



Government of Western Australia  
Department of Water

# Bunbury and South West Coastal groundwater areas

-----  
subarea reference sheets

Plan companion for the South West  
groundwater areas allocation plan



*Looking after all our water needs*



# Bunbury and South West Coastal groundwater areas subarea reference sheets

Plan companion for the South West groundwater  
areas allocation plan

Department of Water

May 2009

**Department of Water**

168 St Georges Terrace

Perth Western Australia 6000

Telephone +61 8 6364 7600

Facsimile +61 8 6364 7601

[www.water.wa.gov.au](http://www.water.wa.gov.au)

© Government of Western Australia 2009

May 2009

This work is copyright. You may download, display, print and reproduce this material in unaltered form only (retaining this notice) for your personal, non-commercial use or use within your organisation. Apart from any use as permitted under the *Copyright Act 1968*, all other rights are reserved. Requests and inquiries concerning reproduction and rights should be addressed to the Department of Water.

ISBN 978-1-921549-69-4 (print)

ISBN 978-1-921549-70-0 (online)

**Acknowledgements**

The Department of Water would like to thank the following for their contribution to this publication: Rebecca Palandri, Patrick Seares, Anna Phillips, Richard Watson, Annaleisha de Chanéet, Phil Commander, Bev Thurlow, Gary Floyd, Brenden Huntley and the South West Region.

For more information about this report, contact:

Wayne Tingey

Regional manager,

South West regional office

35–39 McCombe Road

Bunbury Western Australia 6230

or

PO Box 261

Bunbury Western Australia 6231

Telephone 08 9726 4111

Facsimile 08 9726 4100

**Cover photograph**

Peel-Yalgorup Ramsar wetland

Rebecca Palandri, 2008

# Contents

Contents .....	iv
1 Introduction.....	1
1.1 Purpose of the plan .....	1
1.2 Purpose of the subarea reference sheets .....	1
1.3 Licensing information and the plan.....	1
1.4 How to use the subarea reference sheets.....	2
1.5 Water information data requests .....	3
2 Subarea reference sheets .....	7
3 Bunbury groundwater area .....	9
3.1 Bunbury–Yarragadee .....	9
3.2 Bunbury West .....	12
3.3 Bunbury East .....	16
3.4 Dardanup .....	19
3.5 Australind .....	22
3.6 Kemerton South .....	25
3.7 Kemerton Industrial Park South .....	28
4 South West Coastal groundwater area.....	31
4.1 Kemerton North.....	31
4.2 Kemerton Industrial Park North .....	34
4.3 Myalup .....	37
4.4 Wellesley.....	40
4.5 Harvey.....	43
4.6 Lake Preston South.....	46
4.7 Lake Preston North .....	49
4.8 Lake Preston .....	52
Appendices.....	55
Glossary .....	64
Shortened forms .....	66
References and further reading.....	67

## Appendices

Appendix A	Statewide licensing policies.....	56
Appendix B	Other plans and strategies to be considered.....	61
Appendix C	Useful information and websites for other government departments.....	63

# Figures

- Figure 1 The plan area ..... 4
- Figure 2 Subarea boundaries ..... 5
- Figure 3 Management zones..... 6
- Figure 4 Bunbury–Yarragadee subarea ..... 11
- Figure 5 Bunbury West subarea ..... 15
- Figure 6 Bunbury East subarea..... 18
- Figure 7 Dardanup subarea ..... 21
- Figure 8 Australind subarea ..... 24
- Figure 9 Kemerton South subarea ..... 27
- Figure 10 Kemerton Industrial Park South subarea..... 30
- Figure 11 Kemerton North subarea ..... 33
- Figure 12 Kemerton Industrial Park North subarea ..... 36
- Figure 13 Myalup subarea..... 39
- Figure 14 Wellesley subarea ..... 42
- Figure 15 Harvey subarea ..... 45
- Figure 16 Lake Preston South subarea ..... 48
- Figure 17 Lake Preston North subarea ..... 51
- Figure 18 Lake Preston subarea ..... 54



# 1 Introduction

## 1.1 Purpose of the plan

The *South West groundwater areas allocation plan* provides the department's direction on the taking and use of groundwater resources in the plan area (Figure 1). The planning process considered the ecological, social and economic values of the water resources, with the community's input from a range of consultation processes over several years. It aims to achieve a balance between current and future users, and the protection of the water-dependent environment.

The plan provides a clear and consistent direction to current and future water users in areas that are under pressure from increasing abstraction and climate change.

## 1.2 Purpose of the subarea reference sheets

The subarea reference sheets are designed to assist with licensing of groundwater in the plan area by providing local subarea-based information and guidance on the licensing process. The reference sheets will help to inform prospective licence applicants of their local area requirements for water use in a specific subarea and provide general information to assist in the application process.


## 1.3 Licensing information and the plan


The *South West groundwater areas allocation plan* contains the specific licensing policies and rules that apply to all subareas and must be used in conjunction with this document in any licence assessment process or new application.


The licensing information detailed in this document follows standard statewide protocols and processes used across all plans. For further information please visit the department's website.

Applicants should be aware of the licensing policies and local area rules that may apply to them before submitting their groundwater licence application to the department.

Licensing forms for licence applications can be found on the Department of Water's website: <[www.water.wa.gov.au](http://www.water.wa.gov.au)> Doing business with us > Water licensing > Licensing publications and forms > or by contacting one of the South West regional offices.

 Bunbury (08) 9726 4111

 Busselton (08) 9781 0100

 Manjimup (08) 9771 1878



## 1.4 How to use the subarea reference sheets

The reference sheets provide background information on a particular groundwater subarea. Each subarea has different issues associated with licensing and water management. The reference sheets provide summarised information on the subarea including:

- proclamation, water use and water management issues (Figure 2 and Figures 4–18)
- allocation limits and water availability
- hydrogeology
- ecological, social, cultural and recreational sites of significance that were considered in the assessment process for groundwater licensing
- management zone rules (see Section 5.2 of the *South West groundwater areas allocation plan* for more detail) (Figure 3).

For the full technical detail please see the bibliography of the *South West groundwater areas allocation plan* for a complete reference and recommended reading list.

For a licence application to be assessed it should be consistent with, and meet the requirements of, the *South West groundwater areas allocation plan* and the *Rights in Water and Irrigation Act, 1914*. The reference sheets are not a replacement for a clause 7 (2) licence assessment process under the Act (see Appendix A and Table A1). The information contained in the reference sheets must also be used in conjunction with the following information:

- the principles and objectives for water management described in the *South West groundwater areas allocation plan* (Section 1.2 and Chapter 3 of the plan)
- the policies and rules listed in the *South West groundwater areas allocation plan* (Section 5.1–5.2 of the plan)
- State and Commonwealth legislation relating to water and its use (Appendix B)
- licensing process (Appendix A), unless otherwise stated in the plan
- statewide policies, guidance and allocation notes (Appendix A)
- reviewing the allocation limits for the South West groundwater areas (DoW 2008)
- *South West groundwater areas monitoring program* (DoW 2008)
- *Management triggers and responses for groundwater-dependent ecosystems in the South West groundwater areas* (Del Borrello 2008)
- *Kemerton groundwater subareas water management plan* (DoW 2007).

There are also numerous documents produced by the department and other government agencies that provide information on a range of water management issues that can be used as reference material for licence applications and in the assessment process. The most relevant of these are listed in Appendix B.

Appendix C provides a list of useful departmental websites to access for additional information linked to components of the water management process and used in the licence assessment process. Any licence application should be consistent with other departmental plans and other government agencies plans or strategies where applicable.

Please note that all data presented have specified dates of collection and interpretation. New and updated information should be collected and used where appropriate. All technical and supporting documents are available on the department's website <[www.water.wa.gov.au/allocationplanning](http://www.water.wa.gov.au/allocationplanning)>.

Prospective licensees and licensing officers need to be aware that within a 2 km buffer along either side of the subarea boundary line the aquifer may or may not be accessible, and that hydrogeological investigations may be needed.

## 1.5 Water information data requests

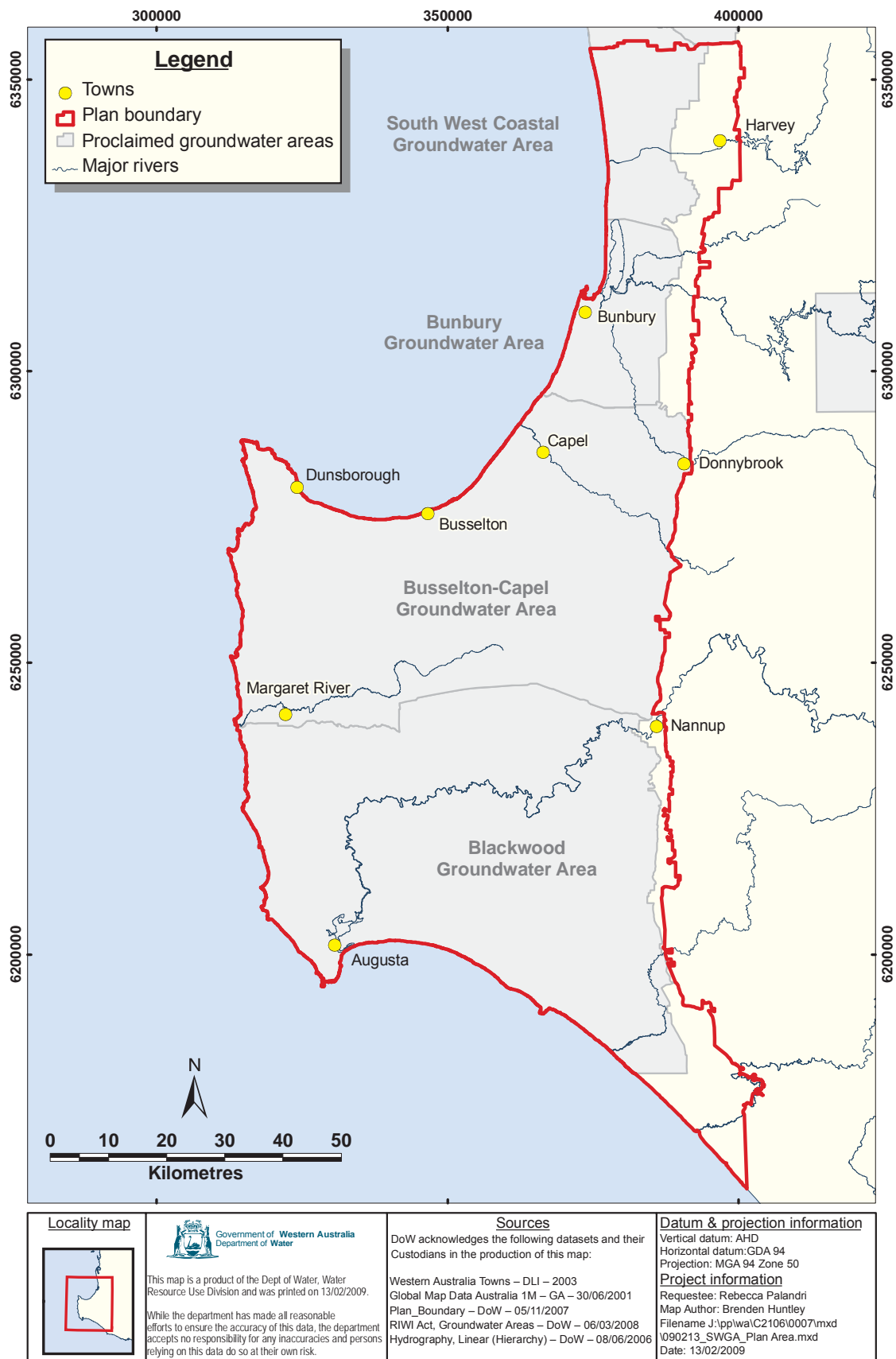
The Department of Water monitors water levels and water quality in its monitoring bore network, storing the data on our water information network (WIN). This information is up-to-date and available upon request using the data request form found here:

<[www.water.wa.gov.au](http://www.water.wa.gov.au)> Tools >Monitoring and data>

or by contacting one of the department's regional offices in the South West. The form is electronic and can be emailed or posted to us.

For more information on current water level trends please see *Groundwater level trends analysis for the South West groundwater areas* (Golder 2008). Updates of water level monitoring will be available annually in the evaluation statement (See Chapter 6 of the *South West groundwater areas allocation plan*).

**Plan companion for the  
South West groundwater areas allocation plan**



**Figure 1 The plan area**

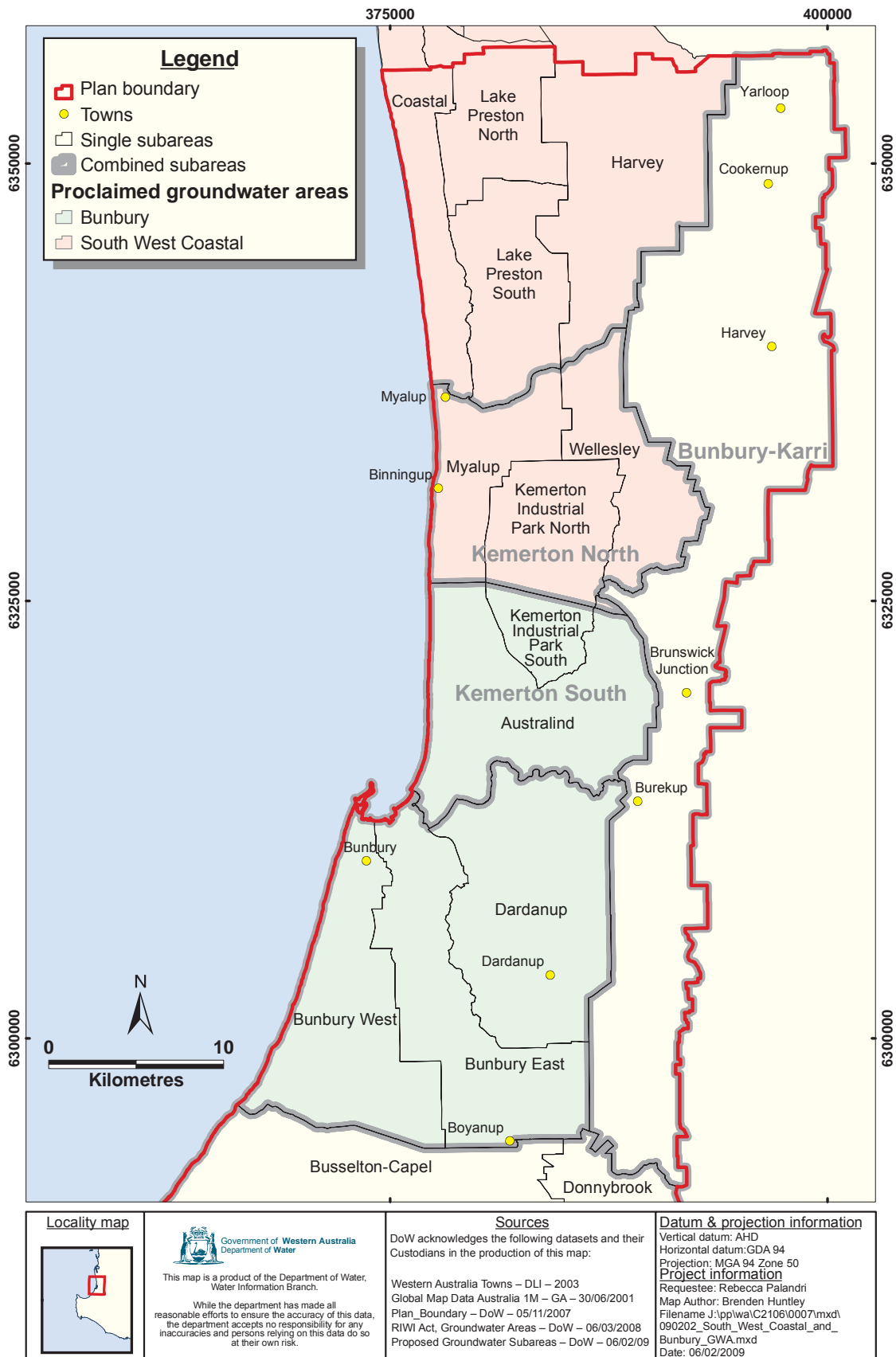
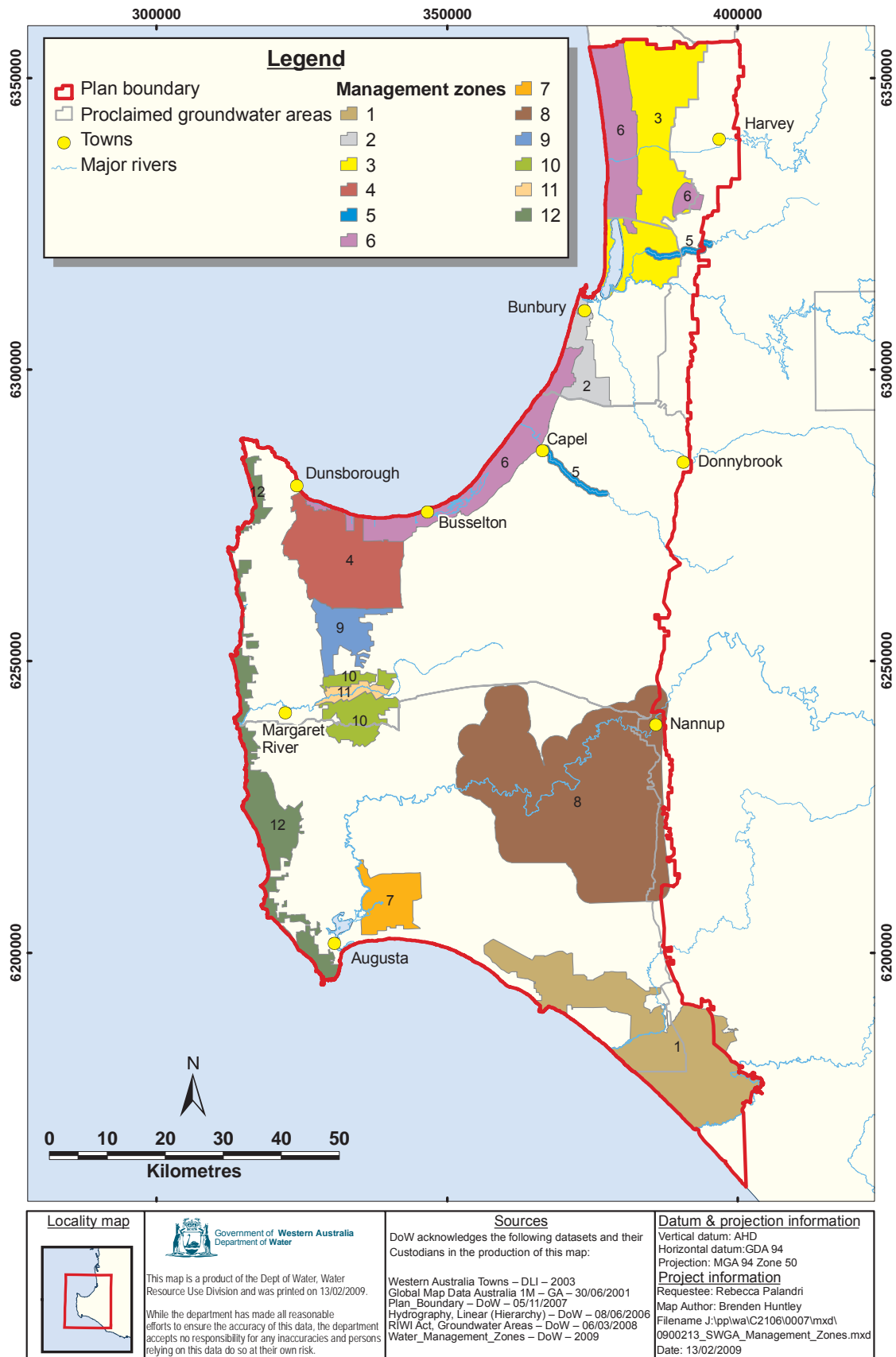


Figure 2 Subarea boundaries

**Plan companion for the  
South West groundwater areas allocation plan**



**Figure 3 Management zones**

## 2 Subarea reference sheets

In assessing a licence application we undertake a clause 7 (2) assessment under the provisions of the *Rights in Water and Irrigation Act 1914*. In conducting this assessment we consider the impacts from the abstraction of the water and its use on ecological, cultural, social and economic factors.

Important sites and values that we consider have been listed in the subarea reference sheets. These are not the full list of values or sites, but the most relevant to water management for a particular subarea that we consider for all groundwater licence applications. Some of the sections of the subarea reference sheets are discussed below.

### *Ecological*

We currently monitor various groundwater-dependent ecosystem (GDE) sites listed in the subarea reference sheets, including implementing their associated management triggers and responses if the water level criteria are breached (Del Borrello 2008).

There are also ecological water requirement (EWR) sites that have been determined through various investigations and studies across the plan area and are a guide to acceptable water level drawdowns near these sites. These sites are not currently monitored. However they are used in assessing licence applications. The full list of sites is available in Hyde 2006 and Del Borrello 2008.

Many groundwater-dependent ecosystem and ecological water requirement sites contain or are linked to declared rare flora, declared rare fauna, threatened ecological communities, environmental protection policy wetlands, Australian national conservation areas, Ramsar wetlands and numerous water courses and their associated pools, bed and banks.

Where these sites are not covered as groundwater-dependent ecosystem or ecological water requirement sites they are listed in the subarea reference sheets to highlight their presence, as they are considered in managing groundwater abstraction. These sites may or may not be groundwater-dependent and as such, if investigation work has not previously been carried out, licensees may be requested to undertake an investigation in order to prove that the proposed drawdown will not adversely affect these sites.

### *Cultural*

The claimant groups listed and any reference to Aboriginal sites of significance (listed heritage sites) have been extracted from the Department of Indigenous Affairs database. The information only refers to those claims that have been determined and the sites are listed on the permanent register. The listed sites in the subarea

reference sheets are directly related to water management and a full search is always undertaken during a licence assessment to ensure that the proposed impacts are acceptable. Applicants may be required to undertake work associated with Aboriginal heritage if a site is likely to be disturbed.

### *Social*

The major social water use values considered are public and private drinking water (including domestic, stock and garden use) and recreational sites. The localities in each subarea are listed to help licensees find out which subarea they are located in. Although there are many different types of recreational sites related to water, only those which are known to be groundwater-dependent are listed.

### *Economic*

The economic aspects of water management are covered by the sections on water use by current licensees, available water and the issues for management. All licence applications are assessed using this information to protect existing uses within the amount of available water and the constraints on accessing the water resource.

### 3 Bunbury groundwater area

#### 3.1 Bunbury-Yarragadee

Bunbury–Yarragadee																				
Subarea description																				
<b>Area</b>	330.0 km <sup>2</sup>	<b>Licensed water use (November 2008)</b>																		
<b>Proclamation</b>	Bunbury groundwater area 1975	Yarragadee: 20 186 750 kL/yr																		
<b>Shire</b>	City of Bunbury and the shires of Capel and Dardanup	<table border="1" style="margin-top: 10px;"> <caption>Licensed water use (November 2008)</caption> <thead> <tr> <th>Category</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Public water supply</td> <td>54.5%</td> </tr> <tr> <td>Mining and industry</td> <td>16.3%</td> </tr> <tr> <td>Service sector</td> <td>18.5%</td> </tr> <tr> <td>Irrigated pasture</td> <td>3.6%</td> </tr> <tr> <td>Domestic, stock and garden</td> <td>2.3%</td> </tr> <tr> <td>Horticulture</td> <td>2.0%</td> </tr> <tr> <td>Viticulture</td> <td>0.9%</td> </tr> <tr> <td>General agriculture</td> <td>0.1%</td> </tr> </tbody> </table>	Category	Percentage	Public water supply	54.5%	Mining and industry	16.3%	Service sector	18.5%	Irrigated pasture	3.6%	Domestic, stock and garden	2.3%	Horticulture	2.0%	Viticulture	0.9%	General agriculture	0.1%
Category	Percentage																			
Public water supply	54.5%																			
Mining and industry	16.3%																			
Service sector	18.5%																			
Irrigated pasture	3.6%																			
Domestic, stock and garden	2.3%																			
Horticulture	2.0%																			
Viticulture	0.9%																			
General agriculture	0.1%																			
<b>Rainfall</b>	800–1000 mm																			
Allocation and water availability kL/yr																				
<b>Aquifer</b>	<b>Allocation limit</b>	<b>Available water</b>																		
Yarragadee	26 500 000	Fully allocated contact the Bunbury office for more information.																		
Issues for water management																				
<p>The Yarragadee Aquifer is fully allocated. Water from this aquifer has been reserved in the Bunbury groundwater area for public water supply for drinking water purposes.</p> <p>The Yarragadee is unconfined and connected to the Superficial Aquifer in the northern portion of the Bunbury West subarea and requires more stringent management in this area. Abstraction restrictions (management zone 2) may apply to maintain water quality and the salt water interface. As a result the location and depth of draw points is likely to be restricted along the coast. Monitoring of water quality may be included as a licence condition.</p> <p>Environmental management triggers and responses apply. See <i>Management triggers and responses for groundwater-dependent ecosystems in the South West groundwater areas</i>, Del Borrello 2008 for more information.</p>																				
Hydrogeology																				
<b>Aquifer</b>	<b>Description</b>																			
Yarragadee	The Yarragadee Aquifer is present within the Bunbury Trough of the Southern Perth Basin. It is composed of four units, of which units 2 to 4 are present in the subarea. Unit 3 is where the aquifer is predominantly accessed. The aquifer ranges in depth from 15 m (west) to < 300 m (in the east of the Bunbury Trough) and is shallow and unconfined south of Bunbury.																			

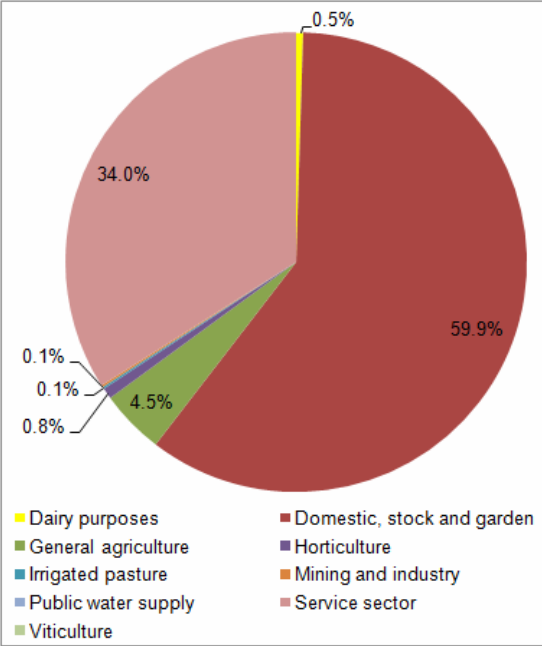


<b>Bunbury–Yarragadee</b>			
	<p>The aquifer is confined by the Bunbury Basalt and the Leederville Aquifer (east of the outcropping Bunbury Basalt). To the north the aquifer merges laterally with the Cattamarra Coal Measures aquifer.</p> <p>The aquifer discharges off the coast and is recharged on the Blackwood Plateau, with some downward leakage from the Superficial Aquifer where the aquifer is unconfined near Bunbury. Water levels in monitoring bores have been declining up to 2 m over last 10 years on the coastal plain. Abstraction impacts are evident in local areas. Salt wedges exist in the aquifer along the coast (Bunbury West subarea) at varying depths in the different layers of the aquifer. Groundwater salinity generally ranges from &lt; 200–400 mg/L TDS.</p>		
<b>Considerations for water use include, but are not limited to, the following</b>			
<b>Ecological</b>			
<p><i>Wetlands and waterways:</i> Several wetlands in the Bunbury West subarea may be groundwater-dependent on the Yarragadee Aquifer.</p> <p><i>Threatened ecological communities and declared rare flora sites:</i> There are several threatened ecological community and declared rare flora sites that are in the Bunbury West subarea may be groundwater-dependent on the Yarragadee Aquifer.</p> <p><i>Groundwater-dependent ecosystems and ecological water requirement sites:</i> There are several ecological water requirement sites which do not have departmental monitoring associated with them but are important and may require additional work if a licence application is submitted near them (see Hyde 2006 for more information).</p>			
<b>Cultural</b>			
<i>Native Title claimant:</i> Gnaala Karla Booja.			
<b>Social</b>			
<p><i>Towns and localities:</i> Towns of Bunbury, Dardanup, Boyanup, and suburbs of Dalyellup, Australind and Eaton cover this subarea with water supply for domestic purposes from rainwater tanks and exempt groundwater abstraction. In some areas, where the Yarragadee Aquifer is accessed, it is not exempt and requires a licence.</p> <p><i>Public water supply:</i> City of Bunbury located within this subarea has its drinking water supplied by the Bunbury Water Board (AQWEST). The Water Corporation supplies the locality of Dalyellup, town of Eaton and the town of Boyanup with drinking water from the Yarragadee Aquifer. Water has been reserved in this subarea for public water supply for drinking water purposes (5 700 000 kL/yr) to meet the demands of current and future scheme water use in the Bunbury groundwater area. There is a water source protection plan that covers the public water supply production bores<sup>1</sup>.</p>			
<b>Management zones that apply in this subarea</b>			
<b>2</b>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%; padding: 5px;">Bunbury west subarea</td> <td style="padding: 5px;">Manage the connected Superficial and underlying unconfined Yarragadee Aquifers from increased abstraction. Manage the impacts of increased urban development and concentration of domestic bores.</td> </tr> </table>	Bunbury west subarea	Manage the connected Superficial and underlying unconfined Yarragadee Aquifers from increased abstraction. Manage the impacts of increased urban development and concentration of domestic bores.
Bunbury west subarea	Manage the connected Superficial and underlying unconfined Yarragadee Aquifers from increased abstraction. Manage the impacts of increased urban development and concentration of domestic bores.		
<p>Additional assessment and licensing requirements apply in the areas covered by a management zone. Please refer to Section 5.2 of the <i>South West groundwater areas allocation plan</i> for more detail.</p>			

<sup>1</sup> Department of Water, 2008, *Bunbury water reserve drinking water source protection plan – Bunbury and Dalyellup water supplies*, Water source protection series report no. 96, Department of Water, Government of Western Australia.



## 3.2 Bunbury West

Bunbury West																				
Subarea description																				
<b>Area</b>	100.3 km <sup>2</sup>	<b>Licensed water use (November 2008)</b> Superficial: 1 025 050 kL/yr  <table border="1" style="display: none;"> <caption>Licensed water use (November 2008)</caption> <thead> <tr> <th>Category</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Domestic, stock and garden</td> <td>59.9%</td> </tr> <tr> <td>Service sector</td> <td>34.0%</td> </tr> <tr> <td>Dairy purposes</td> <td>0.5%</td> </tr> <tr> <td>Viticulture</td> <td>4.5%</td> </tr> <tr> <td>Horticulture</td> <td>0.1%</td> </tr> <tr> <td>Irrigated pasture</td> <td>0.1%</td> </tr> <tr> <td>Public water supply</td> <td>0.8%</td> </tr> <tr> <td>Mining and industry</td> <td>0.1%</td> </tr> </tbody> </table>	Category	Percentage	Domestic, stock and garden	59.9%	Service sector	34.0%	Dairy purposes	0.5%	Viticulture	4.5%	Horticulture	0.1%	Irrigated pasture	0.1%	Public water supply	0.8%	Mining and industry	0.1%
Category	Percentage																			
Domestic, stock and garden	59.9%																			
Service sector	34.0%																			
Dairy purposes	0.5%																			
Viticulture	4.5%																			
Horticulture	0.1%																			
Irrigated pasture	0.1%																			
Public water supply	0.8%																			
Mining and industry	0.1%																			
<b>Proclamation</b>	Bunbury groundwater area 1975																			
<b>Shire</b>	City of Bunbury and Shire of Capel																			
<b>Rainfall</b>	800–1000 mm																			
<b>Allocation and water availability</b> kL/yr																				
<b>Aquifer</b>	<b>Allocation limit</b>	<b>Available water</b>																		
Superficial	2 000 000	Contact the Bunbury office for up-to-date availability.																		
Leederville	50 000	Access restricted by location of aquifer. Contact the Bunbury office for up-to-date availability.																		
Issues for water management																				
<p>The Superficial Aquifer is connected to the Yarragadee Aquifer in this subarea. Any management of abstraction must consider the impacts on the underlying connected aquifer. Abstraction in this subarea also has restrictions (management zone 2) to minimise the impacts associated with acid sulfate soils, water quality and the seawater interface. As a result, the location and depth of draw points is likely to be restricted along the coast. Monitoring of water quality may be included as a licence condition.</p> <p>Environmental management triggers and responses also apply. See <i>Management triggers and responses for groundwater-dependent ecosystems in the South West groundwater areas</i>, Del Borrello 2008 for more information.</p>																				
Hydrogeology																				
<b>Aquifer</b>	<b>Description</b>																			
Superficial	<p>The Superficial formations generally consist of Tamala Limestone, Safety Bay Sands (dunal systems along the coast), Alluvium (north near Bunbury) and Bassendean Sands. The aquifer is usually thin (&lt; 15 m) with a variable thickness across the subarea due to the presence or absence of dunes. It is in direct hydraulic connection with the underlying Yarragadee Aquifer where the Bunbury Basalt is not present.</p> <p>The Superficial Aquifer may receive some discharge from the underlying Yarragadee where the formation becomes thin. Near the surface, clays can lead to high salinity in some areas, but generally water in the Superficial Aquifer is fresh to marginal (&lt; 1000 mg/L TDS).</p>																			

<b>Bunbury West</b>		
	The Superficial Aquifer has a high risk of potential acid sulfate soil and there are sites where this has become acid sulfate soil and is now causing acidification in some local areas.	
Leederville	The Leederville Aquifer is absent throughout the majority of the subarea. There are small areas along the eastern border of the subarea where the Leederville Aquifer is present adjacent to and under the Bunbury Basalt, and in the south along the southern boundary.	
<b>Considerations for water use include, but are not limited to, the following</b>		
<b>Ecological</b>		
<p><i>Wetlands and waterways:</i> 25 registered environmental protection policy wetlands in the subarea. The majority of the wetlands are located on private land, with Big Swamp being the largest. Five-Mile Brook is the only defined water course in the subarea with an area covered as an environmental protection policy wetland west of Bussell Highway (Muddy Lakes) fed by the Brook.</p> <p><i>Threatened ecological communities and declared rare flora sites:</i> Eleven sites listed as threatened ecological community, located outside the City of Bunbury urban area on crown land. Thirteen sites of declared rare flora are located in the subarea, in close proximity to the threatened ecological community and environmental protection policy wetland sites.</p> <p><i>Groundwater-dependent ecosystems and ecological water requirement sites:</i> The groundwater-dependent ecosystem sites listed below have ecological monitoring associated with them. For more information see Del Borrello 2008.</p>		
	<i>GDE sites with management trigger and responses</i>	<i>Maximum drawdown m AHD</i>
	Hay Park	2.73
	Harewoods road	5.72
<b>Cultural</b>		
<p><i>Native Title claimant:</i> Gnaala Karla Booja.</p> <p><i>Aboriginal Heritage sites:</i> Thirteen registered sites with water related sites covering including burial and skeletal remains, natural sites and Stirling beach.</p>		
<b>Social</b>		
<p><i>Towns and localities:</i> Half of the City of Bunbury, with the localities of Dalyellup, Gelorup and Stratham, Usher, Withers, Carey Park, Bunbury and South Bunbury cover this subarea with water supply for domestic purposes from rainwater tanks and exempt groundwater abstraction.</p> <p><i>Public water supply:</i> The majority of the subarea is listed as a public drinking water source protection area under <i>Bunbury–Busselton water source protection plan, 2008</i> as a priority 3 reserve.</p> <p><i>Recreational sites:</i> Big Swamp, Muddy Lakes, Dalyellup beach and many national heritage and estate places are sites of recreational significance.</p>		
<b>Management zones that apply in this subarea</b>		
<b>2</b>	Bunbury west subarea	Manage the connected Superficial and underlying unconfined Yarragadee Aquifers from increased abstraction. Manage the impacts of increased urban development and concentration of domestic bores.

<b>Bunbury West</b>		
<b>6</b>	Swan coastal plain wetlands – including Stirling wetlands, Vasse–Wonnerup estuary, wetlands north of Bunbury	Minimise impacts on groundwater-dependent ecosystems from abstraction in the underlying aquifers and connected systems. Control the decrease in runoff and changes to drainage from agricultural and urban activities. Control abstraction to minimise impacts on social and ecological sites from regional and local abstraction.
Additional assessment and licensing requirements apply in the areas covered by a management zone. Please refer to Section 5.2 of the <i>South West groundwater areas allocation plan</i> for more detail.		



### 3.3 Bunbury East

Bunbury East		
Subarea description		
<b>Area</b>	103.3 km <sup>2</sup>	<b>Licensed water use (November 2008)</b> Superficial: 347 310 kL/yr 
<b>Proclamation</b>	Bunbury groundwater area 1975	
<b>Shire</b>	City of Bunbury and shires of Capel and Dardanup	
<b>Rainfall</b>	800–1100 mm	
<b>Allocation and water availability</b> kL/yr		
<b>Aquifer</b>	<b>Allocation limit</b>	<b>Available water</b>
Superficial	685 000	Contact the Bunbury office for up-to-date availability.
Surficial	15 000	Access restricted by location of aquifer. Contact the Bunbury office for up-to-date availability.
Leederville	2 000 000	Contact the Bunbury office for up-to-date availability.
<b>Issues for water management</b>		
The Superficial Aquifer is very thin in this area and is hydraulically connected to the Leederville Aquifer. The Leederville Aquifer is the major aquifer for abstraction in this subarea.		
<b>Leederville: 1 874 800 kL/yr</b>		
<b>Hydrogeology</b>		
<b>Aquifer</b>	<b>Description</b>	
Superficial	The Superficial formations in this area consist of Bassendean Sands, Guildford formation, Alluvium (north of Bunbury) and a small area of Yoganup formation in the south east corner. The Superficial Aquifer is thin (5–15 m below ground level) across the subarea, especially close to the Bunbury Basalt.	

<b>Bunbury East</b>	
	The aquifer can only supply low bore yields. There is very little fresh groundwater in this aquifer with the water quality mostly marginal to brackish (500–2000 mg/L TDS), especially towards the coast.
Leederville	<p>The Leederville formation in this area is made up of the Upper and Lower Vasse member. The Leederville Aquifer forms a thin veneer over Bunbury Basalt in western half of subarea increasing in thickness towards the east. The thickness of the formation is up to 250–300 m.</p> <p>Groundwater salinity is generally &gt; 500 mg/L TDS, with higher salinities towards the west and coastal areas where the formation is the thinnest.</p>
<b>Considerations for water use include, but are not limited to, the following</b>	
<b>Ecological</b>	
<p><i>Wetlands and waterways:</i> Lower reaches of the Preston River and its tributary Crooked Brook are the major water courses in the subarea. Twenty-five registered environmental protection policy wetlands with the majority located on private land and generally associated with the Preston River and the Leschenault estuary. Most occur outside the urban area along the western boundary of the subarea.</p> <p><i>Threatened ecological communities and declared rare flora sites:</i> Five sites listed as threatened ecological community, located outside the City of Bunbury urban area. Over 20 species of declared rare flora are located in the subarea with most associated with a road reserves (crown land) and private land.</p> <p><i>Groundwater-dependent ecosystems and ecological water requirement sites:</i> There are several ecological water requirement sites which do not have departmental monitoring associated with them but are important and may require additional work if a licence application is submitted near them (see Hyde 2006 for more information).</p>	
<b>Cultural</b>	
<p><i>Native Title claimant:</i> Gnaala Karla Booja.</p> <p><i>Aboriginal Heritage sites:</i> Over 20 sites registered, including several natural sites (trees, rivers, and sand dune cuttings), campsites, the Collie River Waugal, which includes the Harris, Preston and Ferguson Rivers, and scatter/remains sites. Most of the sites are predominantly associated with the Preston River.</p>	
<b>Social</b>	
<p><i>Towns and localities:</i> Boyanup and the inland section of the City of Bunbury's residential area, the two harbours and light industrial areas. The localities of East Bunbury, Glen Iris, Picton, College Grove, Boyanup, North Boyanup, Davenport, Carey Park and Crooked Brook cover this subarea with water supply for domestic purposes from rainwater tanks and exempt groundwater abstraction.</p> <p><i>Public water supply:</i> Small slivers along the western boundary of the subarea are listed as a public drinking water source protection area under <i>Bunbury–Busselton water source protection plan, 2008</i> as a priority 3 reserve.</p> <p><i>National parks, reserves and state forest:</i> Boyanup Forest Block (Boyanup State Forest) in the south-eastern corner of the subarea.</p> <p><i>Recreational sites:</i> The Preston River and its tributaries are used for recreational purposes. The port in Bunbury and the Mangrove areas are also sites of recreational significance.</p>	
<b>Management zones that apply in this subarea</b>	
There are no management zones in the Bunbury East subarea.	



# Plan companion for the South West groundwater areas allocation plan

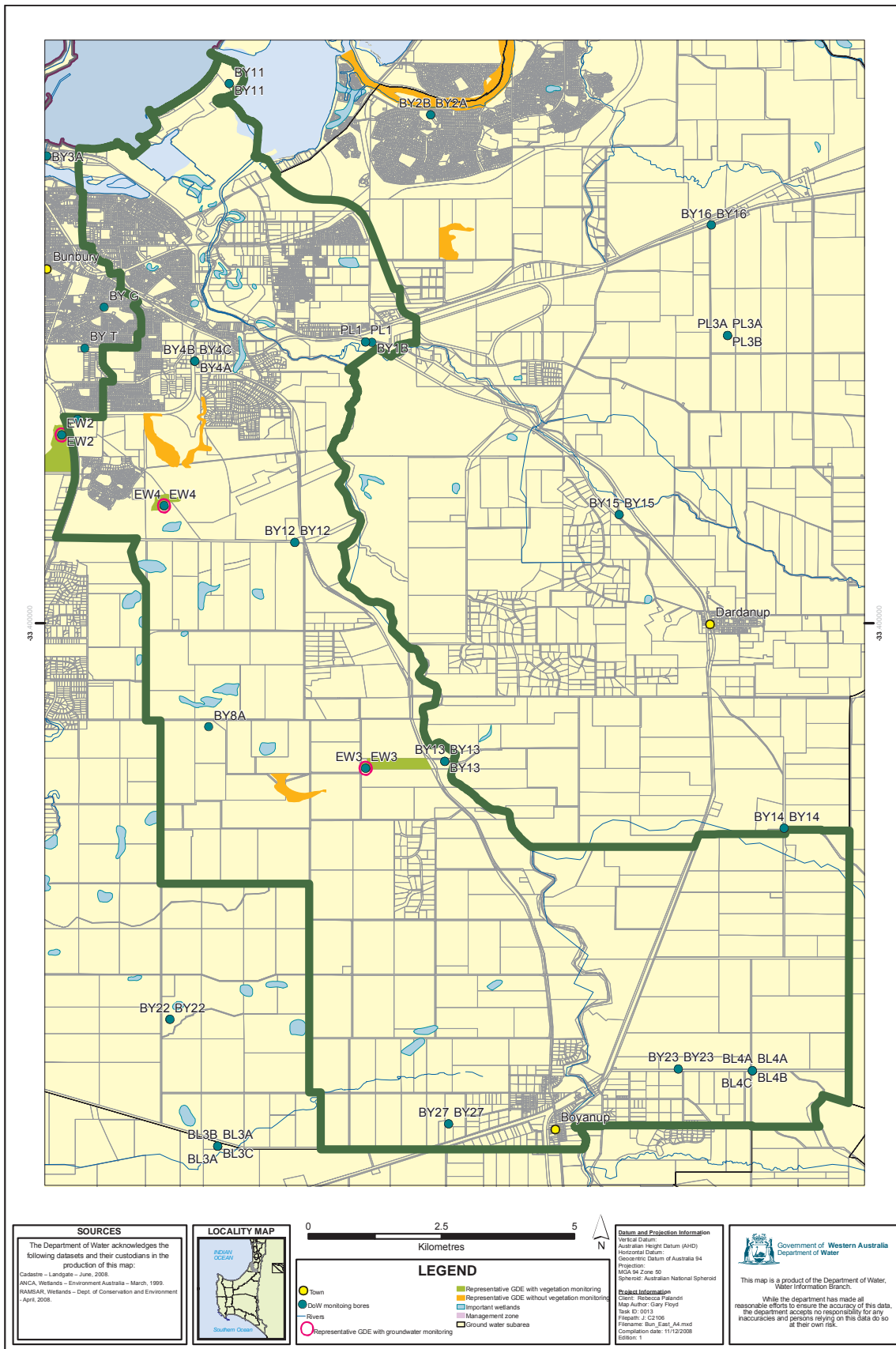
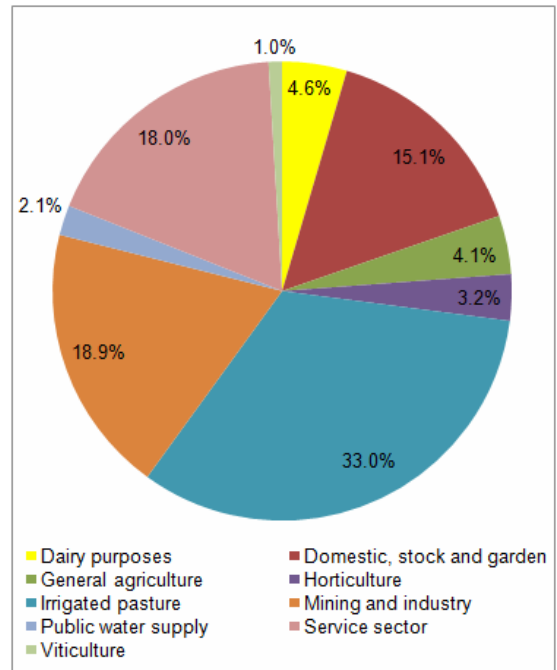


Figure 6 Bunbury East subarea

### 3.4 Dardanup

Dardanup		
Subarea description		
<b>Area</b>	126.4 km <sup>2</sup>	<b>Licensed water use (November 2008)</b> Superficial: 42 800 kL/yr. 100% stock, domestic and garden purposes. Leederville: 3 105 800 kL/yr
<b>Proclamation</b>	Bunbury groundwater area 1975	
<b>Shire</b>	City of Bunbury and Shire of Dardanup	
<b>Rainfall</b>	800–1100 mm	
Allocation and water availability kL/yr		
<b>Aquifer</b>	<b>Allocation limit</b>	<b>Available water</b>
Superficial	290 000	Contact the Bunbury office for up-to-date availability.
Surficial	5 000	Access restricted by location of aquifer. Contact the Bunbury office up-to-date availability.
Leederville	3 500 000	Contact the Bunbury office for up-to-date availability.
Issues for water management		
<p>The Leederville Aquifer is a significant aquifer for abstraction in the subarea. The Superficial Aquifer is thin to absent and only used for domestic supply in some areas.</p>		
Hydrogeology		
<b>Aquifer</b>	<b>Description</b>	
Superficial	The Superficial formations in this area consist of Bassendean Sands, Guildford formation and Alluvium (west near Bunbury). The Superficial Aquifer is thin (5–15 m below ground level) to absent across the subarea, thinning towards the east and overlying the Leederville Aquifer. The aquifer can only supply low bore yields. There is very little fresh groundwater in this aquifer with the water quality mostly marginal to brackish (500–2000 mg/L TDS), especially towards the coast.	
Leederville	The Leederville formation in this area is made up of the Upper and Lower Vasse member. The aquifer thickness ranges between 100–300 m, with depth ranging from 15–300 m below ground level. Allocation in this subarea is restricted in the north due to thinning of the formation and to ensure sufficient through flow to Kemerton North subarea to enable adequate management of the seawater interface. Generally groundwater salinity is >500 mg/L TDS, increasing with depth.	



Dardanup
<b>Considerations for water use include, but are not limited to, the following</b>
<b>Ecological</b>
<p><i>Wetlands and waterways:</i> Preston, Ferguson and Collie rivers and Henty Brook are the major water courses in the subarea. Fifteen registered environmental protection policy wetlands, with the majority located on private land and near the major rivers.</p> <p>The mouth and lower reaches of the Collie River is classed as a system 6 conservation reserve under the <i>Environmental Protection Act 1986</i>.</p> <p><i>Threatened ecological communities and declared rare flora sites:</i> Four threatened ecological community sites located in one of the Aboriginal sites of significance on crown land (Waterloo Brickworks). Over 15 different species of declared rare flora, with most species associated with the threatened ecological community and the road reserve along the Australind Bypass.</p> <p><i>Groundwater-dependent ecosystems and ecological water requirement sites:</i> There is one ecological water requirement site which does not have departmental monitoring associated with it but is important and may require additional work if a licence application is submitted near it (see Hyde 2006 for more information).</p>
<b>Cultural</b>
<p><i>Native Title claimant:</i> Gnaala Karla Booja.</p> <p><i>Aboriginal Heritage sites:</i> Over 35 registered sites including several water related sites such as hunting grounds and the Collie River Waugal.</p>
<b>Social</b>
<p><i>Towns and localities:</i> Localities of Eaton, Picton, Picton East, Waterloo, Paradise, Millbridge, Pelican Point, Dardanup West and Dardanup cover this subarea with water supply for domestic purposes from rainwater tanks and exempt groundwater abstraction.</p> <p><i>Public water supply:</i> The Water Corporation supplies the town of Dardanup from the Leederville Aquifer with drinking water.</p> <p><i>National parks, reserves and state forest:</i> There is several unnamed nature reserves associated with Waterloo Brickworks site of Aboriginal heritage.</p> <p><i>Recreational sites:</i> The Collie, Preston and Ferguson rivers are used for recreational purposes.</p>
<b>Management zones that apply in this subarea</b>
There are no management zones in the Dardanup subarea.

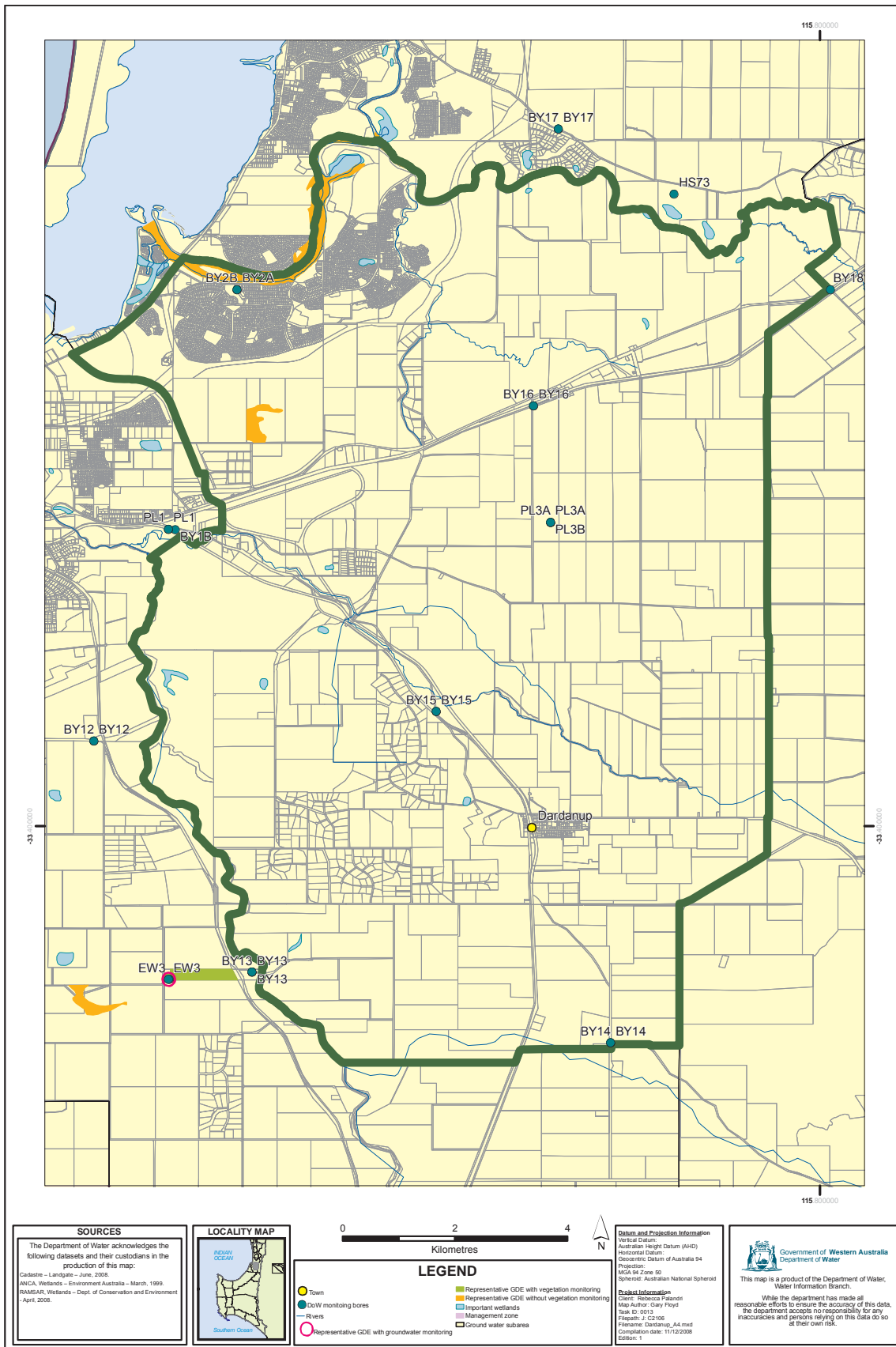


Figure 7 Dardanup subarea

### 3.5 Australind

Australind																				
Subarea description																				
<b>Area</b>	112.9 km <sup>2</sup>	<b>Licensed water use (November 2008)</b>																		
<b>Proclamation</b>	Bunbury groundwater area 1975	<p><i>Superficial: 652 410 kL/yr</i></p> <table border="1" style="margin-top: 10px; width: 100%; font-size: small;"> <caption>Licensed Water Use (November 2008)</caption> <thead> <tr> <th>Category</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Domestic, stock and garden</td> <td>41.3%</td> </tr> <tr> <td>Mining and industry</td> <td>36.4%</td> </tr> <tr> <td>Service sector</td> <td>10.6%</td> </tr> <tr> <td>Horticulture</td> <td>7.7%</td> </tr> <tr> <td>Dairy purposes</td> <td>3.6%</td> </tr> <tr> <td>Public water supply</td> <td>0.3%</td> </tr> <tr> <td>General agriculture</td> <td>-</td> </tr> <tr> <td>Irrigated pasture</td> <td>-</td> </tr> </tbody> </table>	Category	Percentage	Domestic, stock and garden	41.3%	Mining and industry	36.4%	Service sector	10.6%	Horticulture	7.7%	Dairy purposes	3.6%	Public water supply	0.3%	General agriculture	-	Irrigated pasture	-
Category	Percentage																			
Domestic, stock and garden	41.3%																			
Mining and industry	36.4%																			
Service sector	10.6%																			
Horticulture	7.7%																			
Dairy purposes	3.6%																			
Public water supply	0.3%																			
General agriculture	-																			
Irrigated pasture	-																			
<b>Shire</b>	Shire of Harvey																			
<b>Rainfall</b>	800–1100 mm																			
Allocation and water availability kL/yr																				
<b>Aquifer</b>	<b>Allocation limit</b>	<b>Available water</b>																		
Superficial	690 000	Fully allocated. Contact the Bunbury office for more information.																		
Issues for water management																				
<p>The <i>Kemerton subareas groundwater management plan 2007</i> applies in this subarea. This subarea only applies to the Superficial Aquifer. Abstraction on the coast has restrictions (management zone 6) to maintain the seawater interface and minimise the impacts on wetlands and other water bodies. As a result the location and depth of draw points is likely to be restricted. There is a maximum allocation of 4000 kL/ha applied to agricultural land in this subarea. Monitoring of water quality may be included as a licence condition.</p> <p>Environmental management triggers and responses also apply. See <i>Management triggers and responses for groundwater-dependent ecosystems in the South West groundwater areas</i>, Del Borrello 2008 for more information.</p>																				
Hydrogeology																				
<b>Aquifer</b>	<b>Description</b>																			
Superficial	<p>The Superficial formation consists of Safety Bay sands, Tamala limestone, Guildford formation and Bassendean Sands. Most of the subarea is covered by Guildford clay (east), Tamala limestone west of the Brunswick River and east of the Leschenault Inlet and Safety Bay sands west of Leschenault inlet. The Superficial Aquifer has a variable thickness, and ranges from 20–40 m deep across the aquifer.</p> <p>Groundwater flow is westwards in the southern section of the subarea and in the north moves from the Mialla mound (west, south west and south east towards Wellesley River) and is part of the Myalup flow system. The aquifer may be in</p>																			

<b>Australind</b>	
	hydraulic connection with the underlying Leederville Aquifer. Groundwater discharges locally to watercourses (including the Brunswick River and Leschenault inlet), wetlands and swamps. Groundwater salinity ranges from 250–1500 mg/L TDS with local areas of higher salinity (> 2000 mg/L TDS) and acidity.
<b>Considerations for water use include, but are not limited to, the following</b>	
<b>Ecological</b>	
<p><i>Wetlands and waterways:</i> Collie, Brunswick and Wellesley rivers. Twenty registered environmental protection policy wetlands, with the majority located on private land near the coast or associated with river systems. Part of the Brunswick River, Wellesley River, Collie River and the whole of the Leschenault Estuary is covered as a system 6 conservation reserve under the <i>Environmental Protection Act 1986</i>.</p> <p><i>Threatened ecological communities and declared rare flora sites:</i> No sites listed as threatened ecological community. Seven different species of declared rare flora, with most species associated with the Collie River, Leschenault Inlet and environmental protection policy wetlands.</p> <p><i>Groundwater-dependent ecosystems and ecological water requirement sites:</i> There is one ecological water requirement site which does not have departmental monitoring associated with it but is important and may require additional work if a licence application is submitted near it (see Hyde 2006 for more information).</p>	
<b>Cultural</b>	
<p><i>Native Title claimant:</i> Gnaala Karla Booja.</p> <p><i>Aboriginal Heritage sites:</i> Fifteen registered sites including natural sites (gullies, rivers, creeks and the Leschenault Inlet), campsites, burial sites, and the Collie River Waugal.</p>	
<b>Social</b>	
<p><i>Towns and localities:</i> Town of Australind and the localities of Leschenault, Australind, Brunswick and Roelands cover this subarea with water supply for domestic purposes from rainwater tanks and exempt groundwater abstraction. A large amount of water is used by domestic supply in this subarea (&gt; 200 000 kL/yr).</p> <p><i>National parks, reserves and state forest:</i> Morangarel nature reserve and Leschenault Peninsula conservation park.</p> <p><i>Recreational sites:</i> Leschenault Peninsula Conservation Park, Morangarel nature reserve and the national heritage and estate places.</p>	
<b>Management zones that apply in this subarea</b>	
<b>3</b>	<p>Water quality issues for the Swan coastal plain (north of Bunbury) and Kemerton Industrial Park</p> <p>Minimise current salt recycling and watertable aquifer quality (nutrients and potential acid sulfate soils). Minimise current impacts on watertable levels. Restrict potential nutrient and pollution impacts on the watertable aquifer.</p>
<b>6</b>	<p>Swan coastal plain wetlands – including Stirling wetlands, Vasse–Wonnerup estuary, wetlands north of Bunbury</p> <p>Minimise impacts on groundwater-dependent ecosystems from abstraction in the underlying aquifers and connected systems. Control the decrease in runoff and changes to drainage from agricultural and urban activities. Control abstraction to minimise impacts on social and ecological sites from regional and local abstraction.</p>
<p>Additional assessment and licensing requirements apply in the areas covered by a management zone. Please refer to Section 5.2 of the <i>South West groundwater areas allocation plan</i> for more detail.</p>	

Plan companion for the  
South West groundwater areas allocation plan

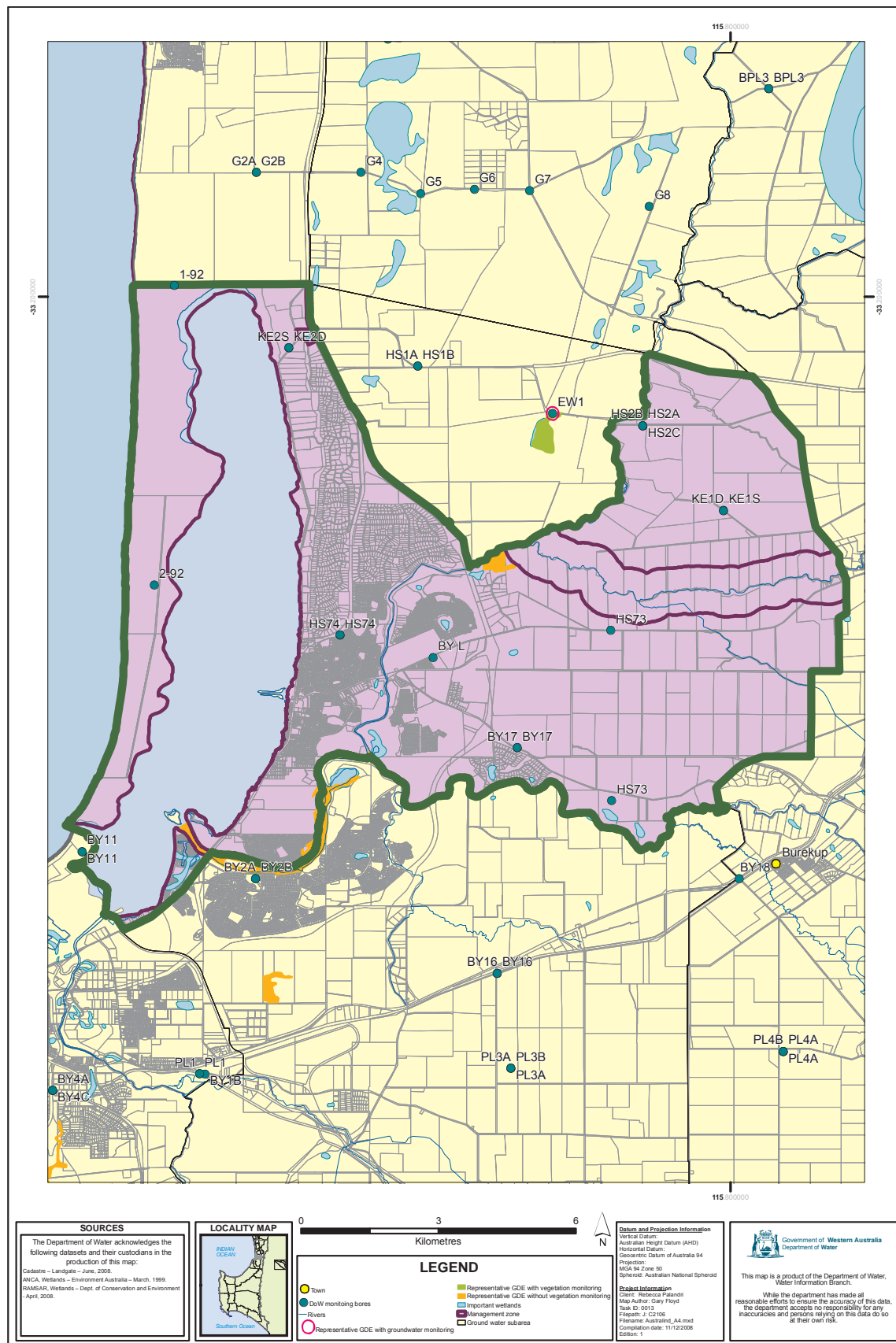


Figure 8 Australind subarea

### 3.6 Kemerton South

Kemerton South		
Subarea description		
<b>Area</b>	135.1 km <sup>2</sup>	<b>Licensed water use (November 2008)</b>
<b>Proclamation</b>	Bunbury groundwater area 1975	<p><i>Leederville: 4 873 750 kL/yr</i></p> <p><i>Cattamarra: 992 000 kL/yr</i> Use: 100% of use for industrial purposes</p>
<b>Shire</b>	Shire of Harvey	
<b>Rainfall</b>	800–1000 mm	
Allocation and water availability kL/yr		
<b>Aquifer</b>	<b>Allocation limit</b>	
Leederville	5 000 000	Contact the Bunbury office for up-to-date availability.
Cattamarra	4 000 000	
Issues for water management		
<p>The quality of water in this subarea, for both aquifers, will restrict what types of potential water use activities can occur. The <i>Kemerton subareas groundwater management plan 2007</i> applies in this subarea. The subarea contains the southern portion of the Kemerton Industrial park.</p> <p>Abstraction may have restrictions (management zone 5 and 6) to maintain the water quality and minimise the impacts on wetlands and other water bodies. As a result the location and depth of draw points is likely to be restricted. Monitoring of water quality may be included as a licence condition.</p> <p>Environmental management triggers and responses also apply. See <i>Management triggers and responses for groundwater-dependent ecosystems in the South West groundwater areas</i>, Del Borrello 2008 for more information.</p>		
Hydrogeology		
<b>Aquifer</b>	<b>Description</b>	
Leederville	The Leederville formation in this area is made up of the Upper and Lower Vasse member. The Leederville Aquifer is recharged mainly by downward leakage from the overlying Superficial Aquifer. Regional groundwater flow is westward, discharging offshore. Discharge is also likely to occur through upward leakage into the superficial aquifer.	



Kemerton South			
	Groundwater is freshest (850–1500 mg/L TDS) between the main recharge area and the saline interface near the coast. The remainder of the aquifer is brackish to saline (1500–19 000 mg/L TDS). The saline interface is estimated to occur at a depth of around 45 m in the Leederville Aquifer (below the base of the superficial formations), between one and two kilometres inland from the coast. The aquifer currently cannot maintain increases in abstraction due to thinning of formation around Australind township and proximity of Leschenault inlet.		
Cattamarra	<p>The Cattamarra Coal Measures is part of the Cockleshell Gully formation. It is a confined multi-layered aquifer composed of siltstone and shale interbedded with sandstone. The aquifer may have a hydraulic continuity with the Yarragadee Aquifer in the southern end of the subarea. It is seen as a large quantity resource of poorer quality groundwater, that may potentially be used for industrial and irrigation needs.</p> <p>The groundwater salinity ranges between 2500–26 000 mg/L TDS and groundwater salinity is generally lower in the south than in the north and increases with depth. The fresher quality groundwater in the southern part of the aquifer is likely to be attributed to the throughflow within the Yarragadee Aquifer.</p>		
<b>Considerations for water use include, but are not limited to, the following</b>			
<b>Ecological</b>			
<i>Wetlands and waterways:</i> Collie, Brunswick and Wellesley rivers. Parts of the Brunswick River may be groundwater-dependent on the Leederville Aquifer. Part of the Brunswick River, Wellesley River, Collie River and the whole of the Leschenault Estuary is covered as a system 6 conservation reserve under the <i>Environmental Protection Act 1986</i> .			
<b>Cultural</b>			
<i>Native Title claimant:</i> Gnaala Karla Booja.			
<i>Aboriginal Heritage sites:</i> Nineteen registered sites including natural sites (gullies, rivers, creeks and the Leschenault Inlet), campsites, burial sites, and the Collie River Waugal.			
<b>Social</b>			
<i>Towns and localities:</i> Town of Australind.			
<i>Public water supply:</i> The Water Corporation supplies the locality of Australind with drinking water from the Leederville Aquifer.			
<b>Management zones that apply in this subarea</b>			
<b>5</b>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Known areas of groundwater baseflow from regional aquifers</td> <td>Manage groundwater abstraction to avoid impact on groundwater baseflow in the Capel and Brunswick rivers.</td> </tr> </table>	Known areas of groundwater baseflow from regional aquifers	Manage groundwater abstraction to avoid impact on groundwater baseflow in the Capel and Brunswick rivers.
Known areas of groundwater baseflow from regional aquifers	Manage groundwater abstraction to avoid impact on groundwater baseflow in the Capel and Brunswick rivers.		
<b>6</b>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Swan coastal plain wetlands – including Stirling wetlands, Vasse-Wonnerup estuary, wetlands north of Bunbury</td> <td>Minimise impacts on groundwater-dependent ecosystems from abstraction in the underlying aquifers and connected systems. Control the decrease in runoff and changes to drainage from agricultural and urban activities. Control abstraction to minimise impacts on social and ecological sites from regional and local abstraction.</td> </tr> </table>	Swan coastal plain wetlands – including Stirling wetlands, Vasse-Wonnerup estuary, wetlands north of Bunbury	Minimise impacts on groundwater-dependent ecosystems from abstraction in the underlying aquifers and connected systems. Control the decrease in runoff and changes to drainage from agricultural and urban activities. Control abstraction to minimise impacts on social and ecological sites from regional and local abstraction.
Swan coastal plain wetlands – including Stirling wetlands, Vasse-Wonnerup estuary, wetlands north of Bunbury	Minimise impacts on groundwater-dependent ecosystems from abstraction in the underlying aquifers and connected systems. Control the decrease in runoff and changes to drainage from agricultural and urban activities. Control abstraction to minimise impacts on social and ecological sites from regional and local abstraction.		
Additional assessment and licensing requirements apply in the areas covered by a management zone. Please refer to Section 5.2 of the <i>South West groundwater areas allocation plan</i> for more detail.			

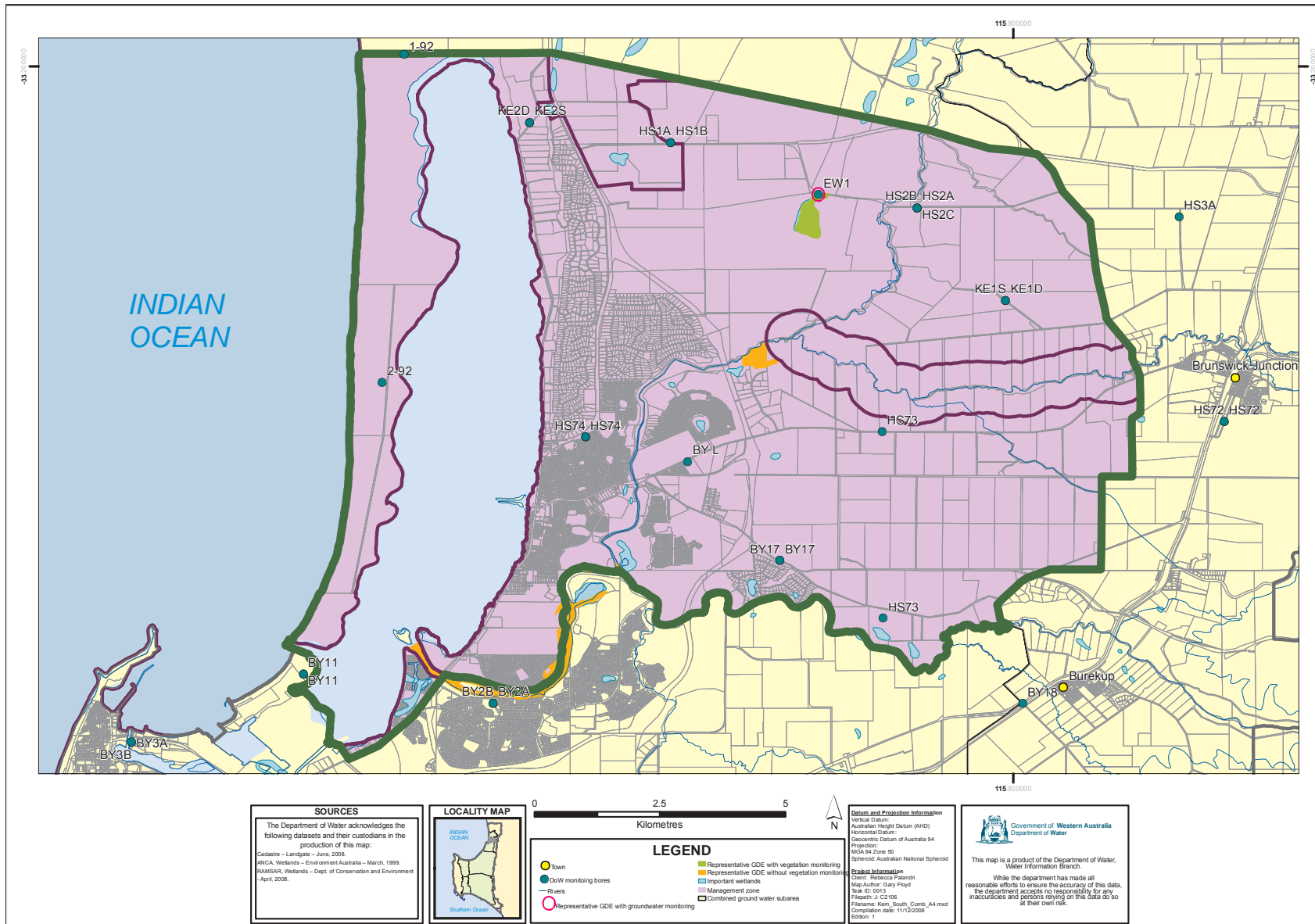


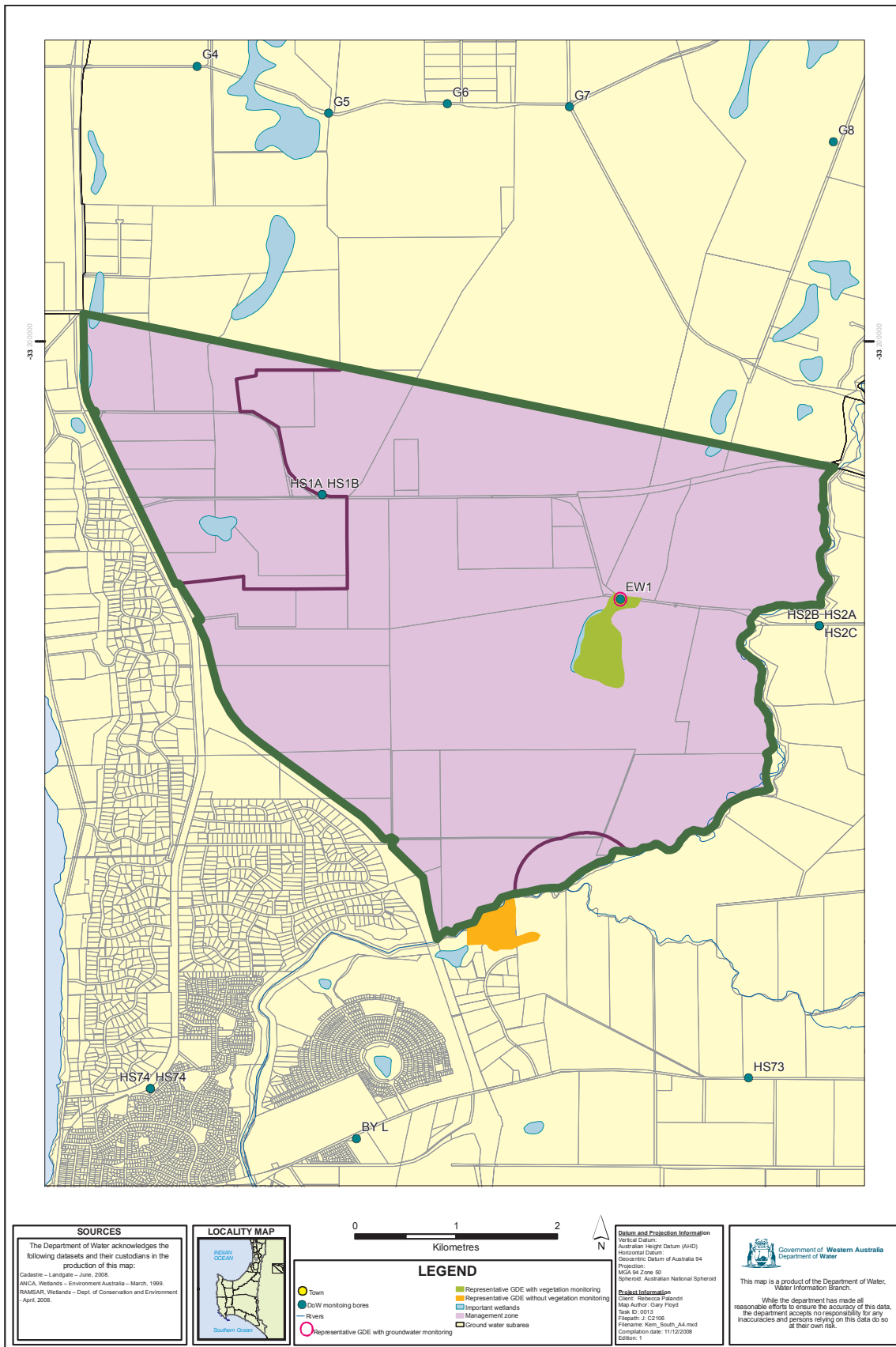
Figure 9 Kemerton South subarea

### 3.7 Kemerton Industrial Park South

Kemerton Industrial Park South		
Subarea description		
<b>Area</b>	22.2 km <sup>2</sup>	<b>Licensed water use (November 2008)</b>
<b>Proclamation</b>	Bunbury groundwater area 1975	Superficial: 196 950 kL/yr 
<b>Shire</b>	Shire of Harvey	
<b>Rainfall</b>	800–1000 mm	
Allocation and water availability kL/yr		
<b>Aquifer</b>	<b>Allocation limit</b>	<b>Available water</b>
Superficial	210 000	Contact the Bunbury office for up-to-date availability.
Issues for water management		
<p>Any abstraction in the subarea must consider acid sulphate soil risk and water quality contamination as part of the licence assessment process.</p> <p>The <i>Kemerton subareas groundwater management plan 2007</i> applies in this subarea. This subarea only applies to the Superficial Aquifer. The subarea contains the southern portion of the Kemerton Industrial park.</p> <p>Abstraction may have restrictions (management zone 6) to maintain the water quality and minimise the impacts on wetlands and other water bodies. As a result the location and depth of draw points is likely to be restricted. There is a maximum allocation of 4000 kL/ha applied to agricultural land in this subarea. Monitoring of water quality may be included as a licence condition.</p> <p>Environmental management triggers and responses also apply. See <i>Management triggers and responses for groundwater-dependent ecosystems in the South West groundwater areas</i>, Del Borrello 2008 for more information.</p>		
Hydrogeology		
<b>Aquifer</b>	<b>Description</b>	
Superficial	The Superficial formation consists of Tamala Limestone, Guildford formation and Bassendean Sands. The Superficial Aquifer consists predominantly of clay and sand in the east and sand and limestone in the west, ranging from 20–40 m deep across the aquifer. Groundwater flow moves from the Mialla mound (west, southwest and east towards Wellesley River) and is part of the Myalup flow system.	

Kemerton Industrial Park South		
<p>The aquifer may be in hydraulic connection with the underlying Leederville Aquifer. Groundwater discharges locally to watercourses (including the Wellesley River), wetlands and swamps. Groundwater to the west of the Wellesley River is generally 250–1500 mg/L TDS and &gt; 1500 mg/L TDS to the east. In some areas abstraction has caused a rise in salinity and acidity.</p>		
<p><b>Considerations for water use include, but are not limited to, the following</b></p>		
<p><b>Ecological</b></p>		
<p><i>Wetlands and waterways:</i> The Wellesley River forms the eastern boundary of the subarea. There are four environmental protection policy wetlands associated with the north–south wetland chain along the Swan coastal plain either side of Bunbury Highway.</p>		
<p><i>Threatened ecological communities and declared rare flora sites:</i> No sites listed as threatened ecological community. Three sites of declared rare flora are located in the subarea.</p>		
<p><i>Groundwater-dependent ecosystems and ecological water requirement sites:</i> The groundwater-dependent ecosystem site listed below has ecological monitoring associated with it. For more information see Del Borrello 2008.</p>		
<i>GDE sites with management trigger and responses</i>	<i>Location</i>	<i>Maximum drawdown m AHD</i>
Kemerton	E384906 N6323330	8.05
<p><b>Cultural</b></p>		
<p><i>Native Title claimant:</i> Gnaala Karla Booja.</p>		
<p><i>Aboriginal Heritage sites:</i> Four artefact sites of significance.</p>		
<p><b>Social</b></p>		
<p>The Kemerton Industrial Park South subarea does not have any social sites of significance.</p>		
<p><b>Management zones that apply in this subarea</b></p>		
<b>6</b>	<p>Swan coastal plain wetlands – including Stirling wetlands, Vasse-Wonnerup estuary, wetlands north of Bunbury</p>	<p>Minimise impacts on groundwater-dependent ecosystem from abstraction in the underlying aquifers and connected systems. Control the decrease in runoff and changes to drainage from agricultural and urban activities. Control abstraction to minimise impacts on social and ecological sites from regional and local abstraction.</p>
<p>Additional assessment and licensing requirements apply in the areas covered by a management zone. Please refer to Section 5.2 of the <i>South West groundwater areas allocation plan</i> for more detail.</p>		

**Plan companion for the  
South West groundwater areas allocation plan**



**Figure 10 Kemerton Industrial Park South subarea**

## 4 South West Coastal groundwater area

### 4.1 Kemerton North

Kemerton North		
Subarea description		
<b>Area</b>	163.2 km <sup>2</sup>	
<b>Proclamation</b>	South West Coastal groundwater area 1977	
<b>Shire</b>	Shire of Harvey	
<b>Rainfall</b>	800–1000 mm	
<b>Licensed water use (November 2008)</b>	<i>Leederville</i> : 150 000 kL/yr. Use: general agricultural activities (25%) and horticulture (75%) <i>Cattamarra</i> : 0 kL/yr Use: no use	
Allocation and water availability kL/yr		
<b>Aquifer</b>	<b>Allocation limit</b>	<b>Available water</b>
Leederville	3 500 000	Limited. Contact the Bunbury office for up-to-date availability.
Cattamarra	6 000 000	Contact the Bunbury office for up-to-date availability.
Issues for water management		
<p>The water use in this area is predominantly from the Superficial Aquifer (Myalup, Wellesley and Kemerton Industrial Park North subareas) as the Leederville Aquifer and Cattamarra Coal Measures have poorer water quality (saline).</p> <p>There is a reserve set aside for public water supply to the towns north of Bunbury and Australind. However, this may become available for other consumptive use when the desalination plant at Binningup is operational.</p> <p>The <i>Kemerton subareas groundwater management plan 2007</i> applies in this subarea. Abstraction may have restrictions (management zone 6) to maintain the water quality and minimise the impacts on wetlands and other water bodies. As a result the location and depth of draw points is likely to be restricted. Monitoring of water quality may be included as a licence condition.</p>		
Hydrogeology		
<b>Aquifer</b>	<b>Description</b>	
Leederville	<p>The Leederville formation in this area is made up of the Upper and Lower Vasse member. The Leederville Aquifer is recharged mainly by downward leakage from the overlying Superficial Aquifer. Regional groundwater flow is westward, discharging offshore.</p> <p>Discharge is also likely to occur through upward leakage into the superficial aquifer between Myalup Swamp and the saline interface closer to the coast. Artesian flows may be encountered in the low-lying area west of Myalup Swamp. Groundwater is freshest (850–1500 mg/L TDS) between the main recharge area and the saline interface near the coast. The remainder of the aquifer is brackish</p>	

Kemerton North			
	to saline (1500–19 000 mg/L TDS). The saline interface is estimated to occur at a depth of around 45 m in the Leederville Aquifer (below the base of the superficial formations), between one and two kilometres inland from the coast. The aquifer currently cannot maintain increases in abstraction due to thinning of formation around Australind township and proximity of Leschenault inlet.		
Cattamarra	<p>The Cattamarra Coal Measures is part of the Cockleshell Gully formation. It is a confined multi-layered aquifer composed of siltstone and shale interbedded with sandstone. The aquifer may have a hydraulic continuity with the Yarragadee Aquifer (further south). It is seen as a large quantity resource of poorer quality groundwater, that may potentially be used for industrial and irrigation needs.</p> <p>The groundwater salinity ranges between 2500–26 000 mg/L TDS and groundwater salinity is generally lower in the south than in the north and increases with depth. The fresher quality groundwater in the southern part of the aquifer is likely to be attributed to the throughflow from the Yarragadee Aquifer.</p>		
<b>Considerations for water use include, but are not limited to, the following</b>			
<b>Ecological</b>			
<p><i>Wetlands and waterways:</i> Wellesley River and the Harvey Diversion Drain (northern boundary). Bengier Swamp is an Australian national conservation wetland area. There are over 30 environmental protection policy wetlands, with the majority along the western side of Wellesley River and along the Bunbury Highway. They include Bengier and Byrd swamps.</p> <p><i>Threatened ecological communities and declared rare flora sites:</i> Three threatened ecological community sites, with two located to the north east of the subarea on crown land (within a system 6 conservation reserve under the <i>Environmental Protection Act 1986</i>). Eight species declared rare flora across 20 sites, with the majority located on private land and near protected wetlands.</p>			
<b>Cultural</b>			
<p><i>Native Title claimant:</i> Gnaala Karla Booja.</p> <p><i>Aboriginal Heritage sites:</i> Eleven registered sites including art, natural, campsites.</p>			
<b>Social</b>			
<p><i>Towns and localities:</i> Towns of Binningup and Myalup, and the localities of Wellesley, Parkfield, Bengier, Wokalup and Myalup cover this subarea with water supply for domestic purposes from rainwater tanks and exempt groundwater abstraction.</p> <p><i>Public water supply:</i> The Water Corporation supplies the locality of Myalup and Binningup with drinking water from the Integrated Water Supply Scheme. There has also been 3 000 000 kL/yr set aside for public water supply to the towns north of Bunbury and Australind.</p> <p><i>Recreational sites:</i> Bengier and Byrd swamps are recreation sites of significance.</p>			
<b>Management zones that apply in this subarea</b>			
<b>6</b>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%; padding: 5px;">Swan coastal plain wetlands – including Stirling wetlands, Vasse-Wonnerup estuary, wetlands north of Bunbury</td> <td style="padding: 5px;">Minimise impacts on groundwater-dependent ecosystems from abstraction in the underlying aquifers and connected systems. Control the decrease in runoff and changes to drainage from agricultural and urban activities. Control abstraction to minimise impacts on social and ecological sites from regional and local abstraction.</td> </tr> </table>	Swan coastal plain wetlands – including Stirling wetlands, Vasse-Wonnerup estuary, wetlands north of Bunbury	Minimise impacts on groundwater-dependent ecosystems from abstraction in the underlying aquifers and connected systems. Control the decrease in runoff and changes to drainage from agricultural and urban activities. Control abstraction to minimise impacts on social and ecological sites from regional and local abstraction.
Swan coastal plain wetlands – including Stirling wetlands, Vasse-Wonnerup estuary, wetlands north of Bunbury	Minimise impacts on groundwater-dependent ecosystems from abstraction in the underlying aquifers and connected systems. Control the decrease in runoff and changes to drainage from agricultural and urban activities. Control abstraction to minimise impacts on social and ecological sites from regional and local abstraction.		
Additional assessment and licensing requirements apply in the areas covered by a management zone. Please refer to Section 5.2 of the <i>South West groundwater areas allocation plan</i> for more detail.			

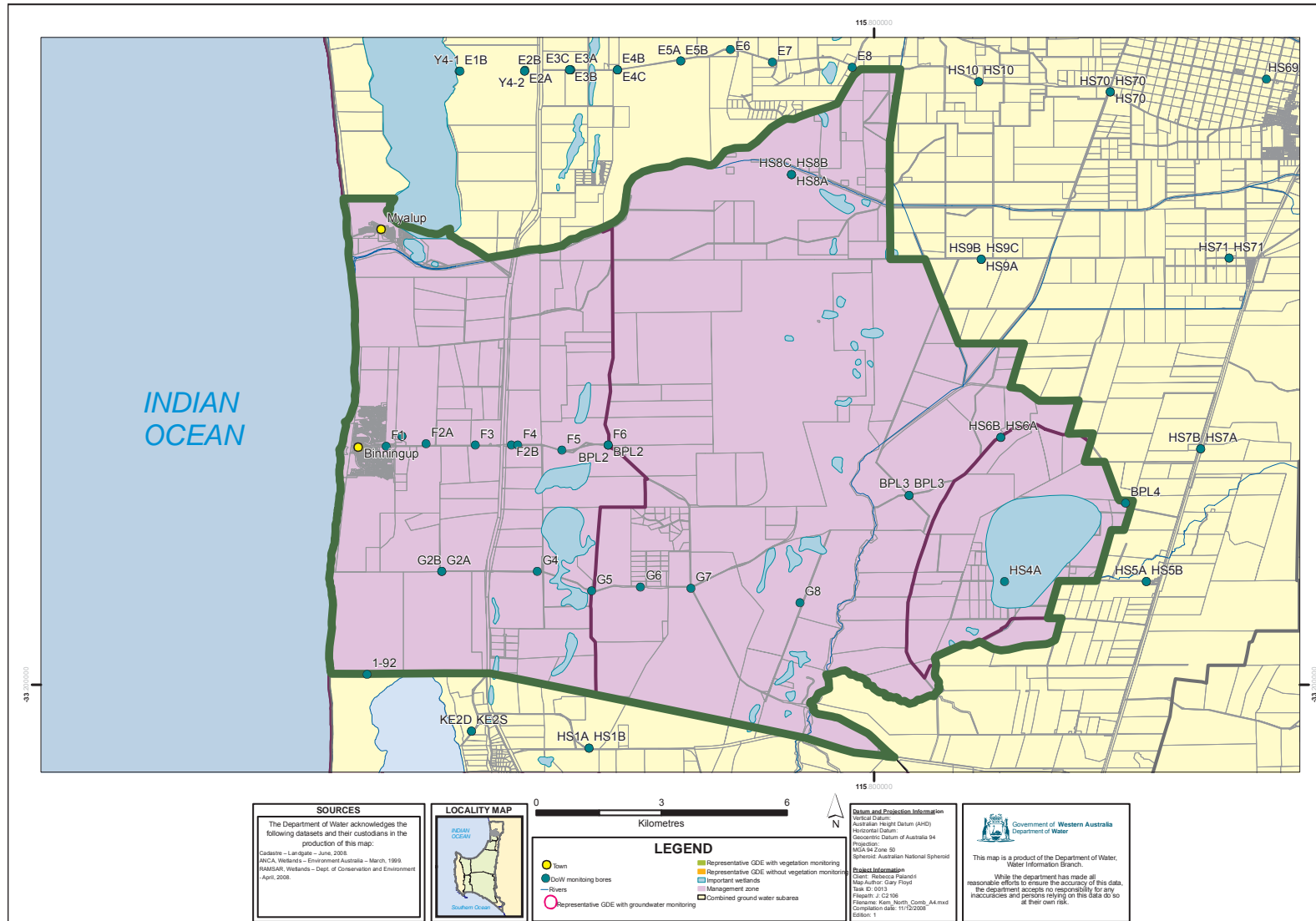


Figure 11 Kemerton North subarea

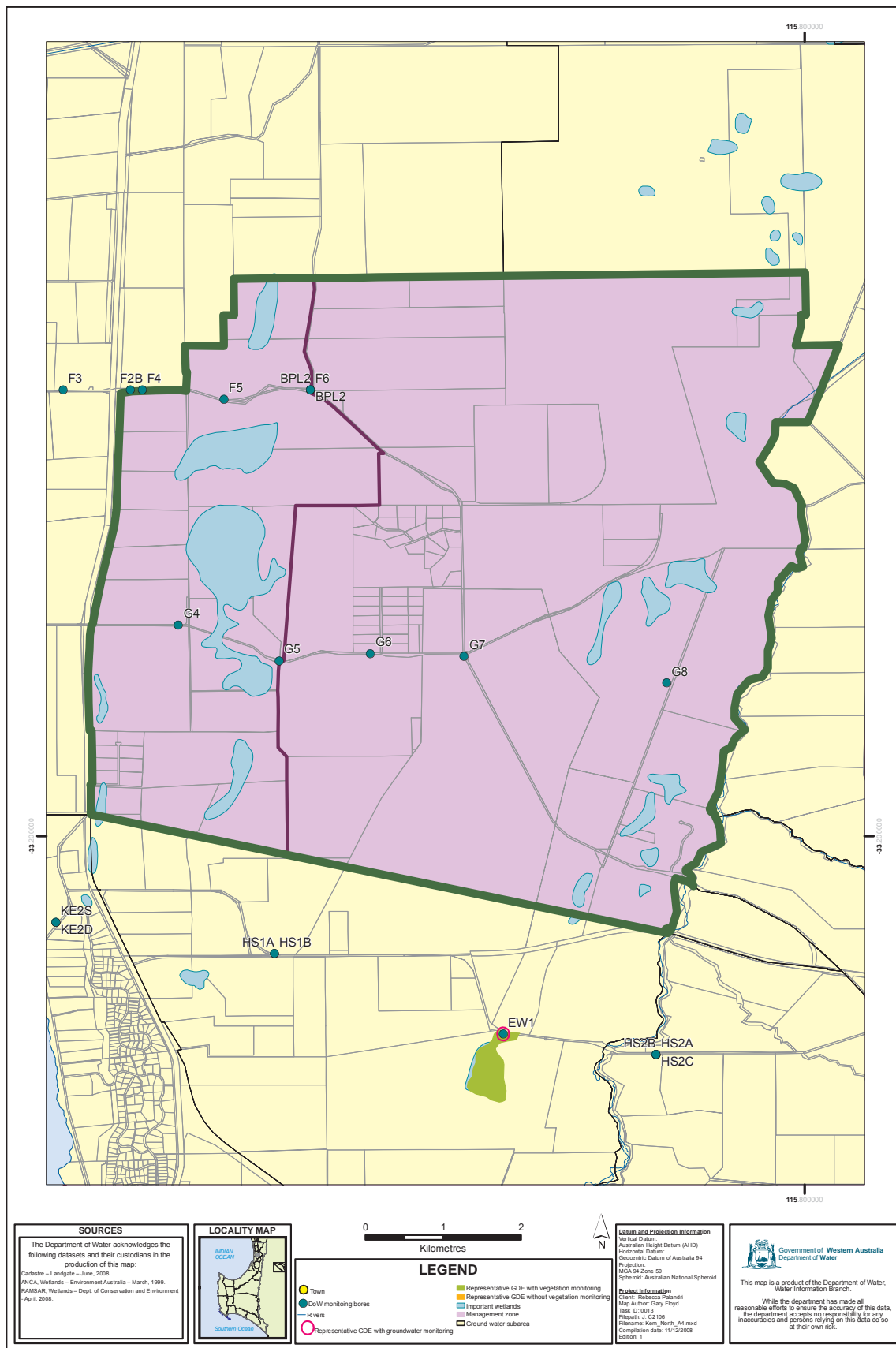


## 4.2 Kemerton Industrial Park North

Kemerton Industrial Park North		
Subarea description		
<b>Area</b>	53.0 km <sup>2</sup>	
<b>Proclamation</b>	South West Coastal groundwater area 1977	
<b>Shire</b>	Shire of Harvey	
<b>Rainfall</b>	800–1000 mm	
<b>Licensed water use (November 2008)</b>	<i>Superficial</i> : 18 900 kL/yr Use: service sector (5%) and stock, domestic and garden purposes (95%) (which is largely exempt from licensing)	
Allocation and water availability kL/yr		
<b>Aquifer</b>	<b>Allocation limit</b>	<b>Available water</b>
Superficial	790 000	Contact the Bunbury office for up-to-date availability.
Issues for water management		
<p>The <i>Kemerton subareas groundwater management plan 2007</i> applies in this subarea. This subarea only applies to the Superficial Aquifer.</p> <p>The subarea contains the northern part of the Kemerton Industrial Park. Abstraction may have restrictions (management zone 3 and 6) to maintain the water quality and minimise the impacts on wetlands and other water bodies. As a result the location and depth of draw points is likely to be restricted.</p> <p>There is a maximum allocation of 4000 kL/ha applied to agricultural land in this subarea. Monitoring of water quality may be included as a licence condition. Any abstraction in the subarea must consider acid sulphate soil risk and water quality contamination as part of the licence assessment process.</p>		
Hydrogeology		
<b>Aquifer</b>	<b>Description</b>	
Superficial	<p>The Superficial formation consists of Tamala Limestone, Guildford formation and Bassendean Sands. The Superficial Aquifer consists predominantly of clay and sand in the east and sand and limestone in the west, ranging from 20–40 m deep across the aquifer. Groundwater flow moves from the Mialla mound (west, southwest and east towards Wellesley River) and is part of the Myalup flow system.</p> <p>The aquifer may be in hydraulic connection with the underlying Leederville Aquifer. Groundwater discharges locally to watercourses (including the Wellesley River), wetlands and swamps. Groundwater to the west of the Wellesley River is generally 250–1500 mg/L TDS and &gt;1500 mg/L TDS to the east. In some areas abstraction has caused increased salinity (&gt; 2000 mg/L TDS) and acidity.</p>	

<b>Kemerton Industrial Park North</b>		
<b>Considerations for water use include, but are not limited to, the following</b>		
<b>Ecological</b>		
<p><i>Wetlands and waterways:</i> The Wellesley River forms the eastern boundary of the subarea. There are sixteen environmental protection policy wetlands, with half along the Wellesley River and the other half along the western boundary. Three reserves which cover some wetlands and part of the Wellesley River are classed as system 6 conservation reserves under the <i>Environmental Protection Act 1986</i>.</p> <p><i>Threatened ecological communities and declared rare flora sites:</i> There is one threatened ecological community site and thirteen sites of declared rare flora with the majority located along the eastern boundary near the environmental protection policy wetlands.</p>		
<b>Cultural</b>		
<p><i>Native Title claimant:</i> Gnaala Karla Booja.</p> <p><i>Aboriginal Heritage sites:</i> Eight artefact sites are registered, with most associated with an environmental protection policy wetland or the system 6 conservation reserves.</p>		
<b>Social</b>		
The Kemerton Industrial Park North subarea does not have any social sites of significance.		
<b>Management zones that apply in this subarea</b>		
<b>3</b>	Water quality issues for the Swan coastal plain (north of Bunbury) and Kemerton Industrial Park	Minimise current salt recycling and watertable aquifer quality (nutrients and potential acid sulfate). Minimise current impacts on watertable levels. Restrict potential nutrient and pollution impacts on the watertable aquifer.
<b>6</b>	Swan coastal plain wetlands – including Stirling wetlands, Vasse-Wonnerup estuary, wetlands north of Bunbury	Minimise impacts on groundwater-dependent ecosystems from abstraction in the underlying aquifers and connected systems. Control the decrease in runoff and changes to drainage from agricultural and urban activities. Control abstraction to minimise impacts on social and ecological sites from regional and local abstraction.
Additional assessment and licensing requirements apply in the areas covered by a management zone. Please refer to Section 5.2 of the <i>South West groundwater areas allocation plan</i> for more detail.		

**Plan companion for the  
South West groundwater areas allocation plan**



**Figure 12 Kemerton Industrial Park North subarea**

### 4.3 Myalup

<b>Myalup</b>		
<b>Subarea description</b>		
<b>Area</b>	52.7 km <sup>2</sup>	<b>Licensed water use (November 2008)</b>
<b>Proclamation</b>	South West Coastal groundwater area 1977	Superficial: 6 582 250 kL/yr 
<b>Shire</b>	Shire of Harvey	
<b>Rainfall</b>	800–1000 mm	
<b>Allocation and water availability kL/yr</b>		
<b>Aquifer</b>	<b>Allocation limit</b>	
Superficial	7 350 000	Contact the Bunbury office for up-to-date availability.
<b>Issues for water management</b>		
<p>The <i>Kemerton subareas groundwater management plan 2007</i> applies in this subarea. This subarea only applies to the Superficial Aquifer. Abstraction may have restrictions (management zone 3 and 6) to maintain the water quality and minimise the impacts on wetlands and other water bodies. As a result the location and depth of draw points is likely to be restricted. Monitoring of water quality may be included as a licence condition.</p> <p>There is a maximum allocation of 4000 kL/ha applied to agricultural land in this subarea.</p>		
<b>Hydrogeology</b>		
<b>Aquifer</b>	<b>Description</b>	
Superficial	<p>The Superficial formation consists of Safety Bay Sands, Tamala limestone and Bassendean Sands. The Superficial Aquifer consists predominantly of clay and sand in the east and sand and limestone in the west, ranging from 20–40 m deep across the aquifer. Groundwater flow moves from the Mialla mound (west and southwest) and is part of the Myalup flow system.</p> <p>The aquifer may be in hydraulic connection with the underlying Leederville Aquifer. Groundwater discharges locally to watercourses, wetlands and swamps (including Myalup Swamp).</p> <p>Groundwater is generally in the range 250–1500 mg/L TDS. In some areas abstraction has caused increased salinity (&gt; 2000 mg/L TDS) and acidity. The area is high in potential acid sulfate soil and has been exposed in some areas causing acidification of the groundwater.</p>	

<b>Myalup</b>		
<b>Considerations for water use include, but are not limited to, the following</b>		
<b>Ecological</b>		
<p><i>Wetlands and waterways:</i> The Harvey diversion drain runs along the northern boundary. There are two environmental protection policy wetlands associated with Lake Preston in the north of the subarea. Two reserves covering the northern part of Leschenault Inlet reserve and a wetland area are classed as system 6 conservation reserves under the <i>Environmental Protection Act 1986</i>.</p> <p><i>Threatened ecological communities and declared rare flora sites:</i> One threatened ecological community site near Binningup. There are no declared rare flora sites.</p>		
<b>Cultural</b>		
<p><i>Native Title claimant:</i> Gnaala Karla Booja.</p> <p><i>Aboriginal Heritage sites:</i> Three artefact sites are registered, with most associated with an environmental protection policy wetland or the system 6 conservation reserves.</p>		
<b>Social</b>		
<p><i>Towns and localities:</i> Towns of Binningup and Myalup and the localities of Myalup, Binningup and Parkfield cover this subarea with water supply for domestic purposes from rainwater tanks and exempt groundwater abstraction.</p> <p><i>Public water supply:</i> The Water Corporation supplies the locality of Myalup and Binningup with drinking water from the Integrated Water Supply Scheme.</p>		
<b>Management zones that apply in this subarea</b>		
<b>3</b>	Water quality issues for the Swan coastal plain (north of Bunbury) and Kemerton Industrial Park	Minimise current salt recycling and watertable aquifer quality (nutrients and potential acid sulfate soils). Minimise current impacts on watertable levels. Restrict potential nutrient and pollution impacts on the watertable aquifer.
<b>6</b>	Swan coastal plain wetlands – including Stirling wetlands, Vasse-Wonnerup estuary, wetlands north of Bunbury	Minimise impacts on groundwater-dependent ecosystems from abstraction in the underlying aquifers and connected systems. Control the decrease in runoff and changes to drainage from agricultural and urban activities. Control abstraction to minimise impacts on social and ecological sites from regional and local abstraction.
Additional assessment and licensing requirements apply in the areas covered by a management zone. Please refer to Section 5.2 of the <i>South West groundwater areas allocation plan</i> for more detail.		

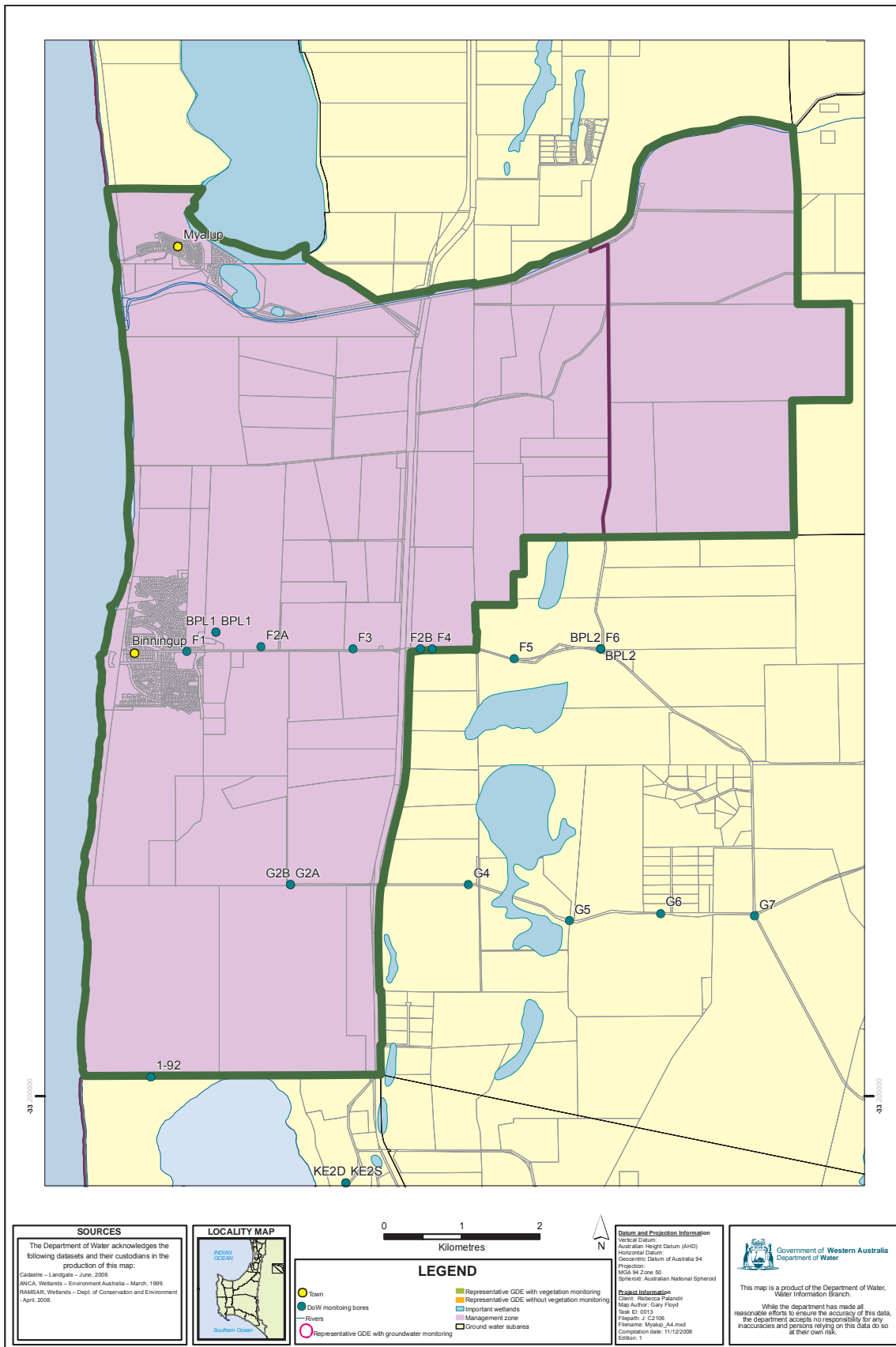


Figure 13 Myalup subarea

## 4.4 Wellesley

<b>Wellesley</b>		
<b>Subarea description</b>		
<b>Area</b>	57.5 km <sup>2</sup>	
<b>Proclamation</b>	South West Coastal groundwater area 1977	
<b>Shire</b>	Shire of Harvey	
<b>Rainfall</b>	800–1000 mm	
<b>Licensed water use (November 2008)</b>	<i>Superficial</i> : 878 000 kL/yr Use: mining and industrial (75%), service sector (22%) and horticulture (3%)	
<b>Allocation and water availability</b>		
<b>kL/yr</b>		
<b>Aquifer</b>	<b>Allocation limit</b>	<b>Available water</b>
Superficial	2 150 000	Contact the Bunbury office for up-to-date availability.
<b>Issues for water management</b>		
<p>The <i>Kemerton subareas groundwater management plan 2007</i> applies in this subarea. This subarea only applies to the Superficial Aquifer.</p> <p>Abstraction may have restrictions (management zone 3) to maintain the water quality and minimise the impacts on wetlands and other water bodies. As a result the location and depth of draw points is likely to be restricted.</p> <p>Monitoring of water quality may be included as a licence condition. There is a maximum allocation of 4000 kL/ha applied to agricultural land in this subarea.</p>		
<b>Hydrogeology</b>		
<b>Aquifer</b>	<b>Description</b>	
Superficial	<p>The Superficial formation consists of mostly the Guildford formation and Bassendean Sands. The Superficial Aquifer consists predominantly of clay and sand in the east and sand in the west, ranging from 20–40 m deep across the aquifer. Groundwater flow moves from the Mialla mound (east towards Wellesley River) and is part of the Myalup flow system.</p> <p>The aquifer may be in hydraulic connection with the underlying Leederville Aquifer. Groundwater discharges locally to watercourses (including the Wellesley River), wetlands and swamps.</p> <p>Groundwater to the west of the Wellesley River is generally 250–1500 mg/L TDS and &gt; 1500 mg/L TDS to the east. In some areas abstraction has caused a rise in salinity and acidity.</p>	
<b>Considerations for water use include, but are not limited to, the following</b>		
<b>Ecological</b>		
<p><i>Wetlands and waterways</i>: Wellesley River and Harvey Diversion drain. There are over 15 environmental protection policy wetlands associated with Benger Swamp and the Wellesley River.</p>		

## Wellesley

Benger Swamp and Australian national conservation wetland area and is also classed as a system 6 conservation reserve under the Environmental Protection Act 1986.

*Threatened ecological communities and declared rare flora sites:* One threatened ecological community site in the northern part of the subarea. Seven sites of declared rare flora recorded with most associated with an environmental protection policy wetland.

### Cultural

*Native Title claimant:* Gnaala Karla Booja.

*Aboriginal Heritage sites:* Two artefact sites registered, one in the north and one in the south.

### Social

*Towns and localities:* Localities of Myalup, Benger, and Wokalup cover this subarea with water supply for domestic purposes from rainwater tanks and exempt groundwater abstraction.

*National parks, reserves and state forest:* Myalup state forest, Benger and Byrd swamps.

*Recreational sites:* Benger and Byrd swamps.

### Management zones that apply in this subarea

<b>3</b>	Water quality issues for the Swan coastal plain (north of Bunbury) and Kemerton Industrial Park	Minimise current salt recycling and watertable aquifer quality (nutrients and potential acid sulfate soils). Minimise current impacts on watertable levels. Restrict potential nutrient and pollution impacts on the watertable aquifer.
----------	-------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Additional assessment and licensing requirements apply in the areas covered by a management zone. Please refer to Section 5.2 of the *South West groundwater areas allocation plan* for more detail.



Plan companion for the  
South West groundwater areas allocation plan

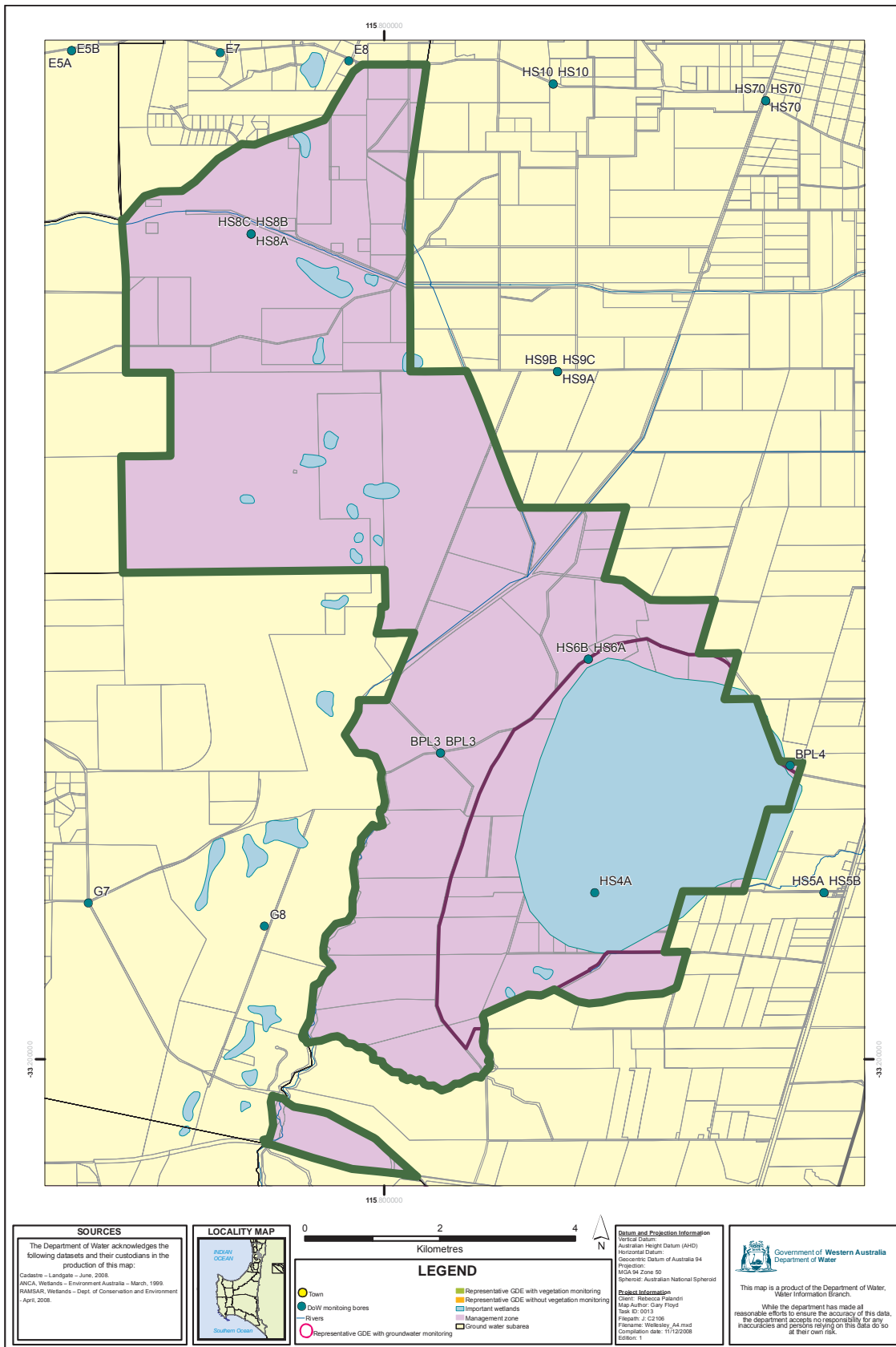


Figure 14 Wellesley subarea

## 4.5 Harvey

Harvey		
Subarea description		
<b>Area</b>	144.1 km <sup>2</sup>	<b>Licensed water use (November 2008)</b>
<b>Proclamation</b>	South West Coastal groundwater area 1977	Superficial: 1 669 000 kL/yr 
<b>Shire</b>	Shire of Harvey	
<b>Rainfall</b>	800–1000 mm	
Allocation and water availability kL/yr		
<b>Aquifer</b>	<b>Allocation limit</b>	
Superficial	11 500 000	Contact the Bunbury office for up-to-date availability.
Leederville	50 000	Access restricted by location of aquifer. Contact the Bunbury office for more information.
Issues for water management		
<p>The majority of water for irrigation is supplied through the Harvey Irrigation Cooperative (surface water). Additional abstraction in this area may impact on the available water in the neighbouring subareas to the west by reducing throughflow. Additional hydrogeological investigations may be required.</p>		
Hydrogeology		
<b>Aquifer</b>	<b>Description</b>	
Superficial	<p>The Superficial formation consists of mostly Guildford formation in this subarea. The Superficial Aquifer consists predominantly of clay and sand, and ranges from 20–40 m deep across the aquifer, thinning to the east.</p> <p>Groundwater flow moves from west towards the Harvey River, Harvey main drain and other drains from the Yanget Mound and is part of the Waroona flow system. The aquifer may be in hydraulic connection with the underlying Leederville Aquifer.</p> <p>Salinity of the groundwater increases towards the Harvey River ranging from 500–3000 mg/L TDS.</p>	
Considerations for water use include, but are not limited to, the following		
<b>Ecological</b>		
<p><i>Wetlands and waterways:</i> Harvey Main, Meredith and Logue Brook and Mangosteen drains. Over 75 registered environmental protection policy wetlands, with the majority located on private land grouped in a chain just inland of the western boundary of the subarea.</p>		

Harvey			
<p>Riverdale and Harvey Flats nature reserves are classed as system 6 conservation reserves under the <i>Environmental Protection Act 1986</i>.</p> <p><i>Threatened ecological communities and declared rare flora sites:</i> Two sites listed as threatened ecological community associated with Wellard nature reserve. Thirteen different species of declared rare flora with several species associated with Wellard nature reserve and the remaining on private land.</p>			
<b>Cultural</b>			
<p><i>Native Title claimant:</i> Gnaala Karla Booja.</p> <p><i>Aboriginal Heritage sites:</i> Six artefact sites registered, including several archaeological sites of significance, campsites and river flats.</p>			
<b>Social</b>			
<p><i>Towns and Localities:</i> Localities of Wagerup, Cookernup, Yarloop and Uduc cover this subarea with water supply for domestic purposes from rainwater tanks and exempt groundwater abstraction.</p> <p><i>National parks, reserves and state forest:</i> Myalup State Forest, nature reserves of Wellard, Harvey Flats, and Riverdale.</p> <p><i>Recreational sites:</i> Harvey flats nature reserve.</p>			
<b>Management zones that apply in this subarea</b>			
<b>3</b>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%; padding: 5px;">Water quality issues for the Swan coastal plain (north of Bunbury) and Kemerton Industrial Park</td> <td style="padding: 5px;">Minimise current salt recycling and watertable aquifer quality (nutrients and potential acid sulfate soils). Minimise current impacts on watertable levels. Restrict potential nutrient and pollution impacts on the watertable aquifer.</td> </tr> </table>	Water quality issues for the Swan coastal plain (north of Bunbury) and Kemerton Industrial Park	Minimise current salt recycling and watertable aquifer quality (nutrients and potential acid sulfate soils). Minimise current impacts on watertable levels. Restrict potential nutrient and pollution impacts on the watertable aquifer.
Water quality issues for the Swan coastal plain (north of Bunbury) and Kemerton Industrial Park	Minimise current salt recycling and watertable aquifer quality (nutrients and potential acid sulfate soils). Minimise current impacts on watertable levels. Restrict potential nutrient and pollution impacts on the watertable aquifer.		
<p>Additional assessment and licensing requirements apply in the areas covered by a management zone. Please refer to Section 5.2 of the <i>South West groundwater areas allocation plan</i> for more detail.</p>			

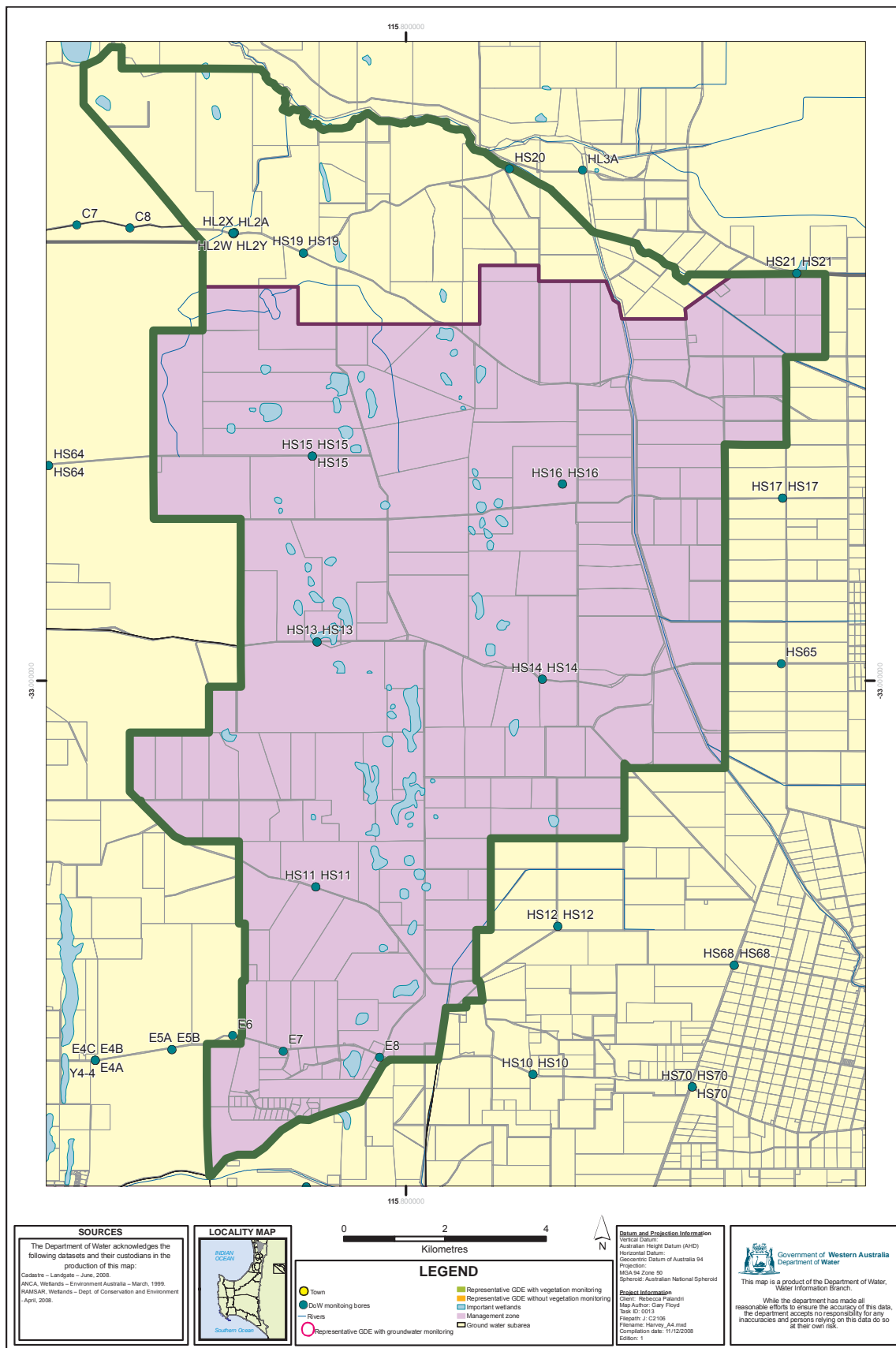


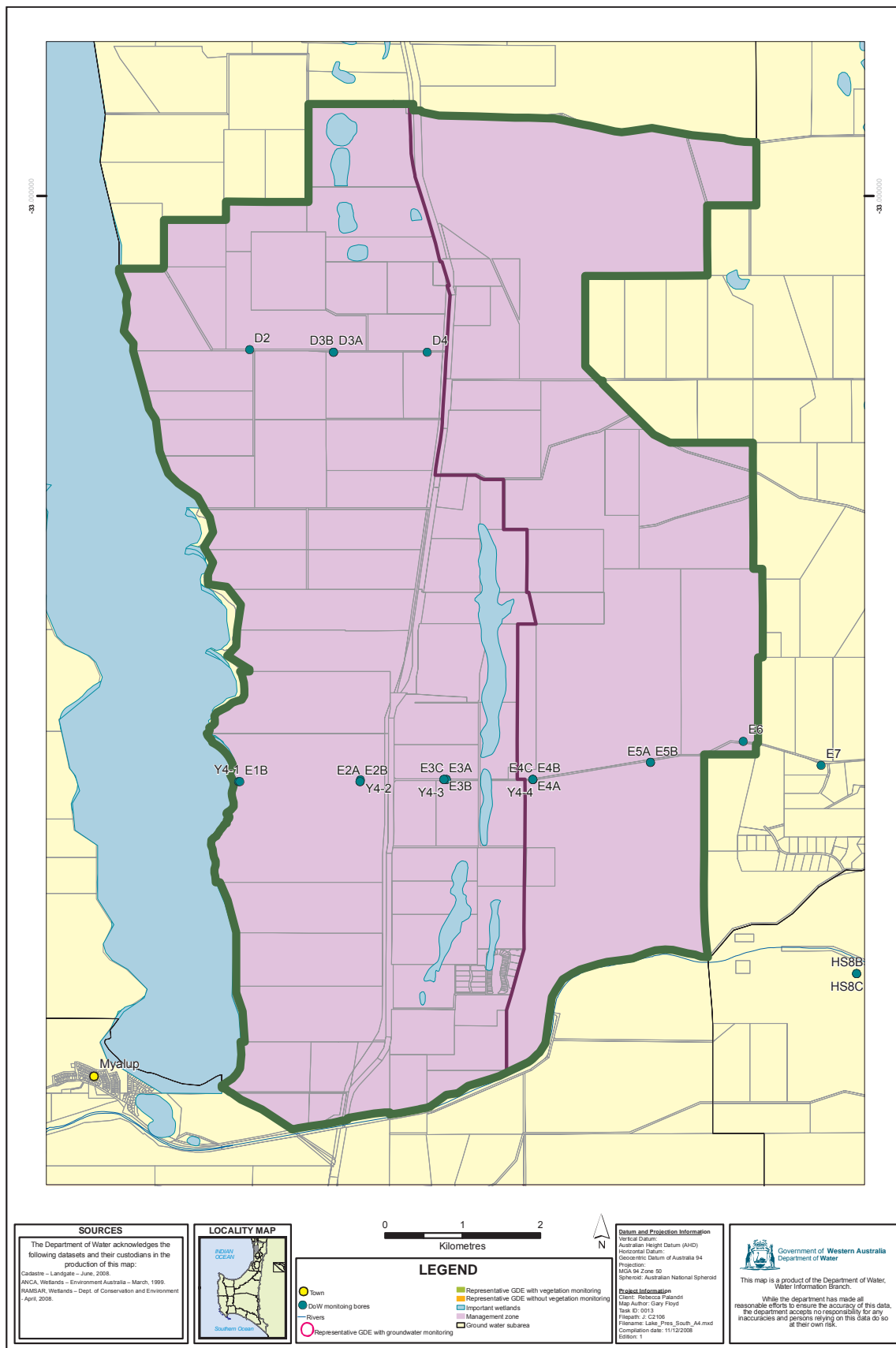
Figure 15 Harvey subarea

## 4.6 Lake Preston South

Lake Preston South		
Subarea description		
<b>Area</b>	63.7 km <sup>2</sup>	
<b>Proclamation</b>	South West Coastal groundwater area 1977	
<b>Shire</b>	Shire of Harvey	
<b>Rainfall</b>	800–1000 mm	
<b>Licensed water use (November 2008)</b>	<i>Superficial</i> : 11 386 740 kL/yr <i>Use</i> : horticulture (75%), irrigation of pasture (22%) and service sector (3%)	
Allocation and water availability kL/yr		
<b>Aquifer</b>	<b>Allocation limit</b>	<b>Available water</b>
Superficial	10 500 000	Over-allocated. Contact the Bunbury office for more information.
Issues for water management		
<p>The lakes and wetlands in this subarea must be protected from changes in water quality and drawdown as they are protected under state, federal and international legislation. The subarea covers the Superficial Aquifer only.</p> <p>Abstraction may have restrictions (management zone 3 and 6) to maintain the water quality and minimise the impacts on wetlands and other water bodies. As a result the location and depth of draw points is likely to be restricted.</p> <p>There is an allocation cap on the maximum allowable abstraction rate per hectare. Monitoring of water quality may be included as a licence condition.</p>		
Hydrogeology		
<b>Aquifer</b>	<b>Description</b>	
Superficial	<p>The Superficial formation consists of Safety Bay Sands, Tamala limestone and Bassendean Sands. The Superficial Aquifer consists predominantly of sand and limestone, ranging from 20–40 m deep across the aquifer.</p> <p>The watertable depth below ground level ranges from 1–20 m and is shallowest close to Lake Preston.</p> <p>Groundwater flow moves from east to west from the Yanget Mound (east) and is part of the Myalup flow system. The aquifer may be in hydraulic connection with the underlying Leederville Aquifer.</p> <p>There is a saline water interface along the eastern shore of Lake Preston. Groundwater quality varies across the subarea; in some areas abstraction has caused increased salinity (&gt; 2500 mg/L TDS).</p>	

Lake Preston South		
Considerations for water use include, but are not limited to, the following		
<b>Ecological</b>		
<p><i>Wetlands and waterways:</i> The Harvey diversion drain is along the southern boundary of the subarea. Yalgorup Lake system (Australian national conservation area and Ramsar site — Peel–Yalgorup system).</p> <p>Over ten registered environmental protection policy wetlands, with the majority located on private land running north/south in a chain along the edge of the Myalup State Forest and in the Yalgorup Lake system. Yalgorup national park, Crampton nature reserve and parts of Myalup state forest are classed as system 6 conservation reserve under the <i>Environmental Protection Act 1986</i>.</p> <p><i>Threatened ecological communities and declared rare flora sites:</i> One site contains declared rare flora, south of Crampton nature reserve.</p>		
<b>Cultural sites</b>		
<p><i>Native Title claimant:</i> Gnaala Karla Booja.</p> <p><i>Aboriginal Heritage sites:</i> Seven sites registered. They include several archaeological sites of significance and Lake Preston.</p>		
<b>Social sites</b>		
<p><i>Towns and localities:</i> Locality of Myalup covers this subarea with water supply for domestic purposes from rainwater tanks and exempt groundwater abstraction.</p> <p><i>National parks, reserves or state forest:</i> Yalgorup National Park, Tuart conservation reserve and Myalup State Forest.</p> <p><i>Recreational sites:</i> Yalgorup National Park and Lake Preston.</p>		
Management zones that apply in this subarea		
<b>3</b>	Water quality issues for the Swan coastal plain (north of Bunbury) and Kemerton Industrial Park	Minimise current salt recycling and watertable aquifer quality (nutrients and potential acid sulfate soils). Minimise current impacts on watertable levels. Restrict potential nutrient and pollution impacts on the watertable aquifer.
<b>6</b>	Swan coastal plain wetlands – including Stirling wetlands, Vasse-Wonnerup estuary, wetlands north of Bunbury	Minimise impacts on groundwater-dependent ecosystems from abstraction in the underlying aquifers and connected systems. Control the decrease in runoff and changes to drainage from agricultural and urban activities. Control abstraction to minimise impacts on social and ecological sites from regional and local abstraction.
<p>Additional assessment and licensing requirements apply in the areas covered by a management zone. Please refer to Section 5.2 of the <i>South West groundwater areas allocation plan</i> for more detail.</p>		

Plan companion for the  
**South West groundwater areas allocation plan**



**Figure 16 Lake Preston South subarea**

## 4.7 Lake Preston North

Lake Preston North		
Subarea description		
<b>Area</b>	56.3 km <sup>2</sup>	
<b>Proclamation</b>	South West Coastal groundwater area 1977	
<b>Shire</b>	Shire of Harvey	
<b>Rainfall</b>	800–1000 mm	
<b>Licensed water use (November 2008)</b>	<i>Superficial:</i> 1 195 200 kL/yr Use: horticulture (99%) and service sector (1%)	
Allocation and water availability kL/yr		
<b>Aquifer</b>	<b>Allocation limit</b>	<b>Available water</b>
Superficial	9 300 000	Contact the Bunbury office for up-to-date availability.
Issues for water management		
<p>The lakes and wetlands in this subarea must be protected from changes in water quality and drawdown as they are protected under state, federal and international legislation. The subarea covers the Superficial Aquifer only.</p> <p>Abstraction may have restrictions (management zone 3 and 6) to maintain the water quality and minimise the impacts on wetlands and other water bodies. As a result the location and depth of draw points is likely to be restricted. There is an allocation cap on the maximum allowable abstraction rate per hectare. Monitoring of water quality may be included as a licence condition.</p>		
Hydrogeology		
<b>Aquifer</b>	<b>Description</b>	
Superficial	<p>The Superficial formation consists of Safety Bay Sands, Tamala limestone and Bassendean Sands. The Superficial Aquifer consists predominantly of sand and limestone, ranging from 20–40 m deep across the aquifer.</p> <p>The watertable depth below ground level ranges from 1–20 m and is shallowest close to Lake Preston.</p> <p>Groundwater flow moves from east to west from the Yanget Mound (east) and is part of the Myalup flow system. The aquifer may be in hydraulic connection with the underlying Leederville Aquifer. There is a saline water interface along the eastern shore of Lake Preston. Groundwater quality varies across the subarea.</p>	
Considerations for water use include, but are not limited to, the following		
<b>Ecological</b>		
<p><i>Wetlands and waterways:</i> Yalgorup Lake system (Australian national conservation area and Ramsar site — Peel–Yalgorup system). Five registered environmental protection policy wetlands, running north–south in a chain along the edge of the Myalup State Forest and in the Yalgorup Lake system.</p> <p>Yalgorup National Park and parts of Myalup State Forest are also classed as system 6 conservation reserves under the <i>Environmental Protection Act 1986</i>.</p>		



Lake Preston North		
<p><i>Threatened ecological communities and declared rare flora sites:</i> Five sites listed as threatened ecological community associated with Myalup State Forest in the north-eastern corner of the subarea containing six different species of declared rare flora.</p>		
<p><b>Cultural</b></p> <p><i>Native Title claimant:</i> Gnaala Karla Booja.  <i>Aboriginal Heritage sites:</i> Two sites registered. One is an artefact site and the other covers Lake Preston.</p>		
<p><b>Social</b></p> <p><i>Towns and localities:</i> Localities of Myalup and Preston Beach cover this subarea with water supply for domestic purposes from rainwater tanks and exempt groundwater abstraction.  <i>Public water supply:</i> Preston Beach water reserve is proposed in the northern part of the subarea                      National parks, reserves or state forest: Yalgorup National Park and Myalup State Forest.                      Recreational sites: Yalgorup National Park and Lake Preston.</p>		
Management zones that apply in this subarea		
<b>3</b>	Water quality issues for the Swan coastal plain (north of Bunbury) and Kemerton Industrial Par	Minimise current salt recycling and watertable aquifer quality (nutrients and potential acid sulfate soils). Minimise current impacts on watertable levels. Restrict potential nutrient and pollution impacts on the watertable aquifer.
<b>6</b>	Swan coastal plain wetlands – including Stirling wetlands, Vasse-Wonnerup estuary, wetlands north of Bunbury	Minimise impacts on groundwater-dependent ecosystems from abstraction in the underlying aquifers and connected systems. Control the decrease in runoff and changes to drainage from agricultural and urban activities. Control abstraction to minimise impacts on social and ecological sites from regional and local abstraction.
<p>Additional assessment and licensing requirements apply in the areas covered by a management zone. Please refer to Section 5.2 of the <i>South West groundwater areas allocation plan</i> for more detail.</p>		

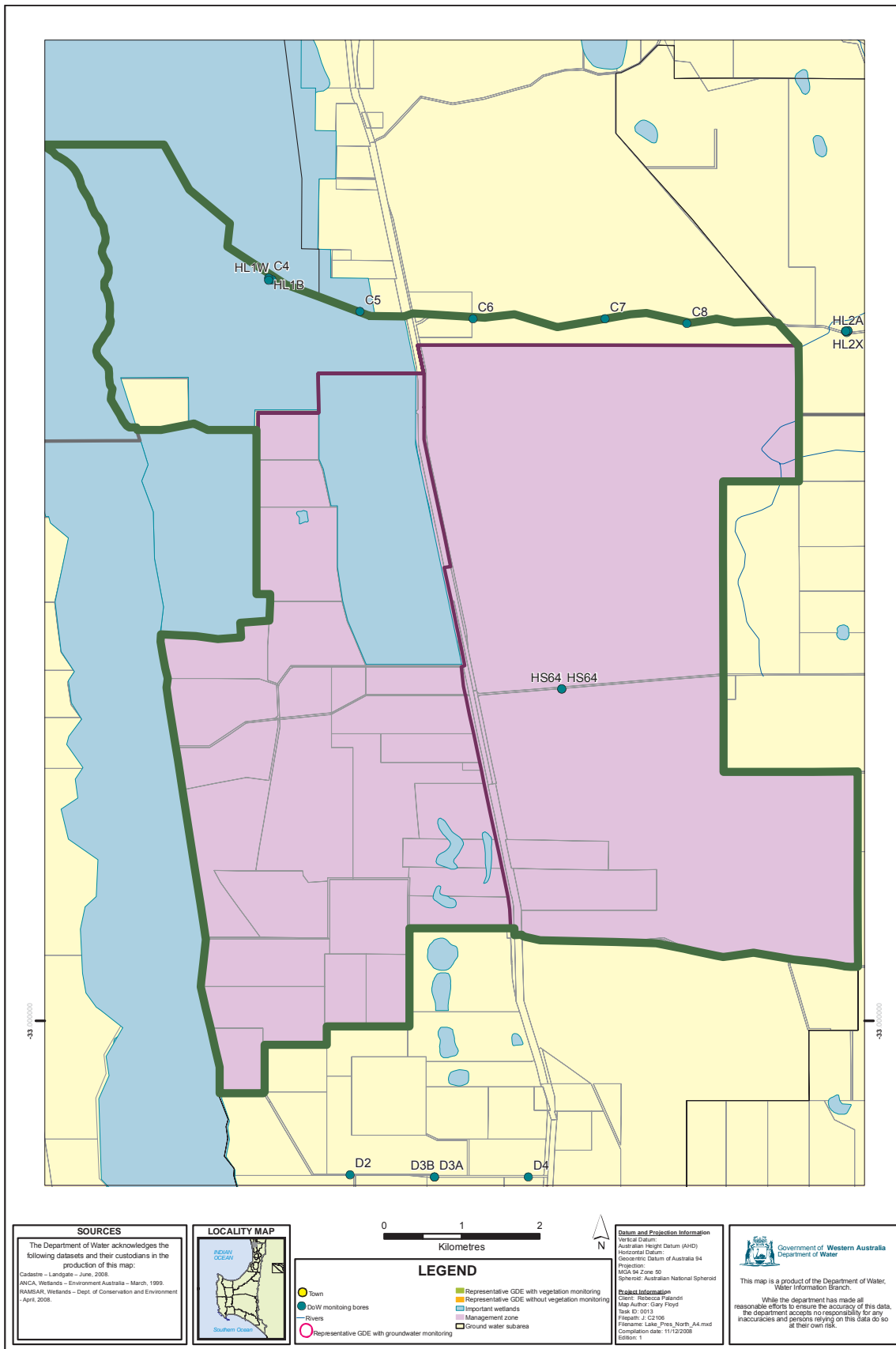


Figure 17 Lake Preston North subarea

## 4.8 Lake Preston

<b>Lake Preston</b>		
<b>Subarea description</b>		
<b>Area</b>	120.0 km <sup>2</sup>	
<b>Proclamation</b>	South West Coastal groundwater area 1977	
<b>Shire</b>	Shire of Harvey	
<b>Rainfall</b>	800–1000 mm	
<b>Licensed water use (November 2008)</b>	Leederville: 420 000 kL/yr Use: public water supply (4%) and horticulture (96%)	
<b>Allocation and water availability kL/yr</b>		
<b>Aquifer</b>	<b>Allocation limit</b>	<b>Available water</b>
Leederville	500 000	Limited. Contact the Bunbury office for up-to-date availability.
<b>Issues for water management</b>		
<p>The lakes and wetlands in this subarea must be protected from changes in water quality and drawdown as they are protected under state, federal and international legislation. The subarea covers the Leederville Aquifer only.</p> <p>Abstraction may have restrictions (management zone 3 and 6) to maintain the water quality and minimise the impacts on wetlands and other water bodies. As a result the location and depth of draw points is likely to be restricted. Monitoring of water quality may be included as a licence condition.</p>		
<b>Hydrogeology</b>		
<b>Aquifer</b>	<b>Description</b>	
Leederville	<p>The Leederville formation is 150–200 m thick below the Superficial formations in this subarea. It contains partially cemented sand layers, separated by shale layers which form the aquifer system. The Leederville Aquifer is recharged by the Superficial Aquifer in the east (Yanget mound in Harvey subarea).</p> <p>Groundwater quality is marginal between the recharge area and the saline water interface, near the coast, with the remainder of the aquifer brackish (1000 mg/L TDS) to saline (&gt; 3000 mg/L TDS).</p>	
<b>Considerations for water use include, but are not limited to, the following</b>		
<b>Ecological</b>		
<p><i>Wetlands and waterways:</i> Harvey Diversion Drain along the southern boundary of the subarea. Yalgorup Lake system (Australian national conservation area and Ramsar site — Peel–Yalgorup system).</p> <p>Over 15 registered environmental protection policy wetlands, with the majority located on private land running north–south in a chain along the edge of the Myalup State Forest and in the Yalgorup Lake system on crown land. Yalgorup National Park, Crampton Nature Reserve and parts of Myalup State Forest are also classed as system 6 conservation reserves under the <i>Environmental Protection Act 1986</i>.</p>		

## Lake Preston

*Threatened ecological communities and declared rare flora sites:* Five sites listed as threatened ecological community associated with Myalup State Forest in the north-eastern corner of the subarea containing six different species of declared rare flora, with one declared rare flora site located south of Crampton reserve.

### Cultural

*Native Title claimant:* Gnaala Karla Booja.

*Aboriginal Heritage sites:* Nine sites registered sites. They include several archaeological sites of significance and Lake Preston.

### Social

*Towns and localities:* Localities of Myalup and Preston Beach cover this subarea with water supply for domestic purposes from rainwater tanks and exempt groundwater abstraction.

*Public water supply:* Preston Beach public water supply reserve<sup>1</sup> covers a small area, protecting the bore field.

*National parks, reserves or state forest:* Yalgorup National Park, Tuart conservation reserve and Myalup State Forest.

*Recreational sites:* Yalgorup National Park and Lake Preston.

### Management zones that apply in this subarea

<b>3</b>	Water quality issues for the Swan coastal plain (north of Bunbury) and Kemerton Industrial Park	Minimise current salt recycling and watertable aquifer quality (nutrients and potential acid sulfate soils). Minimise current impacts on watertable levels. Restrict potential nutrient and pollution impacts on the watertable aquifer.
<b>6</b>	Swan coastal plain wetlands – including Stirling wetlands, Vasse-Wonnerup estuary, wetlands north of Bunbury	Minimise impacts on groundwater-dependent ecosystems from abstraction in the underlying aquifers and connected systems. Control the decrease in runoff and changes to drainage from agricultural and urban activities. Control abstraction to minimise impacts on social and ecological sites from regional and local abstraction.

Additional assessment and licensing requirements apply in the areas covered by a management zone. Please refer to Section 5.2 of the *South West groundwater areas allocation plan* for more detail.

<sup>1</sup> Department of Water 2006, *Preston Beach water reserve drinking water source protection plan*, Water resource protection series report no 57, Department of Water, Government of Western Australia, Perth.

Plan companion for the  
South West groundwater areas allocation plan

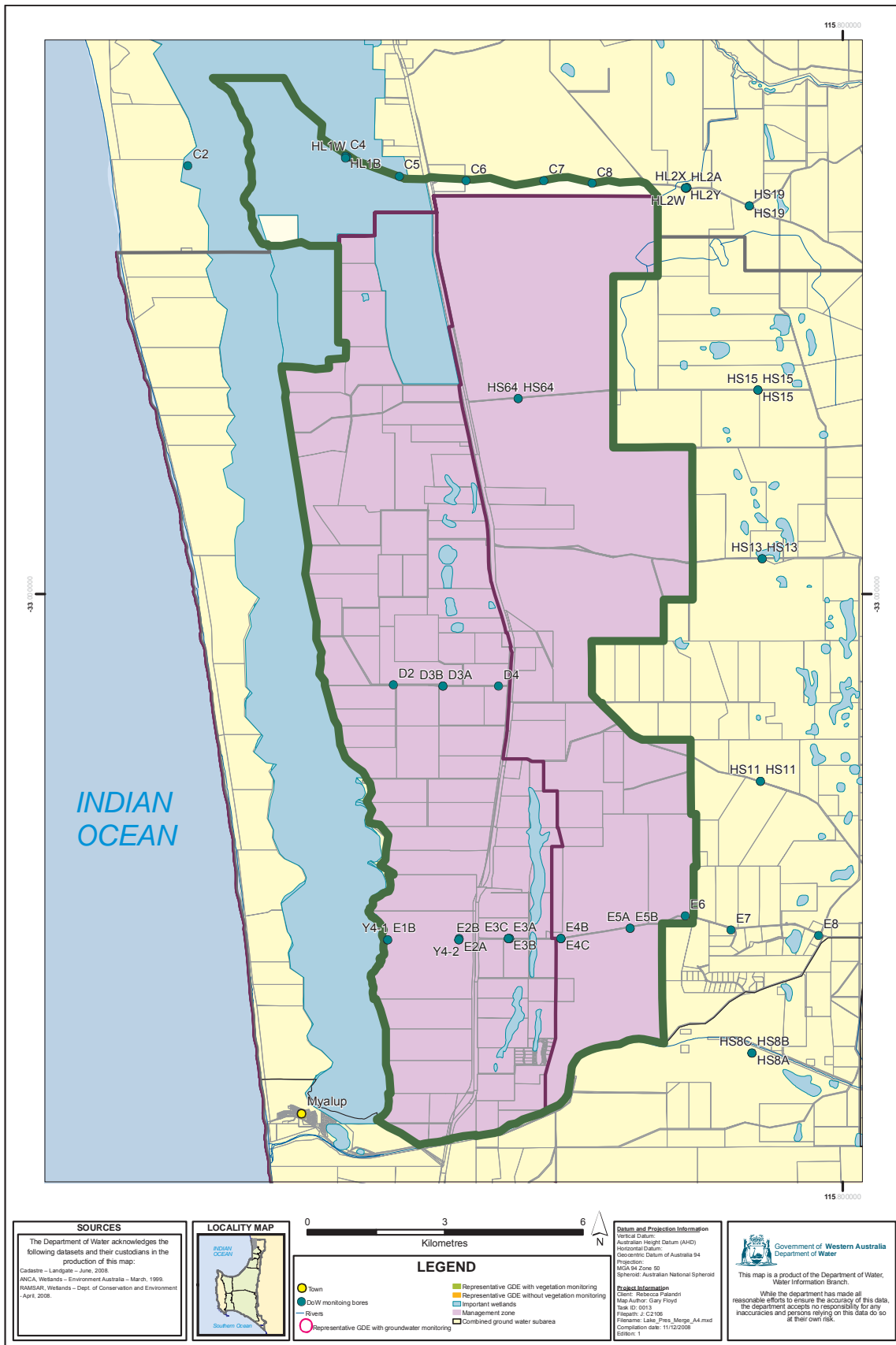


Figure 18 Lake Preston subarea

# Appendices

## Appendix A Statewide licensing policies

Policy name	Brief description
<i>Statewide policy no. 2 – Pesticide use in public drinking water source area</i>	Provides the department's position on the use of pesticides within proclaimed public drinking water source areas.
<i>Statewide policy no. 3 – Policy statement on water sharing</i>	Provides guidance on the overall policy approach to sharing water between competing users.
<i>Statewide policy no. 5 – Environmental water provisions policy for Western Australia</i>	Outlines the department's approach on ensuring that the water needs of the environment are addressed in water allocation decision-making.
<i>Statewide policy no. 6 – Transferable (tradeable) water entitlements for Western Australia</i>	Provides guidance on the transfer and trade of water licences.
<i>Statewide policy no. 8 – Giving an undertaking to grant a licence or a permit under the Rights In Water and Irrigation Act 1914</i>	Defines the circumstances under which the department will give undertakings for the granting of licences to take water, the approval of agreements with respect to water entitlements, permits to interfere with a water course or licences to construct a well.
<i>Statewide policy no. 9 – Water licensing – staged developments</i>	Describes the licensing policy and process used for developments and land uses with a prolonged establishment phase, where water requirements will alter significantly during the life of the project.
<i>Statewide policy no. 10 – Use of operating strategies in the water licensing process</i>	Provides guidance on the structure of operating strategies and on the circumstances and purposes under which they are requested.
<i>Statewide policy no. 11 – Management of unused licensed water entitlements</i>	Outlines how to manage licence allocations to ensure that reducing unused allocations to a minimum effectively uses the water resources.
<i>Draft statewide policy no. 14 – Managing unlicensed groundwater use</i>	Provides the department's position on managing groundwater taken by unlicensed users.
<i>Statewide policy no. 16 – Water conservation and efficiency plans</i>	Provides direction on preparing water conservation and efficiency plans required by water users as part of the water licensing process.
<i>Statewide policy no. 17 – Timely submissions of required further information</i>	Describes the department's policy on the timeframes for submission of further information that is required in the licence assessment process.
<i>Statewide policy no. 19 – Hydrogeological reporting associated with a groundwater well licence.</i>	Provides guidance on when hydrogeological assessments and groundwater monitoring reports are required and the information that they should contain.

All statewide policies are available on the department's website <[www.water.wa.gov.au](http://www.water.wa.gov.au)> Managing our water > Statewide policies>.

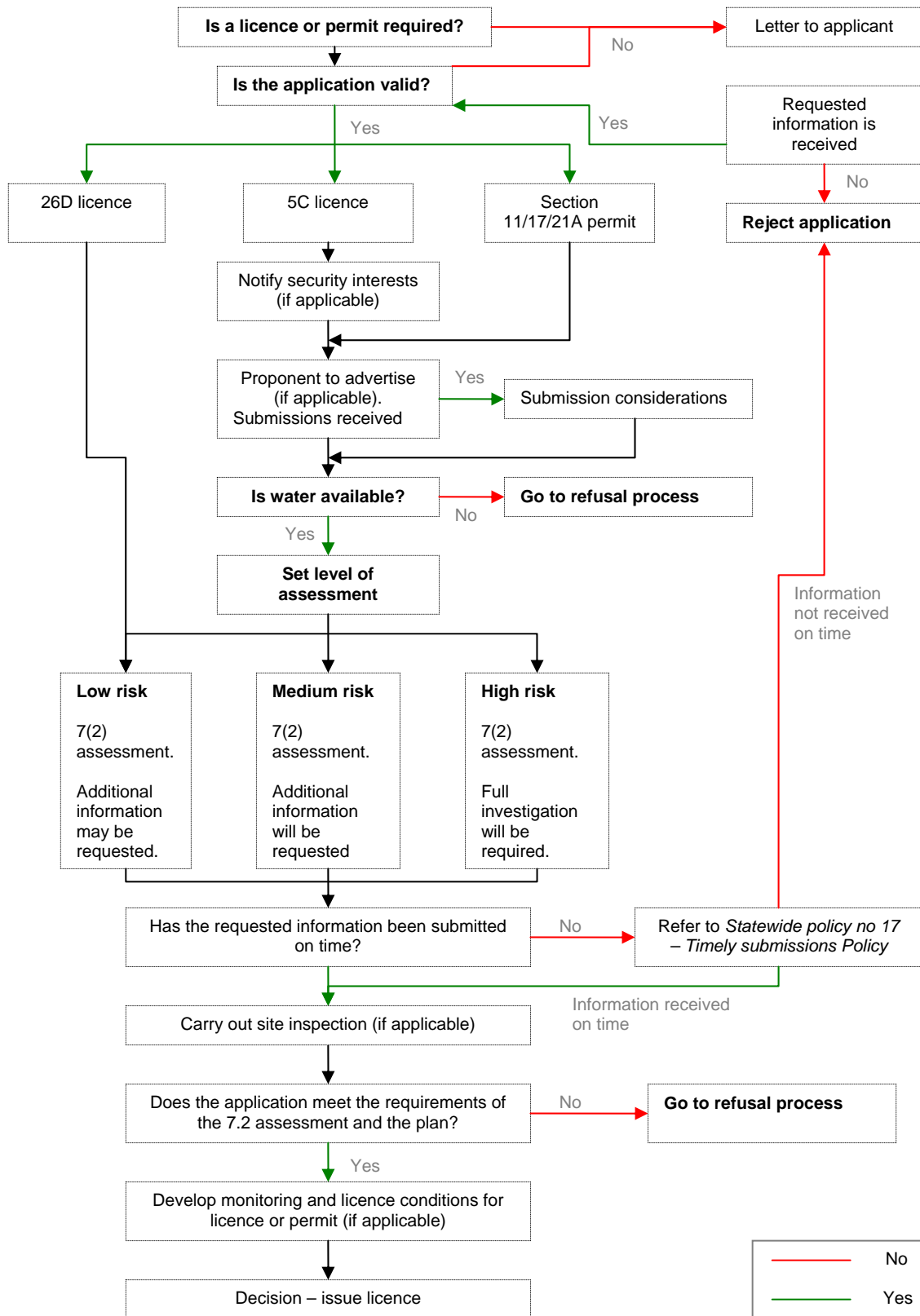


Figure A1 Standard licensing process flowchart



## 7(2) assessments and groundwater licensing

The Department of Water assesses individual licence applications to construct a bore (26D) and to take water (5C licence) under Schedule 1, Division 2, clause 7(2) of the *Rights in Water and Irrigation Act, 1914*. The level of assessment will vary depending on the level of risk to the environment and existing users. Table 1 provides a brief summary of the clause 7 (2) assessment process with regard to a groundwater licence application (5C and 26D) and what the department considers against each of the requirements under clause 7 (2).

**Table A1 Clause 7(2) assessment process for groundwater licensing**

Relevant consideration under clause 7(2)		What the department considers
7(2)(a)	<p><b>Public interest</b></p> <p>Does the proposal have any economic, social or recreational benefits to the public?</p> <p>This is assessed from a regional or state-wide point of view.</p>	<ul style="list-style-type: none"> <li>• social benefit (including water for community parks and gardens)</li> <li>• recreational benefit (including aesthetics of a natural system, camping, fishing)</li> <li>• economic benefit (including regional development, prospective employment)</li> <li>• advertising of proposals under <i>Rights in Water and Irrigation Act, 1914</i> which provides information to assess public interest</li> </ul>
<p><b>Sustainability assessment</b></p> <p>A sustainability assessment considers economic, social and ecological factors together and attempts to satisfy as many factors as possible, with minimal trade-offs, applying the principles below:</p> <ul style="list-style-type: none"> <li>• long-term economic health</li> <li>• equity and human rights</li> <li>• biodiversity and ecological integrity.</li> </ul>		
7(2)(b)	<p><b>Ecologically sustainable</b></p>	<ul style="list-style-type: none"> <li>• water availability</li> <li>• requirements of relevant allocation plan</li> <li>• hydrogeological assessment</li> <li>• impact on any ecologically significant sites</li> <li>• an assessment is made on the requirements to protect the ecology: <ul style="list-style-type: none"> <li>– monitoring as part of the licensing conditions</li> <li>– an operating strategy</li> <li>– nutrient impact or irrigation development assessment</li> <li>– a water conservation/efficiency plan</li> <li>– a water quality assessment</li> </ul> </li> <li>• clearing approval requirements</li> <li>• land capability assessment</li> </ul>

Relevant consideration under clause 7(2)	What the department considers
<p><b>7(2)(c) Environmentally acceptable</b> Can the economic, social and ecological considerations be satisfied? If not, are the impacts acceptable?</p>	
<p><b>Economic</b> Long-term economic health Recognise needs of current and future demand</p>	<ul style="list-style-type: none"> <li>any economic values identified through allocation planning</li> <li>categorisation of economic status: public-commercial or non-commercial, or private-commercial or non-commercial</li> <li>economic benefit to local, regional or state market</li> </ul>
<p><b>Social</b> Equity and human rights</p>	<ul style="list-style-type: none"> <li>any social and recreational values identified through allocation planning:                             <ul style="list-style-type: none"> <li>cultural and heritage considerations:                                     <ul style="list-style-type: none"> <li>Aboriginal sites of significance</li> <li>Native title claims</li> </ul> </li> </ul> </li> <li>Australian heritage listings</li> <li>social and recreational benefits or liabilities (including fishing)</li> </ul>
<p><b>Ecological</b> Biodiversity and ecological integrity</p>	<ul style="list-style-type: none"> <li>findings of the 7(2) (b) assessments</li> </ul>
<p><b>7(2)(d) May prejudice other current and future needs for water</b> The regional view</p>	<ul style="list-style-type: none"> <li>hydrogeological assessment – effects on current and future needs for water and possible environmental impacts on surrounding areas</li> </ul>
<p><b>7(2)(e) Detrimental effect on another person</b> The local view</p>	<ul style="list-style-type: none"> <li>need for advertising process</li> <li>need for an operating strategy</li> <li>hydrogeological assessment (impact on existing use)</li> </ul>
<p><b>7(2)(f) Could be provided for by another source</b> Assessment considers alternative options and sources</p>	<ul style="list-style-type: none"> <li>most appropriate resource – hydrogeological assessment and water availability</li> <li>availability of other sources such as surface water, recycled water, scheme water</li> <li>most economically viable source</li> </ul>
<p><b>7(2)(g) Are in keeping with:</b> <b>(i) Local practices</b> Local practices and planning requirements</p>	<ul style="list-style-type: none"> <li>local government authority approval and/or compatible with current land use zoning</li> <li>application has other relevant government approvals including:                             <ul style="list-style-type: none"> <li>Department of Agriculture and Food</li> <li>Department of Mines and Petroleum</li> <li>Department of State Development</li> <li>Department for Planning and Infrastructure</li> </ul> </li> </ul>

Relevant consideration under clause 7(2)		What the department considers
		<ul style="list-style-type: none"> <li>- Western Australian Planning Commission</li> <li>- Department of Environment and Conservation.</li> <li>• common practice within the local area</li> </ul>
7(2)(g) cont.	(ii) Relevant local by-law	<ul style="list-style-type: none"> <li>• by-laws under <i>Rights in Water and Irrigation Act, 1914</i> or <i>Environmental Protection Act 1986</i> – there are none at present in the South West groundwater areas</li> </ul>
	(iii) Plan approved under Part III Division 3d Subdivision 2	<ul style="list-style-type: none"> <li>• meets the requirements of the plan approved under Part III Division 3d Subdivision 2 (statutory)</li> </ul>
	(iv) Relevant previous decisions of the department	<ul style="list-style-type: none"> <li>• departmental policies and plans</li> <li>• previous licensing decisions where relevant</li> </ul>
7(2)(h)	Are consistent with: (i) Land use planning Instruments	<ul style="list-style-type: none"> <li>• application is consistent with Environmental Protection (Clearing of Native Vegetation) Regulations 2004</li> <li>• local government approval</li> <li>• Western Australian Planning Commission approval</li> <li>• other relevant planning and scheme text.</li> </ul>
	(ii) The requirements and policies of other government agencies Issue of a licence cannot pre-empt approvals under the <i>Native Title Act 1993</i> and Part V of the <i>Environmental Protection Act, 1986</i> .	<ul style="list-style-type: none"> <li>• department refers proposal to other government departments, where appropriate</li> </ul>
	(iii) Any inter-governmental agreement or arrangement	<ul style="list-style-type: none"> <li>• related inter-governmental agreements or arrangements (such as State Development Acts)</li> </ul>

## Appendix B Other plans and strategies to be considered

Plan	Consideration	Agency
<i>State water plan</i>	Strategic direction	DoW
<i>South West regional water plan</i>	Strategic direction, South West community issues, principles and issues that guide subordinate plans	DoW
<i>Kemerton groundwater subareas water management plan</i>	Compliments the South West groundwater areas plan and provides local policy and rules for the Kemerton subareas	DoW
<i>Better managing the urban water cycle – the urban drainage initiative</i>	Urban water drainage and management for better urban design.	DoW
<i>Better urban water management</i>	Urban water management for public services and urban design	DPI
<i>Bunbury water reserve, Bunbury drinking water source protection plan</i>	Manages land and water use activities in this area to ensure safe drinking water quality	DoW
<i>Preston Beach drinking water source protection plan</i>	Manages land and water use activities in this area to ensure safe drinking water quality	DoW
<i>The Leschenault estuarine system, South–Western Australia: condition statement and recommendations for management</i>	Environmental monitoring and management criteria for the area. Strategic planning and recommendations for future work.	DoW
<i>South West natural resource management strategy</i>	Natural resource planning and management	SWCC
<i>Greater Bunbury regional scheme</i>	Statutory planning scheme for land use and zoning	WAPC

DEC = Department of Environment and Conservation

DoW = Department of Water

DPI = Department of Planning and Infrastructure

WAPC = Western Australian Planning Commission

SWCC = South West Catchments Council

### Major legislation relating to water resource management in the South West

Commonwealth legislation:

- *Environmental Protection and Biodiversity Conservation Act 1999*
- *National Water Commission Act 2004*
- *Natural Heritage Trust Act of Australia 1997*
- *National Environmental Protection Council Act 1994*
- *Aboriginal and Torres Strait Islander Heritage Protection Act 1984*
- *World Heritage Properties Conservation Act 1995.*

State legislation:

- *Conservation and Land Management Act 1984*
- *Native Title (State Provisions) Act 1999*
- *Aboriginal Heritage Act 1972*
- *Country Areas Water Supply Act 1947*
- *Environmental Protection Act 1986, amendment 1998*
- *Environmental Protection Regulations 1987*
- *Heritage of Western Australia Act 1990*
- *Metropolitan Water Supply, Sewerage and Drainage Act 1909 (including by-laws)*
- *National Trust of Australia (WA) Act 1964*
- *Rights in Water and Irrigation Act 1914, Regulations 2000*
- *Water Agencies (Powers) Act 1984*
- *Soil and Land Conservation Act 1945, Regulations 1992*
- *Town Planning and Development Act 1928*
- *Water and Rivers Commission Act 1995*
- *Waterways Conservation Act 1976*
- *Western Australian Planning Commission Act 1985*
- *Wildlife Conservation Act 1950, Regulations 1970*
- *Pollution of Waters by Oil and Noxious Substances Act 1987*
- *Contaminated Sites Act 2003.*

**Other documents to consider**

National Parks management plans (Department of Environment and Conservation):

- Benger Swamp nature reserve, 1988
- Leschenault Peninsula Conservation Park, 1999
- Yalgorup National Park, 1995

## Appendix C Useful information and websites for other government departments

Government department	Website	Contact for more information on:
<b>Department of Environment and Conservation</b>	< <a href="http://www.dec.wa.gov.au">www.dec.wa.gov.au</a> >	Acid sulfate soils and contaminated sites. Vegetation clearing and declared rare flora, fauna and threatened ecological sites. Environmental protection policy wetlands. National Park management.
<b>Environmental Protection Authority</b>	< <a href="http://www.epa.wa.gov.au">www.epa.wa.gov.au</a> >	EPA approvals and processes
<b>Department of Environment and Heritage</b>	< <a href="http://www.deh.gov.au">www.deh.gov.au</a> >	Information and approvals under the <i>Environmental Protection and Biodiversity Conservation Act 1999</i>
<b>Department of Agriculture and Food</b>	< <a href="http://www.dafwa.wa.gov.au">www.dafwa.wa.gov.au</a> >	Best management practices and information on agriculture and food
<b>Bureau of Meteorology</b>	< <a href="http://www.bom.wa.gov.au">www.bom.wa.gov.au</a> >	Rainfall, evaporation and climate related information
<b>Department of Mines and Petroleum</b>	< <a href="http://www.dmp.wa.gov.au">www.dmp.wa.gov.au</a> >	Mining tenements, best-management practices and approvals Geological survey maps and reports
<b>Geological Survey of Western Australia</b>		
<b>Department of State Development</b>	< <a href="http://www.dsd.wa.gov.au">www.dsd.wa.gov.au</a> >	State agreement Acts and state developments
<b>Department for Planning and Infrastructure</b>	< <a href="http://www.dpi.wa.gov.au">www.dpi.wa.gov.au</a> >	Cadastral information, land planning information
<b>Western Australian Planning Commission</b>	< <a href="http://www.wapc.wa.gov.au">www.wapc.wa.gov.au</a> >	Planning and land use development approvals
<b>Department of Fisheries</b>	< <a href="http://www.fish.wa.gov.au">www.fish.wa.gov.au</a> >	Aquaculture
<b>Forestry Products Commission</b>	< <a href="http://www.fpc.wa.gov.au">www.fpc.wa.gov.au</a> >	Plantations
<b>Department of Indigenous Affairs</b>	< <a href="http://www.dia.wa.gov.au">www.dia.wa.gov.au</a> >	Aboriginal heritage sites
<b>Office of Native Title</b>	< <a href="http://www.nativetitle.wa.gov.au">www.nativetitle.wa.gov.au</a> >	Native title determination
<b>Heritage Council of Western Australia</b>	< <a href="http://www.heritage.wa.gov.au">www.heritage.wa.gov.au</a> >	Heritage sites
<b>Office of Development Approvals Coordination</b>	< <a href="http://www.odac.dpc.wa.gov.au">www.odac.dpc.wa.gov.au</a> >	Full list of approvals processes for every government agency
<b>State land information platform (SLIP)</b>	< <a href="http://www.slip.wa.gov.au">www.slip.wa.gov.au</a> >	Public mapping information for government agencies

## Glossary

abstraction	The permanent or temporary withdrawal of water from any source of supply, so that it is no longer part of the resources of the locality.
allocation limit	The volume of water that can be abstracted for consumptive uses each year from a water resource with acceptable impacts.
aquifer	A geological formation or group of formations capable of receiving, storing and transmitting large quantities of water.
artesian aquifer	A confined aquifer in which the hydraulic pressure will cause water to rise in a bore or spring above the land surface. If the pressure is insufficient to cause the well to flow at the surface, it is called a sub-artesian aquifer.
base flow	The component of stream flow supplied by groundwater discharge.
bore	An opening in the ground, normally vertical hole drilled in soil or rock, made or used to obtain access to underground water. This is equivalent to the description of a 'well' in <i>the Rights In Water and Irrigation Act 1914</i> .
confined aquifer	An aquifer lying between confining layers of low permeability strata (such as clay, coal or rock) so that the water in the aquifer cannot easily flow vertically.
discharge	The water that moves from the groundwater to the ground surface or above, such as a spring or the ocean. This includes water that seeps onto the ground surface, evaporation from unsaturated soil, and water extracted from groundwater by plants (evapotranspiration) or engineering works (groundwater pumping).
domestic bore	A bore used for providing the in-house and household garden watering requirements.
drawdown	The lowering of a watertable resulting from the removal of water from an aquifer or reduction in hydraulic pressure.
ecological water requirements	The water regime needed to maintain ecological values of water-dependent ecosystems at a low level of risk.
environmental water provisions	The water regimes that are provided as a result of the water allocation decision-making process taking into account ecological, social, cultural and economic impacts. They may meet in part or in full the ecological water requirements
first-in first-served	A process by which groundwater entitlements are allocated in the order in which licence applications are received by the Department of Water.
groundwater	The water that occurs in pore spaces and fractures in rocks beneath the ground surface. See <i>also</i> aquifer, confined aquifer and unconfined aquifer.
groundwater area	An area proclaimed under the <i>Rights in Water and Irrigation Act 1914</i> for the purposes of licensing and managing water use.
groundwater-dependent ecosystem	An ecosystem that is dependent on groundwater for its existence and health.
hydrogeology	The hydrological and geological science concerned with the occurrence, distribution, quality and movement of groundwater, especially relating to the distribution of aquifers, groundwater flow and groundwater quality.

licence (5C)	A formal permit which entitles the licence holder to 'take' water from a watercourse, wetland or underground source.
m AHD	Australian Height Datum – height in metres above Mean Sea Level + 0.026m at Fremantle.
non-artesian well	A well, including all associated works, from which water does not flow, or has not flowed, naturally to the surface but has to be raised, or has been raised, by pumping or other artificial means.
public water supply reserve	Reservation of a volume of water to supply drinking water for human consumption.
recharge	Water that infiltrates into the soil to replenish an aquifer
salinity	The measure of total soluble salt or mineral constituents in water. Water resources are classified based on salinity in terms of total dissolved solids (TDS) or total soluble salts (TSS). Measurements are usually in milligrams per litre (mg/L) or parts per thousand (ppt).
social value	A particular in-situ quality, attribute or use that is important for public benefit, welfare, state or health (physical and spiritual).
social water requirement	Elements of the water regime that are needed to maintain social and cultural values.
stock bore	A bore that provides drinking water for stock.
subarea	A smaller area determined by the Department of Water within a proclaimed area used for water allocation planning and management purposes. The boundaries of which are based on the location of the water resource.
surface water	Water flowing over or held in streams, rivers and wetlands on the surface of the land.
throughflow	The flow of water within an, and between, aquifers.
unconfined aquifer	Is the aquifer nearest the surface, having no overlying confining layer. The upper surface of the groundwater within the aquifer is called the watertable. The aquifer contains water with no upper non-porous material to limit its volume or to exert pressure.
unconformity	A discontinuity in rock sequence indicating interruption of sedimentation, commonly accompanied by erosion of rocks below the break or the interface between such strata.
water efficiency	The minimisation of water use through adoption of best management practices.
water reserve	An area proclaimed under the <i>Metropolitan Water Supply Sewerage and Drainage Act 1909</i> or <i>Country Areas Water Supply Act 1947</i> to allow the protection and use of water on or under the land for public water supplies.
watertable	The saturated water level of the unconfined aquifer. Wetlands in low-lying areas are often seasonal or permanent surface expressions of the watertable.



wetland	For the purposes of this plan (unless otherwise specified) the department adopts the Ramsar Convention definition of a wetland as <i>an area that is permanently, seasonally or intermittently waterlogged or inundated with water that may be fresh, saline, flowing or static, including areas of marine water of which the depth at low tide does not exceed 6 metres.</i>
yield	The volume of water that may be drawn from a well or water supply system measured in cubic metres per day, gigalitres per year, or equivalent

#### Volumes of water

One litre	1 litre	1 litre	(L)
One thousand litres	1000 litres	1 kilolitre	(kL)
One million litres	1 000 000 litres	1 megalitre	(ML)
One thousand million litres	1 000 000 000 litres	1 gigalitre	(GL)

#### Shortened forms

AHD	Australian height datum
ANCA	Australian national conservation area – wetlands
DoW	Department of Water
DEC	Department of Environment and Conservation
DPI	Department for Planning and Infrastructure
DRF	Declared rare flora or fauna
EPA	Environmental Protection Authority
EPP wetland	Environmental protection policy wetland
EWR	Ecological water requirement
GDE	Groundwater-dependent ecosystem
PASS	Potential acid sulfate soils
PWS	Public water supply
SLIP	State land information platform (formerly Landgate)
SWCC	South West Catchments Council
TEC	Threatened ecological community
WAPC	Western Australian Planning Commission

## References and further reading

- Commander DP & Palandri RE 2006, *Groundwater level trends review of the aquifers in the Bunbury, Busselton–Capel and Blackwood groundwater areas 2005*, Hydrogeology report no. 259, Department of Water, Government of Western Australia, Perth.
- Del Borrello NL 2008, *Management triggers and responses for groundwater-dependent ecosystems in the South West groundwater areas*, Water resource allocation planning report no. 31, Department of Water, Government of Western Australia Perth.
- Department of Water 2006, *Preston Beach water reserve drinking water source protection plan*, Water resource protection series report no. 57, Department of Water, Government of Western Australia, Perth.
- 2007, *Statewide policy no. 17 – Timely submission of required further information*, Department of Water, Government of Western Australia Perth.
- 2007, *Statewide policy no. 19 – Hydrogeological reporting associated with a groundwater well licence*, Department of Water, Government of Western Australia Perth.
- 2007, *Kemerton groundwater subareas water management plan*, Water resource allocation planning report no. 17, Department of Water, Government of Western Australia, Perth.
- 2008, *Reviewing the allocation limits for the South West groundwater areas – Supporting information for the South West groundwater areas allocation plan*, Water resource allocation planning report no. 33 Department of Water, Government of Western Australia, Perth.
- 2008, *South West Regional Water Plan – Strategic directions: draft for public comment*, Policy and Planning branch, Department of Water, Government of Western Australia, Perth.
- 2008, *South West Regional Water Plan – Supporting detail: draft for public comment*, Policy and Planning branch, Department of Water, Government of Western Australia, Perth.
- 2008, *South West groundwater areas monitoring program*, Water resource allocation planning report no. 32, Department of Water, Government of Western Australia, Perth.

- 2008, *Bunbury water reserve drinking water source protection plan – Bunbury and Dalyellup water supplies*, Water source protection series report no. 96, Department of Water, Government of Western Australia.
  - 2008, *Draft statewide policy no. 14 – Managing unlicensed groundwater use*, Department of Water, Government of Western Australia, Perth.
  - 2009, *South West groundwater areas allocation plan*, Water resource allocation planning report no. 21, Department of Water, Government of Western Australia, Perth.
  - 2009, *Whicher surface water allocation plan*, Water resource allocation planning report no. 19, Department of Water, Government of Western Australia, Perth.
- Golder Associates 2008, *Groundwater level trends analysis for the South West groundwater areas*, report to the Department of Water and the Australian Government Water for the Future's – Water Smart Australia program, Perth.
- Hyde NL 2006, *A summary of investigations into ecological water requirements of groundwater-dependent ecosystems in the South West groundwater areas*, Environmental water report 3, Department of Water, Government of Western Australia, Perth.
- Water Authority 1994, *Bunbury groundwater area management plan*, Water Authority of Western Australia, Government of Western Australia, Perth.
- 1995, *Busselton–Capel groundwater area management plan*, Water Authority of Western Australia, Government of Western Australia, Perth.
- Water and Rivers Commission 2000, *Statewide policy no. 5 – Environmental water provisions policy for Western Australia*, Water and Rivers Commission, Government of Western Australia, Perth.
- 2001, *Statewide policy no. 6 – Transferable (Tradable) water entitlements for Western Australia*, Water and Rivers Commission, Government of Western Australia, Perth.
  - 2003, *Statewide policy no. 9 – Water licensing – Staged developments*, Water and Rivers Commission, Government of Western Australia, Perth.
  - 2003, *Statewide policy no. 11 – Management of unused licensed water entitlements*, Water and Rivers Commission, Government of Western Australia, Perth.
  - 2004, *Statewide policy no. 10 – Use of operating strategies in the water licensing process*, Water and Rivers Commission, Government of Western Australia, Perth.