



Important information

The *Greenbushes Catchment Area drinking water source protection assessment* (2004, Water Corporation) was reviewed during the 2018–19 financial year.

Please ensure you read the *Greenbushes Catchment Area drinking water source protection review* (2019, WRP no.186) alongside the 2004 assessment to obtain all of the information about this drinking water source.

The 2019 review considers changes that have occurred in and around the Greenbushes Catchment Area since 2004. The review recommends abolishing the Greenbushes Catchment Area under the *Country Areas Water Supply Act 1947* to reflect that the catchment is no longer used as a drinking water source.

You can find the 2019 *Greenbushes Catchment Area drinking water source protection review* at www.dwer.wa.gov.au or by contacting the Department of Water and Environmental Regulation on +61 8 6364 7000 or drinkingwater@dwer.wa.gov.au.

GREENBUSHES CATCHMENT AREA DRINKING WATER SOURCE PROTECTION ASSESSMENT

GREENBUSHES TOWN WATER SUPPLY



2004

Acknowledgements

This ASSESSMENT was prepared by the Infrastructure Planning Branch of the Water Corporation at the request of the Department of Environment.

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*Printed on recyclable stock
June, 2004*

Cover Photograph: Dumpling Gully Dam 1 [taken by Tamara Bianchini]

Purpose of this Assessment

A safe drinking water supply is critical to the wellbeing of the community. Effective catchment protection is fundamental to minimising risks to public health and the cost of supplying water to consumers.

This document presents an initial assessment of the risks to water quality in Greenbushes Catchment Area. It is the first stage in the production of a Drinking Water Source Protection Plan for the catchment.

The Water Corporation is committed to supplying the safest drinking water to its customers that is practicable. It recognises protecting Public Drinking Water Source Areas (PDWSA - i.e. surface water and groundwater catchments) is the most critical component of its Drinking Water Quality Management System. Statutory responsibility for managing PDWSA in Western Australia belongs to the Department of Environment (DoE) and for public health with the Department of Health (DoH). The Water Corporation, as water service provider, has a responsibility to work with both organisations to protect drinking water supplies.

The Australian Drinking Water Guidelines (ADWG), developed by the National Health and Medical Research Council provide a framework for management of drinking water quality, and propose a multiple barrier ('catchment to consumer') approach as the most effective method of protecting drinking water. Management of the drinking water source catchment is considered the first important barrier and involves:

1. Understanding the catchment, and the hazards and events that can compromise drinking water quality; and
2. Developing and implementing preventive strategies and operational controls necessary to ensure the safest possible raw water supply (i.e. before treatment).

Western Australia is meeting the ADWG framework by producing Drinking Water Source Protection Plans (DWSPP) for all PDWSAs. This process involves:

Stages in development of a DWSPP	Comment
1 Prepare Drinking Water Source Protection Assessment	Assessment document prepared following catchment survey and preliminary information gathering from State and Local Government Agency stakeholders.
2 Conduct stakeholder consultation	Advice sought from key stakeholders using the Assessment as a tool for background information and discussion.
3 Prepare Draft DWSPP	Draft DWSPP developed taking into account inputs from stakeholders and any additional advice received.
4 Release Draft DWSPP for public comment	Draft DWSPP released for a six week public consultation period.
5 Publish DWSPP	Final DWSPP published after considering advice received in submissions on the Draft. Includes recommendations on how to protect the drinking water catchment.

DoE requested the Water Corporation undertake Stage 1 and prepare this assessment document because it is the licensed water service provider for Greenbushes Town Water Supply. The Water Corporation has a good understanding of the water quality issues in the PDWSA and a strong desire to ensure water quality is protected. DoE will undertake Stages 2 to 5.

This PDWSA should be recognised in the Shire of Bridgetown-Greenbushes Town Planning Scheme, consistent with the Western Australian Planning Commission's Statement of Planning Policy No. 2.7 - *Public Drinking Water Source Policy*. Where a DWSPP has not been completed for a PDWSA, State and Local Government planners should use this assessment document together with the DoE's Water Quality Protection Note – *Land use compatibility in Public Drinking Water Source Areas* when planning or approving land use developments and activities proposed within current or future PDWSAs. Other stakeholders should use the document as a guide for protecting the quality of water in our limited drinking water catchments.

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1 Drinking water supply system overview

Greenbushes is a small mining town settled in the 1860's. It is situated amidst a farming district, on the edge of the big timber country. It is located approximately 260 kilometres (km) south east of Perth in the South West corner of Western Australia (see Figure 1) and has a population of approximately 334.

Greenbushes town water supply is sourced from Dumpling Gully Dam 1 and Dam 2, which are located approximately 1.2 km north-west of the town. The Water Corporation operates the Dumpling Gully Dams as one integrated water supply system. They have a catchment area of 3.6 km² and are located in the Shire of Bridgetown-Greenbushes. Figure 2 shows their location and catchment. An aerial photo of the catchment is presented in Photo 2.

1.1 Existing water supply system

Dumpling Gully Dam 1 was constructed in 1962, followed by Dumpling Gully Dam 2 in 1987. Both dams are earthfill with a height of about 5 m. Dumpling Gully Dam 1 reservoir has a storage capacity of 95 Megalitres (ML) and a surface area of 4.5 hectares (ha). Dumpling Gully Dam 2 reservoir has a storage capacity of 98 ML and a surface area of 5.4 ha.

Water is supplied to Greenbushes from Dam 1 (see cover photo), which is supplemented from the higher Dam 2 (see Photo 1) when water levels are low. New Zealand Gully Dam (also known as Dumpling Gully Dam 3) is upstream of the Dumpling Gully Dams and is available for emergency use. Water is pumped from Dam 1 through Greenbushes town reticulation to two high level ground tanks and an elevated tank. When pumping stops, the tanks then deliver water into the reticulation by gravitation. Dumpling Gully Dam 1 also augments supply to Balingup.



Photo 1 Dumpling Gully Dam 2

1.2 Water treatment

Water from Dumpling Gully Dam 1 is chlorinated prior to supply to Greenbushes. This provides a disinfection barrier against possible microbiological contamination.

1.3 Catchment details

1.3.1 Physiography

Dumpling Gully Dams catchment is contained within the Darling Plateau which consists of an undulating, dissected peneplain with gravelly, pale orange soils cloaked by extensive areas of tall forest. Deep steeply sided valleys occur throughout the area, occasionally punctuated by impressive dome shaped granite outcrops.

Soils are predominantly gravels with occasional block laterite outcrops and some elevated areas of sands and sandy loams. In the deeper valleys the soils are heavier alluvials.

1.3.2 Climate

Greenbushes has a warm temperate climate, characterised by warm and dry summers with cool, wet winters. Average annual rainfall for the period 1975 to 2002 has been estimated at 863 millimetres (mm).

1.3.3 Hydrology

Dumpling Gully Dams catchment has an area of approximately 3.6 km². Dumpling Gully Dam 1 and Dam 2 reservoirs have an elevation at Full Supply Level of 261 m and 265 m AHD respectively rising to 330 m AHD at the head of the catchment.

Mean annual flow at Dumpling Gully Dam 1 over the period 1975 to 2002 has been estimated at 278 ML. (Water Corporation, unpublished).

1.4 Future water supply requirements

The Water Corporation is currently developing a new Water Source Plan for the Bridgetown – Greenbushes Region. This plan assesses reliable scheme draws and source development requirements to meet current and future demands.

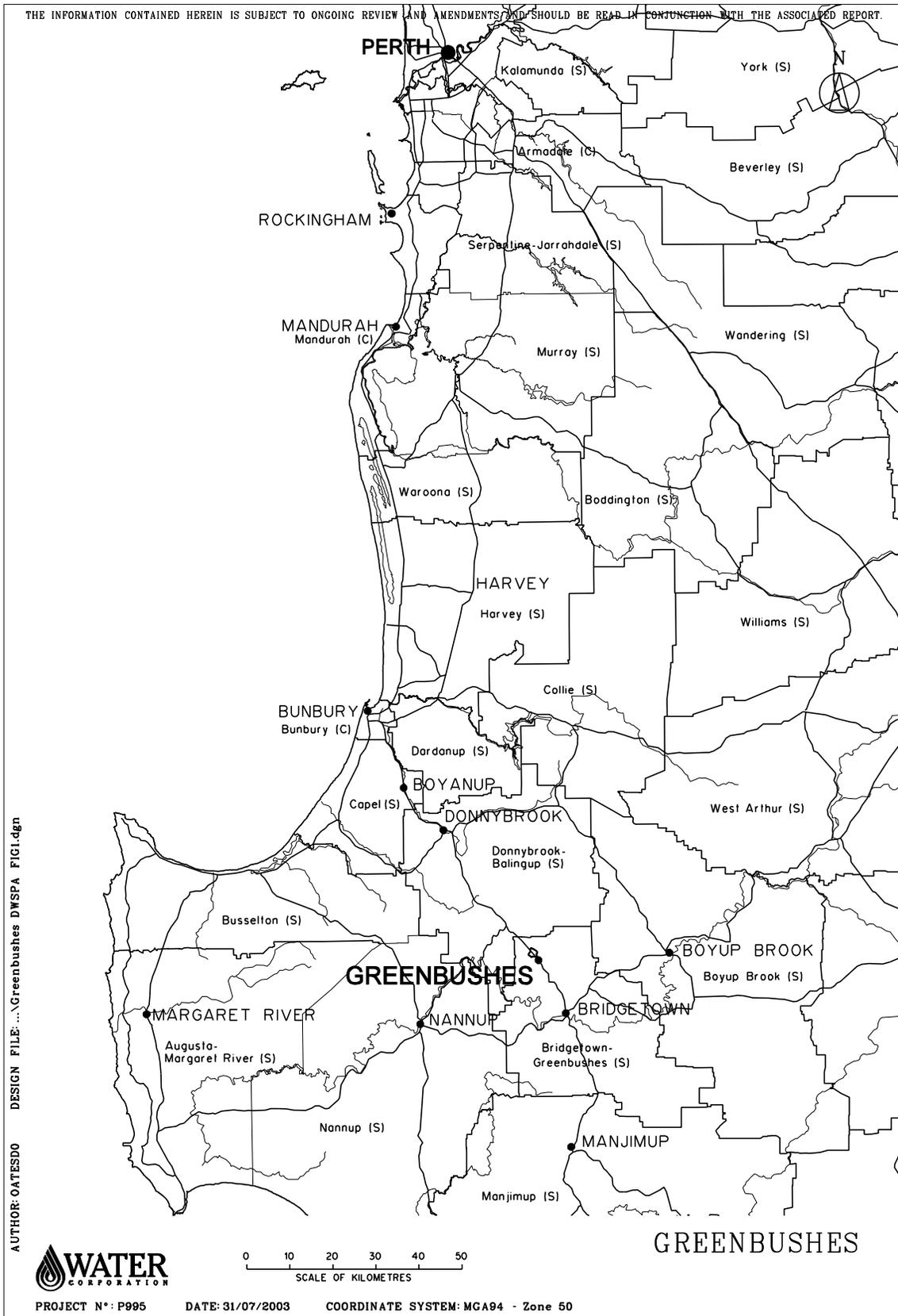


Figure 1 Greenbushes locality map

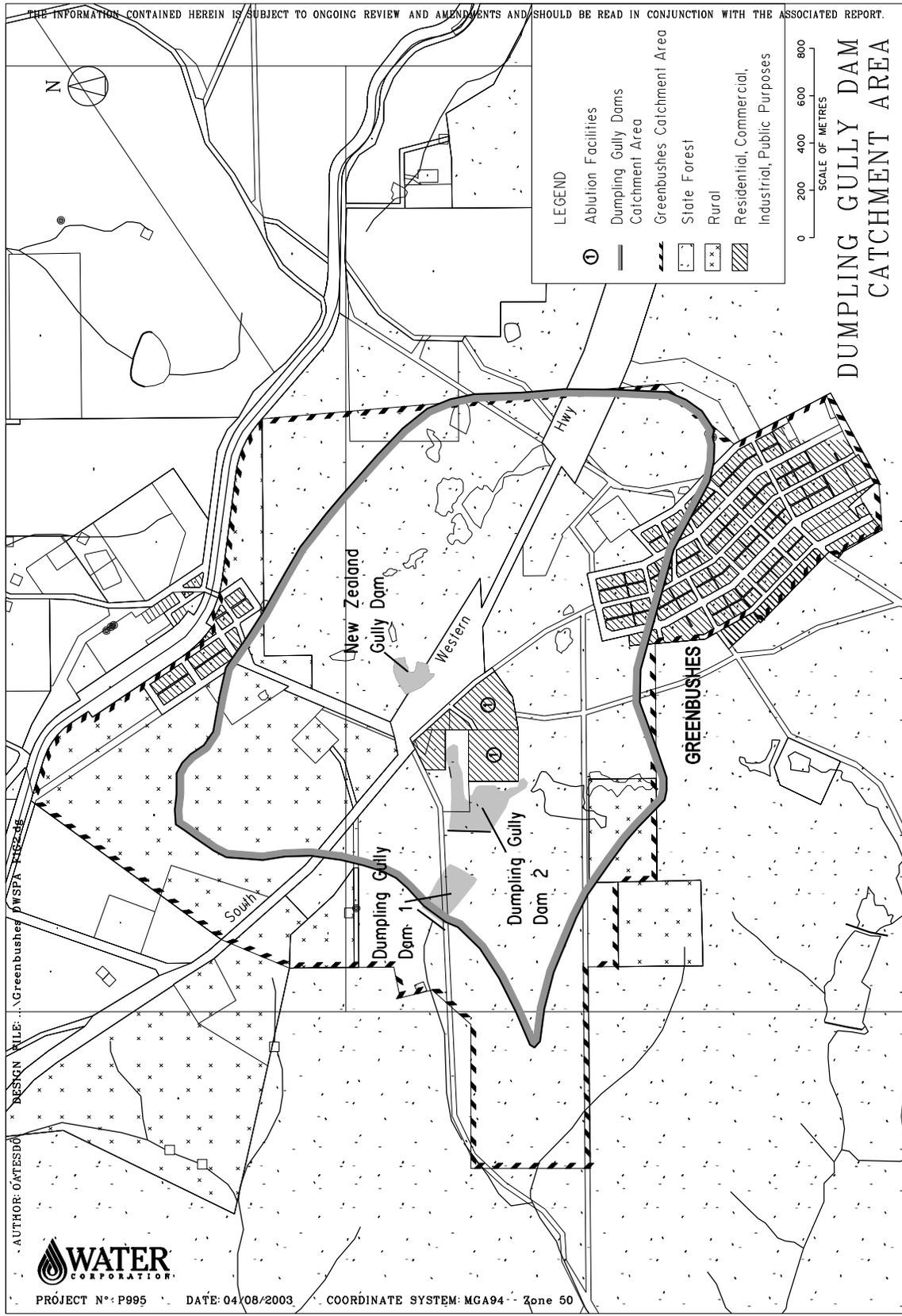


Figure 2 Dumpling Gully Dams catchment area



Photo 2 Dumpling Gully catchment aerial

1.5 Protection and allocation

1.5.1 Existing water source protection

Greenbushes Catchment Area (Dumpling Gully Dams), shown in Figure 2, was proclaimed in 1974 under the *Country Areas Water Supply Act 1947* for the purpose of protecting this public drinking water source from potential contamination. DoE has delegated to the Water Corporation the performance of catchment management and protection functions for the Greenbushes Catchment Area.

No priority classification areas for source protection or protection zones have been assigned to the Catchment Area. However, State-owned (public) land is managed for Priority 1 source protection. Private land is managed for Priority 2 or Priority 3 source protection. Assignment of priority classification areas and special purpose protection zones will occur in the future through development by DoE of a related 'Drinking Water Source Protection Plan' (DWSPP) for the Greenbushes Catchment Area. Advice on the status of the plan can be obtained from DoE's Water Source Protection Branch. Appendix 1 describes DoE's approach to drinking water protection and explains priority classification areas and protection zones.

1.5.2 Current allocation licence

Surface water resource use and conservation in Western Australia is administered by DoE in accordance with the *Rights in Water and Irrigation Act 1914*. This Act requires a licence to draw water from surface water and groundwater areas proclaimed under the Act (except for domestic and stock use) and all artesian wells throughout the State.

The Water Corporation is licensed by DoE to draw 170 000 kL per annum from Dumpling Gully Dams for public water supply purposes. Abstraction in 2002/03 was 147 091 kL.

2 Water quality

The quality of raw water from Dumpling Gully Dams is monitored in accordance with the Australian Drinking Water Guidelines (ADWG) and the program set out in the Greenbushes Water Resource Management Operation Strategy (Water Corporation, 1998). It is regularly monitored for microbiological contamination, health related chemicals and aesthetic chemicals and parameters.

ADWG gives guidance on the quality of water that should be provided to consumers at the point of use.

Water drawn from Dumpling Gully Dam 1 and Dam 2 is of good quality and complies with ADWG health guidelines. The aesthetic characteristic of iron is occasionally above the ADWG aesthetic guidelines.

The water quality at the point of use at the tap is of good quality and complies with ADWG health, microbiological and aesthetic guidelines.

Summary details of raw water quality from Dumpling Gully Dams are presented in Appendix 2.

3 Hazard identification and risk assessment

Hazards associated with existing and proposed land uses and activities in the Dumpling Gully Dams catchment area have been identified. The risk posed by each hazard has been assessed and a catchment management priority of *High*, *Medium* or *Low* assigned.

The priority level assigned to identified hazards was determined by assessing the likelihood and consequences of the source being contaminated, taking into account current catchment preventive and management strategies. The risk assessment process was conducted in accordance with ADWG 2003 recommendations (Water Corporation, 2003b). DoE is preparing a document to further explain risk assessment in drinking water catchments. It will soon be available via <http://www.environment.wa.gov.au>.

Land uses and contamination threats in the Dumpling Gully Dams catchment are presented in Figure 2 and drinking water risk assessment details are provided in Table 1.

3.1 Existing land uses

Dumpling Gully Dams catchment area is predominately State-managed (public) land (283 ha, 78 %) which is covered by State forest and bisected by the South Western Highway, a regional transport route. The State forest is vested in the Conservation Commission of Western Australia and managed by the Department of Conservation and Land Management on their behalf. Managed uses can include conservation, recreation, timber production, water catchment protection and other regulated purposes. In the catchment the State forest is largely disturbed from past mining activities and is currently not used for timber production.

The remaining land zonings in the catchment are Rural (55.4 ha, 15 %), which is uncleared, and Residential and Public Purpose (24.4 ha, 7 %).

3.2 Proposed land uses

Bridgetown - Greenbushes Shire is currently working on Town Planning Scheme Numbers 3 and 4. They are also developing a new draft planning scheme that will encompass Greenbushes town and outlying areas. Under the new planning scheme there are several proposals that may impact adversely on drinking water quality.

It is proposed to excise land at the northern end of the Greenbushes town site from State forest and develop it as a residential zone and small light industrial estate. Residential and industrial development is less compatible with the objectives of protecting drinking water quality than the current State forest use and represents an increased risk to drinking water quality.

Further development of the Mixed Use Zone within the Greenbushes Central Business District had been proposed. This could impact drinking water quality, depending on the number and intensification of new activities within this area.

Future land uses should be conducted in accordance with DoE's Water Quality Protection Note - Land use compatibility in Public Drinking Water Source Areas.

Table 1 Dumppling Gully Catchment Area Risk Assessment for Drinking Water Quality

Land use/ Activity	Hazard Event / Source	Hazard ¹	Catchment Management Priority ²	Considerations	Current Catchment Preventive Strategies
<i>Crown Land (including State Forest)</i>					
Forest Management	Unsealed roads and fires/burning	Turbidity	Low	The State forest in the catchment area is currently not used for timber production. Fire management, including controlled burns is conducted by CALM.	<ul style="list-style-type: none"> • CALM management • Detention time • Department of Agriculture compliance with DoH PSC 88 • Water quality monitoring
	Blackberry spraying	Pesticides	Medium	Ongoing spraying to control blackberries is conducted by the Department of Agriculture with all chemicals used approved for use in PDWSAs by the Department of Health (PSC 88 <i>Use of Herbicides in Water Catchment Areas</i>)	<ul style="list-style-type: none"> • Detention time • Water quality monitoring
Native Fauna	Excreta and carcasses	Pathogens	Medium	A significant quantity of native fauna is present in the area with animals accessing the water body.	<ul style="list-style-type: none"> • Detention time • Water quality monitoring
Off Road Vehicle Use	Human activity	Pathogens	Medium	There are a number of gravel roads running through the catchment providing access for off-road vehicles. Most vehicle activity is confined to tracks and roads.	<ul style="list-style-type: none"> • Detention time • Water Corporation surveillance • Signage • Water quality monitoring
	Erosion caused by vehicle use	Turbidity	Low		
Bushwalking and Horse Riding	Human activity and domestic animals	Pathogens	Medium	There are a couple of popular bushwalking tracks in the catchment including the New Zealand Gully Trail, the Greenbushes Loop heritage trail and Bibbulmun Tract Connection (see Photo 3) which connects with the Bibbulmun Track outside the catchment. The trails pass alongside the reservoirs and feeder streams, increasing the likelihood of human contact with the water. The trails are maintained and promoted by the local Eco-Cultural Discovery Centre, which provides walkers with information regarding protection of water quality.	<ul style="list-style-type: none"> • Detention time • Water Corporation surveillance • Signage • Walk notes which include information about drinking water • Water quality monitoring
Picnicking and Camping	Human Activity	Pathogens	Medium	Evidence of picnics and camping was observed near the reservoirs. This activity is typically associated with fishing or swimming.	<ul style="list-style-type: none"> • Detention time • Water Corporation surveillance • Signage • Water quality monitoring
	Erosion caused by vehicle use	Turbidity	Low		

Land use/ Activity	Hazard Event / Source	Hazard ¹	Catchment Management Priority ²	Considerations	Current Catchment Preventive Strategies
Swimming	Human contact with water	Pathogens	Medium	<p>Human or animal contact with water involves an immediate threat to water quality with the potential for <i>Cryptosporidium</i> contamination. Chlorination alone does not provide sufficient protection against <i>Cryptosporidium</i>.</p> <p>Several swimming spots are located outside of the catchment area however anecdotal evidence suggests that swimming by people and dogs occurs occasionally in the reservoirs. Direct contact with the water significantly reduces the effectiveness of detention time as a barrier.</p> <p>Swimming is a prohibited activity in the reservoirs.</p>	<ul style="list-style-type: none"> • Water Corporation surveillance • Signage • Water quality monitoring
Fishing or Marroning	Human activity and use of bait Erosion caused by human activity	Pathogens Turbidity	High Low	<p>Human or animal contact with water involves an immediate threat to water quality with the potential for <i>Cryptosporidium</i> contamination. Chlorination alone does not provide sufficient protection against <i>Cryptosporidium</i>.</p> <p>The Dumping Gully Dams are popular spots for marroning. This activity involves direct contact with the water which significantly reduces the effectiveness of detention time as a barrier.</p> <p>Fishing and marroning are prohibited activities in the reservoirs.</p>	<ul style="list-style-type: none"> • Water Corp surveillance • Signage • Water quality monitoring
Roads	Fuel or chemical spills Erosion and stormwater runoff Litter	Hydrocarbons Turbidity Pathogens	Medium Low Medium	<p>The South Western Highway, a major regional transport route bisects the catchment, passing within 100 m of the Dam 2 reservoir. There are also a number of minor roads in the catchment, with gravel roads passing next to the reservoirs.</p> <p>A HAZMAT response would be initiated for major spills and accidents, reducing the risk to water quality associated with these incidents.</p> <p>Detention time is not a barrier to hydrocarbon contamination.</p>	<ul style="list-style-type: none"> • Detention time • Water Corp surveillance • Signage • HAZMAT Emergency Response • Water quality monitoring

Land use/ Activity	Hazard Event / Source	Hazard ¹	Catchment Management Priority ²	Considerations	Current Catchment Preventive Strategies
<i>Rural Land</i>					
Native Fauna	Exereta and carcasses	Pathogens	Medium	The rural land in the catchment is undeveloped and covered with native vegetation.	<ul style="list-style-type: none"> • Detention time • Water quality monitoring
<i>Residential Land</i>					
Residential	Septic tanks and animal excreta	Nutrients	Low	A small area of the Greenbushes town site is in the upper section of the catchment (30 – 40 residential blocks). Stormwater flows into a settling pond that is approximately 600 m upslope from Dam 2 reservoir.	<ul style="list-style-type: none"> • Detention time • Settling pond • Water quality monitoring
	Fertiliser use	Pathogens	Medium		
	Pesticide use	Nutrients	Low		
		Pesticides	Low		
<i>Public Purpose Land</i>					
Public Open Space	Fertiliser use	Nutrients	Medium	A recreation area, which includes and oval and playing field with ablution facilities is located 400 – 600 m from Dam 1 and less than 100 m from Dam 2 reservoir.	<ul style="list-style-type: none"> • Detention time • Water quality monitoring
<ul style="list-style-type: none"> • Oval and Recreation area 	Ablution facilities	Pathogens	High		
	Parking areas	Nutrients	Medium	The playing fields are fertilised and reticulated. The ablution facilities are connected to a septic system. Usage is typically on weekends. There is the potential for septic to overflow during periods of high usage and high rainfall.	
		Turbidity	Low		
Decommissioned Landfill	Chemical or hydrocarbon disposal	Hydrocarbons/ Chemicals	Low	A decommissioned landfill is located 800 m outside of the surface water catchment. There is the possibility of leachate contaminating the groundwater, which may contribute to reservoir inflow.	<ul style="list-style-type: none"> • Water quality monitoring
<i>Commercial Land</i>					
Petrol Stations	Underground tanks	Hydrocarbons	Low	Two petrol stations are located in the town. They are not in the surface water catchment.	<ul style="list-style-type: none"> • Water quality monitoring

1. See Table 2 Water Quality Hazards and Potential Impact on Consumer table.

2. Catchment Management Priority Scale Used: *High, Medium and Low*.

Table 2 Water Quality Hazards and Potential Impact on Consumer

Water Quality Hazards and Potential Impact on Consumer	
Hazard	Potential Impact on Consumer
Health	
Hydrocarbons (eg fuels, oils and solvents) and Organic Chemicals	Some toxic and some carcinogenic. Harmful by-products may be formed when combined with chlorine. May have poor taste and smell.
Nutrients	Nitrate/nitrite is toxic to humans at high levels, with infants less than three months old being most susceptible. Nutrients can cause algal blooms.
Pathogens (Bacteria, Viruses, Protozoa)	Disease causing organisms.
Pesticides	Are toxic and some potentially carcinogenic.
Aesthetic	
Colour	Not a health consideration if derived from natural organics. Harmful by-products may be formed when combined with chlorine.
Total Dissolved Solids / Salinity	Poor taste and corrosion to pipe work and household appliances.
Turbidity	Discolouration and cloudiness of water. May reduce the effectiveness of disinfection.

Refer to the ADWG for further information about water quality hazards, available via www.health.gov.au/nhmrc/publications/pdf/eh19.pdf.



Photo 3 Greenbushes Loop Trail entrance

4 Conclusion

The current risks to water quality from land uses and activities within the Dumpling Gully Dams catchment area have been identified and assessed.

The following activities represent the greatest risk to drinking water quality within the catchment with the potential to contaminate the water source with pathogens. They are rated a **High** management priority.

- Fishing and marroning in the Dumpling Gully reservoirs
- Ablution facilities at the oval

Other identified land uses and activities in the catchment including swimming in the reservoirs, bushwalking and horse riding, picnicking, roads, residences and forest management could contaminate the water source with pathogens, hydrocarbons and pesticides and are considered a **Medium** management priority.

The proposal to excise land from State forest at the northern end of the Greenbushes town site for residential and light industrial purposes presents an increased risk to drinking water quality and is not supported by the Water Corporation.

Risks identified in this document, and any raised in future public consultation processes, will be further considered during development of the Greenbushes Catchment Area Drinking Water Source Protection Plan (DWSPP).

It is essential existing catchment preventive and management strategies be continued and protection measures identified in the forthcoming DWSPP be implemented to ensure the ongoing availability of good quality drinking water. The Water Corporation will continue to implement preventive measures within its assigned responsibility, such as monitoring, signage and surveillance. Other relevant agencies and stakeholders are also encouraged to implement preventive measures prior to development of the DWSPP wherever possible. Examples of potential strategies used in PDWSAs for managing drinking water quality risks can be found in Appendix 3.

Planning and other land use decision-makers should recognise the significance of this drinking water catchment in the decisions they make in accordance with the Western Australian Planning Commission's Statement of Planning Policy No 2.7 – *Public Drinking Water Source Policy* and with reference to DoE's Water Quality Protection Note – *Land use compatibility in Public Drinking Water Source Areas*. Further advice on drinking water catchment protection issues is available from the Water Corporation, DoE and DoH.

References

Department of Environment, Environmental Guidelines, Water Quality Protection Notes and Recreation Policy available via <www.environment.wa.gov.au>.

Department of Health, 1993, *Public Service Circular 88 Use of Pesticides in Water Catchment Areas*. Available via <www.population.health.wa.gov.au/environmental/resources/use%20of%20herbicides%20in%20water%20catchment%20areas.pdf>.

National Health and Medical Research Council and Agriculture and Resource Management Council of Australia and New Zealand, 1996, *Australian Drinking Water Guidelines*. Available via www.health.gov.au/nhmrc/publications/pdf/eh19.pdf. Further information is available via www.health.gov.au/nhmrc/publications/synopses/eh19syn.htm.

Water Corporation, 2003a, *Draft Greenbushes/Balingup Water Source Review*.

Water Corporation, 2003b, SG097- *Risk Assessment Process for Drinking Water Source Quality*.

Water Corporation, 1998, *Greenbushes/Balingup Region Water Resource Management Operation Strategy*.

Water and Rivers Commission, 1998, *Busselton-Walpole Region Water Resources Review and Development Plan*.

Western Australian Planning Commission, 2001, *Warren –Blackwood Land Release Plan 2001-2005*.

Western Australian Planning Commission, 2003, *Warren Blackwood Rural Strategy- For Public Comment*. Available via www.wapc.wa.gov.au.

Western Australian Planning Commission, 2003, *Statement of Planning Policy No. 2.7 - Public Drinking Water Source Policy*, Government Gazette WA. Available via www.wapc.wa.gov.au.

WHO, 1996, *Guidelines for Drinking Water Quality 1996, Volume 2, Chapter 10*, World Health Organisation. Available via http://www.who.int/water_sanitation_health/dwq/en/2cdvol2p1.pdf

Glossary and Acronyms

ADWG	Australian Drinking Water Guidelines, published by the National Health and Medical Research Council and Agriculture and Resource Management Council of Australia and New Zealand under rolling review.
Aesthetic	Relating to the physical characteristics of water (taste, clarity, smell and feel).
Allocation	The quantity of water permitted to be abstracted by an allocation licence, usually specified in kilolitres/year (kL/a).
Catchment	The area of land which intercepts rainfall and contributes the collected water to surface water (streams, rivers, wetlands) or groundwater.
Diffuse Source Pollution	Pollution originating from a widespread area, e.g. urban stormwater runoff, agricultural runoff.
DoE	Department of Environment
DoH	Department of Health
DWSPA	Drinking Water Source Protection Assessment
DWSPP	Drinking Water Source Protection Plan
Effluent	The liquid, solid or gaseous wastes discharged by a process, treated or untreated.
HAZMAT	Hazardous Materials
Health Related Chemical	Water quality characteristic that may pose a health risk to consumers.
Leaching / Leachate	The process by which materials such as organic matter and mineral salts are washed out of a layer of soil or dumped material by being dissolved or suspended in percolating rainwater; the material washed out is known as leachate. Leachate can pollute groundwater and waterways.
m AHD	Australian Height Datum. Height in metres above Mean Sea Level +0.026 m at Fremantle.
Microbiological Contaminant	Micro-organisms which can either directly cause disease (pathogens) or indicate the possible presence of other pathogens.
Nutrient Load	The amount of nutrient reaching the waterway over a given time (usually per year) from its catchment area.
Nutrients	Minerals dissolved in water, particularly inorganic compounds of nitrogen (nitrate and ammonia) and phosphorus (phosphate) which provide nutrition (food) for plant growth. Total nutrient levels include the inorganic forms of an element plus any bound in organic molecules.
PDWSA	Public Drinking Water Source Area

Peneplain	Nearly flat land after an advanced state of erosion.
Pesticides	Collective name for a variety of insecticides, fungicides, herbicides, algaecides, fumigants and rodenticides used to kill organisms.
Point Source Pollution	Specific localised source of pollution, e.g. sewage or effluent discharge, industrial waste discharge.
Pollution	Water pollution occurs when waste products or other substances, e.g. effluent, litter, refuse, sewage or contaminated runoff, change the physical, chemical, biological or thermal properties of the water, adversely affecting water quality, living species and beneficial uses.
Runoff	Water that flows over the surface from a catchment area, including streams.
Scheme Supply	Water diverted from a source (or sources) by a water authority or private company and supplied via a distribution network to customers for urban, industrial or irrigation use.
Storage Reservoir	A major reservoir of water created in a river valley by building a dam.
Stormwater	Rainwater that has run off the ground surface, roads, paved areas etc and is usually carried away by drains.
TDS	Total Dissolved Solids, a measure of salinity, calculated from TFSS (Total Filterable Suspended Solids) and measured in accordance with ADWG.
Treatment	Application of techniques such as settlement, filtration and chlorination to render water suitable for specific purposes including drinking and discharge to the environment.
Wastewater	Water that has been used for some purpose and would normally be treated and discarded. Wastewater usually contains significant quantities of pollutant.
Water Quality	The physical, chemical and biological measures of water.

Appendices

Appendix 1 Department of Environment - Water Quality Protection Note:
Land use compatibility in Public Drinking Water Source Areas.

Appendix 2 Water Quality

Appendix 3 Example protection strategies used in drinking water catchments in
Western Australia.

Appendix 4 Department of Environment -Water Quality Protection Note:
Protecting Public Drinking Water Source Areas.

Appendix 1

DoE WQPN Land use compatibility in Public Drinking Water Source Areas

Refer to DoE website <<http://www.environment.wa.gov.au>> for latest version.

Water Quality Protection Note

Land use compatibility in Public Drinking Water Source Areas

Purpose

The Department of Environment (DoE) is responsible for managing and protecting the State's water resources. This note provides advice on the acceptability of land uses and activities within specific catchments that are the water source for schemes supplying cities and towns. These catchments are termed Public Drinking Water Source Areas (PDWSAs) and they require comprehensive water resource quality and land planning protection measures to ensure the ongoing availability of a 'safe, good quality drinking water' supply to protect the health of consumers for now and into the future. This note supports the DoE's Public Drinking Water Resource Policy (July 2004).

The note also forms an integral part of the Western Australian Planning Commission's *Statement of Planning Policy No. 2.7- Public Drinking Water Source Policy 2003* (relevant to approximately 140 existing PDWSAs in Western Australia) prepared by the Department for Planning and Infrastructure under Section 5AA of the *Town Planning and Development Act 1928*. It is also intended to support the proposed Statement of Planning Policy for *Water Resources* designed to guide planning decisions in future PDWSAs. This note should be used by Local Government when developing local planning strategies, structure plans and town planning schemes. It should also be used in the assessment of subdivision and other development applications. The note will also assist the development of formal guidelines on land use activities in PDWSA prepared in liaison with key stakeholders such as the Water Corporation, Department of Health, Department of Conservation and Land Management, Department of Agriculture, Department of Industry and Resources, Department for Planning and Infrastructure and local government.

A review of this note may occur within 12 months (depending on feedback) to reflect DoE's policy position (which is influenced by public consultation undertaken for PDWSAs), advances in technology or land use activity standards, and Government decisions made concerning drinking water quality protection. This note may not consider all the circumstances that exist for planning strategies, plans and schemes across the State. Accordingly, changes to this note will only be considered if they apply broadly across the State. Other means of addressing localised special circumstances may be employed and the DoE will assist in achieving this outcome provided those changes do not place the PDWSA at a higher contamination risk.

Scope

This note provides the DoE's position on a range of land uses assessed against the Department's water quality protection strategy and management objectives within PDWSAs. Where a specific land use has not been covered in the accompanying tables, it should be referred to the Department's Water Source Protection Branch for assessment and a written response concerning its acceptability or any necessary water resource protection measures.

Public Drinking Water Source Area in Western Australia is the collective description for:

- Underground Water Pollution Control Areas,
- Water Reserves, and
- Catchment Areas,

declared under the *Metropolitan Water Supply, Sewerage and Drainage Act 1909* or the *Country Areas Water Supply Act 1947*.

This note is intended to complement the statutory role and policy of State and local government authorities, but it does not override Government policy or the need for proponents to fulfil their legal responsibilities for land use planning, environmental, health, building or other necessary approvals.

PDWSA protection framework

The protection of PDWSAs relies on statutory measures available in water resource management and land use planning legislation. The DoE policy for the protection of PDWSAs includes three risk management based priority classification areas and two types of protection zones. The priority classification areas and protection zones are determined via specific Drinking Water Source Protection Plans (DWSPP) that are prepared in consultation with State government agencies, landowners, local government, and key industry and community stakeholders. Where a fully consulted DWSPP does not exist for a PDWSA, the DoE initially prepares Drinking Water Source Protection Assessment (DWSPA) documents to reflect readily available information for use in land use planning assessments and decision making.

Priority classification areas

Priority 1 (P1) classification areas are managed to ensure that there is **no degradation** of the drinking water source by preventing the development of potentially harmful activities in these areas. The guiding principle is **risk avoidance**. This is the most stringent priority classification for drinking water sources. P1 areas normally encompass land owned or managed by State agencies, but may include private land that is strategically significant to the protection of the drinking water source (e.g. land immediately adjacent to a reservoir). Most land uses create some risk to water quality and are therefore defined as “**Incompatible**” in P1 areas.

Priority 2 (P2) classification areas are managed to ensure that there is **no increased risk** of water source contamination/ pollution. For P2 areas, the guiding principle is **risk minimisation**. These areas include established low-risk land development (e.g. low intensity rural activity). Some development is allowed within P2 areas for land uses that are defined as either “**Compatible with conditions**” or “**Acceptable**”.

Priority 3 (P3) classification areas are defined to **manage the risk of pollution** to the water source from catchment activities. Protection of P3 areas is mainly achieved through guided or regulated environmental (risk) management for land use activities. P3 areas are declared over land where water supply sources co-exist with other land uses such as residential, commercial and light industrial development. Land uses considered to have significant pollution potential are nonetheless opposed or constrained.

Wellhead and reservoir protection zones

In addition to the three Priority Classification Areas, specific protection zones are defined to protect drinking water sources from contamination in the immediate vicinity of water extraction facilities. Within these zones by-laws may prohibit, restrict or approve defined land uses and activities to prevent water source contamination or pollution. Special conditions, such as restrictions on storage and use of chemicals, may apply within these zones. The legislation is currently being reviewed to simplify and enhance the protection of public drinking water sources.

Wellhead protection zones (WHPZ) are used to protect underground sources of drinking water. They are circular (unless information is available to determine a different shape), with a radius of 500 metres in P1 areas, and 300 metres in P2 and P3 areas. WHPZ do not extend outside PDWSA boundaries. Reservoir protection zones (or ‘**prohibited zones**’ as they are called in the by-laws) consist of a statutory 2 kilometre wide buffer area around the top water level of storage reservoirs in the Perth water supply area, and include the reservoir water-body. The reservoir protection zones (RPZ) apply over Crown land and prohibit public access to prevent contamination (physical, chemical and biological) of the source water. RPZ do not extend outside PDWSA boundaries. The DoE is currently considering a provision for RPZ buffer areas of less than 2 kilometres, and creation of consistent by-laws for country and Perth PDWSAs.

Special protection measures apply in WHPZ and RPZ (prohibited zones) as described in the By-laws under the *Metropolitan Water Supply, Sewerage and Drainage Act 1909* and the *Country Areas Water Supply Act 1947*.

The determination of priority classification areas or protection zones over land in a PDWSA is based on:

- the strategic importance of the land or water source,
- the local planning scheme zoning,
- form of land tenure, and
- existing approved land uses/activities.

The land use tables in this protection note directly apply to the three types of priority classification areas identified in DWSP or agreed in specific *Land Use and Water Management Strategy* documents. Currently there are 45 DWSPs available to guide land use planning decisions in PDWSAs, and (nearly 100) others are in development. In the absence of a DWSP, the DoE recommends that planning decisions within any gazetted or proposed PDWSA are guided by DWSPA documents (where they exist) and the '**potential**' priority classification area or protection zone status of a proposal identified using **Diagram 1: Assessment of potential priority classification areas and protection zones** (overleaf).

Compatibility of land uses within PDWSAs

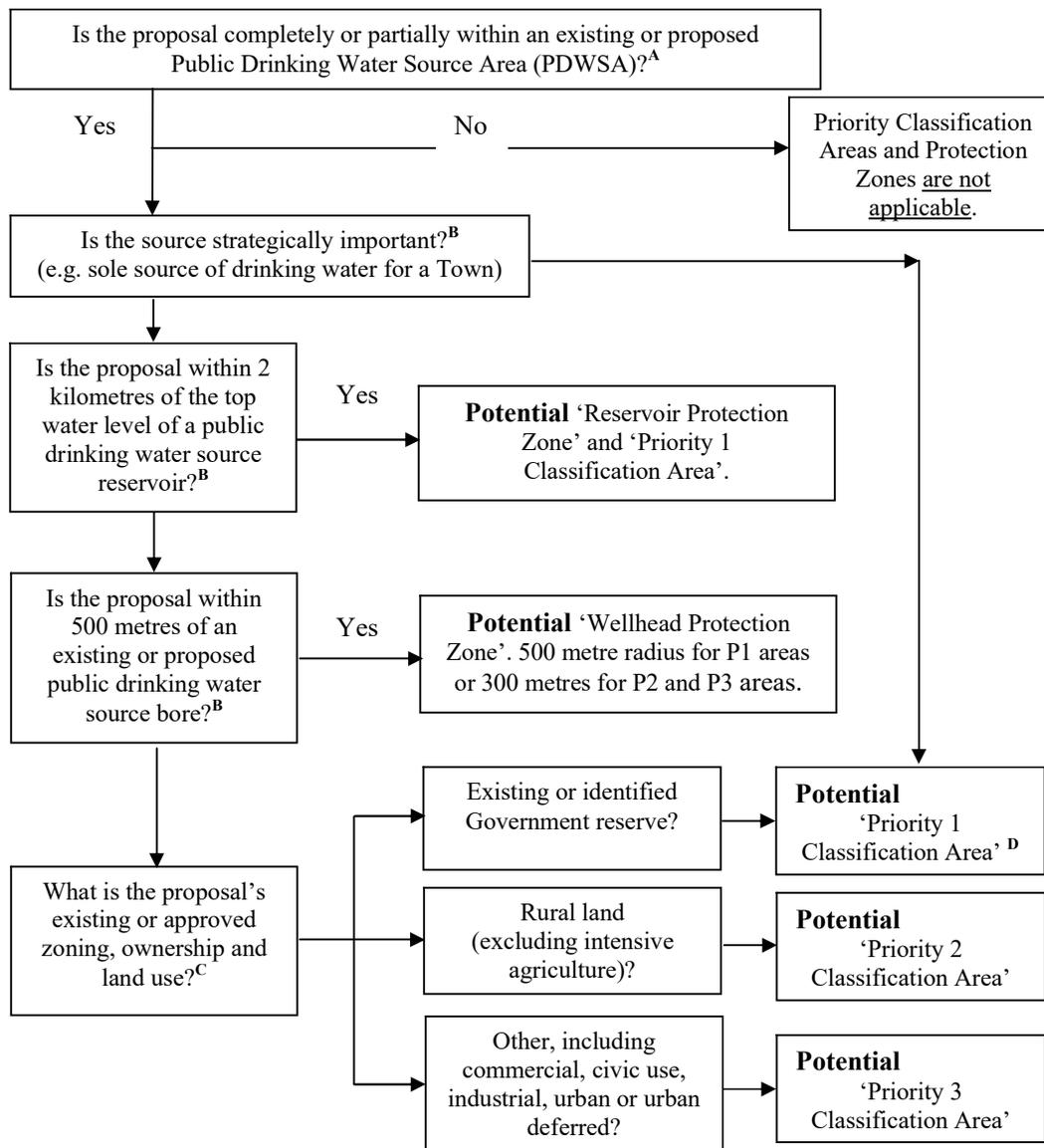
The tables in this note have been prepared for use by local governments, State planners and other agencies as a basis for regulating land use within PDWSAs. The note complements the Western Australian Planning Commission's *Statement of Planning Policy Number 2.7 (June 2003) Public Drinking Water Sources*. These tables define land uses in terms of their compatibility with the sustainable use of the drinking water source. They promote a priority for protection of the environmental value: 'drinking water' within a PDWSA over other values that may exist. The three definitions used are '**Incompatible**', '**Compatible with conditions**' and '**Acceptable**'. In previous versions of this note the definitions were 'Incompatible', 'Conditional' and 'Compatible'.

The DoE recognises that there may be special circumstances which may occasionally result in an '**Incompatible**' land use receiving approval. Where planning decisions result in this outcome it is important for project proponents to have demonstrated an overriding community benefit and that the land use will not increase the risk of contamination to the PDWSA. The DoE expects to have significant, early involvement in planning decisions of this nature to maximise the protection of the drinking water resource. It should be noted that where a water source is the sole supply for a community, or has a particularly high strategic value for the supply of drinking water, then it would be difficult to understand how that source might be put at any risk of contamination.

Detailed information on water quality protection issues and recommended best management practices for '**Compatible with conditions**' land uses are being developed in approved environmental policy, codes of practice, management guidelines and water quality protection notes. These documents, along with the most recent version of this note, can be found on the DoE Internet site <http://www.environment.wa.gov.au>. Information on land use and development regulation within PDWSAs can also be obtained from DoE's regional offices.

The DoE's Water Source Protection Branch, presently located in East Perth, is custodian of this water quality protection note and will provide detailed advice on its application and coordinate any suggested amendments.

Diagram 1: Assessment of potential priority classification areas and protection zones



Legend

- A. The location of PDWSAs can be found in DoE’s Drinking Water Source Protection Assessments and Plans or through your regional DoE office, Local Government office, Water Corporation or from the Department for Planning and Infrastructure.
- B. Strategically significant sources and potential contamination from land uses close to drinking water reservoirs or abstraction bores are considered first, due to these involving the highest risk of contamination reaching consumers.
- C. Current zoning or land use information is available from your Local Government office.
- D. Government land is protected to achieve the highest level of safety for drinking water in all parts of a catchment through a Priority 1 classification, wherever this is reasonable and practicable.

Existing approved land uses

Many land uses covered in this note may have been legally established prior to establishment/ gazettal of the PDWSA or modern protection measures being required. The DoE policy is that existing approved land uses/ activities can continue at their presently approved level, provided they operate lawfully. Where necessary, negotiations may be arranged with land owners to acquire property rights in P1 source protection areas. Where practical, this agency will also negotiate with the operators of existing ‘*Incompatible*’, or ‘*Compatible with conditions*’ activities to implement environmental management practices that minimise risks to water sources.

Proposed land uses

After reading this protection note, please view the DoE Internet site and/or contact your nearest DoE Regional Office for advice on the location of PDWSAs, priority classification areas, and reservoir or wellhead protection zones. You may discuss with DoE staff any proposed land use activities that may affect water resources. The early identification of water resource protection issues in development stages of land use planning proposals is recommended in both the June 2003 *Statement of Planning Policy for Public Drinking Water Sources* and proposed *Water Resources Policy* by the Western Australian Planning Commission.

Definition of terms used in the following tables

‘**Acceptable**’ (equivalent to ‘compatible’ in previous version of this note)- means the land use is accepted by DoE as not likely to harm the drinking water source, and is consistent with the management objectives of that priority classification. The adoption of best practice environmental management methods for new proposals to protect water quality is expected. Existing land users are also encouraged to adopt best practice environmental management methods to help protect water quality. These land uses generally do not need referral to the DoE.

‘**Compatible with conditions**’ (equivalent to ‘conditional’ in previous version of this note) - means the land use is likely to be accepted by DoE as not likely to harm the drinking water source, (and is consistent with the management objectives of the priority classification) provided best environmental management practices are used. This may result in the application of ‘specific conditions’ (via the planning or environmental approval processes) that must be complied with to ensure the water quality objective of the priority area is maintained.

Land uses described as ‘Compatible with conditions’ need ONLY to be referred to DoE for assessment and a written response if the activity does not follow recommendations endorsed by DoE such as those made in policy, environmental management guidelines, protection notes; Ministerial Conditions, Works Approvals, Licenses or agreements (e.g. a ‘Memorandum of Understanding’ developed between any Local Government and DoE).

‘**Incompatible**’- means the land use is UNACCEPTABLE to DoE as it does not meet the management objectives of the priority classification area. DoE will normally oppose approval of these land uses through the planning decision making process and under legislation administered by DoE. If planning decisions are made to approve these land uses (e.g. as a consequence of a planning appeals process), then DoE should be advised of that decision and have been directly involved in providing advice to the planning decision makers on water quality protection issues. It should be noted that contentious proposals may be referred to the EPA for Environmental Impact Assessment under the *Environmental Protection Act 1986*.

‘**Extensive**’- means limited additional inputs beyond those supplied by nature are required to support the land use, e.g. for agriculture- animal feed supplements only during seasonal dry periods, or during the final preparation of stock for the market.

‘**Intensive**’- means regular additional inputs are required to support the desired land use, e.g. for agriculture-irrigation, fertilisers, pesticides, or non-forage animal feeding dominates.

Interpretation of land use recommendations for planning schemes and development approvals

When using the following land use compatibility tables to guide planning schemes and development approval decisions, the following relationships should be used:

- a) Where the table identifies a land use as ‘**Acceptable**’, this use is permitted by DoE within that priority classification area. It may be identified as a ‘**P**’ (permitted) use in a scheme, providing the use complies with the relevant development standards and requirements of the planning scheme.
- b) Where the table identifies a use as ‘**Compatible with conditions**’, this use should be a discretionary use within the priority classification area and should be identified as either a ‘**D**’ or ‘**A**’ (after special notice) use in the scheme. Proposals for ‘**Compatible with conditions**’ uses should **ONLY** be referred to DoE for assessment and response if they do not meet existing agency policy, guidelines or protection note measures, unless prior agreement has been made between a specific local government and DoE on alternative measures.
- c) Relevant environmental management guidelines, codes of practice, water quality protection notes or agreements should be used in the first instance to define DoE's position on any land-use and limit the need to refer proposals to the DoE. Where these do not exist, site specific advice may be provided by the DoE.
- d) Where the table identifies a use as ‘**Incompatible**’, that use should not be permitted within that priority source protection area, and should be identified as an ‘**X**’ (unacceptable use) in the scheme.

Where the table does not include a proposed land use that could affect water quality, that use should be considered to be ‘**Incompatible**’ until the proponent can demonstrate that it meets the drinking water quality protection objective of the designated priority classification area. Specific advice on the proposed land use should be obtained from the DoE’s Water Source Protection Branch.

If the land use planning approval process supports a proposal that is inconsistent with this water quality protection note, then DoE Water Source Protection Branch should be advised of this situation and the reasons for that decision. This advice will trigger DoE’s assessment of the significance/ consequence of that decision to the drinking water source and the outcome will be considered in future strategies for water quality protection, and in the periodic review and update of this note. A means to ensure the DoE’s effective early involvement with such cases is currently being developed.

Tables defining compatibility of various land uses within PDWSA

It is important to note that this table provides the DoE’s recommended compatibility of land uses for the current zoning of land. It must not be used to support rezoning of land to provide for more intensive land uses. For example, although P3 areas provide for high density urban development when the land is already zoned Urban or Urban deferred, this Table must not be read to justify a zoning change within P3 areas to allow for high density urbanisation of rural zoned land.

Model Scheme Text (MST) land uses are shown in **bold** in the first column. Definitions covered in the MST (see note 23) can also be found in the *Town Planning Amendment Regulations 1999*.

Model Scheme Text & interpreted type of land use	P1 areas	P2 areas	P3 areas
Agriculture– extensive			
- pastoral leases	Compatible with conditions	Acceptable	Acceptable
- floriculture (non irrigated), stock grazing (excluding pastoral leases) and broad hectare cropping,	Incompatible	Compatible with conditions (see notes 11, 12)	Acceptable
Agriculture- intensive			
- aquaculture (fish, plants and crustaceans)	Incompatible	Compatible with conditions	Compatible with conditions
- orchards; production nurseries– potted plants; viticulture– wine and table grapes	Incompatible	Compatible with conditions	Acceptable
- floriculture; market gardens (see note 24); turf farms	Incompatible	Incompatible	Compatible with conditions
- hydroponic plant growing	Incompatible	Compatible with conditions	Compatible with conditions
- plant nurseries / garden centres	Incompatible	Compatible with conditions (see note 2)	Acceptable
Agro-forestry	Incompatible	Compatible with conditions	Acceptable
Amusement parlour	Incompatible	Incompatible	Acceptable (see note 1)
Animal establishment			
- animal saleyards and stockyards (see note 13)	Incompatible	Compatible with conditions (see note 2)	Compatible with conditions (see note 2)
- apiaries	Compatible with conditions	Acceptable	Acceptable
- catteries	Incompatible	Acceptable	Acceptable
- dairy sheds	Incompatible	Compatible with conditions (see notes 2, 3, 12)	Compatible with conditions (see note 3)
- dog kennels	Incompatible	Compatible with conditions	Compatible with conditions
- equestrian centres (see note 17)	Incompatible	Incompatible	Acceptable
- feedlots, intensive outdoor livestock holding	Incompatible	Incompatible	Compatible with conditions
- stables (see note 18)	Incompatible	Compatible with conditions	Acceptable
Animal husbandry- intensive			
- piggeries	Incompatible	Incompatible	Incompatible
- poultry farming - housed	Incompatible	Compatible with conditions	Compatible with conditions
Bed and breakfast (accommodating a maximum of 6 guests)	Compatible with conditions (see notes 6, 16)	Acceptable (see note 23)	Acceptable
- farm stay accommodation, rural chalets)	Compatible with conditions (see notes 6, 16)	Compatible with conditions (see note 4)	Acceptable
Betting agency	Incompatible	Compatible with conditions (see note 2)	Acceptable (see note 1)
Caravan park	Incompatible	Incompatible	Compatible with conditions (see note 1)
Caretakers dwelling	Compatible with conditions (see note 2)	Compatible with conditions	Acceptable
Car park	Incompatible	Compatible with conditions (see note 2)	Acceptable
Cemeteries	Incompatible	Incompatible	Compatible with conditions

Model Scheme Text & interpreted type of land use	P1 areas	P2 areas	P3 areas
Child care premises	Incompatible	Compatible with conditions (see note 2)	Acceptable (see note 1)
Cinema/ theatre	Incompatible	Incompatible	Acceptable (see note 1)
Civic use	Incompatible	Compatible with conditions (see note 2)	Acceptable (see note 1)
Club premises			
- sporting or recreation clubs	Incompatible	Compatible with conditions	Acceptable (see note 1)
- health centres	Incompatible	Incompatible	Acceptable (see note 1)
Community purpose			
- community halls	Incompatible	Compatible with conditions (see note 2)	Acceptable
- irrigated golf courses or recreational parks	Incompatible	Incompatible	Compatible with conditions (see note 11)
- motor-sports (permanent racing facilities)	Incompatible	Incompatible	Compatible with conditions
- public swimming pools/ aquatic centres	Incompatible	Incompatible	Compatible with conditions
- rifle ranges	Incompatible	Compatible with conditions	Acceptable
Consulting rooms	Incompatible	Compatible with conditions (see note 2)	Acceptable (see note 1)
Convenience store	Incompatible	Compatible with conditions (see note 2)	Acceptable (see note 1)
Corrective institution	Incompatible	Incompatible	Compatible with conditions (see note 1)
Educational establishment			
- community education centres, scientific research institution	Compatible with conditions (see note 2)	Compatible with conditions (see note 2)	Acceptable (see note 1)
- primary / secondary schools, tertiary education facilities	Incompatible	Incompatible	Acceptable (see note 1)
Exhibition centre	Incompatible	Incompatible	Acceptable (see note 1)
Family day care	Incompatible	Acceptable (see note 19)	Acceptable (see note 1)
Fast food outlet	Incompatible	Incompatible	Acceptable (see note 1)
Forestry (native forest/ silviculture/ tree farming)	Compatible with conditions (see note 11)	Compatible with conditions (see note 11)	Acceptable
Fuel depot (storage/ transfer)	Incompatible	Incompatible	Compatible with conditions
Funeral parlour	Incompatible	Incompatible	Acceptable (see note 1)
Home business	Incompatible	Acceptable (see note 20)	Acceptable (see note 1)
Home occupation	Compatible with conditions (see note 15)	Acceptable (see note 21)	Acceptable (see note 1)
Home office	Compatible with conditions (see note 15)	Acceptable	Acceptable
Home store	Incompatible	Compatible with conditions	Acceptable (see note 1)

Model Scheme Text & interpreted type of land use	P1 areas	P2 areas	P3 areas
Hospital	Incompatible	Incompatible	Compatible with conditions (see note 1)
Hotel (includes hotels, hostels, resorts)	Incompatible	Incompatible	Acceptable (see note 1)
Industry			
- abattoirs	Incompatible	Incompatible	Incompatible
- cottage	Compatible with conditions	Compatible with conditions	Acceptable
- drinking water treatment plant	Compatible with conditions	Compatible with conditions	Compatible with conditions
- extractive, includes construction/ mining camps (see note 10)	Compatible with conditions	Compatible with conditions	Compatible with conditions
- food processing, dairy product factories, breweries	Incompatible	Incompatible	Compatible with conditions (see note 1)
- general (chemical manufacture/ formulation, dry cleaners, dye works, laboratories, photo-processors)	Incompatible	Incompatible	Compatible with conditions (see note 1)
- general (metal production/ finishing, pesticide operator depots, heavy or energy industry, petroleum refineries)	Incompatible	Incompatible	Incompatible
- general (concrete batching, cement products, fertiliser manufacture/ bulk storage, wrecking)	Incompatible	Incompatible	Compatible with conditions
- general (mineral processing)	Incompatible	Incompatible	Compatible with conditions (see note 9)
- light industry	Incompatible	Incompatible	Compatible with conditions (see note 1)
- milk transfer depots	Incompatible	Incompatible	Compatible with conditions
- mining (includes mineral and energy exploration, oil or gas extraction / decontamination for transport)	Compatible with conditions (see note 9)	Compatible with conditions (see note 9)	Compatible with conditions (see note 9)
- mining (tailings dams)	Incompatible	Incompatible	Compatible with conditions (see note 9)
- mining (includes construction/ mining camps), (see note 10)	Compatible with conditions	Compatible with conditions	Compatible with conditions
- rural (animal product rendering works, tanneries, wool scour)	Incompatible	Incompatible	Incompatible
- rural (farm supply centres, manure stockpiling/ processing facilities)	Incompatible	Compatible with conditions (see note 2)	Compatible with conditions
- rural (forestry products processing– chip mills, pulp/ paper, timber preservation, wood/ fibre works, composting/ soil blending - commercial)	Incompatible	Incompatible	Compatible with conditions
- service industry	Incompatible	Incompatible	Compatible with conditions
Landfill (solid waste disposal)			
- class I (refer also to 'Storage - used tyres' advice)	Incompatible	Incompatible	Compatible with conditions
- class II or III	Incompatible	Incompatible	Incompatible
- class IV or V	Incompatible	Incompatible	Incompatible
Lunch bar	Incompatible	Compatible with conditions (see note 2)	Acceptable (see note 1)
Major transport infrastructure (roads, railways)	Incompatible	Compatible with conditions (see note 14)	Acceptable
Marina (includes boat moorings and servicing)	Incompatible	Incompatible	Compatible with conditions
Marine filling station (boat fuelling)	Incompatible	Incompatible	Compatible with conditions

Model Scheme Text & interpreted type of land use	P1 areas	P2 areas	P3 areas
Market (food; general produce; second-hand goods)	Incompatible	Incompatible	Acceptable (see note 1)
Medical centre	Incompatible	Incompatible	Acceptable (see note 1)
Motel	Incompatible	Incompatible	Acceptable (see note 1)
Motor vehicle, boat or caravan sales (sales yards)	Incompatible	Incompatible	Acceptable (see note 1)
Motor vehicle repair	Incompatible	Incompatible	Compatible with conditions
Motor vehicle wash	Incompatible	Incompatible	Compatible with conditions
National and regional parks and nature reserves	Acceptable	Acceptable	Acceptable
Night club	Incompatible	Incompatible	Acceptable (see note 1)
Office	Incompatible	Compatible with conditions	Acceptable (see note 1)
Park home park	Incompatible	Incompatible	Compatible with conditions (see note 1)
Place of worship	Incompatible	Incompatible	Acceptable (see note 1)
Plantation	Compatible with conditions (see note 11)	Compatible with conditions (see note 11)	Acceptable
Reception centre	Incompatible	Incompatible	Acceptable (see note 1)
Recreation – private (within non-designated recreation areas on Crown land)	Incompatible	Incompatible	Acceptable
Residential building			
- house	Compatible with conditions (see note 16)	Acceptable (see note 4)	Acceptable (see note 1)
- group dwellings (aged and dependent persons)	Incompatible	Incompatible	Acceptable (see note 1)
Restaurant	Incompatible	Incompatible	Acceptable (see note 1)
Restricted premises (adult interests)	Incompatible	Incompatible	Acceptable (see note 1)
Rural pursuit	See Agriculture, Animal establishment or husbandry		
Service station (includes aircraft, automotive repairs, boats, mechanical plant, service stations at transport and municipal works depots)	Incompatible	Incompatible	Compatible with conditions (refer to note 1)
Shop	Incompatible	Compatible with conditions (see note 2)	Acceptable (see note 1)
Showroom	Incompatible	Incompatible	Acceptable (see note 1)
Storage			
- used tyres (see note 22)	Incompatible	Incompatible	Incompatible
- chemical storage in under ground tanks	Incompatible	Incompatible	Compatible with conditions
- chemical storage in above ground tanks	Incompatible	Compatible with conditions	Compatible with conditions
Tavern	Incompatible	Incompatible	Acceptable (see note 1)
Telecommunications infrastructure	Compatible with conditions	Compatible with conditions	Compatible with conditions
Toilet blocks and change rooms	Compatible with conditions (see note 2)	Compatible with conditions	Acceptable
Trade display	Incompatible	Incompatible	Acceptable (see note 1)

Model Scheme Text & interpreted type of land use	P1 areas	P2 areas	P3 areas
Veterinary centre	Incompatible	Compatible with conditions (see note 2)	Compatible with conditions (see note 1)
Warehouse	Incompatible	Compatible with conditions (see note 2)	Compatible with conditions (see note 1)
Waste transfer station (includes recycling depots)	Incompatible	Incompatible	Compatible with conditions
Wastewater infrastructure			
- sewerage – gravity sewers	Incompatible	Incompatible	Acceptable
- sewerage – pressure mains	Incompatible	Compatible with conditions	Acceptable
- sewer pump stations	Incompatible	Compatible with conditions	Compatible with conditions
- treatment plants, wastewater disposal to land	Incompatible	Incompatible	Compatible with conditions
- wastewater injection into the ground (see note 25)	Incompatible	Incompatible	Incompatible
Water treatment plants (drinking)	See Industry		
Winery (includes wine tasting facilities)	Incompatible	Compatible with conditions (see notes 3 & 5)	Compatible with conditions (see note 3)

Table recommending compatibility of land subdivision within PDWSA:

Note - This table reflects the recommended size of a subdivision based on the existing zoning and the priority classification area status of land. It should be noted that Town Planning Scheme provisions for specific zones and reserves will take precedent over the following recommended lot sizes.

Form of subdivision (specific to current zoning)	P1 areas	P2 areas	P3 areas
Rural subdivision			
- to a lot size of 4 hectares or greater	Incompatible	Acceptable	Acceptable
- to a lot size less than 4 hectares	Incompatible	Incompatible	Incompatible
Special rural subdivision			
- to a lot size of 2 hectares or greater	Incompatible	Compatible with conditions (see notes 7 & 8)	Compatible with conditions (see note 8)
- to a lot size between 1 and 2 hectares	Incompatible	Incompatible	Compatible with conditions (see notes 7 & 8)
- to a lot size less than 1 hectare	Incompatible	Incompatible	Compatible with conditions (see note 7)
Urban subdivision	Incompatible	Incompatible	Acceptable (see note 1)
Industrial subdivision	Incompatible	Incompatible	Acceptable (see note 1)

Explanatory notes related to land uses described the tables:

The following notes provide interpretive information based on the scale or type of development described in the preceding tables. They do not list all the conditions that could apply to any activity or development.

1. Must be connected to deep sewerage, except where exemptions apply under State Government Sewerage Policy. The Policy recognises that sewer connection may be impractical in some areas. Under these circumstances maximum wastewater loadings (based on people/ hectare) apply linked to the management Priority of the site.

2. The land use is normally incompatible, but may be conditionally approved where this facility is consistent with approved State and local government planning strategies or schemes.
3. The land use must incorporate best environmental management practices compatible with the management strategy for the designated priority area defined in the relevant source protection plan.
4. In Priority 2 areas: conditions may apply to density of dwellings (i.e. hectares per dwelling).
5. Size of the grape crush shall not exceed 500 tonnes per year.
6. May be approved if occupancy is of equivalent size to a single dwelling household (i.e. less than 10 people– defined by capacity of a septic tank based on-site wastewater treatment system).
7. An average, rather than minimum, lot size may be accepted if the proponent can demonstrate that the water quality objectives of the source protection area are met, and caveats/memorials are placed on titles of specified blocks stating that further subdivision shall not occur.
8. Lots should only be created where land capability assessment shows that effective on-site soakage of treated wastewater can be achieved. Conditions apply to siting of wastewater disposal systems in areas with poor land drainage and/ or a shallow depth to groundwater, animals are held or fertiliser is applied. Alternative wastewater treatment systems, where approved by the Department of Health, may be accepted with ongoing maintenance requirements.
9. Conditions are likely to be placed via a Department of Industry and Resources mineral tenement lease, and / or as a result of Minister for the Environment’s approval after an Environmental Impact Assessment.
10. Conditions apply to the storage of fuels and chemicals, the depth of excavation related to the water table and rehabilitation criteria. Underground fuel or chemical storage tanks are prohibited via DoE by-laws in Priority 1 and 2 areas within Underground Water Pollution Control Areas.
11. Conditions apply to regulate fertiliser and pesticide application.
12. Can be approved if animal stocking levels (animals per hectare, guided by the Department of Agriculture’s stocking rate guidelines) are consistent with the priority source protection area objectives.
13. This does not include stockyards occasionally used on farms or pastoral leases for animal husbandry.
14. Conditions may be imposed to cover design, construction of infrastructure and the types of goods.
15. May only be approved if *Home Occupation* relates to an existing residence.
16. Limited to one residential building per property.
17. Includes land or buildings dominantly used for the showing, competition or training of horses, and riding schools.
18. Includes any land, building or structure used for equine (e.g. horses, asses, mules and donkeys) housing, keeping and feeding and associated activities.
19. In accordance with *Community Services (Child Care) Regulations 1988: A child care service provided to a child in a private dwelling in a family of or domestic environment. No more than 5 children of pre-school age and no more than 7 children under 12 years old, including the children of the licensee or permit holder.*
20. No more than 2 employees, and the home business occupies an area up to 50 square metres. Compatible if only an office/ administrative business (i.e. overnight parking of only one commercial vehicle, no refuelling or repair/ maintenance of business vehicles, and no activities involving on-site use storage or disposal of chemicals or process wastewater).
21. Employees shall be members of the household, and the home business occupies an area of up to 20 square metres. No provision for refuelling, repair or maintenance of commercial/ business vehicles or on-site use or storage of chemicals.
22. Used tyre use, storage and disposal are subject to *Used Tyre Regulations 1996*, administered by this agency.

23. As defined in the *Model Scheme Text* (1997) or the *Residential Design Codes of Western Australia* (2002) prepared by the Western Australian Planning Commission, and covering local government planning schemes.
24. Applies to the commercial production of horticultural crops e.g. vegetables, flowers and fruit crops grown in contact with the ground. Does not apply to cereal or oil seed crops, perennials e.g. orchards, vineyards, nuts; or any crop grown separate from contact with soils in the natural environment e.g. hydroponics.
25. The use of recycled (reclaimed) water to address the diminishing level of scheme water supply in Western Australia is currently being investigated by Government. The social, environmental, health and economic issues related to this option are significant and need to be further progressed before its applicability in PDWSA is reconsidered.

More information or feedback

More information about recommended best management practices is available in Environmental Management Guidelines and Water Quality Protection Notes for some of the listed land uses. These are available on DoE's Internet site <http://drinkingwater.environment.wa.gov.au> or by contacting DoE regional offices.

We welcome your comments on this note. The note will be updated from time to time as feedback is received or land-use activity standards change. If you wish to discuss this note, please contact DoE Water Source Protection Branch at the Hyatt Centre in East Perth. Phone: (08) 9278 0300 (business hours); Fax: (08) 9278 0585; or E-mail: use {feedback} section at DoE Internet address <http://www.environment.wa.gov.au> citing the topic and version.



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Appendix 2 Water Quality

The Water Corporation has monitored the water quality from Dumpling Gully Dam 1 and 2 in accordance with the Australian Drinking Water Guidelines (ADWG) and interpretations agreed to with the Department of Health. The drinking water criteria that have been monitored together with ADWG health and aesthetic guideline values are available from the Water Corporation on request. Water from these sources is chlorinated prior to supply to users.

MICROBIOLOGICAL CONTAMINANTS

Microbiological testing of raw water samples from Dumpling Gully Dam 1 has been conducted on a regular basis since January 2001. Thermotolerant coliform counts are used as an indicator of the degree of faecal contamination of the raw water from warm-blooded animals. A count less than 20 colony forming units (cfu) per 100 mL is typically associated with low levels of faecal contamination from indigenous animals and is used as a microbiological contamination benchmark (WHO, 1996).

Positive thermotolerant coliform counts were recorded in 49% of samples. Approximately 6% of the positive samples had thermotolerant coliform counts greater than 20 cfu per 100mL.

Disinfection effectively maintains the microbiological quality of the drinking water supplied to Greenbushes from this source with no positive thermotolerant coliform detections in the Greenbushes Town Water Supply in the reviewed period of September 1998 to October 2003.

HEALTH RELATED CHEMICAL WATER QUALITY DATA

Raw water from Dumpling Gully Dam 1 and 2 is analysed for health related chemicals. Health related chemicals include inorganics, heavy metals, industrial hydrocarbons and pesticides. Health related water quality parameters that have been measured at detectable levels in the sources between September 1998 and October 2003 are summarised in the following table. All values are in milligrams per litre (mg/L).

Parameter	Range of Monitored Values		1996 ADWG Health Value*
	Min-Max	Median	
	Dumpling Gully Dam 1	Dumpling Gully Dam 2	
Metals			
Barium	0.013 – 0.014 0.014	-	0.7 mg/L
Boron	0.03 – 0.03 0.03	-	4 mg/L
Inorganics			
Fluoride	No Detection – 0.15 No Detection	0.15	1.5 mg/L
Iodide	0.04	-	0.1 mg/L
Nitrate + Nitrite (as N)	<0.05	<0.05 - 0.31 <0.05	11.3 mg/L

*A health guideline value is the concentration or measure of a water quality characteristic that, based on present knowledge, does not result in any significant risk to the health of the consumer over a lifetime of consumption.

All detected metals and inorganics are at concentrations, which present no health concern. The raw water from Dumpling Gully Dam 1 and 2 complies with the ADWG health guidelines.

AESTHETIC WATER QUALITY DATA

Aesthetic water quality analyses for raw water from Dumpling Gully Dam 1 and 2 are summarised in the following table. The values are taken from ongoing raw water monitoring for the period September 1998 to October 2003. All values are in milligrams per litre (mg/L) unless stated otherwise. The water quality parameters that have on occasion exceeded the ADWG aesthetic guideline for supplied drinking water are shaded.

Parameter	Range of Monitored Values		1996 ADWG Aesthetic Value
	Min-Max Median		
	Dumpling Gully Dam 1	Dumpling Gully Dam 2	
TDS	249-359 317	251-383 300	1 000 mg/L
Hardness (CaCO ₃)	52-78 65	53-84 65	200 mg/L
Turbidity	0.2-4 0.7	0.6-4.6 1	5 NTU
pH	7.48-8.81 7.79	7.68-8.07 7.75	6.5-8.5
Colour	3-6 5	2-5 3.5	15 TCU
Iron (unfiltered)	0.065-0.44 0.114	0.079-0.192 0.121	0.3 mg/L
Manganese (unfiltered)	0.006-0.04 0.008	0.009-0.044 0.021	0.1 mg/L
Aluminium (unfiltered)	0.01-0.28 0.095	0.03-0.4 0.091	-

The raw water from Dumpling Gully Dam 1 and 2 is of good quality with only iron concentrations occasionally exceeding ADWG aesthetic guideline values.

The raw water from Dumpling Gully Dam 1 is chlorinated prior to supply to Greenbushes as drinking water. The drinking water supply complies with ADWG health, microbiological and aesthetic guideline limits.

Appendix 3

Examples of Protection Strategies (Used in existing Drinking Water Source Protection Plans)

Activity	Recommended Protection Strategies
State owned (public) land (P1 source protection)	
Reserves State Forest Unallocated	<p><i>Acceptable with best management practices</i></p> <ul style="list-style-type: none"> Encourage government agency that manages the land to include provisions for water quality protection. Review agency management plans regularly to ensure water quality protection objectives met. Inspect protection measures on-site.
Timber Production (State Forest)	<p><i>Acceptable with best management practices</i></p> <ul style="list-style-type: none"> Ensure compliance with the Contractor's Timber Harvesting Manual for water quality protection. Review 1 year and 5 year harvesting plans to ensure water quality protection objectives are met. Inspect protection measures on-site.
Apiarists Wildflower picking Seed collection Firewood collection	<p><i>Acceptable activity with conditions</i></p> <ul style="list-style-type: none"> Activities to be restricted to outside proposed RPZ and away from feeder streams. Apply conditions for Apiarists, Wildflower Picking and Seed collection that meet water quality protection objectives. Promote casual firewood collection areas outside catchment area. Firewood collection is not authorised in vested Reserves.
Roads	<p><i>Acceptable with best management practices</i></p> <ul style="list-style-type: none"> Review road maintenance practices and develop a plan to minimise risk to water quality. Conduct risk assessment survey for transport of fuel and chemicals. Place signs along road with an emergency contact number for spills. Construct sumps at major stream crossings. Ensure emergency response process is in place and local emergency management advisory committee is aware of management requirements for drinking water catchment.
Off-road vehicle use	<p><i>Unacceptable activity</i></p> <ul style="list-style-type: none"> Remove site as a destination in CALM "4WD Days Out of Perth" publication. Recognise activity in regional recreation plan and look at alternative sites. Encourage involvement in organised events. Use signage to promote awareness that off-road driving is not permitted. Undertake surveillance to control off-road driving in the catchment.
Bushwalking	<p><i>Acceptable activity with conditions</i></p> <ul style="list-style-type: none"> Ensure trails outside RPZ, away from streams feeding into reservoir, and cross-streams where culverts and / or bridges are established. Compliance with the Department of Environment's Policy and Guidelines for Recreation within Public Drinking Water Source Areas on Crown Land (Recreation Policy), available via www.environment.wa.gov.au. Promote bushwalking opportunities as part of a regional recreational plan. Use signage as education tool. Undertake surveillance. Require organised groups to obtain approval for events
Picnicking	<p><i>Acceptable activity with conditions</i></p> <ul style="list-style-type: none"> Locate picnic sites outside the proposed RPZ. Promote use of controlled picnic away from watercourses. Promote picnicking opportunities as part of a regional recreational plan. Prohibit dogs through education/signs, promotional material and surveillance. Compliance with DoE's Recreation Policy available via www.environment.wa.gov.au.
Horse riding events	<p><i>Acceptable with Best Management Practices</i></p> <ul style="list-style-type: none"> An environmental management plan developed for each event, addressing water quality protection measures. Approval for each event subject to implementation and review of plan. Camping will be restricted to specific sites as developed in regional recreation plan. All events to be staged on roads and trails. Stream crossings to be on made roads at culverts or bridges. Monitor existing events to identify water quality risks to be addressed in the environmental management plan. No new events to operate in the catchment. Refer to Environmental Guidelines for Horse Facilities and Activities, available via www.environment.wa.gov.au.

Activity	Recommended Protection Strategies
Hunting	<p><i>Unacceptable activity</i></p> <ul style="list-style-type: none"> • Catchment to be closed to hunting through the CAWS Act and MWSSDB 1909 By-Laws. • Place signs throughout catchment indicating uncontrolled hunting is illegal. • Undertake surveillance of the catchment. • Control feral animal through managed program.
Swimming	<p><i>Unacceptable activity</i></p> <ul style="list-style-type: none"> • Increase public awareness that swimming is prohibited under the CAWS Act By-laws. • Signs in the catchment • Undertake surveillance & by-law enforcement. • Compliance with DoE's Recreation Policy, available via www.environment.wa.gov.au.
Fishing Marroning	<p><i>Unacceptable activity</i></p> <ul style="list-style-type: none"> • Increase public awareness that fishing and marroning is prohibited under the CAWS Act By-laws. • Place signs throughout catchment indicating fishing and marroning is not permitted. • Undertake surveillance & by-law enforcement. • Signs in the catchment • Compliance with DoE's Recreation Policy, available via www.environment.wa.gov.au.
Boating	<p><i>Unacceptable activity</i></p> <ul style="list-style-type: none"> • Increase public awareness that boating is prohibited under the CAWS Act By-laws. • Undertake surveillance & by-law enforcement. • Signs in the catchment • Compliance with the DoE's Recreation Policy available via www.environment.wa.gov.au.
Motor vehicle rallies Including: Rally Australia Motor bike events	<p><i>Acceptable with best management practices</i></p> <ul style="list-style-type: none"> • No new rallies to operate in the catchment. • An environmental management plan developed for each event, addressing water quality protection measures. Approval for each event subject to implementation and review of plan. Compliance with DoE's Recreation Policy available via www.environment.wa.gov.au.
Military activities	<p><i>Acceptable activity with conditions</i></p> <ul style="list-style-type: none"> • Restrict military training to outside of the RPZ. • Ensure approval for military activities contains conditions for water quality protection. • Undertake discussions with military to investigate the use of alternative areas. • Undertake surveillance to ensure compliance with approval.
Water supply construction	<p><i>Acceptable with Best Management Practices</i></p> <ul style="list-style-type: none"> • Ensure water quality risk addressed in EMP. • Work with contractors on-site and advice on issues related to water quality protection. • Monitor turbidity and undertake remediation if monitoring shows adverse impact.
Private Land (P1 source protection)	
	<p><i>Long term goal of crown ownership of private land</i></p> <ul style="list-style-type: none"> • Landowners can continue current activities with best practices being encouraged (refer to Quality Protection information. www.environment.wa.gov.au) • Oppose intensification of land uses through planning approval process. • Offer landowners opportunity to sell or swap their land. Purchased land to become Crown Reserve and re-vegetated. Long-term Crown ownership is preferable
Private Land - Rural (P2 source protection)	
Cropping and grazing Tree farming Viticulture	<p><i>Acceptable with best management practices</i></p> <ul style="list-style-type: none"> • Landowners continue current activities with best practices being encouraged (refer to Quality Protection information www.environment.wa.gov.au) • Ensure Town Planning Scheme adequately controls development. • Oppose intensification of land uses through planning approval process. • Promote water quality protection.
Land clearing for broadacre farming in Clearing Control Catchments	<p><i>Manage as non-conforming land use</i></p> <ul style="list-style-type: none"> • Landowner can continue current activities (consistent with <i>Environmental Protection Act 1986</i> and <i>Country Area Water Supply Act 1947</i> approvals), with best management practices being encouraged • Continue to support changes in land use within existing approvals that reduce salinisation. • Oppose intensification of land uses through planning approval process. • Continue re-vegetation initiatives under clearing control legislation. Land transferred to Crown ownership to be re-vegetated.

Activity	Recommended Protection Strategies
Rural residential	<p><i>Maintain existing planning controls</i></p> <ul style="list-style-type: none"> • Ensure the Special Provisions for the Rural Residential Zone control development. • Encourage landowners to adopt best management practices for permitted activities (refer to Quality Protection information <www.environment.wa.gov.au>). • Oppose intensification of land use through planning approval process. • Support changes within existing approvals that reduce groundwater contamination risks. • Encourage connection to deep sewerage through planning approval process. • Promote water quality protection.
Rural development Including: Special rural zones Rural retreats Hobby farms Cottage industries Chalets Bed and breakfasts and farmstays	<p><i>Conditional with best management practices</i></p> <ul style="list-style-type: none"> • Landowners can continue current activities with best practices being encouraged (refer to Quality Protection information <www.environment.wa.gov.au>). • Ensure Town Planning Scheme adequately controls development. • Oppose intensification of land uses through planning approval process.
Private Land - (P3 source protection)	
	<p><i>Acceptable with controls</i></p> <ul style="list-style-type: none"> • Landowners can continue current activities, with best practices being encouraged (refer to Quality Protection information <www.environment.wa.gov.au>). • Ensure Town Planning Scheme adequately controls development. • Further subdivision and land use to be consistent with water quality objectives. • Oppose incompatible land uses through planning approval process. • Encourage connection to deep sewerage through planning approval process.
Power stations	<p><i>Manage as non-conforming land use</i></p> <ul style="list-style-type: none"> • Landowner can continue current activities, with best management practices being encouraged. • Support changes in land use within existing approvals that reduce groundwater contamination risks.
Disused depots Including: Water Corporation Western Power Shire	<p><i>Unacceptable in current condition</i></p> <ul style="list-style-type: none"> • Remove all infrastructure and contaminant threats including septic system and decontaminate site. • Return site to natural bushland.
Rubbish disposal	<p><i>Unacceptable activity</i></p> <ul style="list-style-type: none"> • Encourage local council to close site and undertake remediation to decontaminate site. • Return site to natural bushland.
Horticulture	<p><i>Maintain existing planning controls</i></p> <ul style="list-style-type: none"> • Landowners can continue current activities with best management practices being encouraged (refer to environmental guidelines for horticulture and/or viticulture via <www.environment.wa.gov.au>). • Oppose intensification of land use through planning approval process. • Support changes in land use within existing approvals that reduce groundwater contamination risks.
Residential	<p><i>Acceptable activity with controls</i></p> <ul style="list-style-type: none"> • Ensure Town Planning Scheme adequately controls development (refer to Quality Protection information <www.environment.wa.gov.au>). • Encourage connection to deep sewerage through planning approval process. • Further subdivision to be consistent with Draft Country Sewerage Policy 2003. • Promote water quality protection.
Industrial and commercial sites.	<p><i>Acceptable activity with controls</i></p> <ul style="list-style-type: none"> • Landowner can continue current activities. They are also encouraged to upgrade existing facilities to meet DoE recommendations (refer to Quality Protection information <www.environment.wa.gov.au>). • Oppose intensification of land use through planning approval process (eg those activities not acceptable in P3 areas). • Support changes in land use within existing approvals that reduce contamination risks.

Appendix 4

DoE WQPN Protecting Public Drinking Water Source Areas

Note WQPN subject to change. Refer to the DoE website
<<http://www.environment.wa.gov.au>> for latest version.

Water Quality Protection Note

Protecting Public Drinking Water Source Areas

Introduction

This agency is the custodian of all of the State's water resources. Our role is to ensure the State's water resources are managed to support sustainable development and conservation of the environment for the long-term benefit of the community.

Next to food, water is the most essential element for life, and our aim is to protect Public Drinking Water Source Areas (PDWSA). Achieving this aim will provide consumers with reliably 'safe, good quality drinking water' to protect public health for now and into the future at a reasonable cost to consumers.

This note provides an overview of policy and processes used to protect PDWSA supplying drinking water to major population centres in Western Australia. Generally, private sources supplying drinking water to a household, business or remote aboriginal community are not subject to the same level of assessment, sampling, treatment and reporting requirements. Accordingly, they are not directly addressed in this protection note. Nonetheless, the approaches described in this note are still recommended for private sources. For example, the Water Corporation have a number of significant private drinking water source areas (eg 'roaded' catchments) that they operate consistent with PDWSA policy and processes.

The former State Government agencies the *Department of Environmental Protection* and *Water and Rivers Commission* are presently being combined to form the *Department of Environment*. This process will not be complete until enabling legislation has been passed by Parliament and proclaimed. This note aims to present a generic 'combined agency' position on the nominated topic.

Who is involved in protecting our drinking water supplies?

Responsibility for the condition (quality) and availability (quantity) of our drinking water must be shared by the community, land owners/developers, industry, agriculture, local government, water service providers and the State government. All of these groups play a significant role in the development of Drinking Water Source Protection Plans (DWSPP) for PDWSAs (also called drinking water catchments in this note). They also may be involved in the implementation of the recommendations in those plans. Their direct and ongoing involvement in the protection of our drinking water catchments is essential to achieve a successful outcome.

The Department of Environment (DOE), is primarily responsible for defining, proclaiming and protecting the catchments of Public Drinking Water Source Areas (PDWSAs). The PDWSAs are made up of any area proclaimed to protect public drinking water source catchments. These areas are proclaimed as Water Reserves, Catchment Areas or Underground Water Pollution Control Areas under the *Metropolitan Water Supply, Sewerage and Drainage Act 1909*, and Water Reserves or Catchment Areas under the *Country Areas Water Supply Act 1947*.

The DOE has responsibility to administer the State's catchment protection legislation. This administration includes:

- undertaking and facilitating effective by-law enforcement and catchment surveillance;
- the assessment and permitting of land use developments or activities;
- negotiating protection mechanisms in the land use planning process; and
- advising on the compatibility of land development and use activities.

The DOE also has responsibility for preparing policies and guidelines, drinking water source protection assessments and plans and advising other decision-making agencies on source protection requirements. The Department promotes a coordinated approach to catchment protection encompassing a variety of related measures including regional and local land use planning; health; and environmental legislation.

Where public health is concerned, the Department of Health has primary responsibility. The Department of Health's role is to minimise human exposure to environmental health hazards that pose or have the potential to pose a health risk and to reduce the incidents and impact of communicable disease. To safeguard against unhealthy drinking water, the Department of Health works closely with the DOE and individual Water Service Providers. The Department of Health also chairs an inter-agency committee, called the "Advisory Committee for the Purity of Water", established in 1925 and charged with the ongoing responsibility of advising the State on drinking water protection issues. The Office of Water Regulation is another government agency with a key role in regulating drinking water supply issues. It issues licences to individual Water Service Providers such as the Water Corporation, Aqwest (Bunbury) and Busselton Water Board.

The Water Corporation is the largest Water Service Provider in WA, and it was formed in the mid 1990's after the split of the former Water Authority of Western Australia as part of the COAG Water Industry Reform initiatives. The Corporation is the major licensed Water Service Provider in Western Australia, supplying the Perth metropolitan area as well as a further 230 towns across the State. It is a corporation, with the state government being the sole shareholder, and is subject to corporation law. It is managed by a board of directors including the Managing Director (its CEO). The Corporation is required to return a dividend on the Government's investment in the Corporation's assets and in return receives Customer Service Obligation (CSO) payments to subsidise uneconomic services that are required to be provided by the Government. The Corporation also pays federal tax equivalents to the State Government in accordance with the COAG reform agreement.

Source Protection Operational Agreements exist between the DOE and the Water Corporation, which assign roles in catchment protection, clarify responsibilities in catchment protection and ensure the process is carried out effectively. Under the legislation, the DOE may delegate certain catchment management functions to the Water Corporation (or other water service providers). Delegation is appropriate as the Corporation has a strong vested interest in assuring high quality drinking water from the catchments and is also prepared to resource catchment management functions. Currently, delegated functions relate to catchment surveillance, enforcing by-laws regarding transient catchment activities, entry onto land and catchment management planning. The extent of delegated responsibilities may vary between catchments.

Why should we protect our drinking water supplies?

Drinking water should be safe to drink and aesthetically pleasing. Ideally, it should be clear, colourless, pleasant tasting and contain no harmful chemicals or disease-causing microbes. To keep drinking water clean it is important to protect both our surface and underground drinking water sources (e.g. surface dams and groundwater) and the catchments in which they are located.

This advice deals with the water consumed in homes and provided by licensed Water Service Providers (often referred to as 'scheme' supplies). These WSP are responsible for water treatment (including disinfection) and distribution services to the community. Advice on alternative (potentially less safe) drinking water sources, such as private bores or rainwater tanks, is available in other documents. As a rule neither the Department of Health nor DOE recommend the use of rainwater or private bore water for drinking water purposes where a scheme water source is available. This is because the catchments of these other sources are generally not protected from contamination and they are not analysed or treated to meet the relevant health guidelines for drinking water. Such sources can however be useful for non-potable uses such as in washing machines, toilets or for gardens. If a scheme supply is not available, then it is important that the consumer implements the necessary measures to ensure their drinking water source is safe to drink (i.e. arrange water analyses and treatment as required).

In the mid 1990's, the Council of Australian Government reforms process took an initiative to pursue the sustainable use of water resources by protecting and enhancing their quality, while maintaining economic and social development. This was achieved through the development of a National Water Quality Management Strategy (NWQMS) presently comprising 21 national guideline documents. Two of these focused on drinking water, the *Australian Drinking Water Guidelines-Summary* and the *Australian Drinking Water Guidelines, 1996* (an update of the 1987 *Guidelines for Drinking Water Quality in Australia*). The *Australian Drinking Water Guidelines, 1996* (ADWG) recognised water source protection through catchment management as an effective approach to preventing contamination of drinking water sources and undertook to investigate this issue further.

In May 2001, Western Australia supported the NWQMS (including the ADWG) through the launch of its own State Water Quality Management Strategy (SWQMS). In late 2002, the ADWG were updated and released for public comment. The ADWG 2003 have now been finalised and are planned to be released in late 2003. A 'consumer guide' to the ADWG 2003 called *Water made clear* has also been developed to raise awareness of the need to protect drinking water catchments from 'catchment to consumer'.

Roughly half of Perth's water supplies come from surface sources with the remainder harvested from groundwater. In 1994, a Parliamentary Select Committee reported on the issue of Perth's development and groundwater supplies. The Select Committee considered experience from around the world and overwhelmingly concluded, "*an ounce of prevention is worth a pound of cure*". In his foreword, the chairman of the Select Committee noted: "*experts around the world expressed their envy of our relatively pristine water supply and advised us to protect our groundwater supply at all costs*".

In 2000, the State Legislative Council's *Standing Committee on Ecologically Sustainable Development in relation to the Quality of Perth's Water Supply* expressed confidence in the system managing and operating Perth's water supply. The Standing Committee noted, however, that various activities posed a contamination risk to water supplies. It found as a "*first priority that water sources be protected through good land use planning*." It also noted that "*Using treatment to deal with contamination is a second-best option. The Committee found support for adopting catchment protection as the major weapon in preventing contamination of water supplies*". In November 2001, in support of this finding, the Western Australian Planning Commission (in consultation with the Water and Rivers Commission) released a *Public Drinking Water Source Policy* for public comment. The Policy was gazetted in June 2003. This policy will guide State and Local Government land use planning decisions in public drinking water catchments.

Although the above committees were reporting on Perth's water supplies, their findings apply to all public drinking water sources in Western Australia. This is especially true when a community is reliant upon a single drinking water resource (such as the groundwater bore network in Kununurra or surface water dam in Quinninup) rather than an integrated series of sources (such as those that supply Perth). Contamination of a single resource from inappropriate land use planning or polluting activities within the catchment can have significant health and economic impacts, which should be avoided.

In February 2003, the Western Australian Government released its State-wide water strategy. Although prepared in response to a number of forums around State focusing on drought, it did however make a significant statement about protecting our public drinking water sources. It stated unequivocally that *recognition of the primacy of water quality in the management of drinking water catchments, to protect the long term sustainability of the resource, will be used to guide catchment management decisions*.

This is interpreted to mean, when managing and protecting any public drinking water source catchment, the dominant consideration must be maintenance of water resource quality and the prevention of contamination risk. This objective in most cases may prevent or constrain further land development.

More recently in September 2003, the Western Australian Government also released its State-sustainability strategy document – "Hope for the future". Drinking water catchments are now recognised as important 'natural resources' together with the other more common natural resources (eg. agriculture, fisheries, forestry, mining, tourism, aquatic systems, coastal and marine environments and rangelands). The 'Vision' in the Strategy is that "Drinking water sources are fully protected for future generations". The Strategy lists the following 'Actions': (number 3.48) that we "Work to ensure all present and future drinking water sources

are protected”; and (number 3.51) that we “Ensure the activities in catchments are actively managed and sustainable...” through “...investigation of the impact of active catchment management strategies that enhance water quality and quantity outcomes...”.

What are we protecting the drinking water supplies from?

Land use planning decisions and recreational or business activities occurring in drinking water catchments can impact on the quality and quantity of drinking water. Where catchments remain covered with native vegetation with little human activity, the risk of contamination is low. However, contamination risks increase with increased human activity.

Potential contaminants may include:

- physical contaminants e.g. colour, foaming agents and suspended solids;
- chemical contaminants e.g. salts, heavy metals and poisons; or
- microbiological contaminants e.g. bacteria, protozoa and pathogenic viruses.

Although many contaminants can be removed by treatment processes, such treatment increases the cost of the water supply, and continuous effective removal of all contaminants is not considered technically or economically feasible. If contamination does occur, the opportunity to locate and develop a replacement source is often limited, and the provision of alternatives, e.g. bottled drinking water, is costly and can only be considered a short-term solution. Stopping contamination before it occurs prevents the need for costly treatment or the development of often more costly alternative sources. It should also be appreciated that there is a substantial ongoing financial cost to be borne in sampling and testing for contaminants if they become prevalent in drinking water sources. The benefits (environmental, social and economic) of avoiding contamination through best management decisions and practices are recognised in the ADWG 2003.

Clearly drinking water quality and safety cannot be taken for granted. Appropriate State and Local Government controls are required in consultation with, and the support of the community and other stakeholders. These controls are needed to manage a number of threats to drinking water areas, including inappropriate:

- land use planning processes and decisions resulting in high risk developments in catchments;
- recreational activities where the impact of human wastes and damage to natural protective measures associated with higher intensity land use is often underestimated; and
- use and/or disposal of chemicals, animal and domestic wastes and pesticides.

We should also appreciate that beyond the actual catchment and water storage area, drinking water that is not properly treated, or which travels through an inadequately maintained distribution system, also poses a serious public health risk.

Several recent events that have occurred nationally and internationally that highlight the importance of protecting drinking water, especially at the source.

The main finding of an inquiry into the well-publicised [Sydney Water Crisis](#) in 1998 was that the catchments were seriously compromised by many possible sources of contamination, and that there was insufficient regulatory control to guarantee safe drinking water. The Sydney Water Catchment Authority was set up in response to this event which transferred responsibility for land use decisions within the catchment from the Planning Authority to the new catchment Authority.

In Walkerton (Canada), in 2000 a drinking water catchment related tragedy unfolded where a pathogenic E-coli outbreak resulted in over 2300 cases of illness amongst 4,800 residents, 70 people were hospitalised and 7 deaths were attributed to the outbreak. A judicial inquiry concluded that the likely initial cause of the outbreak was from manure application on farmland (a common practice even in WA) that resulted in bacterial contamination finding its way into the shallow underground water-body which was used to supply drinking water. Other contributing factors to the outbreak included a high rainfall event just prior to the contamination outbreak, and an inadequate disinfectant dose rate and monitoring issues related to the distribution system. It is important to appreciate that the drinking water system at Walkerton operated for

more than 8 years without major incident up until the year 2000. The over-reliance on treatment to provide a safe drinking water supply was highlighted and a new approach adopted that considered both catchment protection and improved treatment (in combination) to provide a more reliably-safe supply to consumers.

How do we protect public drinking water source areas in WA?

A 'catchment to consumer' multiple barrier approach is used in the management of drinking water quality in Western Australia. Catchment management for protection of the water source (held in storage in surface dams or underground aquifers) is considered the first important barrier. Historically, a heavy reliance was placed on treating water to achieve the desired level of safety, but it is now recognised that treatment alone does not remove all hazards to public health. Therefore, to maximise public health safety effective catchment protection is also essential. Other barriers include:

- selection of an appropriate safe high quality source (where alternatives exist);
- controls over land uses and high risk human activities in catchments underpinned by statutory measures;
- protective undeveloped buffer zones to supply bores, reservoirs and feeder streams;
- catchment protection strategies for education, surveillance, enforcement and monitoring/reporting;
- pre-treatment of drinking water, for example use of detention and settling in reservoirs to induce microbes to die off;
- protection of water storage works, for example water tanks and reservoirs;
- disinfection of drinking water before it enters the distribution system and provision to ensure an adequate disinfectant residual throughout that system;
- maintaining the distribution system as a whole including the pipe system, vermin-proofing of water tanks and preventing back-flow; and
- Promotion of source protection measures in local government planning schemes using the WA Planning Commission's *Statement of Planning Policy – Public Drinking Water Source Policy* (June 2003).

A key process employed by this agency to protect drinking water sources involves the preparation of Drinking Water Source Protection Plans (DWSPP) for the State's PDWSAs.

Drinking Water Source Protection Plans (and Drinking Water Source Protection Assessments)

Drinking Water Source Protection Plans are a key component of the 'catchment-to-consumer' protection strategy for Western Australia's drinking water supplies. This is reflected in the Government's report "*Securing our water future - A State Water Strategy for Western Australia (2003)*" which states that **water source protection plans should be completed for all public drinking water supply catchments throughout the State**. A DWSPP aims to identify existing and potential threats to a drinking water source and to provide risk management strategies and programs for the ongoing management/protection of that source. They are prepared in consultation with the community, potentially affected stakeholders (especially landowners), local government and the State government. Stakeholders are strongly encouraged to consider the risks and potential consequences of inappropriate land-use planning or human activities in the catchment (e.g. contamination of the resource and costs to clean-up or establish a new drinking water source). It should be noted that decisions made following consultation may result in some land use/activity restriction in order to achieve a safe, good quality drinking water supply.

Providing a basis for establishing compatible land uses within PDWSAs, the DWSPP is only one of a suite of measures used by this agency to meet its drinking water protection responsibilities. As at June 2003, there were approximately 139 plans listed for completion. Of this number, 50 are complete and 89 are in production.

While the full suite of DWSPPs await completion, land planners and developers need to be aware of the location of and risks to existing drinking water catchments. To this end the DOE is preparing Drinking Water Source Protection Assessments (DWSPA). These Assessments will provide a broad overview of catchment risks, planning and land uses; and a basic understanding of the drinking water catchment and supply system. They are not intended to include extensive data, but to characterise the drinking water system by providing useful information for decision makers. Generally, the DWSPA will be a desktop assessment

followed by a site visit and discussions with local government. In some circumstances the DWSPA may be all that is required to achieve good land planning/activity controls (e.g. through planning schemes or strategies) for the protection of drinking water source areas. Otherwise, the DWSPA will be considered base information for development of the DWSP described above.

Priority classification system

This agency has also implemented policies to protect public drinking water source areas that includes a differential '*priority classification area*' system that includes special 'protection zones' around bores and reservoirs. Through development of a DWSP (or possibly the DWSPA), land in a PDWSA is identified as a mix of Priority 1 (P1), Priority 2 (P2) or Priority 3 (P3) classification areas, with appropriate protection zones.

Priority 1 (P1) source protection areas are defined to ensure that there is **no degradation** of the water source. P1 areas are declared over land where the provision of high quality public drinking water is the prime beneficial land use. P1 areas would typically include land under public ownership but may in a limited number of cases include private land.

P1 areas are managed in accordance with the principle of **risk avoidance**, and hence land development is generally not permitted. Where P1 land is in private ownership this agency may make an offer to the owner to sell their land at agreed market values subject to available funding and priority order purchasing rules. There is no obligation on the owner to sell their land.

Priority 2 (P2) areas are defined to ensure that there is **no increased risk of pollution** to the water source. P2 areas are declared over land where low intensity development (such as rural) already exists. Protection of public water supply sources is a high priority relative to other land use values in these areas.

P2 areas are managed in accordance with the principle of **risk minimisation**, and as such only limited conditional development is supported. Such development must be consistent with the protection of waters within the drinking water catchment. A proposed change in land use from a relatively low to a more intensive use may result in contamination of the PDWSA, and would not be supported.

Priority 3 (P3) areas are defined where it is practical to **manage the risk of pollution** to the water source, and where water supply sources need to co-exist with other generally existing land uses such as residential, commercial and light industrial developments.

Protection of P3 areas is achieved through **management guidelines** rather than restrictions on land use. Key elements in protection of P3 areas are the provision of deep sewerage and land users using best environmental management practices for their activities. In P3 areas, compared to P1 and P2 areas, it is likely that the direct cost of providing the drinking water to consumers is greater, given the need to monitor and treat the water more comprehensively due to the variety of existing and allowable land uses/risks. If water from P3 areas becomes contaminated, then that water may need to be further treated or an alternative water source found.

In these priority areas there is a strong reliance on landowners, developers, regulators and other users to be acutely aware of the drinking water resource and risks, such that the adoption and implementation of best management practices will help protect the drinking water source. Existing lawfully established but non-conforming land uses in PDWSAs are allowed to continue, however land users will be encouraged to adopt environmentally responsible/best practice land use practices. This agency has prepared a "*Water Quality Protection Note -Land Use Compatibility table in PDWSAs*" that provides guidance on the type of land uses appropriate within P1, P2 and P3 areas.

Reservoir and wellhead protection zones

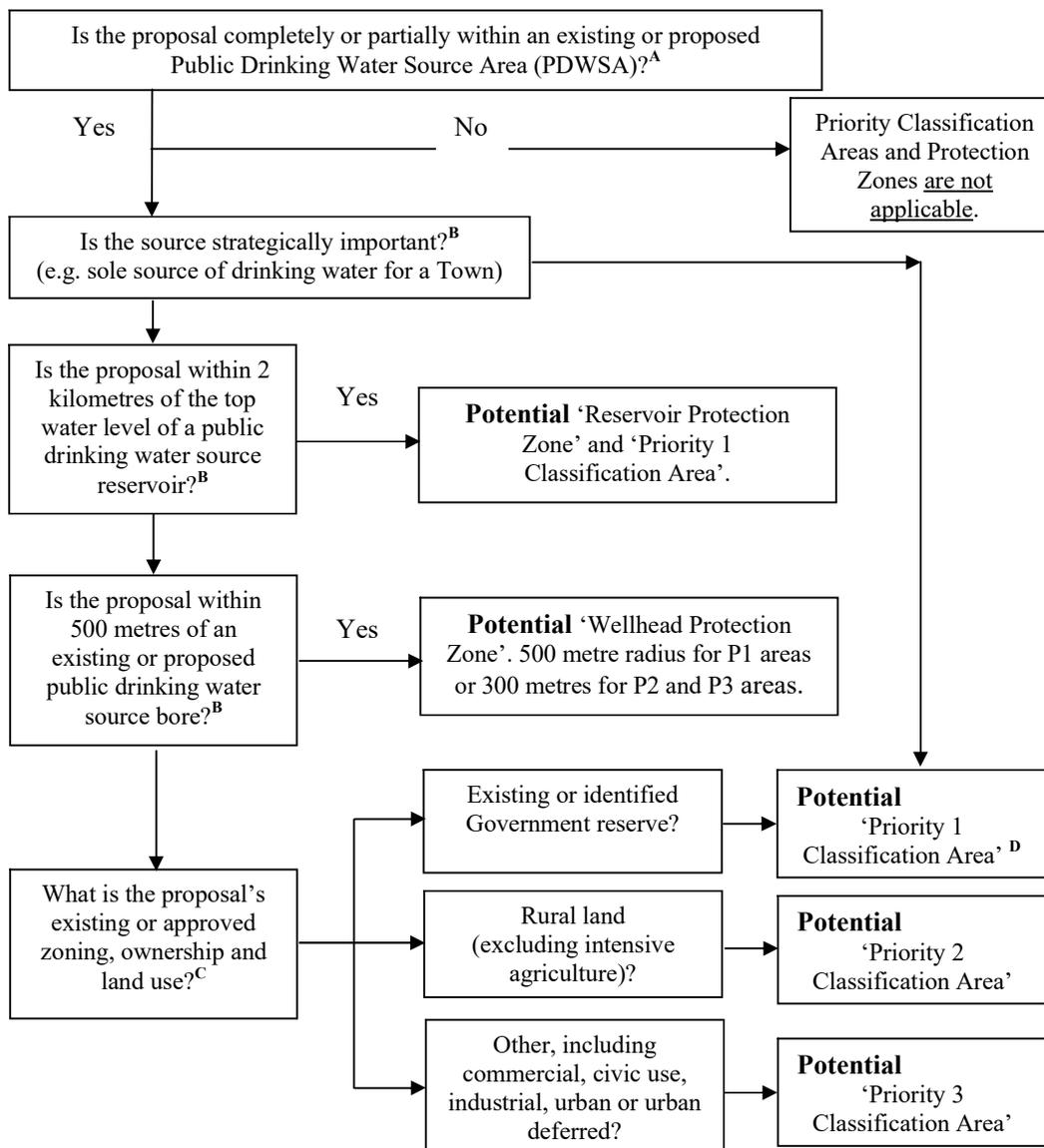
As noted above, reservoir protection zones (RPZ) are also defined to protect the surface water source from contamination in the immediate vicinity of reservoirs. Reservoir protection zones consist of up to a 2 kilometre buffer around the top water level of a reservoir and includes the reservoir itself. These zones do not extend outside the catchment area (i.e. downstream from a dam wall). This agency provides a high level

of protection in these zones and does not support land uses or activities that may add to the risk of contamination of the water source. Generally conditions apply in these zones aimed at preventing people from entering the RPZ to avoid the risk of contamination (consistent with the P1 areas).

For underground water sources, well-head protection zones are defined around the abstraction bores and allowable activities/ land uses in these areas are also restricted and subject to approval processes. Well-head protection zones in P1 areas are set at a 500 metre radius around a bore, and in P2 or P3 areas they are set at a 300 metre radius around a bore.

How are priority classification areas and protection zones determined?

The determination of a priority classification area or protection zone over land in a PDWSA is based on the strategic importance of the land or water source, its zoning, ownership and existing approved land uses/activities. The land use tables in this protection note directly relate to the three types of priority classification areas identified in DWSPP or agreed in Land Use and Water Management Strategy documents. In the absence of a DWSPP, the DOE recommends that planning decisions within any gazetted or proposed PDWSA are guided by DWSPA documents (where they exist) and the 'potential' priority classification area or protection zone status of a proposal identified using the following process flow diagram.



Legend

- A. The location of PDWSAs can be found in DoE's Drinking Water Source Protection Assessments and Plans or through your regional DoE office, Local Government office, Water Corporation or from the Department for Planning and Infrastructure.
- B. Strategically significant sources and potential contamination from land uses close to drinking water reservoirs or abstraction bores are considered first, due to these involving the highest risk of contamination reaching consumers.
- C. Current zoning or land use information is available from your Local Government office.
- D. Government land is protected to achieve the highest level of safety for drinking water in all parts of a catchment through a Priority 1 classification, wherever this is reasonable and practicable.

Conclusion

We can improve the availability of 'safe, good quality drinking water' to protect public health if we continue to combine catchment protection and water treatment approaches. This 'catchment to consumer' approach to drinking water protection is the basis of the recently updated *Australian Drinking Water Guidelines 2003*.

Many land uses and activities can pose a risk to water quality, so in undeveloped drinking water catchments strict management controls are proposed to 'avoid the risk' of contaminating the source. In catchments with some level of development, management controls recognise the existing development but may place restrictions on alternative land uses or expansion of existing land uses. This approach looks to 'minimise' or 'manage the risk' of contamination in the catchment. These management controls help protect public health, lower the costs of supplying drinking water to consumers and provide a long term source of safe, good quality drinking water.

More information

We welcome your thoughts on this note. The note will be updated from time to time as comments are received, or industry standards change.

If you wish to comment on the note or require more information, please contact our Program Manager, Protection Planning (Stephen Watson) at the Resource Quality Branch in our head office in the Hyatt Centre. Phone: (08) 9278 0454 (business hours), Fax: (08) 9278 0585.



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