GOVERNMENT OF
WESTERN AUSTRALIA

# NORTHAMPTON WATER RESERVE
# WATER SOURCE PROTECTION PLAN

## Northampton Town Water Supply

WATER RESOURCE PROTECTION SERIES

WATER AND RIVERS COMMISSION REPORT WRP 28
2000



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*Cover Photograph: Northampton landscape taken by Kim Griffin*

# NORTHAMPTON CATCHMENT AREA WATER SOURCE PROTECTION PLAN

Northampton Town Water Supply

Prepared under the direction of
Water and Rivers Commission
Policy and Planning Division
by the Water Quality Protection Branch

WATER AND RIVERS COMMISSION
WATER RESOURCE PROTECTION SERIES
REPORT NO.WRP 28
2000

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# Foreword

## Water Source Protection Plans

Water Source Protection Plans establish the level of protection required in Water Reserves. The plans identify sources of contamination that should be investigated and set out programs for management of the resource. Water Source Protection Plans are developed in consultation with affected landowners and industry groups and relevant Government agencies.

Proclaiming Water Reserves under the *Country Areas Water Supply Act (1947)* protects the quality of water sources in country Western Australia. The Act's by-laws enable the Water and Rivers Commission to control potentially polluting activities, to regulate land use, inspect premises and to take steps to prevent or clean up pollution.

The Water and Rivers Commission aims to work pro-actively with planning agencies to incorporate water protection in the land planning process. Decisions on land use zoning and subdivision applications have a significant impact on the protection of water sources. The Commission supports the amendment of Town Planning Schemes and Development Strategies that reflect land use compatible with Water Source Protection Plans.

This Water Source Protection Plan provides a basis for establishing compatible land uses within the Water Reserve at Northampton and is a mechanism for practical implementation of the Commission's protection strategies. Local government decision-makers, State planning authorities and operational staff are encouraged to recognise this document as a basis for ensuring the long term protection of this groundwater resource for generations to come.

## Water Quality Protection Framework

The Water and Rivers Commission is responsible for managing and protecting Western Australia's water resources. The Commission has developed policies for the protection of public drinking water source areas (PDWSAs) that include three levels of priority classification.

**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 the highest quality public drinking water is the prime beneficial land use. P1 areas would typically include land under Crown ownership. P1 areas are managed in accordance with the principle of risk avoidance and so land development is generally not permitted.

**Priority 2** (P2) source protection 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 in these areas. P2 areas are managed in accordance with the principle of risk minimisation and so some development is allowed under specific guidelines.

**Priority 3** (P3) source protection areas are defined to minimise the risk of pollution to the water source. P3 areas are declared over land where water supply sources need to co-exist with other 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. If the water source does become contaminated, then water may need to be treated or an alternative water source found.

In addition to priority classifications, wellhead protection zones are defined to protect the water source from contamination in the immediate vicinity of production wells and reservoirs. Wellhead protection zones are usually circular, with a radius of 500 metres in P1 areas and 300 metres in P2 and P3 areas. These zones do not extend outside the Water Reserve. Special conditions apply within these zones.

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# Summary

Northampton is situated on the Northwest Coastal Highway, approximately 50km north of Geraldton. The town water supply comes from nine Water Corporation production bores which abstract water from a fractured rock aquifer. This aquifer is recharged by the infiltration of rainfall and surface water runoff and is highly vulnerable to contamination.

The source has the potential to be contaminated from urban and agricultural land uses.

In view of the limited groundwater resources in the Northampton area, the Water Reserve should protect potential as well as existing sources for public water supply. The existing water reserve boundary should be retained and the area be classified for Priority 3 source protection.

Existing land uses are considered compatible with Priority 3 classification. Any development proposals which may affect the quality of the water source should be referred to the Water and Rivers Commission for comment.

This plan has undergone consultation during the development process. In preparing the draft plan, discussions were held with key stakeholders. The draft plan was released for comment to key stakeholders including the Water Corporation, Ministry for Planning, Department of Environmental Protection, Shire of Northampton, the local landcare group and Agriculture Western Australia. Comments received were considered and have been addressed in the preparation of this plan. The Shire and other key stakeholders will be briefed on the recommendations of the plan.

# 1. Introduction

Northampton is situated on the banks of the Nokanena Brook and straddles the North West Coastal Highway approximately 50km north of Geraldton in Western Australia (Figure 1). The area was first settled in 1842 after the discovery of copper at Wanerenooka and lead was discovered in the surrounding area six years later.

Mining ceased during the 1950s and the town now services local agriculture and functions as the administrative centre for the Shire of Northampton.

Land use in the Northampton area is predominantly broad hectare agriculture with wheat and barley as the dominant crops, and some livestock grazing.

Town water supply for Northampton is derived from groundwater abstracted from a series of Water Corporation production bores, most of which are located on agricultural land close to the town. The wellfield is located within the Northampton Water Reserve which was proclaimed in 1989 under the *Country Areas Water Supply Act (1947)* (see Figure 2).

Northampton had a population of approximately 3,000 in 1996, which is projected to increase to 3,300 by 2001 and 3,850 by 2011 (Western Australian Planning Commission, 1999).

# 2. Climate

Northampton is located on the northern limit of the semi arid Wheatbelt. The area experiences a Mediterranean climate with an annual average rainfall of 494 mm. 80% of the rainfall occurs between May and September. Evaporation data recorded at Nokanena indicates an annual average evaporation of approximately 2,400 mm.

# 3. Hydrogeology

## 3.1 Regional geology

The Northampton area is underlain by the Proterozoic Northampton Complex which comprises a suite of metamorphic rocks locally overlain by laterite and sandplain deposits. The local geology in the area immediately surrounding the town of Northampton consists of granulite which has been extensively intruded by north east-south west trending dolerite dykes (see Figure 3).

The crystalline geology and relatively shallow weathered profile of the Northampton area is not conducive to the development of extensive or high yielding aquifer systems (Bowyer, R., 1997). Groundwater flow is largely restricted to interconnected systems of fractures which have developed along dyke margins. Flow predictions in such a geological system are not well understood so finding high yielding, good quality water sources and defining recharge areas is difficult (Kern, 1986).

There is presently no data on the proportion of rainfall which recharges the fractured rock aquifer in this area. Groundwater monitoring data collected by a horticultural development in the area indicates seasonal ground water level fluctuation may exceed 10m and suggests that rapid aquifer recharge occurs as a result of rainfall, associated runoff and streamflow infiltration over the winter period.

Fractured rock aquifer systems are often highly vulnerable to contamination because of the small volume of groundwater in storage and potential for rapid movement of contaminants through fractures. The Northampton system is considered vulnerable to contamination from land uses in recharge areas as the aquifers are unconfined and the groundwater table is generally within 10m of the surface.

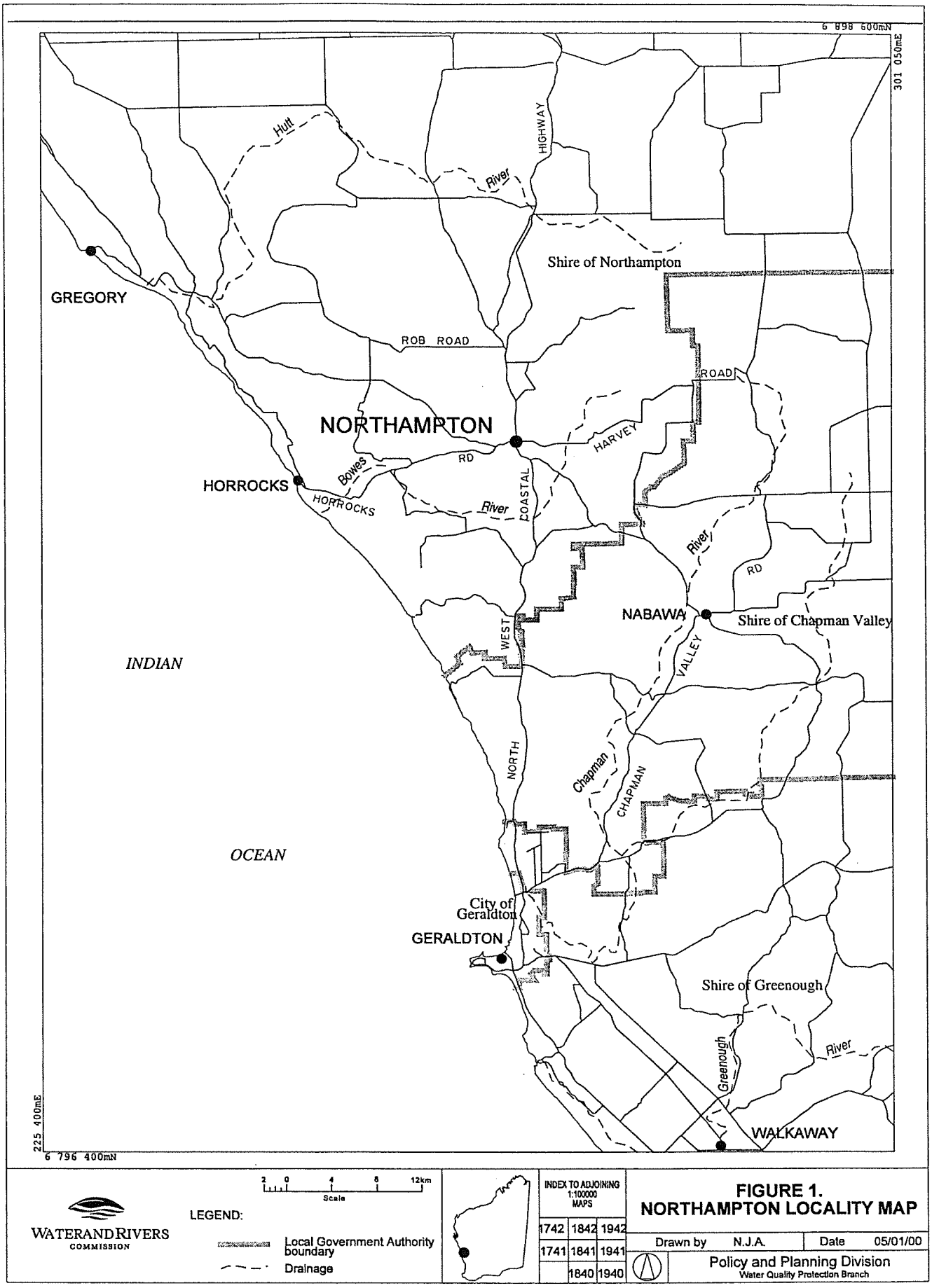


**Figure 1: Northampton locality map**

## 3.2 Northampton Wellfield

Northampton town water supply is supplied entirely by groundwater. The nine shallow town water supply production bores lie on or close to dyke margins. They pump water to a 2,500m$^3$ storage tank on Wanerenooka Hill where it is treated prior to reticulation. Abstraction for town water supply is conducted in accordance with Groundwater Well Licence No. 0055396 which permits a maximum annual abstraction of 350ML. The location of the production bores is indicated on Figure 2.

Until 1997, town water supply was supplemented by abstracting water from the disused Gwalla Shaft (see Figure 2). This was discontinued due to failure of the production casing and it is understood there are no plans to reinstate this source of supply. Replacement supplies are difficult to establish as groundwater resources are localised and high yielding well sites are difficult to identify.

Under the groundwater well licence, source water from the production bores is to be analysed annually for a range of water quality parameters. Production bore water levels are monitored at least monthly (Water Authority of Western Australia, 1987).

The reticulated supply is monitored regularly and its water quality meets guideline values. There is limited water quality data on individual production bores. This issue needs to be addressed because bores are vulnerable to contamination and the availability of high quality monitoring data is essential to reviewing scheme performance.

# 4. Land Uses - Existing and Proposed

## 4.1 Existing land use

Most of the land within the water reserve is privately owned and has been developed for broad hectare agriculture. Typical broad hectare cultivated crops include wheat, barley, lupin, peas and canola. Plate 1 illustrates typical land use surrounding the wellfield.

Most farms maintain livestock, primarily sheep. In addition to traditional broad hectare cultivation, some horticulture, viticulture, floriculture and orchard development has been recently established in the existing Water Reserve.

The residential development in the area is located in the centre of Northampton and is zoned as R20. Commercial and industrial enterprises such as mechanical servicing, hotels and shops are also established in the townsite. Lot size increases with distance from town. With the exception of production bore 29/88, lots surrounding production bores exceed 20ha in area. As Northampton has no deep sewerage system, residential and commercial properties are serviced by septic tanks.

All production bores, except bore 29/88, are surrounded by agricultural land. Bore 29/88 is surrounded by residential development and is down gradient of the disused Catholic cemetery. Bores 28/88, 29/88 and 1/94 are located within 100m of main roads.

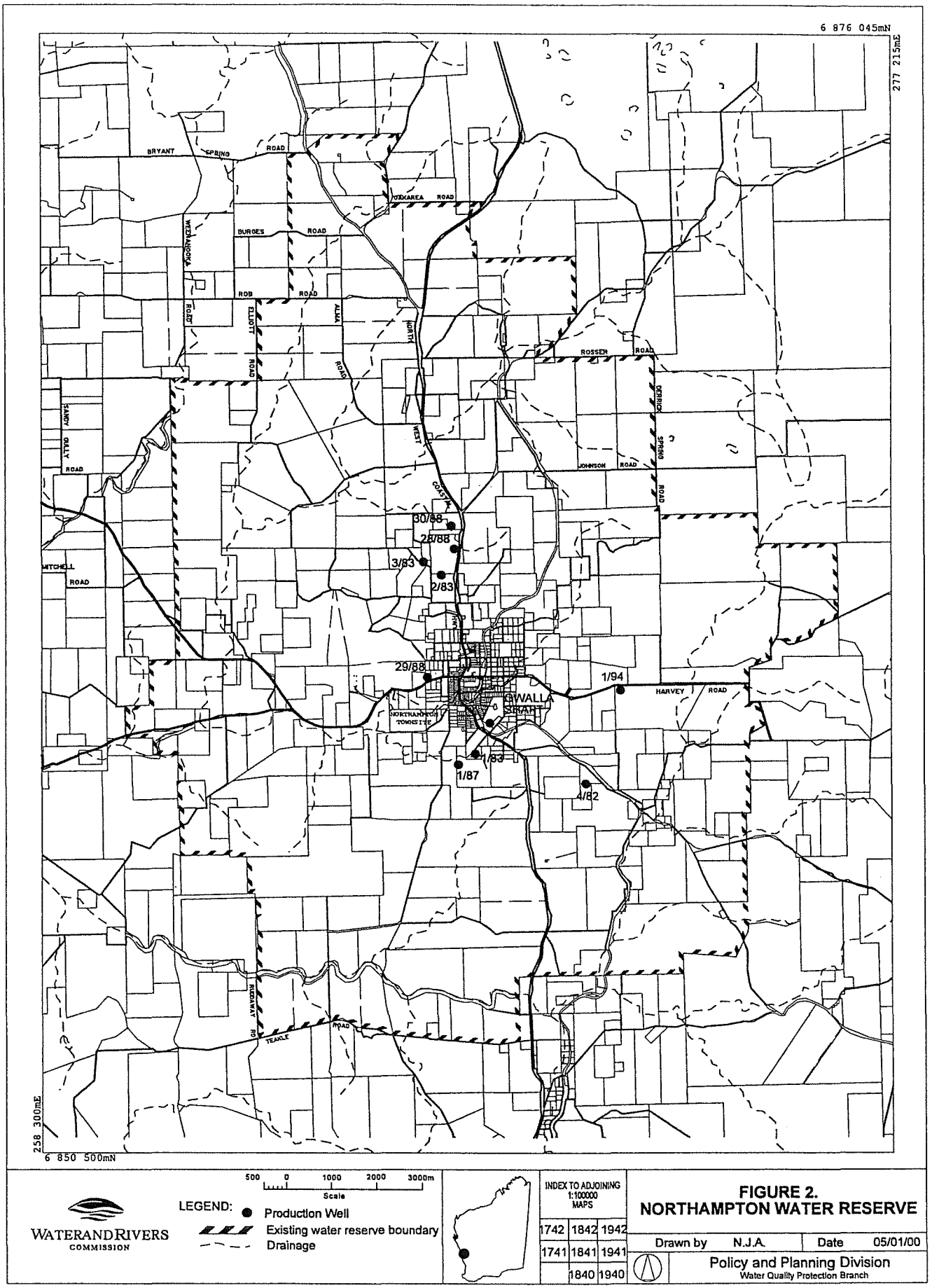


**Figure 2: Northampton Water Reserve**

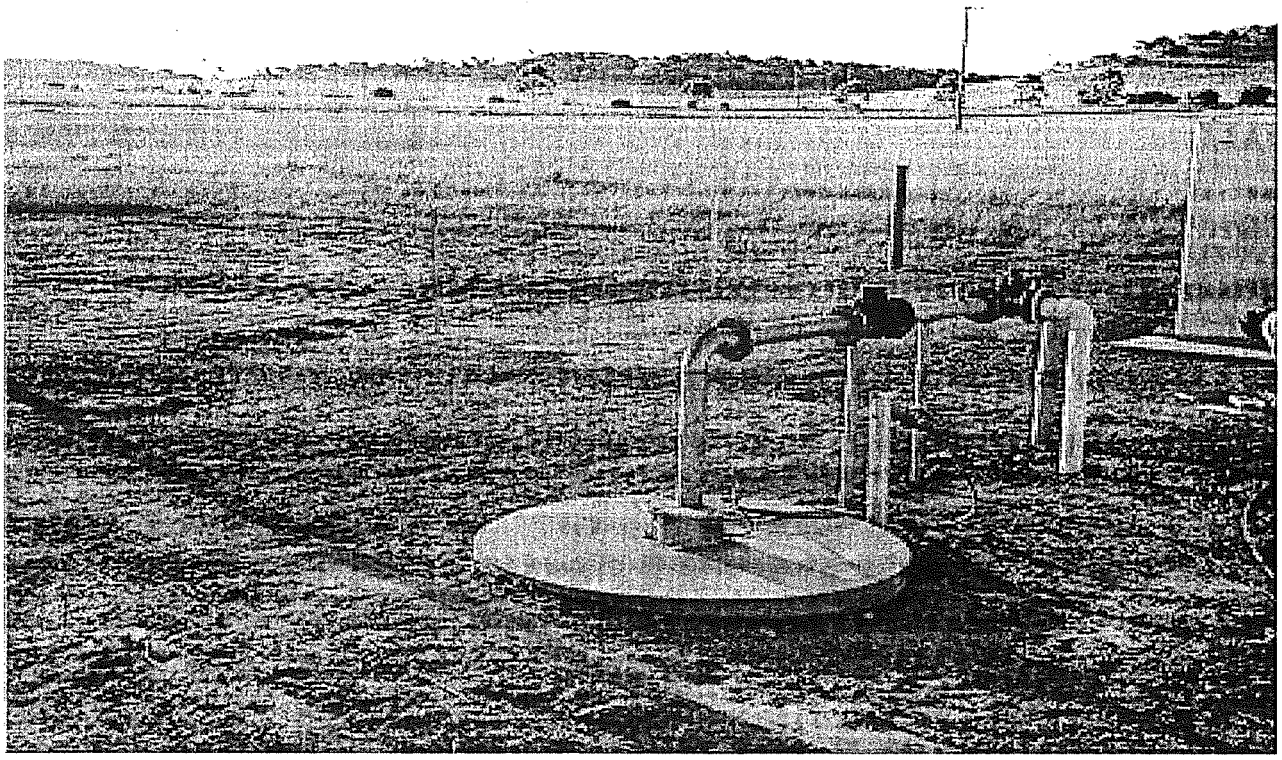

**Plate 1: Typical land use surrounding Northampton production bores**

## 4.2 Proposed land use

The area directly south east of the town centre has been proposed for industrial development.

It is also proposed to construct a bypass to route the North West Coastal Highway east of town. The bypass route has yet to be confirmed, but is likely to be east of the wellfield, rejoining the existing highway near production bores 2/83 and 3/83.

Further urban development is expected around the centre of town in the R20 zone. The rate of residential expansion will depend on the success of nearby ventures such as the Oakajee project.

Development of more orchards, horticulture and viticulture is possible but will depend on the success of current ventures and demand for produce. It is envisaged development will be constrained by the limited availability of irrigation water. The Geraldton Region Plan has identified the entire water reserve as suitable for intensive horticulture (Western Australian Planning Commission, 1999).

# 5. Potential for Contamination

Table 1 details the potential sources of contamination in the Water Reserve, the associated water quality risks and leads to a recommended strategy to manage these risks.

The recommended strategies balance the need to protect water quality for the community in the long-term, with the rights of land holders to use their land for lawful purposes. Figure 3 shows the location of potential contaminant threats.

# 6. Proposed Proclaimed Areas

The groundwater source is currently protected by an existing Water Reserve.

Previous drilling investigations have highlighted the difficulty of siting high yielding bores which would be suitable for town water supply. It will therefore be difficult to develop additional supply sources to supplement town water supply due to increased demand or to replace existing production bores which may be rendered unusable by a reduction in yield or deterioration of water quality.

In view of the limited groundwater resources in the Northampton area, the Water Reserve should protect potential and existing town water supply sources. Therefore, it is recommended the existing Water Reserve be retained.

The water supply sources need to be managed in the context of current and future land use and the strategic nature of the source. The Northampton Water Reserve contains substantial urban development and rural areas have been earmarked for future horticultural development (Western Australian Planning Commission, 1999). Limited water resources in the area will constrain the horticultural industry within the Water Reserve.

In the light of current and projected land use, it is recommended the Northampton Water Reserve be managed for Priority 3 source protection.

A Wellhead Protection Zone (WPZ) of 300 m radius centred on each bore should be implemented. Land use activities and development are managed within the WPZ to avoid immediate contamination risks. In particular, underground chemical storage tanks should not be situated in these zones.

# 7. Management of Potential Water Quality Risks

This plan generally recommends strategies to implement best management practices to manage risks rather than restricting land use options. The Priority 3 classification proposed for the Water Reserve has the fundamental water quality objective of risk management.

## 7.1 Best management practices

Best Management Practices for land use activities are encouraged to help protect water quality. These are often in the form of an industry code of practice or environmental guideline. They are usually developed in consultation with industry groups, producers and State government agencies. Research for this plan has emphasised the need for an environmental management guideline which addresses contamination risks posed by broad hectare agriculture.

## 7.2 Water Quality Protection Notes

The Commission has prepared Water Quality Protection Notes to provide information for facilities and activities that may impact on the quality of the State's water resources. These notes provide a basis for developing formal best management practice guidelines in consultation with key stakeholders.

They can be found on the internet via the Commission homepage ( http://www.wrc.wa.gov.au/protect/policy).

## 7.3 Land use planning

Establishing appropriate protection mechanisms in statutory land use planning processes is necessary to secure the long-term protection of water sources. It is therefore appropriate that the Water Reserve and priority classification be recognised in land planning strategies.

Potential sources of contamination will only pose a threat to the quality of the current Northampton Town Water Supply if they are located within areas which contribute recharge to production bores. As wellhead Protection Zones delineate most likely recharge areas, careful management of land use activities and field surveillance should be focussed in these areas to reduce this risk.

## 7.3 Emergency response

Escape of chemicals during unforeseen incidents and use of chemicals during emergency response can cause groundwater contamination. The Northampton Local Emergency Management Advisory Committee through the Geraldton Emergency Management District should be familiar with the location and purpose of the Northampton Water Reserve. A locality plan should be provided to the Fire and Rescue Services headquarters for the HAZMAT Emergency Advisory Team. The Regional Manager Water and Rivers Commission should have an advisory role to any HAZMAT incident in the Northampton Water Reserve.

Personnel who deal with WESTPLAN - HAZMAT incidents within the area should be given ready access to a locality map of the Water Reserve. These personnel should receive training to ensure an understanding of the potential impact of spills on the water resource.

## Table 1. Potential sources of contamination within the Northampton Water Reserve

Note : 'Potential Impact' indicates the extent of impact the issue poses if it does contaminate the water source and 'Likelihood'indicates the potential for that event to occur.

| Ref. | Issue | Risks /Threats | Potential Impact | Likelihood | Current Preventative Measures | Suggested Protection Measures |
|---|---|---|---|---|---|---|
| 1. | Agricultural activities | Herbicides, pesticides and fertilisers used on rural land in the recharge area could contaminate the groundwater. | Low | Low/Medium | Reticulated water is monitored. | • Current production bore monitoring program be reviewed to ensure risks from agricultural chemicals/nutrients and farm waste disposal are monitored.<br>• Provide landowners with information on pesticide use, waste disposal, fuel storage etc.<br>• Prepare environmental guidelines for broad hectare agricultural activities. |
| | | Manure from grazing livestock could contaminate the groundwater with nutrients and microbiological contaminants. | Low | Low | | |
| | | On-farm disposal of waste, spillage of agricultural chemicals and refuse. | High | Low | | |
| | | Fuel storage and mechanical servicing | High – small quantities may contaminate the source. | Low | | |
| 2. | Open abandoned wells and bores near production bores (see plates 2 and 3). | Abandoned wells and bores near production bores 1/83, 2/83, 3/83 and 1/87, are potential conduits for contaminants from agricultural chemicals and refuse to the groundwater source. | Medium to High - Agricultural chemicals, livestock and their waste, may enter the wells and contaminate the source. | Medium | Inadequate protective structures | Cap, fence or fill the bores and wells in question. |
| 3. | Accidental spillages | Accidental spillage of fuels and chemicals transported by roads. Bores 28/88, 1/94 and 29/88 are within 100m of a road. | High – small quantities may contaminate the source. | Low | Emergency response plan in the event of a major spill requiring HAZMAT response | Ensure awareness of the plan and keep relevant personnel briefed. |

| Ref. | Issue | Risks /Threats | Potential Impact | Likelihood | Current Preventative Measures | Suggested Protection Measures |
|---|---|---|---|---|---|---|
| 4. | Urban Areas | Nutrient and bacteriological contaminants from septics | Medium | Medium for bore 29/88 – all commercial and residential properties rely on septics for waste disposal. | Reticulated water is monitored. | • Current source water monitoring program be reviewed to ensure risks from septics, cemeteries, stormwater and petrol stations are addressed.<br>• Ensure awareness of community need to protect water quality.<br>• Stormwater management be reviewed to identify means of limiting the potential impact on groundwater.<br>• When fuel storage systems are installed or upgraded, encourage adoption of WRC requirements as part of development approval.<br>• Future wellfield expansion to consider existing risks. |
| | | Contaminated stormwater runoff from urban and commercial areas in recharge area for production bore 29/88. Stormwater may include washdown of chemical and fuel spillage from petrol stations, machinery repair shops, storage areas and industrial sites. | Medium to high | Medium – the stormwater passes through the potential recharge area of bore 29/88. | Reticulated water is monitored. | |
| | | Storage of fuel in underground storage tanks at petrol stations upgradient of bore 29/88. Potential for leakage. | Medium to high | Unknown – no evidence of leakage and flow of groundwater in this area is not well understood. | Reticulated water is monitored. | |
| | | Nitrogenous leachate from cemeteries contaminating groundwater | Low | Low – old cemetery is closed and the new one is well away from production bores. | Reticulated water is monitored. | |

| Ref. | Issue | Risks /Threats | Potential Impact | Likelihood | Current Preventative Measures | Suggested Protection Measures |
|---|---|---|---|---|---|---|
| 5. | Town refuse disposal site | Potential for heavy metals, septic waste, fuels and chemicals leaching into groundwater. | High | None to existing groundwater scheme.<br>Licensed landfill is downstream of existing production bores.<br><br>Some risk to groundwater quality downgradient. | Current Department of Environmental Protection Licence with conditions | • Regular auditing of licence conditions.<br>• Future wellfield expansion to consider risk from the landfill.<br>• Ensure waste from septic tanks is disposed of outside the water reserve. |
| 6. | Disused State battery site | Potential for leachate from an old tailings dam near the Nokanena Brook entering groundwater. | Low | None for existing groundwater scheme – tailings dam is downgradient of the existing production bores.<br><br>Some risk to groundwater quality downgradient. | The extent of soil contamination is being assessed by the Department of Environmental Protection. | Future wellfield expansion to consider risk from this site. |

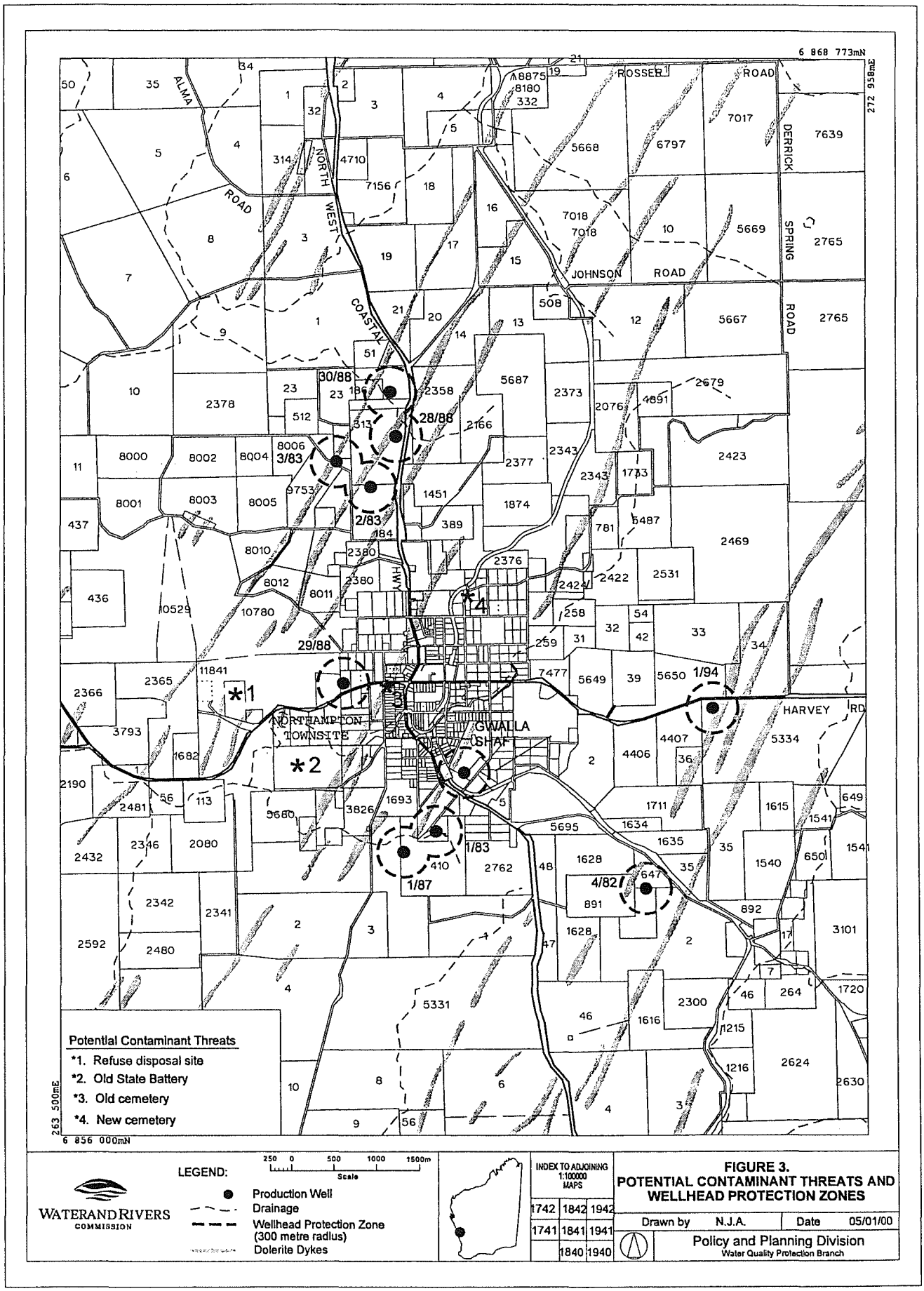


**Figure 3: Potential contaminant threats and wellhead protection zones**

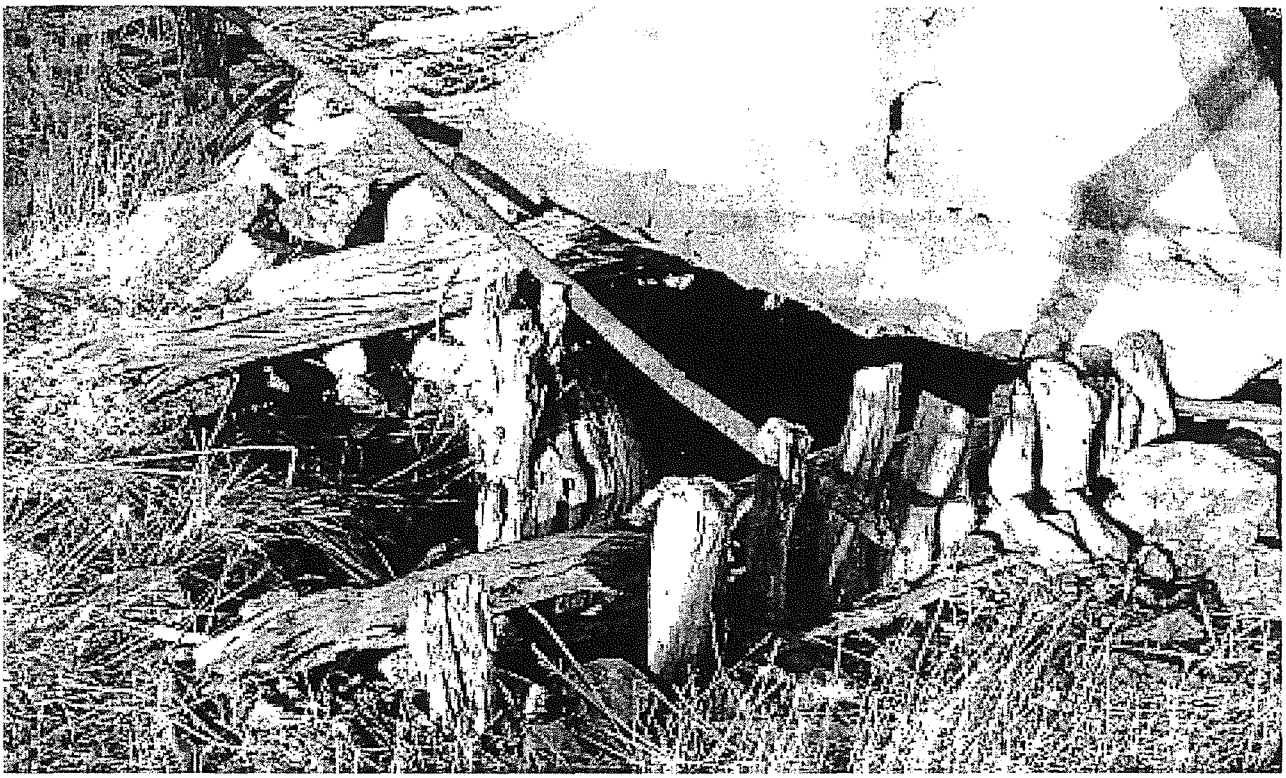

**Plate 2: A poorly protected abandoned well adjacent to a production bore**

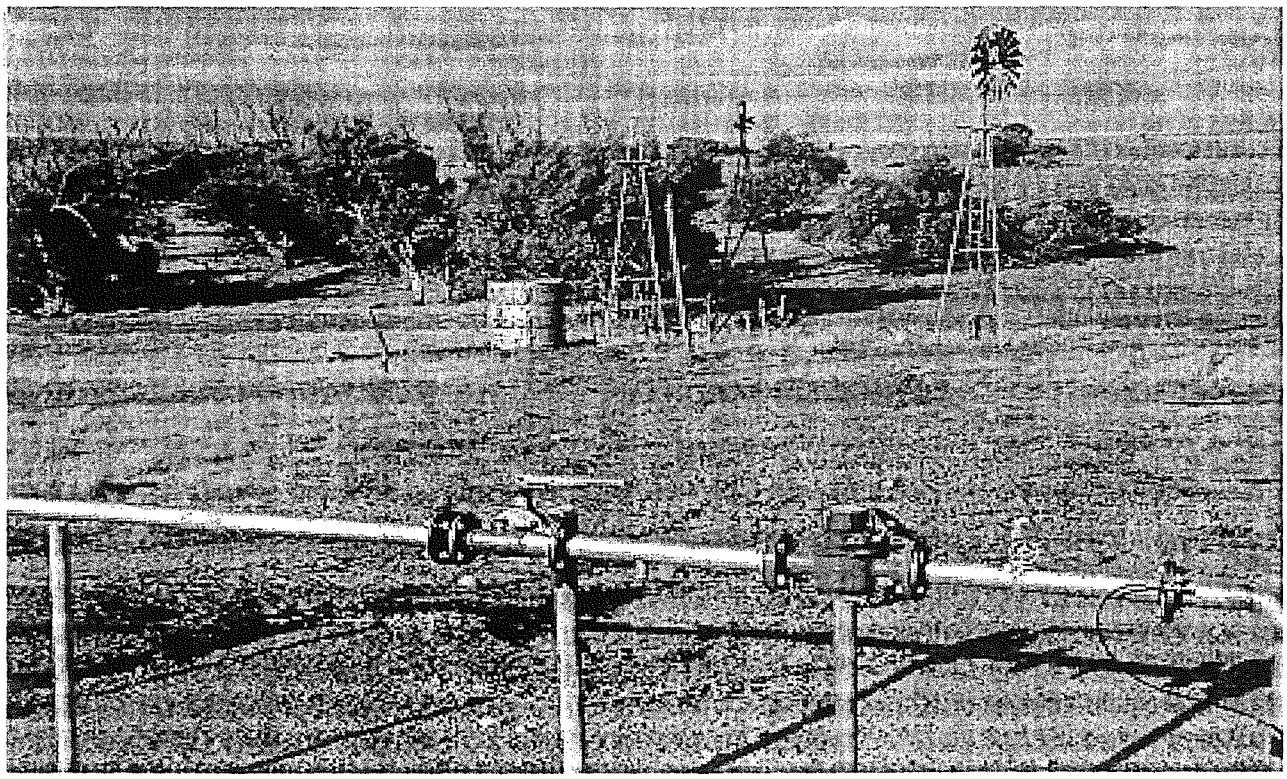

**Plate 3: Abandoned wells near a production bore**

# Recommendations

1. Planning strategies, such as the Shire of Northampton Town Planning Scheme, should incorporate the management principles outlined in the Water and Rivers Commission's *Compatibility of Land Use Within Public Drinking Water Source Areas* (see Appendix 1) and reflect the Priority 3 classification given to the Water Reserve.

2. All development proposals in the Water Reserve which are likely to impact on water quality should be referred to the Water and Rivers Commission. In particular, all proposed developments which are located within the wellhead protection zones of existing production bores should be carefully reviewed.

3. The location and implications of the existing Water Reserve should be made more visible to the Northampton community.

4. Open, disused bores and wells adjacent to production bores 1/83, 2/83, 3/83 and 1/87 should be sealed / secured.

5. A surveillance and bylaw enforcement program should be established to identify incompatible land uses or potential contamination threats within the Water Reserve.

6. Incidents covered by WESTPLAN – HAZMAT in the Northampton Water Reserve should be addressed through the following measures:
   - The Northampton Local Emergency Management Advisory Committee (through the Geraldton Emergency Management District) being familiar with the location and purpose of the Northampton Water Reserve.
   - The locality plan for the Northampton Water Reserve being provided to the Fire and Rescue Services headquarters for the HAZMAT Emergency Advisory Team.
   - The Water and Rivers Commission's Regional Manager should have an advisory role to any HAZMAT site management team.
   - Personnel dealing with WESTPLAN - HAZMAT incidents in the area given ready access to a locality map of the Water Reserve and training to understand the potential impacts of spills on the groundwater resource.

7. Stormwater management in Northampton should be reviewed to identify means of limiting the potential impact of contaminated stormwater runoff on water quality in bore 29/88 and the Nokanena Brook.

8. The current monitoring program should be reviewed to address the risks identified in this plan. This should include a baseline groundwater quality monitoring program of all production bores. This will provide a future benchmark for contaminant levels and a status update for production bores.

9. Provide agricultural landowners with water quality protection information on pesticide use, waste disposal, fuel storage etc in the form of an environmental guideline for broad hectare agriculture.

10. Implementation of these recommendations should be reviewed annually. A full review of this protection plan should be undertaken every five years or as required.

# Implementation strategy

| No | Description | Implemented by | Timing |
|---|---|---|---|
| 1. | Incorporation into land planning strategies | Shire of Northampton and Ministry for Planning | Ongoing |
| 2. | Referral of development proposals:<br>a) Provide guidelines for referral of development proposals.<br>b) Referral of development proposals.<br>c) Incorporate source protection strategy into town planning scheme for Northampton. | a) Regional Manager, Mid-West Gascoyne<br>b) Shire of Northampton, Ministry for Planning, DEP, Department of Minerals and Energy<br>c) WRC and Shire of Northampton | a) Ongoing<br>b) Ongoing<br>c) To be arranged |
| 3 | Publicise the location, extent and implications of the water reserve to the Northampton community. Part of education is signage.<br>Signage:<br>a) Development of guidelines for signage.<br>b) Determine location and quantity of signs.<br>c) Erect signs. | Regional Manager, Mid-West Gascoyne (WRC) in conjunction with Shire of Northampton<br>a) Program Manager, Protection Planning, Water Quality Protection Branch (WQPB)<br>b) Regional Manager, Mid-West (WRC) and Regional Business Manager, Water Corporation (WC)<br>c) Regional Manager, Mid-West (WRC) and Regional Business Manager, Water Corporation (WC) | To be arranged<br>a) 2000/01<br>b) 2000/01<br>c) To be arranged |
| 4 | Secure abandoned bores and wells in close vicinity of production bores. | Regional Manager, Mid-West Gascoyne (WRC) to co-ordinate with Water Corporation, Shire of Northampton and landowners. | ASAP |

| No | Description | Implemented by | Timing |
|---|---|---|---|
| 5 | Surveillance and bylaw enforcement program:<br>a) Develop guidelines for the surveillance of the water reserve.<br>b) Implement the surveillance program and enforce bylaws. | Regional Manager, Mid-West Gascoyne (WRC) and Regional Business Manager, Mid-West (WC) | ASAP |
| 6 | Incidents covered by WESTPLAN – HAZMAT in the Northampton Water Reserve should be addressed through the following measures:<br>a) The Northampton Local Emergency Management Advisory Committee (through the Geraldton Emergency Management District) being familiar with the location and purpose of the Northampton Water Reserve.<br>b) The locality plan for the Northampton Water Reserve being provided to the Fire and Rescue Services headquarters for the HAZMAT Emergency Advisory Team.<br>c) The Water and Rivers Commission advising the HAZMAT Emergency Advisory Team during incidents in the Northampton Water Reserve.<br>d) Personnel dealing with WESTPLAN - HAZMAT incidents in the area given ready access to a locality map of the Water Reserve and training to understand the potential impacts of spills on the groundwater resource. | a) Mid-West Gascoyne region to advise Northampton Local Emergency Management Advisory Committee<br>b) WRC (Mid-West Gascoyne region)<br>c) Water Corporation<br>d) Northampton Local Emergency Management Advisory Committee | a) 2000<br>b) 2000<br>c) Ongoing<br>d) ASAP |
| 7 | Review of stormwater management in Northampton | Regional Manager, Mid-West Gascoyne (WRC) in conjunction with Shire of Northampton | To be arranged |
| 8 | Monitoring program:<br>a) Review monitoring program to address parameters associated with land use risks.<br>b) Regularly review water quality data for adverse trends.<br>c) Undertake baseline sampling of production bores. | a) Water Corporation<br>b) Water Corporation<br>c) Water Corporation | a) ASAP<br>b) As necessary<br>c) ASAP |
| 9 | Develop and implement an environmental guideline for broad hectare agriculture in consultation with peak industry bodies and landowners. | Program Manager, Assessment and advice, Water Quality Protection Branch (WQPB) | To be arranged |
| 10 | Review of this plan and recommendations:<br>a) Review implementation strategy.<br>b) Full review. | a) Water Quality Protection Branch (WRC)<br>b) Water Quality Protection Branch (WRC) | a) annually<br>b) after 5 years |

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# Glossary

| | |
|---|---|
| **Abstraction** | Pumping groundwater from an aquifer. |
| **Allocation** | The quantity of groundwater permitted to be abstracted by a well licence, usually specified in kilolitres/year (kL/a). |
| **Alluvium (alluvial)** | Detrital material which is transported by streams and rivers and deposited. |
| **Aquifer** | A geological formation or group of formations able to receive, store and transmit significant quantities of water. |
| **Bore** | A narrow, lined hole drilled to monitor or withdraw groundwater. |
| **Catchment** | The area of land which intercepts rainfall and contributes the collected water to surface water (streams, rivers, wetlands) or groundwater. |
| **Confined Aquifer** | An aquifer that is confined between shale and siltstone beds and therefore contains water under pressure. |
| **Diffuse Source Pollution** | Pollution originating from a widespread area e.g. urban stormwater runoff, agricultural runoff. |
| **Effluent** | The liquid, solid or gaseous wastes discharged by a process, treated or untreated. |
| **Groundwater** | Water which occupies the pores and crevices of rock or soil. |
| **Hydrogeology** | The study of groundwater, especially relating to the distribution of aquifers, groundwater flow and groundwater quality. |
| **Leaching / Leachate** | The process by which materials such as organic matter and mineral salts are washed out of a layer of soil or dumped material by being dissolved or suspended in percolating rainwater; the material washed out is known as leachate. Leachate can pollute groundwater and waterways. |
| **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, algicides, fumigants and rodenticides used to kill organisms. |

| | |
|---|---|
| **Point Source Pollution** | Specific localised source of pollution e.g. sewage or effluent discharge, industrial waste discharge. |
| **Pollution** | Water pollution occurs when waste products or other substances e.g. effluent, litter, refuse, sewage or contaminated runoff, change the physical, chemical, biological or thermal properties of the water, adversely affecting water quality, living species and beneficial uses. |
| **Public Water Source Area** | (PWSA) As for UWPCA, but allowing the taking of groundwater for public supplies. |
| **Recharge** | Water infiltrating to replenish an aquifer. |
| **Recharge Area** | An area through which water from a groundwater catchment percolates to replenish (recharge) an aquifer. An unconfined aquifer is recharged by rainfall throughout its distribution. Confined aquifers are recharged in specific areas where water leaks from overlying aquifers, or where the aquifer rises to meet the surface. |
| **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. |
| **Stormwater** | Rainwater which has run off the ground surface, roads, paved areas etc and is usually carried away by drains. |
| **Treatment** | Application of techniques such as settlement, filtration and chlorination to render water suitable for specific purposes including drinking and discharge to the environment. |
| **Unconfined Aquifer** | An aquifer containing water, the upper surface of which is lower than the top of the aquifer. The upper surface of the groundwater within the aquifer is called the watertable. |
| **Underground Water Pollution Control Area (UWPCA)** | An area defined under the Metropolitan Water Supply Sewerage and Drainage Act, in which restrictions are put on activities that may pollute the groundwater. |
| **Wastewater** | Water that has been used for some purpose and would normally be treated and discarded. Wastewater usually contains significant quantities of pollutant. |
| **Water Quality** | The physical, chemical and biological measures of water. |
| **Watertable** | The upper saturated level of the unconfined groundwater. |
| **Wellfield** | A group of bores to monitor or withdraw groundwater. |

# Appendices

## Appendix 1: Land Use Compatibility in Public Drinking Water Source Areas

# LAND USE COMPATIBILITY IN PUBLIC DRINKING WATER SOURCE AREAS

## Purpose

To provide information on land use and activities that may impact on the quality of the State's water resources.

These notes provide a basis for developing formal guidelines in consultation with key stakeholders.

## Scope

These notes apply to proposed and existing land use within Public Drinking Water Source Areas (PDWSAs).

PDWSAs include Underground Water Pollution Control Areas, Water Reserves and public water supply catchment areas declared under the *Metropolitan Water Supply, Sewerage and Drainage Act 1909*, and the *Country Areas Water Supply Act 1947*.

## Preamble

The following notes reflect the Commission's current position. They are recommendations only, and may be varied at the discretion of the Commission.

### Overview of Protection Framework

The Water and Rivers Commission is responsible for managing and protecting Western Australia's water resources. The Commission has policies for the protection of public drinking water source areas that include three levels of priority classification of lands within PDWSAs.

**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 the highest quality public drinking water is the prime beneficial land use. P1 areas would typically include land under Crown ownership. P1 areas are managed in accordance with the principle of **risk avoidance** and so land development is generally not permitted.

**Priority 2** (P2) source protection 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 in these areas. P2 areas are managed in accordance with the principle of **risk minimisation** and so conditional development is allowed.

**Priority 3** (P3) source protection areas are defined to **manage the risk of pollution** to the water source. P3 areas are declared over land where water supply sources need to co-exist with other land uses such as residential, commercial and light industrial developments. Protection of P3 areas is achieved through **management guidelines** for land use activities. If the water source does become contaminated, then water may need to be treated or an alternative water source found.

In addition to priority classifications, **wellhead protection zones** and **reservoir protection zones** are defined to protect the water source from contamination in the immediate vicinity of production wells and reservoirs. Wellhead protection zones are usually circular, with a radius of 500 metres in P1 areas and 300 metres in P2 and P3 areas. Reservoir protection zones usually consist of a 2 kilometre buffer area around the top water level of a reservoir and include the reservoir itself. These zones do not extend outside water reserves. Special conditions apply within these zones.

### Tables showing Land Use compatibility with the Commission's PDWSA protection strategy

These tables should be used as a guideline only. More detailed information on the Commission's requirements in the form of activity guidelines or notes is available for some land uses. These can be found on the 'Protecting Water' web page on the Commission's Internet site (www.wrc.wa.gov.au). Alternatively, information relating to land use and development within PDWSAs including those not listed in the tables, can be obtained from the Commission's Water Quality Protection Branch.

The Commission recognises that many activities were established before the introduction of these tables. The Commission will negotiate with the operators of such activities to develop appropriate management practices to minimise the impact on water resources.

These tables do not replace the need for assessment by the Commission. Please consult the Commission for advice on any land use proposals in Public Drinking Water Source Areas that may impact on water resources.

### Definitions used in the following tables

| | |
|---|---|
| *Compatible* | The land use is compatible with the management objectives of the priority classification. |
| *Incompatible* | The land use is incompatible with the management objectives of the priority classification. |
| *Conditional* | The land use can be compatible with the management objectives of the priority classification, with appropriate site management practices. All conditional developments / activities should be referred to the Commission for assessment on a case specific basis. |
| *Extensive* | Where limited additional inputs are required to support the desired land use. eg supplementary animal feed only during seasonal dry periods. |

*Intensive* Where regular additional inputs are required to support the desired land use. eg irrigation, fertilisers and non forage animal feed dominates.

## More information

We welcome your comment on these notes. They will be updated from time to time as comments are received or activity standards change. The Commission is progressively developing Water Quality Protection Notes and Guidelines covering land uses described in the attached tables. Advice on available guidance documents may be obtained by contacting the Commission.

If you wish to comment on the notes or require more information, please contact the Commission's Water Quality Protection Branch at the Hyatt Centre in East Perth.
Phone: (08) 9278 0300 (business hours) or Fax:(08) 9278 0585.
E-mail: use the {feedback} section at our Internet address (http://www.wrc.wa.gov.au) citing the topic and version.

## Tables showing land use compatibility with PDWSA protection objectives

### *AGRICULTURE - ANIMALS*

| Land use | Priority 1 | Priority 2 | Priority 3 |
|---|---|---|---|
| Animal saleyards and stockyards[14] | Incompatible | Incompatible[7] | Conditional[7] |
| Apiaries on Crown land | Conditional | Conditional | Conditional |
| Aquaculture eg. crustaceans, fish, algae farms | Incompatible | Conditional | Conditional |
| Dairy sheds | Incompatible | Incompatible[11,15] | Conditional[15] |
| Feedlots | Incompatible | Incompatible | Conditional |
| Livestock grazing - pastoral leases | Conditional | Compatible | Compatible |
| Livestock grazing - broad hectare (extensive) | Incompatible | Conditional[11] | Compatible |
| Livestock grazing (intensive) | Incompatible | Incompatible | Conditional[11] |
| Piggeries | Incompatible | Incompatible | Incompatible |
| Poultry farming (housed) | Incompatible | Conditional | Conditional |
| Stables | Incompatible | Conditional | Compatible |

### *AGRICULTURE - PLANTS*

| Land use | Priority 1 | Priority 2 | Priority 3 |
|---|---|---|---|
| Broad hectare cropping i.e. non-irrigated | Incompatible | Conditional[1] | Compatible |
| Floriculture (extensive) | Incompatible | Conditional | Compatible |
| Floriculture (intensive) | Incompatible | Incompatible | Conditional |
| Horticulture- hydroponics | Incompatible | Conditional | Conditional |
| Horticulture - market gardens | Incompatible | Incompatible | Conditional |
| Orchards | Incompatible | Conditional | Compatible |
| Nurseries (potted plants) | Incompatible | Conditional | Compatible |
| Silviculture (tree farming) | Conditional | Conditional | Compatible |
| Turf farms | Incompatible | Incompatible | Conditional |
| Viticulture (wine & table grapes) | Incompatible | Conditional | Compatible |

### *DEVELOPMENT - COMMERCIAL*

| Land use | Priority 1 | Priority 2 | Priority 3 |
|---|---|---|---|
| Aircraft servicing | Incompatible | Incompatible | Conditional[6] |
| Airports or landing grounds | Incompatible | Incompatible | Conditional[6] |
| Amusement centres | Incompatible | Incompatible | Compatible[6] |
| Automotive businesses | Incompatible | Incompatible | Conditional[6] |
| Boat servicing | Incompatible | Incompatible | Conditional[6] |
| Catteries | Incompatible | Compatible | Compatible |
| Caravan and trailer hire | Incompatible | Incompatible | Conditional[6] |
| Consulting rooms | Incompatible | Incompatible[7] | Compatible[6] |
| Concrete batching and cement products | Incompatible | Incompatible | Conditional |
| Cottage Industries | Conditional | Conditional | Compatible |
| Dog kennels | Incompatible | Conditional | Conditional |
| Drive-in / take-away food shops | Incompatible | Incompatible | Compatible[6] |
| Drive-in theatres | Incompatible | Incompatible | Compatible[6] |

| | | | |
|---|---|---|---|
| Dry cleaning premises | Incompatible | Incompatible | Conditional[6] |
| Farm supply centres | Incompatible | Incompatible[7] | Conditional |
| Fuel depots | Incompatible | Incompatible | Conditional |
| Garden centres | Incompatible | Incompatible | Compatible |
| Laboratories (analytical, photographic) | Incompatible | Incompatible | Conditional[6] |
| Markets | Incompatible | Incompatible | Compatible[6] |
| Mechanical servicing | Incompatible | Incompatible | Conditional[6] |
| Metal production / finishing | Incompatible | Incompatible | Incompatible |
| Milk transfer depots | Incompatible | Incompatible | Conditional |
| Pesticide operator depots | Incompatible | Incompatible | Incompatible |
| Restaurants and taverns | Incompatible | Incompatible | Compatible[6] |

| **Land use** | **Priority 1** | **Priority 2** | **Priority 3** |
|---|---|---|---|
| Service stations | Incompatible | Incompatible | Conditional[6] |
| Shops and shopping centres | Incompatible | Incompatible[7] | Compatible[6] |
| Transport depots | Incompatible | Incompatible | Conditional |
| Vehicle parking (commercial) | Incompatible | Incompatible | Compatible |
| Vehicle wrecking and machinery | Incompatible | Incompatible | Conditional |
| Veterinary clinics / hospitals | Incompatible | Incompatible[7] | Conditional[6] |

### *DEVELOPMENT - INDUSTRIAL*

| **Land use** | **Priority 1** | **Priority 2** | **Priority 3** |
|---|---|---|---|
| Heavy Industry | Incompatible | Incompatible | Incompatible |
| Light or general Industry | Incompatible | Incompatible | Conditional[6] |
| Power Stations | Incompatible | Incompatible | Incompatible |

### *DEVELOPMENT - URBAN*

| **Land use** | **Priority 1** | **Priority 2** | **Priority 3** |
|---|---|---|---|
| Aged and dependent persons group dwellings | Incompatible | Incompatible | Compatible[6] |
| Cemeteries | Incompatible | Incompatible | Conditional |
| Civic buildings | Incompatible | Conditional[7] | Compatible[6] |
| Clubs-sporting or recreation | Incompatible | Conditional | Compatible[6] |
| Community halls | Incompatible | Conditional[7] | Compatible |
| Family day care centres | Incompatible | Incompatible[7] | Compatible[6] |
| Funeral parlours | Incompatible | Incompatible | Compatible[6] |
| Health centres | Incompatible | Incompatible | Compatible[6] |
| Hospitals | Incompatible | Incompatible | Conditional[6] |
| Medical centres | Incompatible | Incompatible | Compatible[6] |
| Toilet blocks and change rooms | Incompatible[7] | Conditional | Compatible |

### *EDUCATION / RESEARCH*

| **Land use** | **Priority 1** | **Priority 2** | **Priority 3** |
|---|---|---|---|
| Community education centres | Conditional[7] | Conditional[7] | Compatible[6] |

| | | | |
|---|---|---|---|
| Primary / Secondary Schools | Incompatible | Incompatible | Compatible[6] |
| Scientific Research | Conditional | Conditional | Compatible |
| Tertiary Education Facilities | Incompatible | Incompatible | Conditional[6] |

### *MINING AND MINERAL PROCESSING*

| Land use | Priority 1 | Priority 2 | Priority 3 |
|---|---|---|---|
| Extractive industries (sand mining, quarries) | Conditional[2] | Conditional[2] | Conditional[2] |
| Mineral exploration | Conditional[4] | Conditional[4] | Conditional[4] |
| Mining | Conditional[4] | Conditional[4] | Conditional[4] |
| Mineral processing | Incompatible | Incompatible | Conditional[4] |
| Tailings dams | Incompatible | Incompatible | Conditional[4] |

### *PROCESSING OF ANIMALS / ANIMAL PRODUCTS*

| Land use | Priority 1 | Priority 2 | Priority 3 |
|---|---|---|---|
| Animal product rendering works | Incompatible | Incompatible | Incompatible |
| Abattoirs | Incompatible | Incompatible | Incompatible |
| Dairy product factories | Incompatible | Incompatible | Conditional[6] |
| Food Processing | Incompatible | Incompatible | Conditional[6] |
| Tanneries | Incompatible | Incompatible | Incompatible |
| Wool-scourers | Incompatible | Incompatible | Incompatible |

### *PROCESSING OF PLANTS / PLANT PRODUCTS*

| Land use | Priority 1 | Priority 2 | Priority 3 |
|---|---|---|---|
| Breweries | Incompatible | Incompatible | Conditional[6] |
| Composting / soil blending (commercial) | Incompatible | Incompatible | Conditional |
| Vegetable / food processing | Incompatible | Incompatible | Conditional[6] |
| Wineries | Incompatible | Incompatible | Conditional |

### *SUBDIVISION*

| Land use | Priority 1 | Priority 2 | Priority 3 |
|---|---|---|---|
| Rural subdivision to a minimum lot size of 4 ha | Incompatible | Compatible | Compatible |
| Rural subdivision to a lot size less than 4 ha | Incompatible | Incompatible | Incompatible |
| Special rural subdivision to a minimum lot size of 2 ha | Incompatible | Conditional[8,9] | Conditional[8] |
| Special rural subdivision to a lot size between 1 and 2 ha | Incompatible | Incompatible | Conditional[8,9] |
| Special rural subdivision to a lot size less than 1 ha | Incompatible | Incompatible | Incompatible |
| Urban subdivision | Incompatible | Incompatible | Compatible[6] |
| Industrial subdivision | Incompatible | Incompatible | Conditional[8] |

***Note: Subdivision of lots to any size within Priority 1 areas is incompatible.***

### *SPORT AND RECREATION*

| Land use | Priority 1 | Priority 2 | Priority 3 |
|---|---|---|---|
| Equestrian centres | Incompatible | Incompatible | Compatible |
| Golf courses | Incompatible | Incompatible | Conditional[1] |
| Motor sports i.e. permanent racing facilities | Incompatible | Incompatible | Conditional |
| Public swimming pools | Incompatible | Incompatible | Conditional |
| Recreational parks -irrigated | Incompatible | Incompatible | Conditional[1] |
| Rifle ranges | Incompatible | Conditional | Compatible |

### *STORAGE/ PROCESSING OF TOXIC AND HAZARDOUS SUBSTANCES (THS)*

| Land use | Priority 1 | Priority 2 | Priority 3 |
|---|---|---|---|
| Above ground storage of THS | Conditional | Conditional | Conditional |
| Underground storage tanks for THS | Incompatible | Incompatible | Conditional |

### *TOURISM ACCOMMODATION.*

| Land use | Priority 1 | Priority 2 | Priority 3 |
|---|---|---|---|
| Bed and breakfast accommodation | Incompatible | Conditional[16] | Compatible |
| Caravan parks | Incompatible | Incompatible | Conditional[6] |
| Farm stay accommodation | Incompatible | Conditional[16] | Compatible |
| Motels, hotels, lodging houses, hostels | Incompatible | Incompatible | Compatible[6] |

### *WASTE TREATMENT AND MANAGEMENT*

| Land use | Priority 1 | Priority 2 | Priority 3 |
|---|---|---|---|
| Injection of liquid wastes into ground water | Incompatible | Incompatible | Incompatible |
| Landfills -Class I, II or III | Incompatible | Incompatible | Conditional |
| Landfills -Class IV and V | Incompatible | Incompatible | Incompatible |
| Recycling depots | Incompatible | Incompatible | Conditional |
| Refuse transfer stations | Incompatible | Incompatible | Conditional |
| Sewers (gravity) | Incompatible | Incompatible | Compatible |
| Sewers (pressure mains) | Incompatible | Conditional | Compatible |
| Sewage pump stations | Incompatible | Conditional | Conditional |
| Used tyre storage / disposal facilities | Incompatible | Incompatible | Incompatible |
| Wastewater treatment plants | Incompatible | Incompatible | Conditional |
| Wastewater application to land | Incompatible | Incompatible[17] | Conditional |

### *OTHER DEVELOPMENTS*

| Land use | Priority 1 | Priority 2 | Priority 3 |
|---|---|---|---|
| Caretaker's housing | Incompatible[7] | Conditional | Compatible |
| Drinking water treatment plants | Conditional | Conditional | Conditional |
| Communications receivers / transmitters | Conditional | Conditional | Conditional |
| Construction projects (not shown elsewhere) | Conditional | Conditional | Conditional |
| Forestry | Conditional[1] | Compatible | Compatible |

| | | | |
|---|---|---|---|
| Major transport routes | Incompatible | Conditional[10] | Compatible |
| National and Regional Parks[13] | Compatible | Compatible | Compatible |
| Nature reserves | Compatible | Compatible | Compatible |

**Table reference notes:**

1. Conditions may limit fertiliser and pesticide application.

2. Conditions cover the storage of fuels and chemicals, the depth of mining in relation to the water table with strict guidelines for rehabilitation.

3. Conditions cover the storage and use of fuel and other chemicals.

4. Conditions placed via the mining lease and / or environmental approval.

5. Special rural development must have appropriate provisions under the Town Planning Scheme, to prevent introduction of land uses and practices that pose an unacceptable risk to water resources.

6. Must be connected to deep sewerage, except where exemptions apply under the current Government Sewerage Policy.

7. Only permitted if this use is incidental to the overall land use in the area and consistent with planning strategies.

8. Lots should only be created where land capability allows effective on-site soakage disposal of treated wastewater. Conditions apply to siting of wastewater disposal systems in areas with poor land capability and / or a shallow depth to groundwater, animals are held or fertiliser is applied. Alternative wastewater treatment systems, where approved by the Health Department, may be accepted with maintenance requirements.

9. An average rather than minimum lot size may be acceptable if the proponent can demonstrate that the water quality objectives of the source protection area are met, and caveats are placed on titles of larger blocks stating that further subdivision cannot occur.

10. Conditions cover road design, construction and the types of goods that may be carried.

11. May be permitted if animal stocking levels (number of animals per hectare) are consistent with source protection objectives.

12. May be permitted if the type, volume and storage mechanisms for chemicals are compatible with water quality protection objectives.

13. Visitor and management infrastructure and facilities must be appropriately sited and maintained.

14. This does not include on-farm / pastoral lease stock-yards used for animal husbandry.

15. Waste management practices must be compatible with source protection objectives.

16. Conditions apply on density of accommodation in Priority 2 areas.

17. May be permitted if the quantity and quality are compatible with water quality protection objectives.

# Publication feedback form

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