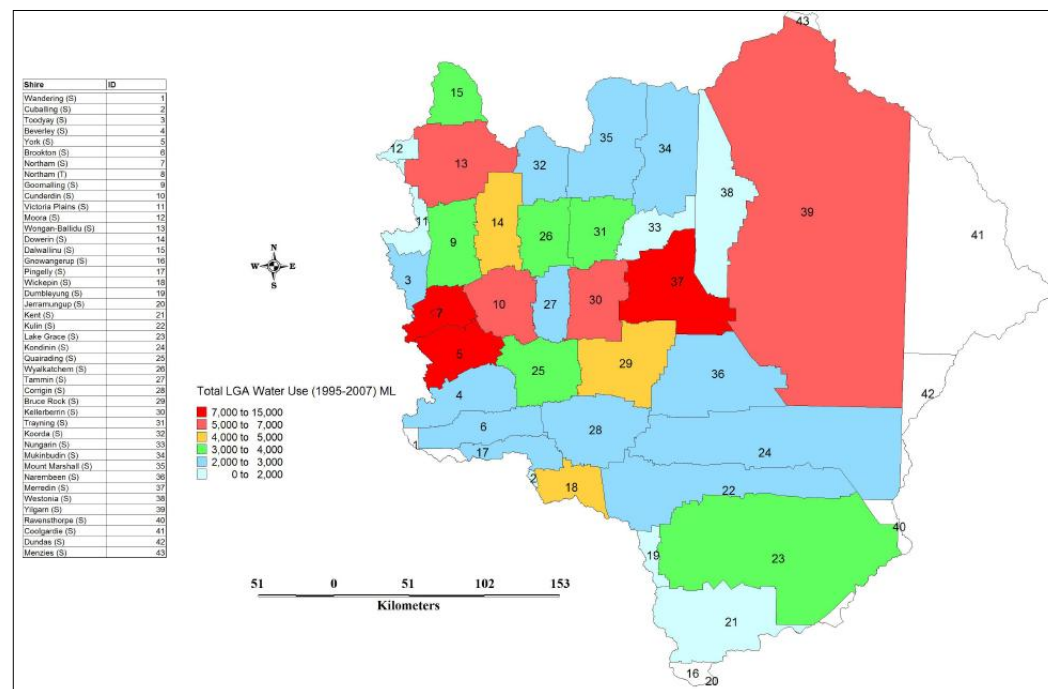
An estimated 27 GL/year of potable water is delivered through the Mundaring-Kalgoorlie pipeline, with approximately 11.5 GL/year of this water consumed within the Avon River Basin (GHD 2008). Table 1 lists water consumption by category for the Avon River Basin.

Table 1 Summary of Water Corporation Consumption by Category (GHD 2008)

Category	Average Annual Consumption (kL)	%
Residential	4,870,634	42.5
Farms	4,366,149	38.1
Parks & gardens	526,687	4.6
Services & amenities	508,536	4.4
Industrial	462,783	4.0
Accommodation Services	339,110	3.0
Commercial	291,160	2.5
Standpipes, Community Water Supplies	63,277	0.6
Mining	19,212	0.2
Transport Infrastructure	6,108	0.1
Total	11,453,656	100

Figure 3 illustrates water consumption by local government areas in the Avon River Basin.

Figure 3 Total Water Use by Local Government 1995-2007 (GHD 2008)



Demand:

Current demand is adequately met however there is no water supply planning for Wheatbelt areas connected to the GAWSS and IWSS. Peri-urban growth and industrial expansion will require significant upgrades to the Main Conduit and the Mundaring Water Treatment Plant. To accommodate the aspirational population target established in the SuperTowns program, the Chidlow and Wundowie stations will require an upgrade when demand nears

130 ML/day (currently 125 ML/day). The cost of these upgrades is estimated at \$6 million each. The Mundaring Weir Water Supply Improvement Project (MWWSIP) which is currently being completed by Helena Water will increase capacity of the Mundaring Water Treatment Plant and Pumping Station. This project is due for completion by mid 2013 and will increase capacity to 160ML/day. However, upgrades to infrastructure at Mundaring will be required when demand nears 170 ML/day (currently 142 ML/day). This upgrade is estimated to cost \$27.7 million. Additional 13,000 residents in Northam would consume another 11.3 ML/day. Currently there is no additional funding available for these capital works upgrades for the Water Corporation.

Required upgrades identified in *Northam Regional Centre Growth Plan* include:

- Upgrade to storage tanks in Sawyers Valley (50 ML deficit) - \$37.6 million
- Northam Tank 2 roof replacement - \$1.05 million
- Storage tank and transfer pump station in Wundowie for new development - \$6 million
- New developments in Toodyay (700 residential lots) are unable to be serviced from existing tanks requiring new tanks, pipelines and pumps - \$52 million
- Capacity upgrade to York gravity main and tank (4 ML) - \$6.8 million (planning in York is due to be complete in 2013)

Other than financial, there are unlikely to be any insurmountable obstacles to accommodate growth in these areas.

GREAT SOUTHERN TOWNS WATER SUPPLY SCHEME (GSTWSS)

Supply:

Water supply in the Wheatbelt South (excluding Corrigin) is provided through the GSTWSS. Harris Dam, near Collie, is the major source for this scheme supplying 33 towns in the Wheatbelt and Upper Great Southern. Catchment for the Harris Dam spreads between the Shire of Collie, Shire of Harvey and Shire of Williams.

Approximately half of the localities also have local sources (primarily surface water) which can contribute to supply if required. The Water Corporation can also transfer water from Harris Dam to the IWSS when there is a reasonable chance of Harris Dam overflowing. Once the water treatment plant is operational at Harris Dam, the Water Corporation plans to undertake transfers to Stirling Dam on a more frequent basis.

Figure 4 Great Southern Region and GSTWS (Water Corporation 2011)



Capacity and Consumption:

Harris Dam holds 72 million kilolitres. The long term average stream flow into the Harris reservoir is 27.2 GL with an estimated annual yield from the dam of 17.5 GL (WRC 1998). Declining rainfall is attributed to a 50% reduction in inflow.

A number of local governments in the Wheatbelt South have reported vulnerability to pipe leakages and long response/repair times due to aging infrastructure and other Water Corporation budget priorities.

Small reservoirs in the Wheatbelt South include:

- Brookton Dam: 136 ML full capacity; currently at 23.4%
- Hyden Humps Dam: 47 ML full capacity; currently at 51.4%
- Kondinin/Yeerakine Dam: 41 ML full capacity; currently at 86.4%
- Kukerin Reservoir: 36 ML full capacity; currently at 78.4%
- Lake Grace No 1 Dam: 55 ML full capacity, currently at 86.5%
- Lake King Dam: 12 ML full capacity; currently at 106.5%
- Newdegate Turkey Nest Dam: 47 ML full capacity; currently at 81.8%
- Cuballing Reservoir
- Dumbleyung Dam
- Karlgarin Reservoir
- Wandering No 1 Dam
- Wandering No 2 Dam
- Wave Rock Dam

Demand:

The GSTWSS has limited capacity to expand at present and programmed expansion of the scheme is based on a 1% per annum growth. No planning has been undertaken to quantify the require upgrades in terms of growth in the Wheatbelt South and Great Southern (three SuperTowns, Boddington, Collie and Katanning are included supplied from GSWTSS). Upgrades to infrastructure in Boddington were undertaken in 2010 with an additional \$9 million earmarked for further expansion. This included an additional 2 ML tank and upgrades to 22 km of GSTWSS main.

A water treatment plant which would have the capacity to treat the entire GSTWSS has been proposed by the Water Corporation. Construction of the water treatment plan is estimated in the next 10 to 15 years. The Harris Dam may require augmenting from the IWSS or possibly Wellington to accommodate further growth in the Wheatbelt South and Great Southern Region. Alternatively further investigation into abstraction, desalination and treatment of groundwater could provide some of the potable water required to service expansion.

A number of local supplies from existing small reservoirs are facing quality issues including turbidity (cloudiness) caused by wind action and maintenance of chlorine residuals. At Lake Grace a turbidity curtain has been installed and is currently being evaluated for its effectiveness. New chlorine facilities have been installed at Lake King during 2009/10 and a ground level tank has been installed at Pingaring to buffer storage off the GSTWSS.

GROUNDWATER AQUIFERS IN THE CENTRAL COAST AND CENTRAL MIDLANDS

Supply:

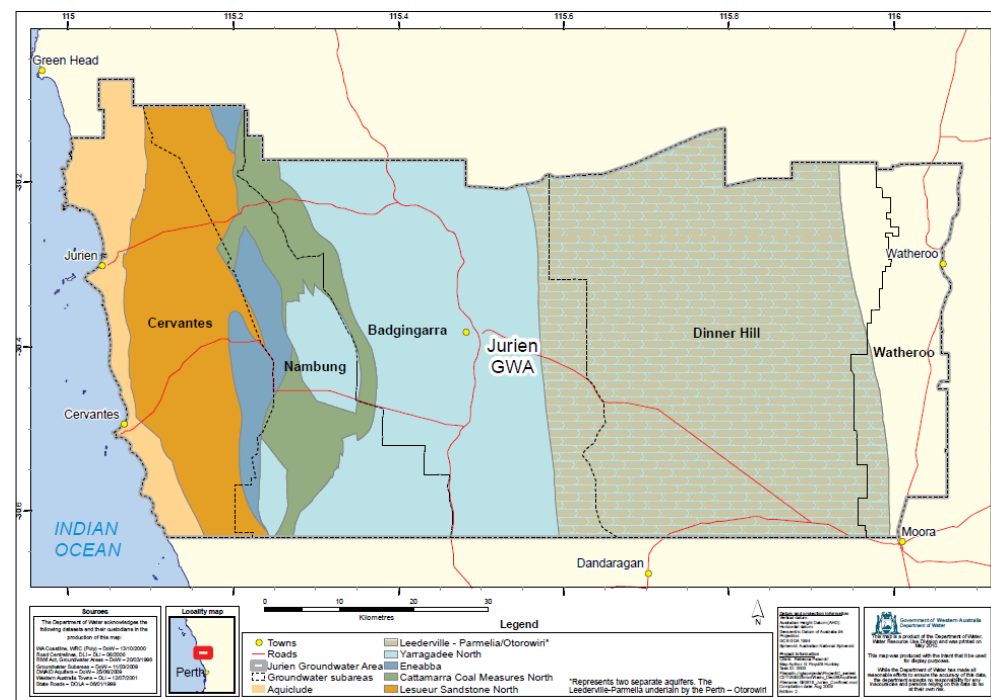
The Jurien groundwater area (5,012 km²) and Gingin ground water area (6,147 km²) are located in the Northern Perth Basin. The Gingin-Jurien groundwater areas contain eight sedimentary aquifer systems and fractured rock aquifer systems:

- Superficial
- Surficial
- Mirrabooka
- Leederville-Parmelia
- Yarragadee
- Cattamarra
- Eneabba
- Lesueur

The Superficial, Yarragadee and Leederville–Parmelia aquifers are the main groundwater resources used (for public water supply, agriculture, horticulture and mining). Other sedimentary aquifers are localised and have lower yields which makes them less useful as a water resource. Moora is supplied from the local Kolburn borefield stored in holding tanks. The Bindoon–Chittering area accesses groundwater sources under a water trading agreement.

Each town’s supply is determined by proximity to certain aquifers, rainwater storage and town infrastructure. The Water Corporation provides potable water to most town sites in this area under license which is gravity fed from a standalone bore system and storage tanks via a reticulated pipeline network. Bindoon’s access to groundwater is subject to a tripartite Water Allocation Trade between Lennards Brook Farming Pty Ltd, Water Corporation, Department of Water, and Shire of Chittering.

Figure 5 Confined Aquifer Boundaries in the Jurien Bay Groundwater Area (Department of Water 2010)



Capacity and Consumption:

94.6 GL is available for take annually from the Jurien groundwater area. The volume of licensed entitlements as measured in April 2010 was 18.7 GL for general consumption and 1.5 GL for public water supply. 7 GL has been reserved for public water supply to meet demand until 2040 and there is approximately 64.4 GL from all resources available for new users.

The Water Corporation is currently licensed to draw 420,000 kL/annum from the Jurien wellfield for public water supply

purposes. This involves extraction from an unconfined aquifer in the Tamala Limestone which is vulnerable to contamination.

Table 2 Groundwater allocation limits and water availability for licensing
(Department of Water 2010)

Resource		Allocation limit ¹ kL/yr	Unlicensed components		Licensable component	Status of water availability for licensing ²
Subarea	Aquifer		Public water supply reserve kL/yr	Exempt unlicensed kL/yr	General licensing kL/yr	
Badgingarra	Cattamarra	400 000	0	0	400 000	water available
	Leederville-Parmelia	300 000	0	0	300 000	water available
	Otorowiri	(100 000)	0	0	(100 000)	unknown
	Yarragadee	27 500 000	0	940 000	26 560 000	water available
Cervantes	Cattamarra	(100 000)	0	0	(100 000)	unknown
	Eneabba	600 000	0	0	600 000	water available
	Lesueur	3 000 000	2 450 000	550 000	0	no water available - fully allocated
	Superficial	30 000 000	3 000 000	280 000	26 720 000	water available
Dinner Hill	Leederville-Parmelia	12 600 000	1 500 000	0	11 100 000	limited water available
	Mirrabooka	(500 000)	0	0	(500 000)	unknown
	Otorowiri	(100 000)	0	0	(100 000)	unknown
	Surficial	(1 000 000)	0	530 000	(470 000)	unknown
Nambung	Cattamarra	1 600 000	0	0	1 600 000	water available
	Eneabba	300 000	0	0	300 000	water available
	Lesueur	2 700 000	0	0	2 700 000	water available
	Superficial	4 000 000	0	370 000	3 630 000	limited water available
	Yarragadee	8 800 000	0	0	8 800 000	water available
Watheroo	Leederville-Parmelia	100 000	0	90 000	10 000	limited water available
	Surficial	(300 000)	35 000	0	(265 000)	unknown
	Fractured rock	(600 000)	0	270 000	(330 000)	unknown
Total		94 600 000	6 985 000	3 030 000	84 585 000	

Demand:

There is deemed to be sufficient water resources available for population and industry expansion in the Central Coast and parts of the Central Midlands. Complex hydrogeology, naturally variable water quality and the distribution of each aquifer may restrict possibilities for abstraction in particular cases. Extension or upgrading infrastructure accessing this water supply would be required with growth and increasing demand.

In the SuperTowns process, the Water Corporation has advised that they have augmentation plans in place suitable for the planned expansion of Jurien Bay to a population of 20,000+ people. These plans include increased storage capacity, additional production bores at the current groundwater treatment plant site and two additional storage reservoirs located within the Turquoise Coast development. Investigation into water access and supply for a future food production industrial site in the sub-region is required.

The *Wheatbelt Land Use Planning Strategy* determined that Gingin's water supply was close to capacity with no planning in place to cater for growth. Moora was also identified to require immediate investigation into potable water capacity/quality constraints. This aquifer is subject to salinity monitoring. More than affecting urban water supplies, this may affect growth in the horticulture sector.

Water infrastructure in Bindoon is at capacity and cannot cater for new developments in this now peri-urban area. The nature of the Water Allocation Trade arrangement means that formally no allocation is budgeted for in the State-wide planning process. In the absence of a large, financially secured land developer, the cost of the required upgrades and expansion is inhibitive to developers. This is resulting in continued ad hoc development of

larger lot sizes generating a significant servicing issue for local government and other State agencies. Preliminary infrastructure upgrades valuing at \$2.3 million has been identified.

An estimated 48 GL from the Gingin-Jurien groundwater aquifers has been identified as a possible new source to be extracted for metropolitan use between 2030 and 2060.

Future high demand may result in competition for groundwater between various industries. Once the allocation limits have been reached, meeting further demand will only be possible by increasing water use efficiency, by trading or by developing alternative sources. Continued liaison with stakeholders regarding the use of surface and groundwater and its management is fundamental to protection of groundwater resources.

LINKS TO OTHER REGIONS

There are great opportunities to link with water supply planning occurring in neighbouring regions. For example:

- Esperance desalination project and the Esperance-Kalgoorlie-Boulder pipeline (limited progress to-date, however potential to supplement the GAWSS)
- Future water supply planning for the Perth metropolitan area

FUTURE DISCUSSION PAPERS AND ACTIONS

- Waste water, sewerage, and water recycling/reuse initiatives in the Wheatbelt
- Energy/Power, Telecommunications, Transport
- GIS mapping

- Liaise with key stakeholders to verify content and seek engagement in solutions
- Ongoing liaison with the Water Corporation and Dept of Water to encourage more integrated planning.
- Liaise with Wheatbelt local governments and agencies to link with Wheatbelt Development Commission and Department of Planning sub-regional and whole-of-region planning activity

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Local government and stakeholder consultation