Government of Western Australia
Department of Water and Environmental Regulation

## Important information

The *Proposed Ravensthorpe Water Reserve drinking water source protection assessment* (2006) was reviewed in 2018.

Please ensure you read the *Ravensthorpe Water Reserve and Ravensthorpe Bitumen Catchment Area drinking water source protection review* (2018, WRP no. 170) alongside the 2006 assessment to obtain all of the information about this drinking water source.

The 2018 review considers changes that have occurred in Ravensthorpe since the completion of the 2006 *assessment.* New recommendations have been prepared to ensure the ongoing protection of this public drinking water source area:

- proclaiming the boundary of the Ravensthorpe Bitumen Catchment Area under the *Country Areas Water Supply Act 1947*
- preparing a drinking water source protection plan when long-term planning for the Ravensthorpe bore field is complete.

You can find the 2018 *Ravensthorpe Water Reserve and Ravensthorpe Bitumen 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.

# PROPOSED RAVENSTHORPE WATER RESERVE DRINKING WATER SOURCE PROTECTION ASSESSMENT

## RAVENSTHORPE TOWN WATER SUPPLY

WATER CORPORATION

**2006**

# Acknowledgements

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

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*Cover Photograph: [taken by Lara Sweet ]Ravensthorpe Dam No. 4*

# 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 the proposed Ravensthorpe Water Reserve. 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 Water (DoW – formerly Department of Environment) 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. |

DoW requested the Water Corporation undertake Stage 1 and prepare this assessment document because it is the licensed water service provider for Ravensthorpe 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. DoW will undertake Stages 2 to 5.

This PDWSA should be recognised in the Shire of Ravensthorpe 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 DoW'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.

# Contents



## Figures



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## Photographs

# 1 Drinking water supply system overview

The town of Ravensthorpe has a population of about 500 people and is located approximately 325 km east north east of Albany in the Shire of Ravensthorpe. It supports the surrounding farming area which sustains primary production for wool, sheep, wheat and a variety of other produce (Figure 1).

Ravensthorpe also supports a local mining industry that is continuing to develop. The centre piece of this industry is the Ravensthorpe Nickel Operation (RNO), due to commence operating in 2006. The RNO, and associated industrial development, has placed considerable additional demand on the existing Ravensthorpe water supply system.

The Ravensthorpe Town Water Supply (TWS) is obtained from a wellfield about 5km south-east of the town and a small dam about 10km south of the town.

## 1.1 Existing water supply system

The Ravensthorpe water source comprises one dam and a wellfield, although the Water Corporation has another 3 dams in Ravensthorpe (see Figure 2).

The No.4 dam and the wellfield provide water to the Ravensthorpe Town Water Supply (TWS). The No.4 dam has a capacity of 56 250 kilolitres (kL) and stores water collected off a 21 hectare bitumen catchment. The Ravensthorpe wellfield is located in the natural catchment area for Dam No. 3 (Figure 2). It currently has two production bores, 11/97 and 13/97. Two additional bores, 1/05 and 3/05, were drilled nearby in June 2005 as part of the Ravensthorpe TWS Scheme upgrade works, but are yet to be commissioned. Another proposed production bore, 2/05, is yet to be completed and test-pumped.

The No.1 (40 000 kL) and No.2 (15 140 kL) dams are still an integral part of the system, but are only used for the storage of water. The No.1 dam stores excess water from the Number 4 dam. Previously, water collected from two separate bitumen catchments and a large natural catchment was stored in No.1 dam. However these have been disconnected from the dam due to the poor quality of water collected from them. The No.2 dam has never had a catchment, and is the final raw water storage point prior to distribution.

Ravensthorpe Dam No. 3, also known as Cordingup Dam, is no longer used due to high salinity levels caused by the inflow of water from a nearby saline spring.

Water from the wellfield passes through a reverse osmosis (RO) desalination plant near Dam No. 3 before being transferred to Dam No. 2. The plant has a production capacity of 50 000 kL/annum. Water from Dam No. 2 is pumped to two 225 kL elevated holding tanks for reticulated supply. Brine waste from the desalination plant is pumped to Mt. Cattlin Mine Shaft.

The Ravensthorpe TWS Scheme is currently being upgraded to improve water quality and the reliability of the system. This involves:

- The relocation of the existing 1 Megalitre (ML) service tank in Albany to the new site in Ravensthorpe,
- Lining of the No. 2 Dam with a flexible concrete polymer,
- Installing a new Reverse Osmosis and pre-treatment unit, and
- Mains improvement works to the reticulation system.

The DoW requires a Drinking Water Source Protection Assessment (DWSPA) for naturally occurring water sources (surface water or groundwater) which have a natural catchment area. Dam No. 4 collects water from an artificial catchment owned by the Corporation so it does not require a DWSPA. This DWSPA is therefore confined only to the recharge area for the wellfield.

## 1.2 Water treatment

The water collected at Ravensthorpe is treated for turbidity with aluminium sulphate in Dam Nos 1 and 2. Disinfection is by gas chlorination at the outlet of dam No. 2, with manual dose rate adjustment. Soda ash is used for pH correction.

Raw brackish water from bores 11/97 and 13/97 is treated in the RO plant before transfer to Dam No. 2. It is pre-treated with chlorine to reduce iron and manganese, then dosed with sodium metabisulphite before passing through sand filters to remove sediment. Anti-scalant is injected to inhibit bacteria growth in the plant membranes. Membranes are cleaned using caustic soda and citric acid, which is flushed out before raw water is passed through the system.

## 1.3 Catchment details

### 1.3.1 Physiography

Ravensthorpe is located on an old peneplain at the base of the Ravensthorpe Range, which rises abruptly from the surrounding countryside. The subsurface granite basement of the plain occasionally outcrops to rise above the plain to form distinctive granitic hills. The topography becomes more gently undulating as the plain falls gradually to the coast, south of Ravensthorpe. The most prominent features along the coast are the narrow belt of sand dunes and the Eyre and Mt Barren Ranges.

The main drainage systems are the Phillips, Steere and Jerdacuttup Rivers, which rise in the ranges and hills surrounding Ravensthorpe and flow intermittently southwards to wetlands within the coastal dune system.

### 1.3.2 Climate

Ravensthorpe has a Mediterranean – type climate, with cool wet winters and warm, dry summers. Average rainfall is 425 mm, measured at the Ravensthorpe Town Hall over the period 1901 to 2005. The mean daily maximum temperature ranges from 16 °C in June to 29 °C in February.

### 1.3.3 Hydrogeology

Ravensthorpe wellfield is located in a region of fractured Archaean granitic rocks, dominated by massive, coarse-grained tonalite and quartz diorite (Manyutup Tonalite). At the site of production bore 11/97 the tonalite consists predominantly of coarse-grained equi-granular Na-Ca-feldspar, quartz, hornblende and biotite, with ferro-magnesian minerals comprising 5-15% of the rock. Other accessory minerals include magnetite, ilmenite and apatite. Bore 13/97 is situated in a region of medium-grained quartz diorite with abundant dark minerals (Rockwater, 1998).

Numerous air-photo lineaments (possibly shear zones) cross the area, generally striking north-south or north-east to south-west. Bore 11/97 is adjacent to a creek that follows a north-easterly trending lineament, and intersected large water-bearing fractures in the granite.

## 1.4 Future water supply requirements

Demand, driven largely by BHP Billiton's new nickel mine, is expected to reach 100 000 kL by the year 2025. The total source yield from Dam No. 4 and the wellfield is inadequate to meet current and future demands (Sweet, In prep.). Additional source capacity is therefore needed in the short term and long term for the Ravensthorpe TWS.

## 1.5 Alternative water sources

In 1997, the feasibility of developing an aquifer storage and recovery (ASR) site in the vicinity of the Cordingup Dam (Dam No. 3) was assessed. The aim was to collect surface water runoff during winter months and inject into the local aquifer system for later use during drier summer months. In this way groundwater supply would be maximised and its quality improved. Three options were put forward but to date have not been pursued.

In 2005, exploration sites were selected for additional fresh to saline groundwater which could be used as feed-water for additional RO capacity to supplement the TWS (Rockwater, 2005). The Corporation is currently investigating these sites. Some additional source capacity may also be possible using bores 1/05, 2/05 and 3/05 which have not yet been commissioned.

Should insufficient additional groundwater capacity be available in the Ravensthorpe area, then transfers from outside the region may have to be considered. One possibility is supply of water from the Hopetoun wellfields.

### 1.5.1 Existing water source protection

No Water Reserve for the Ravensthorpe wellfield has been proclaimed under the *Country Areas Water Supply Act 1947* for the purpose of protecting the public drinking water source from potential contamination. Advice received from hydrogeologists suggests the best approximation for the wellfield recharge area is the surface water catchment for Dam No. 3. Due to the underlying layer of fractured rock, seepage of surface water supplies water to the bores. Therefore, the suggested area for the Water Reserve is the natural catchment area for the old Dam No. 3 (Figure 2).

Assignment of the priority classification areas and wellhead protection zones within the Water Reserve will occur in the future through development of a related Drinking Water Source Protection Plan by Department of Water (DoW). Refer to Appendix 1 for a description of DoW's approach to drinking water protection and protection zone system. Advice on the status of the Plan can be obtained from DoW's Water Source Protection Branch.

### 1.5.2 Current allocation licence

Water resource use and conservation in Western Australia is administered by DoW 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 Ravensthorpe Groundwater Scheme is not located within a proclaimed groundwater area and currently does not require licensing. Additionally, the surface water allocation licence for Ravensthorpe Town Water Supply Scheme was cancelled in 2004 because the dams do not impound natural stream flow.

The current number of services in Ravensthorpe supplied with drinking water is 261 (April 2006). In 2004/05 77 920 kL was supplied from the Ravensthorpe scheme and an additional 9 877 kL was carted in from Esperance and Lake Grace.

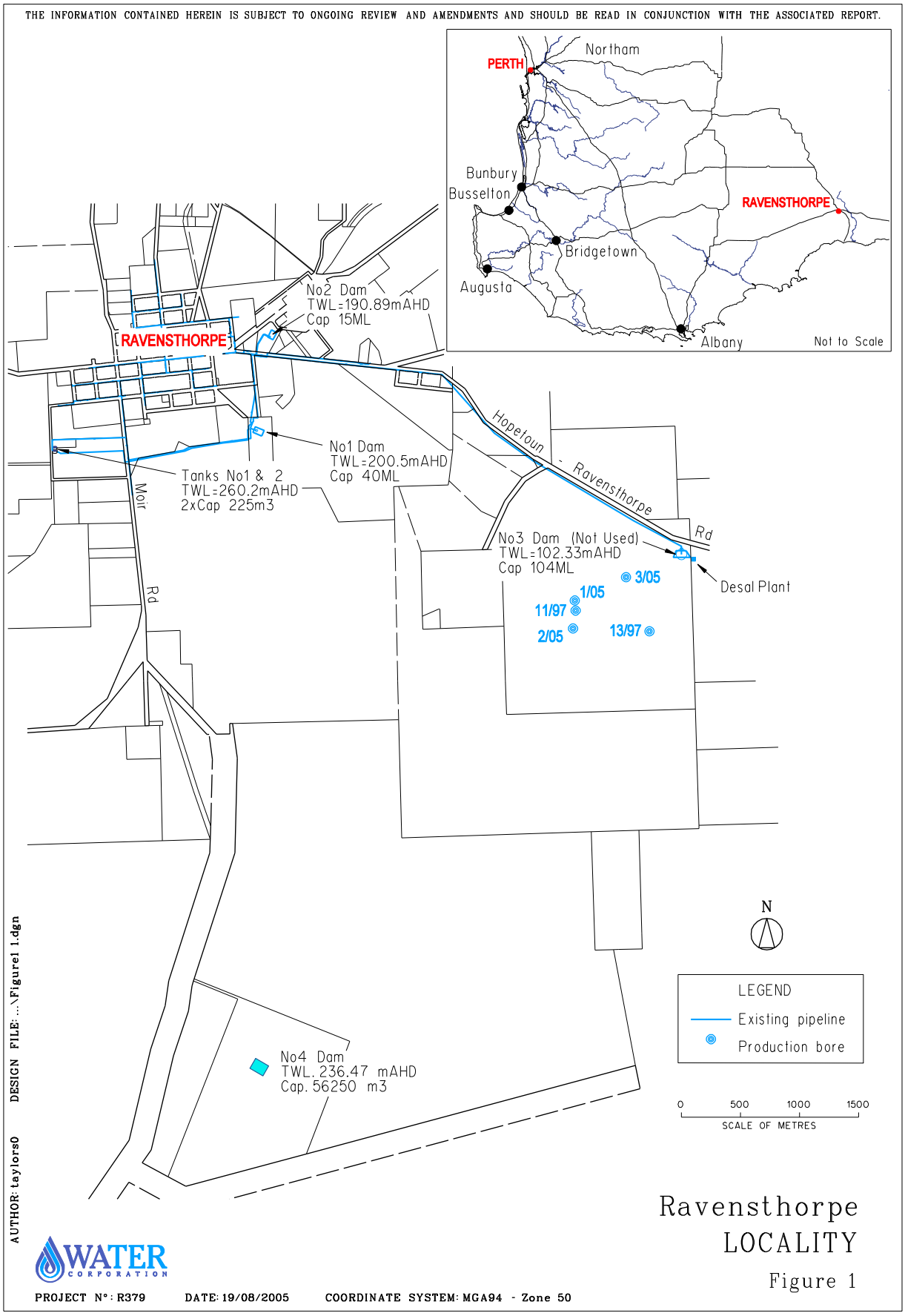


**Figure 1 Ravensthorpe locality**

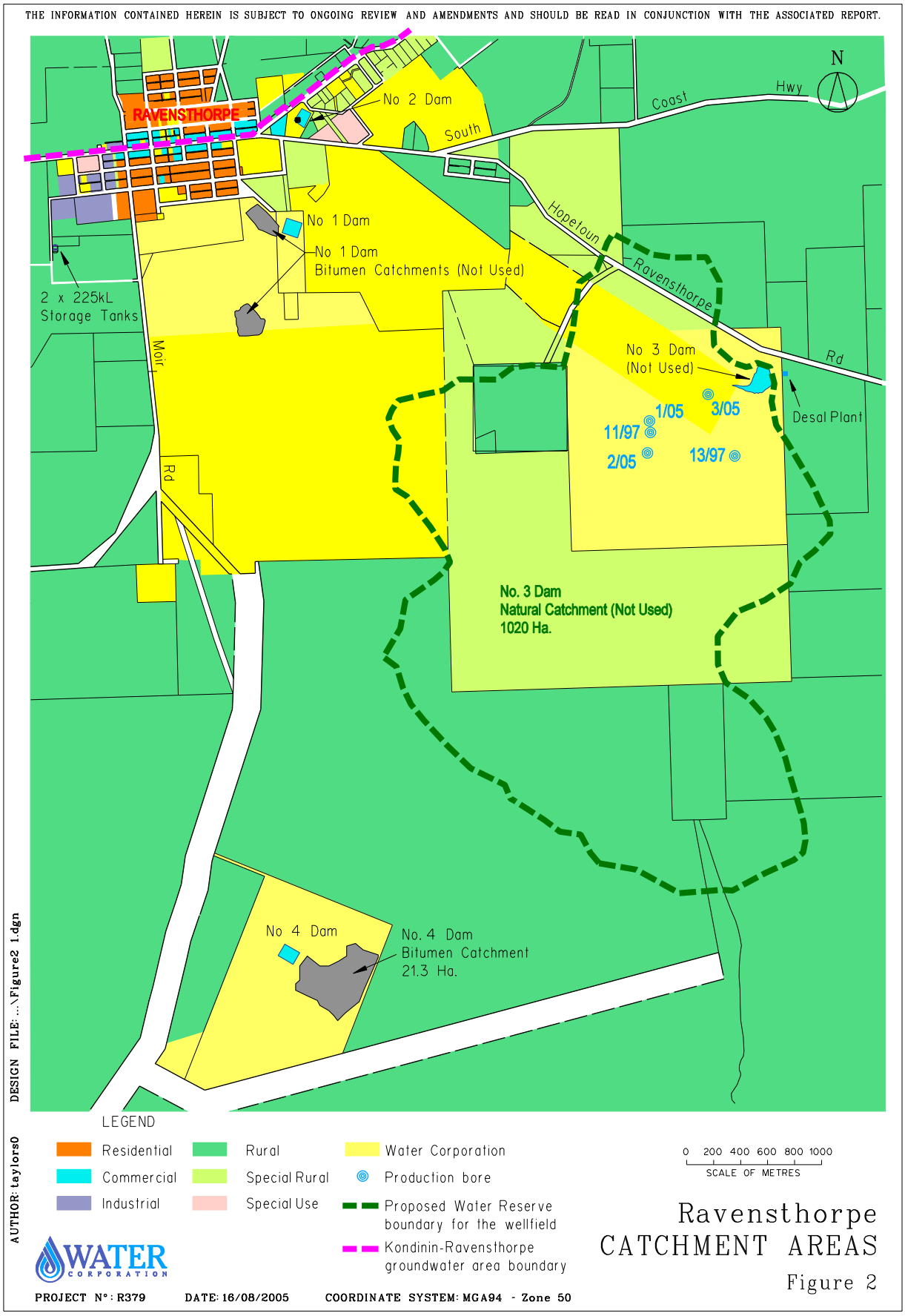


**Figure 2 Ravensthorpe catchment areas**

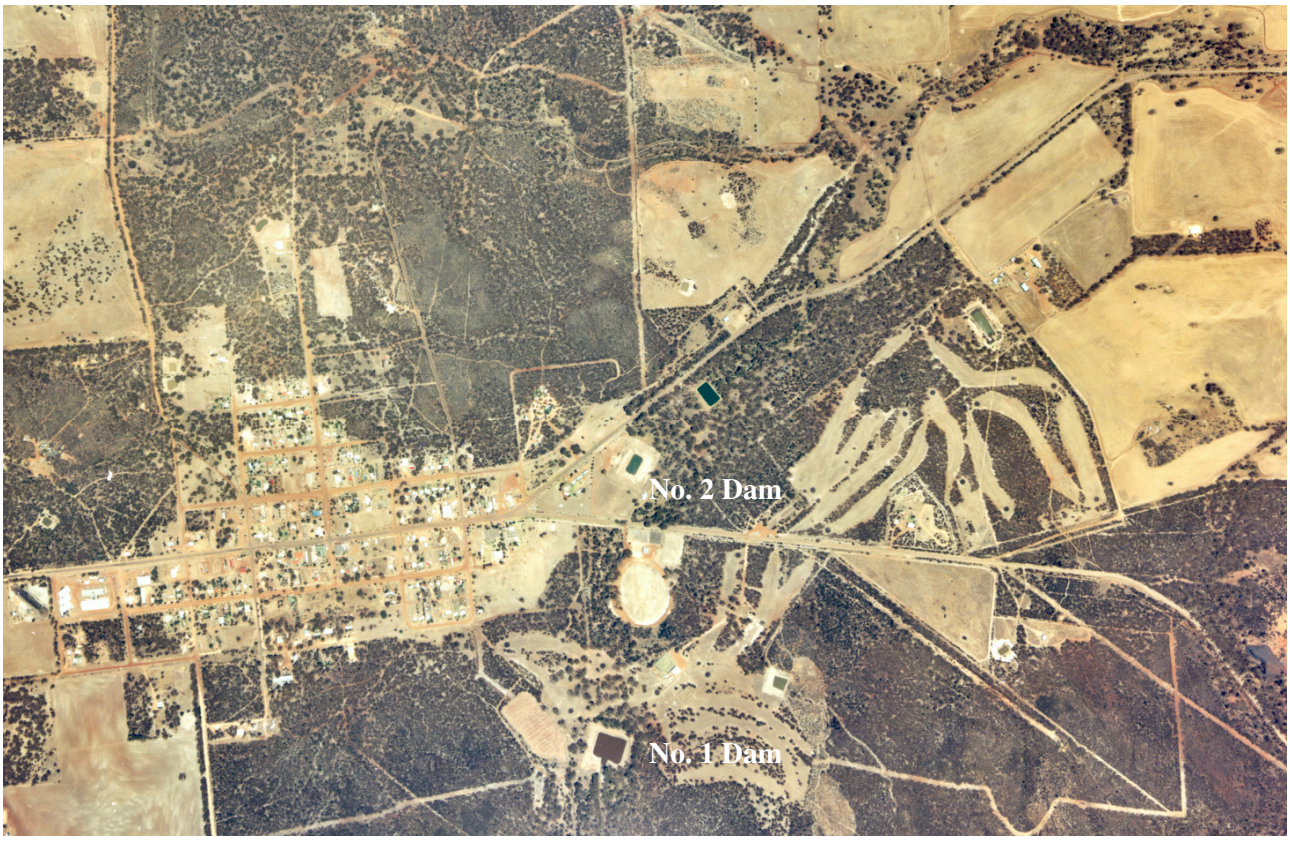


**Photo 1 Ravensthorpe town site and Dam Nos 1 and 2**

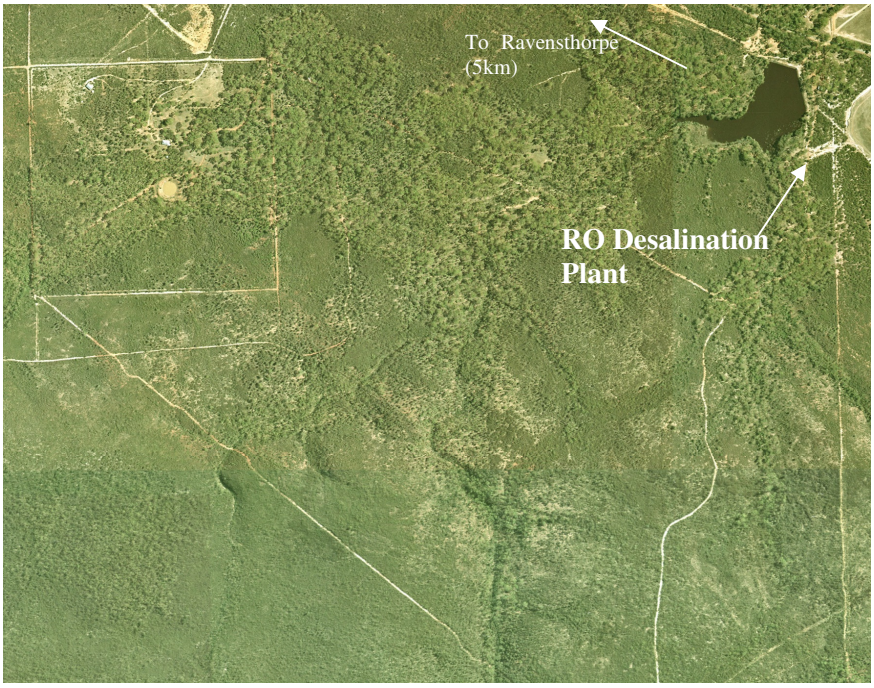


**Photo 2 Dam No 3 (also known as Cordingup)**


**Photo 3 Ravensthorpe Dam No 4 catchment**

# 2 Water quality

The quality of raw water from Dam No. 4 is monitored in accordance with the Australian Drinking Water Guidelines (ADWG) and the program set out in the Ravensthorpe Water Resources Management Operation Strategy (Water Corporation, 2000). Dam No. 4 is regularly monitored for microbiological contamination, health related chemicals and aesthetic chemicals and parameters. Raw bore water quality is not currently monitored; however, once passed through the desalination plant, bore water is stored in Dam No. 2 where water quality is monitored prior to final treatment and distribution.

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

Salinity levels observed in the bores when drilled in 1997 were 13 000 mg/L in bore 11/97 and 4 050 mg/L in bore 13/97. The groundwater also had elevated levels of iron, sodium, hardness, chloride and sulphate exceeding guideline values. There has been no further testing of raw bore water quality since.

High thermotolerant coliform counts, which are indicators of faecal contamination, have regularly been detected in the raw water in the two dams. Salinity levels in the dams are generally within the ADWG guideline values, with the exception of an isolated elevated result at Dam No. 2. Dam water generally has elevated hardness, turbidity, colour, iron, manganese and aluminium with pH exceeding the ADWG aesthetic guideline values.

The water quality of the treated water supplied to the town is generally of good quality complying with ADWG microbiological, health and aesthetic requirements.

Summary details of raw water quality from Dam No. 2 and Dam No. 4 are shown in Appendix 2.

# 3 Hazard identification and risk assessment

Hazards associated with existing and proposed land uses and activities in the wellfield recharge 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 2004 recommendations (Water Corporation, 2003). DoW 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.

## 3.1 Existing land uses

The wellfield recharge area is approximated by dam No. 3 catchment which has 50% of its catchment located on Crown Land and 50% located on private property.

The recharge area is situated adjacent to a rifle range and private farming land used predominately for stock grazing and cropping. The catchment area also includes a disused quarry. The local shire tip, situated approximately 1.5km east of the catchment, is not expected to impact on wellfield water quality, but may have a local impact on environmental water quality.

An assessment of the identified existing land uses and activities and the associated hazards in the wellfield catchment are detailed in Table 1.

## 3.2 Proposed land uses

Land uses and activities in the catchment are not expected to change in the short term. Residential expansion is anticipated along the southern side of the Hopetoun – Ravensthorpe Road infringing on the wellfield catchment to the east of the existing township. Expansion of the industrial area south of South Coast Highway towards the wellfield is expected in the long term and is linked with mining operations.

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

**Table 1 Drinking Water Quality Risk Assessment**

| Land Use / Activity | Hazard Event / Source | Hazard[1] | Catchment Management Priority[2] | Considerations | Current Catchment Preventative Strategies |
|---|---|---|---|---|---|
| Residences | Septic Systems | Pathogens & Nutrients | Low | There are currently no residences within the catchments, however, residential development is planned which may impact upon the wellfield if not sewered. | Water Quality Monitoring |
| | Household Chemicals and waste | Hydrocarbons Chemicals | Low | | |
| Quarry | Machinery | Hydrocarbons Chemicals | Low | Located within dam No. 3 catchment, the quarry has been used in the past for granite, and has the potential to be used, and expanded in the future. This may have impacts on groundwater. | Water Quality Monitoring<br>Filtration |
| | Clearing and removal of granite | Turbidity | Low | | |
| Recreational Site Access | Off-road use of vehicles | Hydrocarbons | Low | Fencing and signage will deter some, but not all people entering. Signage needs to be updated. Effective surveillance of the site will be difficult. | Water Quality Monitoring<br>Community Education<br>Review Signage to SG 111 |
| | | Turbidity | Low | | |
| Fire - Controlled and Wildfire | Erosion from fire breaks and stripping of vegetation | Turbidity | Low | FESA is responsible for fire management in the reserve surrounding the catchment. | Bush Fire Regulations<br>Water Quality monitoring<br>Filtration |
| Roads | Transport of goods<br>Erosion and Runoff<br>Accidents and Spills | Hydrocarbons Chemicals | Low | Road usage is estimated at 300 vehicles per day with seasonal variances. | Water quality monitoring<br>HAZCHEM procedures<br>HAZMAT Emergency response Procedures |
| Rifle Range | Disposal of bullets | Lead | Low | Controlled by the Shire and used as a pistol club. | 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 4 Natural vegetation within the Ravensthorpe catchment**


**Photo 5 Fencing and gates at dams**

# 4 Conclusion

The current risks to water quality from land uses and activities within the Ravensthorpe wellfield have been identified and assessed.

No Water Reserve for the Ravensthorpe wellfield has been proclaimed under the *Country Areas Water Supply Act 1947* for the purpose of protecting the public drinking water source from potential contamination. The proposed area for the Water Reserve is the topographical catchment of the wellfield.

Land use activities in the proposed Water Reserve include recreation, a granite quarry, Ravensthorpe – Hopetoun Road, a rifle range and a planned residential development. All activities in the proposed Water Reserve are not considered to pose a significant risk to water quality and have been rated a ***Low*** management priority.

Risks identified in this document, and any raised in future public consultation processes, will be further considered during development of the Ravensthorpe Water Reserve 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 DoW'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, DoW and DoH.

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# 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. |
| **DoW** | Department of Water (formerly Department of Environment) |
| **DoH** | Department of Health |
| **DWSPA** | Drinking Water Source Protection Assessment |
| **DWSPP** | Drinking Water Source Protection Plan |
| **HAZMAT** | Hazardous Materials |
| **Health Related Chemical** | Water quality characteristic that may pose a health risk to consumers. |
| **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. |
| **Pesticides** | Collective name for a variety of insecticides, fungicides, herbicides, algaecides, fumigants and rodenticides used to kill organisms. |
| **PDWSA** | Public Drinking Water Source Area |
| **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. |
| **Water Quality** | The physical, chemical and biological measures of water. |

# Appendices

**Appendix 1** DoW - 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** DoW -Water Quality Protection Note:
Protecting Public Drinking Water Source Areas.

## Appendix 1 DoW WQPN Land use compatibility in Public Drinking Water Source Areas

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

July 2004

Water Quality Protection Note

Department of Environment

# 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 DWSPP or agreed in specific *Land Use and Water Management Strategy* documents. Currently there are 45 DWSPPs available to guide land use planning decisions in PDWSAs, and (nearly 100) others are in development. 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 **Diagram 1: Assessment of potential priority classification areas and protection zones** (overleaf).

## Compatibility of land uses within PDWSAs

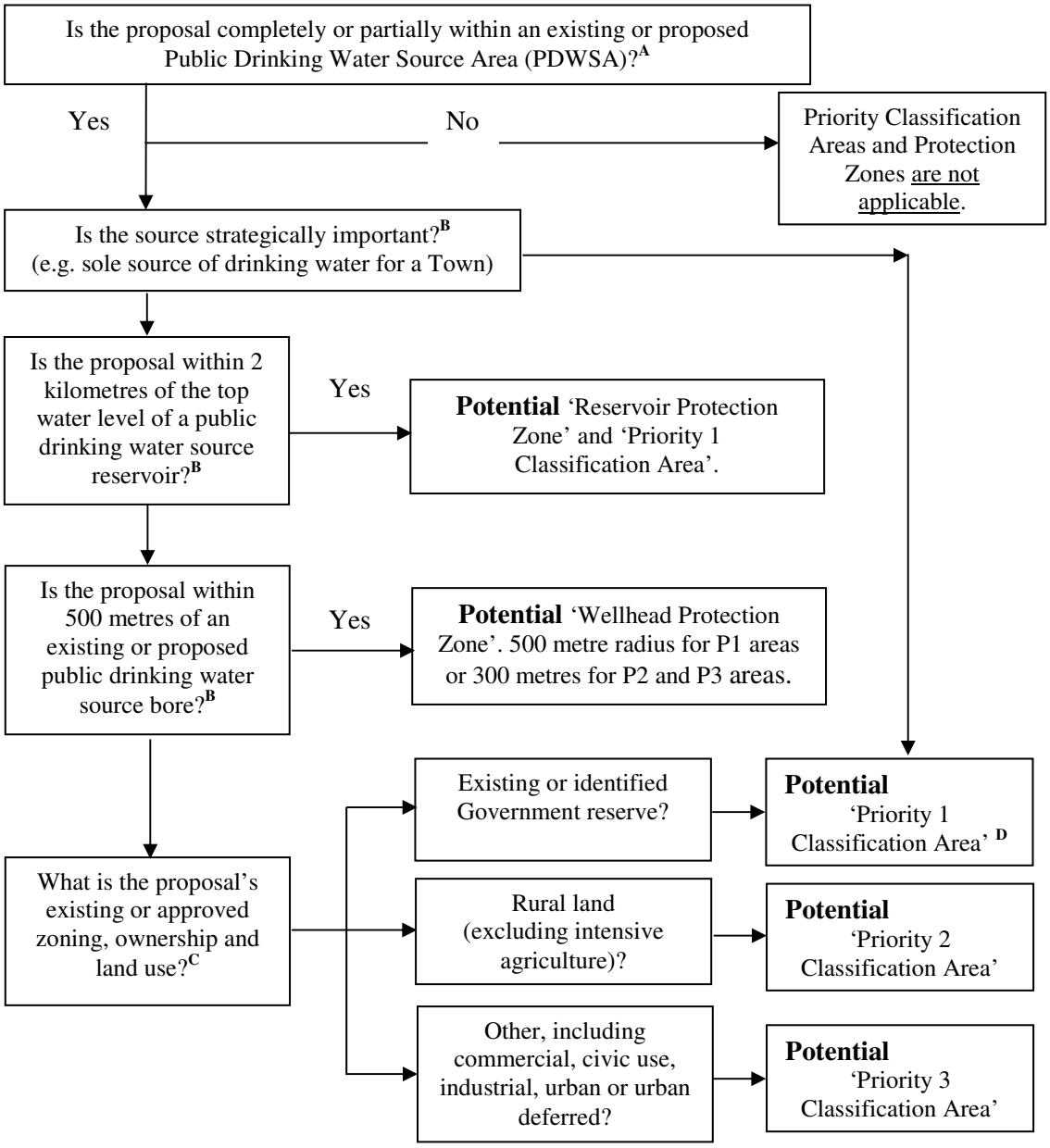
The tables in this note have been prepared for use by local governments, State planners and other agencies as a basis for regulating land use within PDWSAs. The note complements the Western Australian Planning Commission's *Statement of Planning Policy Number 2.7 (June 2003) Public Drinking Water Sources*. 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 scours) | 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.

Department of Environment

Level 2, Hyatt Centre
3 Plain Street, East Perth
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# Appendix 2 Water Quality

The Water Corporation has monitored the raw (source) water quality from Ravensthorpe in accordance with the Australian Drinking Water Guidelines (ADWG) and interpretations agreed to with the Department of Health. The raw water is regularly monitored for:

- **Health related characteristics**
  - Microbiological Contaminants
  - Health Related Chemicals
- **Aesthetic characteristics** – (Non-Health Related)

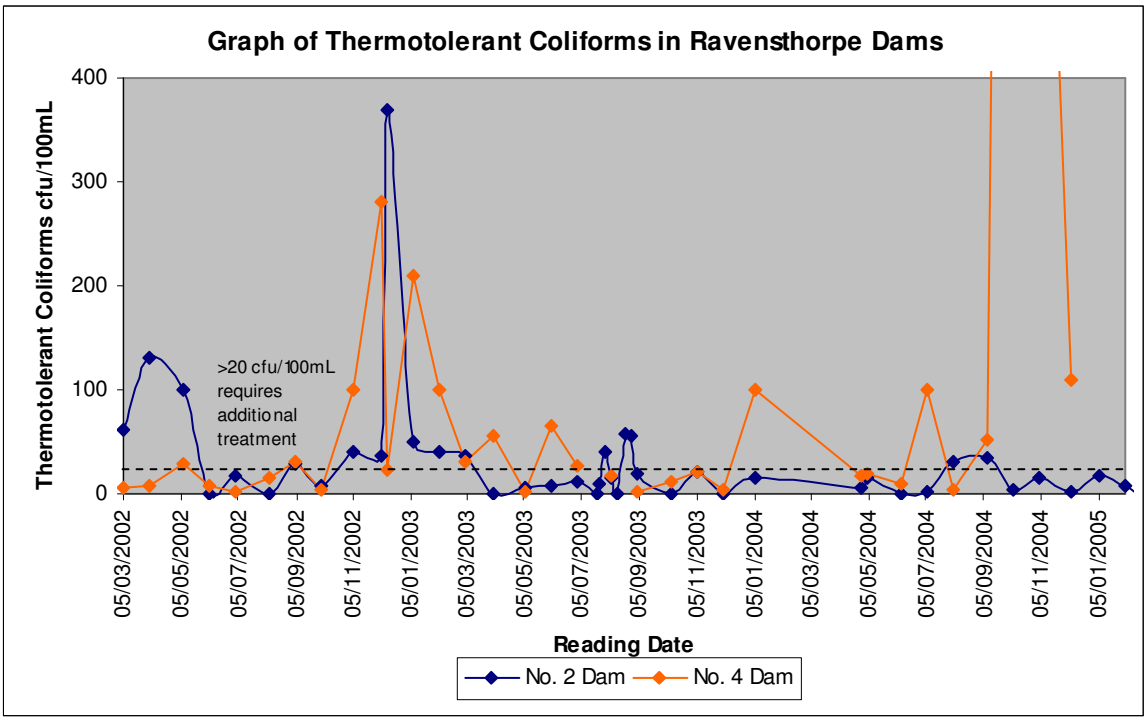
Following is data representative of the quality of raw water from Dam No. 4 and preliminary treated Dam No. 2 water. In the absence of specific guidelines for raw water quality, the results have been compared with ADWG values set for drinking water. Results that exceed ADWG have been shaded to give an indication of potential raw water quality issues associated with this source.

It is important to appreciate that this water data presented **does not** represent the quality of drinking water distributed to the public. Following treatment the drinking water supplied to Ravensthorpe complies with ADWG for microbiological, health and aesthetic parameters. For more information on the quality of drinking water supplied refer to the most recent Water Corporation Drinking Water Quality Annual Report at <http://www.watercorporation.com.au/dwq/index.cfm>.

## MICROBIOLOGICAL CONTAMINANTS

Microbiological testing of water samples from Ravensthorpe Dams No. 2 and No. 4 has been conducted on a monthly basis since March 2002. No raw bore water has been sampled; however, Dam No. 2 is a mix of raw bore water and treated (colour, turbidity and pH) Dam No. 4 water.

Thermototolerant coliform counts were recorded in 88% and 95%, of samples from Dams No. 2 and No. 4, respectively. Of these 62% and 50%, respectively were above 20 cfu/100ml. The thermotolerant coliform data for the two dams is presented in the graph below. High concentrations of thermotolerant coliforms are generally associated with contamination of the water sources with faecal matter from the catchments.



## HEALTH RELATED CHEMICAL WATER QUALITY DATA

Health related water quality analyses for water from Ravensthorpe Dam No. 2 and Dam No. 4 sources are summarised in the following table. Dam No.4 collects water from a bitumen catchment. Dam No. 2 is a blended supply of desalinised bore water and treated (colour, turbidity and pH) Dam No. 4 water. Health related water quality parameters that have been measured at detectable levels in the sources since January 1980 are summarised in the following tables. All values are in milligrams per litre (mg/L) for inorganic chemicals and micrograms per litre (µg/L) for organic chemicals. Bolded values exceed ADWG (1996) guideline values.

| Parameter | Range of monitored values<br>Min-Max<br>Median | | 1996 ADWG Health Guideline Value ^ |
|---|---|---|---|
| | Dam No. 2 | Dam No. 4 | |
| **Metals** | | | |
| Barium | 0.01 - 0.03<br>0.014 | 0.0085 - 0.04<br>0.025 | 0.7 mg/L |
| Boron | 0.16 - 0.64<br>0.44 | ND - 0.04<br>0.03 | 4 mg/L |
| Manganese (unfiltered) | ND - 0.14<br>0.006 | ND - 0.34<br>0.006 | 0.5 mg/L |
| **Inorganic** | | | |
| Fluoride | ND - 0.2<br>ND | ND - 0.2<br>ND | 1.5 mg/L |
| Nitrate + Nitrite (as N) | ND - 0.115<br>ND | ND - 0.205<br>ND | 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.

ND is Not Detected

The raw water complies with the ADWG (1996) health guideline values.

## AESTHETIC WATER QUALITY DATA

Aesthetic water quality analyses for water from Ravensthorpe Dam No. 2 and Dam No. 4 sources are summarised in the following table. Dam No.4 collects water from a bitumen catchment. Dam No. 2 is a blended supply of desalinised bore water and treated (colour, turbidity and pH) Dam No. 4 water. The values are taken from ongoing water monitoring for the period November 1999 to April 2005. All values are in milligrams per litre (mg/L) unless stated otherwise. The water quality parameters that have on occasion exceeded the ADWG aesthetic guidelines for supplied drinking water are bolded.

| Parameter | Range of monitored values<br>Min-Max<br>Median | | 1996 AWDG Health Guideline Value ^ |
|---|---|---|---|
| | Dam No. 2 | Dam No. 4 | |
| Salinity (TFSS less $CO_2$) | 217 - **1119**<br>624 | 114 - 614<br>231 | 1 000 mg/L |
| Hardness ($CaCO_3$) | 60 - **545.5**<br>**220.2** | 27.6 - **284.1**<br>58 | 200 mg/L |
| Turbidity | 1.1 - **11**<br>3.4 | 0.6 - **130**<br>**9** | 5 NTU |
| pH | 6.77 - **9.27**<br>7.705 | 6.8 **- 9.01**<br>7.41 | 6.5-8.5 |
| True Colour | ND - **290**<br>4 | ND - **17**<br>9 | 15 TCU |
| Iron (unfiltered) | ND -**7**<br>0.134 | ND – **1.0**<br>0.22 | 0.3 mg/L |
| Manganese (unfiltered) | ND - **0.14**<br>0.006 | ND - **0.34**<br>0.006 | 0.1 mg/L |
| Aluminium (unfiltered) | 0.07 – **1.8**<br>**0.3** | 0.06 – **2.4**<br>**0.48** | 0.2 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.

ND is Not Detected

The water from Dam No. 2 and Dam No. 4 generally has elevated hardness, turbidity, colour, iron, manganese and aluminium with pH exceeding the ADWG aesthetic guideline values on one or more occasions. High turbidity and colour is generally associated with rainfall events, when large volumes of silt are transported from the catchment into the Dams. High levels of aluminium may be associated with the bulk dosing of alum used to reduce turbidity levels before supply as drinking water. Dam No. 2 also has an elevated salinity level which may be attributed to the proportion of the water supplied from the wellfield which still contains levels of dissolved solids after passing through the RO plant.

# 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<br>State Forest<br>Unallocated | *Acceptable with best management practices*<br>• Encourage government agency that manages the land to include provisions for water quality protection.<br>• Review agency management plans regularly to ensure water quality protection objectives met.<br>• Inspect protection measures on-site. |
| Timber Production (State Forest) | *Acceptable with best management practices*<br>• Ensure compliance with the Contractor's Timber Harvesting Manual for water quality protection.<br>• Review 1 year and 5 year harvesting plans to ensure water quality protection objectives are met.<br>• Inspect protection measures on-site. |
| Apiarists<br>Wildflower picking<br>Seed collection<br>Firewood collection | *Acceptable activity with conditions*<br>• Activities to be restricted to outside proposed RPZ and away from feeder streams.<br>• Apply conditions for Apiarists, Wildflower Picking and Seed collection that meet water quality protection objectives.<br>• Promote casual firewood collection areas outside catchment area.<br>• Firewood collection is not authorised in vested Reserves. |
| Roads | *Acceptable with best management practices*<br>• Review road maintenance practices and develop a plan to minimise risk to water quality.<br>• Conduct risk assessment survey for transport of fuel and chemicals. Place signs along road with an emergency contact number for spills.<br>• Construct sumps at major stream crossings.<br>• 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 | *Unacceptable activity*<br>• Remove site as a destination in CALM "4WD Days Out of Perth" publication.<br>• Recognise activity in regional recreation plan and look at alternative sites. Encourage involvement in organised events.<br>• Use signage to promote awareness that off-road driving is not permitted.<br>• Undertake surveillance to control off-road driving in the catchment. |
| Bushwalking | *Acceptable activity with conditions*<br>• Ensure trails outside RPZ, away from streams feeding into reservoir, and cross-streams where culverts and / or bridges are established.<br>• 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>.<br>• Promote bushwalking opportunities as part of a regional recreational plan.<br>• Use signage as education tool.<br>• Undertake surveillance.<br>• Require organised groups to obtain approval for events |
| Picnicking | *Acceptable activity with conditions*<br>• Locate picnic sites outside the proposed RPZ.<br>• Promote use of controlled picnic away from watercourses.<br>• Promote picnicking opportunities as part of a regional recreational plan.<br>• Prohibit dogs through education/signs, promotional material and surveillance.<br>• Compliance with DoE's Recreation Policy available via <www.environment.wa.gov.au>. |
| Horse riding events | *Acceptable with Best Management Practices*<br>• An environmental management plan developed for each event, addressing water quality protection measures. Approval for each event subject to implementation and review of plan.<br>• Camping will be restricted to specific sites as developed in regional recreation plan.<br>• All events to be staged on roads and trails. Stream crossings to be on made roads at culverts or bridges.<br>• Monitor existing events to identify water quality risks to be addressed in the environmental management plan.<br>• No new events to operate in the catchment.<br>• Refer to Environmental Guidelines for Horse Facilities and Activities, available via <www.environment.wa.gov.au >. |

| Activity | Recommended Protection Strategies |
|---|---|
| Hunting | *Unacceptable activity*<br>• Catchment to be closed to hunting through the CAWS Act and MWSSDB 1909 By-Laws.<br>• Place signs throughout catchment indicating uncontrolled hunting is illegal.<br>• Undertake surveillance of the catchment.<br>• Control feral animal through managed program. |
| Swimming | *Unacceptable activity*<br>• Increase public awareness that swimming is prohibited under the CAWS Act By-laws.<br>• Signs in the catchment<br>• Undertake surveillance & by-law enforcement.<br>• Compliance with DoE's Recreation Policy, available via <www.environment.wa.gov.au>. |
| Fishing<br>Marroning | *Unacceptable activity*<br>• Increase public awareness that fishing and marroning is prohibited under the CAWS Act By-laws.<br>• Place signs throughout catchment indicating fishing and marroning is not permitted.<br>• Undertake surveillance & by-law enforcement.<br>• Signs in the catchment<br>• Compliance with DoE's Recreation Policy, available via <www.environment.wa.gov.au>. |
| Boating | *Unacceptable activity*<br>• Increase public awareness that boating is prohibited under the CAWS Act By-laws.<br>• Undertake surveillance & by-law enforcement.<br>• Signs in the catchment<br>• Compliance with the DoE's Recreation Policy available via <www.environment.wa.gov.au>. |
| Motor vehicle rallies<br>Including:<br>Rally Australia<br>Motor bike events | *Acceptable with best management practices*<br>• No new rallies to operate in the catchment.<br>• 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 | *Acceptable activity with conditions*<br>• Restrict military training to outside of the RPZ.<br>• Ensure approval for military activities contains conditions for water quality protection.<br>• Undertake discussions with military to investigate the use of alternative areas.<br>• Undertake surveillance to ensure compliance with approval. |
| Water supply construction | *Acceptable with Best Management Practices*<br>• Ensure water quality risk addressed in EMP.<br>• Work with contractors on-site and advice on issues related to water quality protection.<br>• Monitor turbidity and undertake remediation if monitoring shows adverse impact. |
| ***Private Land (P1 source protection)*** | |
| | *Long term goal of crown ownership of private land*<br>• Landowners can continue current activities with best practices being encouraged (refer to Quality Protection information. <www.environment.wa.gov.au>)<br>• Oppose intensification of land uses through planning approval process.<br>• 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<br>Tree farming<br>Viticulture | *Acceptable with best management practices*<br>• Landowners continue current activities with best practices being encouraged (refer to Quality Protection information <www.environment.wa.gov.au>)<br>• Ensure Town Planning Scheme adequately controls development.<br>• Oppose intensification of land uses through planning approval process.<br>• Promote water quality protection. |
| Land clearing<br>for broadacre farming<br>in Clearing Control Catchments | *Manage as non-conforming land use*<br>• Landowner can continue current activities (consistent with *Environmental Protection Act 1986* and *Country Area Water Supply Act* 1947 approvals), with best management practices being encouraged<br>• Continue to support changes in land use within existing approvals that reduce salinisation.<br>• Oppose intensification of land uses through planning approval process.<br>• Continue re-vegetation initiatives under clearing control legislation. Land transferred to Crown ownership to be re-vegetated. |

| Activity | Recommended Protection Strategies |
|---|---|
| Rural residential | *Maintain existing planning controls*<br>• Ensure the Special Provisions for the Rural Residential Zone control development.<br>• Encourage landowners to adopt best management practices for permitted activities (refer to Quality Protection information <www.environment.wa.gov.au.>).<br>• Oppose intensification of land use through planning approval process.<br>• Support changes within existing approvals that reduce groundwater contamination risks.<br>• Encourage connection to deep sewerage through planning approval process.<br>• Promote water quality protection. |
| Rural development<br>Including:<br>Special rural zones<br>Rural retreats<br>Hobby farms<br>Cottage industries<br>Chalets<br>Bed and breakfasts and farmstays | *Conditional with best management practices*<br>• Landowners can continue current activities with best practices being encouraged (refer to Quality Protection information <www.environment.wa.gov.au>).<br>• Ensure Town Planning Scheme adequately controls development.<br>• Oppose intensification of land uses through planning approval process. |
| ***Private Land - (P3 source protection)*** | |
| | *Acceptable with controls*<br>• Landowners can continue current activities, with best practices being encouraged (refer to Quality Protection information <www.environment.wa.gov.au>.<br>• Ensure Town Planning Scheme adequately controls development.<br>• Further subdivision and land use to be consistent with water quality objectives.<br>• Oppose incompatible land uses through planning approval process.<br>• Encourage connection to deep sewerage through planning approval process. |
| Power stations | *Manage as non-conforming land use*<br>• Landowner can continue current activities, with best management practices being encouraged.<br>• Support changes in land use within existing approvals that reduce groundwater contamination risks. |
| Disused depots<br>Including:<br>Water Corporation<br>Western Power<br>Shire | *Unacceptable in current condition*<br>• Remove all infrastructure and contaminant threats including septic system and decontaminate site.<br>• Return site to natural bushland. |
| Rubbish disposal | *Unacceptable activity*<br>• Encourage local council to close site and undertake remediation to decontaminate site.<br>• Return site to natural bushland. |
| Horticulture | *Maintain existing planning controls*<br>• 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>).<br>• Oppose intensification of land use through planning approval process.<br>• Support changes in land use within existing approvals that reduce groundwater contamination risks. |
| Residential | *Acceptable activity with controls*<br>• Ensure Town Planning Scheme adequately controls development (refer to Quality Protection information <www.environment.wa.gov.au>).<br>• Encourage connection to deep sewerage through planning approval process.<br>• Further subdivision to be consistent with Draft Country Sewerage Policy 2003.<br>• Promote water quality protection. |
| Industrial and commercial sites. | *Acceptable activity with controls*<br>• 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>).<br>• Oppose intensification of land use through planning approval process (eg those activities not acceptable in P3 areas).<br>• Support changes in land use within existing approvals that reduce contamination risks. |

# Appendix 4 DoW WQPN Protecting Public Drinking Water Source Areas

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

Water Quality Protection Note

Department of Environment

# 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 DWSPP 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 DWSPP (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

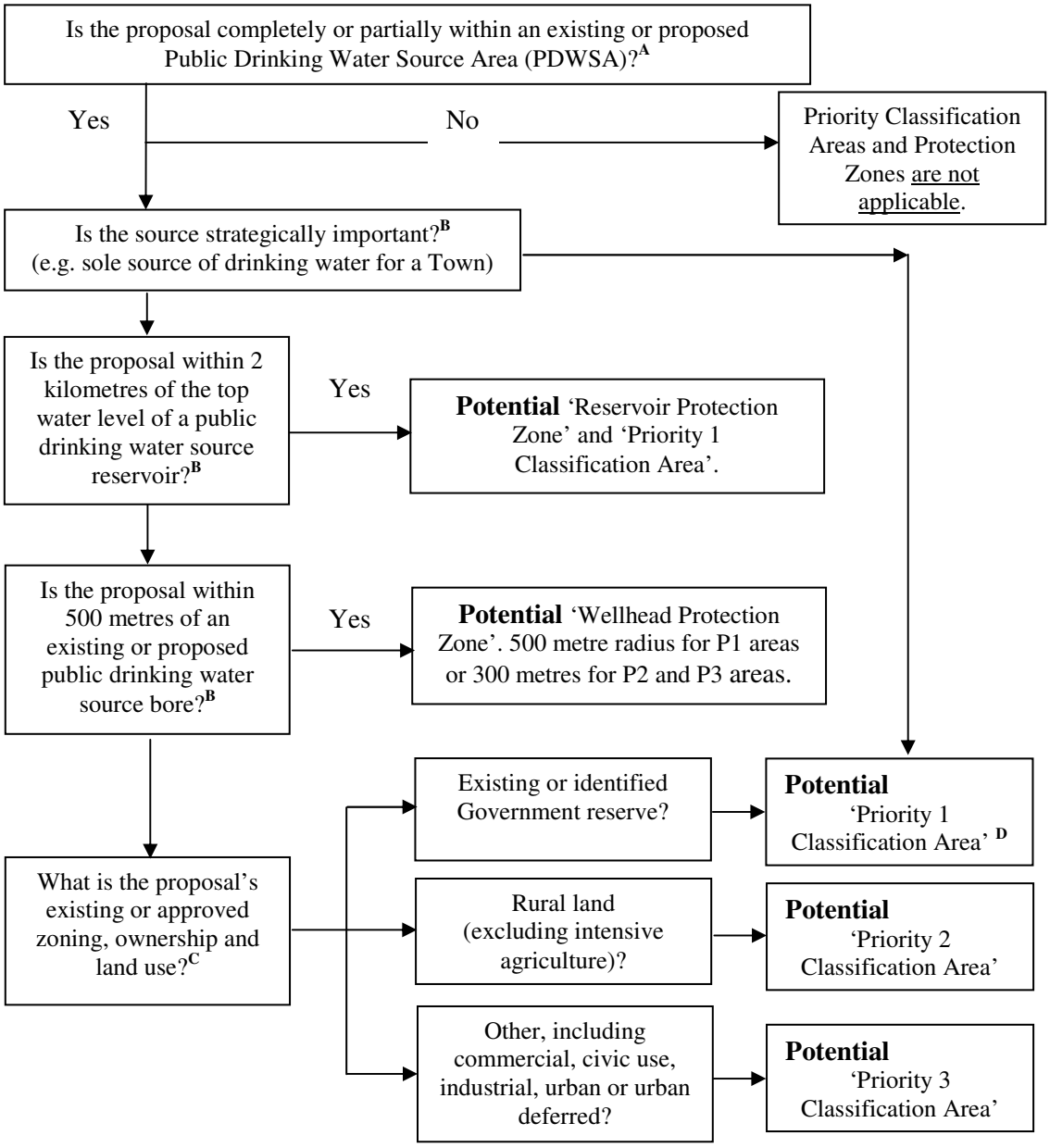
As noted above, reservoir protection zones (RPZ) are also defined to protect the surface water source from contamination in the immediate vicinity of reservoirs. Reservoir protection zones consist of up to a 2 kilometre buffer around the top water level of a reservoir and includes the reservoir itself. 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 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 DoW's Drinking Water Source Protection Assessments and Plans or through your regional DoW 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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