GOVERNMENT OF WESTERN AUSTRALIA

MINGENEW WATER RESERVE

WATER SOURCE PROTECTION PLAN

Mingenew Town Water Supply

WATER RESOURCE PROTECTION SERIES

WATER AND RIVERS COMMISSION REPORT WRP 42

2001

WATER AND RIVERS COMMISSION

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Water and Rivers Commission
Policy and Planning Division

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Cover Photograph: Mingenew wellfield recharge area

Foreword

Water source protection plans

Water Source Protection Plans establish the level of protection required in Water Reserves. Catchment protection of water sources is considered a fundamental part of ensuring the provision of a safe drinking water supply.

Water Source Protection Plans identify sources of contamination that should be investigated and set out programs for management of the resource. The 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 Mingenew 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 that include three levels of priority classification of lands within Priority Drinking Water Source Areas (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 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 bores. 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 water reserves. Special conditions apply within these zones.

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Summary

The town of Mingenew is about 300 km north of Perth. Mingenew is the administrative centre for the Shire of Mingenew and provides services for local rural activities including cereal and sheep farming.

The Mingenew town water supply comes from four Water Corporation production bores that abstract groundwater from the semi-confined aquifer of the Parmelia Formation. The Mingenew Water Reserve was declared in December 1983.

The land uses within the Water Reserve are mainly extensive agricultural, but also include recreational areas and a waste transfer facility. The wellfield is vulnerable to contaminants entering the aquifer through direct recharge and therefore careful management of land uses above the aquifer is necessary to protect the resource.

It is proposed to classify the Mingenew Water Reserve for Priority 2 source protection.

The Water Reserve will be managed to minimise the risk of contamination to the aquifer. Management strategies will include posting signs to indicate the location of the reserve, and assessment of development proposals with respect to water quality protection.

1. Introduction

This report provides a management plan for the protection of groundwater resources in the Mingenew Water Reserve. The plan also establishes a basis for the promotion of compatible, non-polluting land uses within the reserve.

The town of Mingenew is located approximately 300 km north of Perth (Figure 1). Mingenew is the administrative centre for the Shire of Mingenew and provides services for local rural activities including cereal and sheep farming.

The water scheme supplying Mingenew consists of four Water Corporation production bores located south east of the town. The wellfield is of strategic importance to the town of Mingenew as it is the closest potable water supply. The Mingenew Water Reserve was declared in December 1983.

2. Physiography

The region is gently undulating farming land. The topography ranges in elevation from about 130 m AHD (Australian Height Datum) along the Lockier River, to more than 300 m AHD about 6 km south of the town.

The town is in the valley of the Lockier River, a tributary of the Irwin River. The Lockier River drains the generally saline region to the east and may contain water of salinity greater than 7000 mg/L TDS (Total Dissolved Solids).

Mingenew has a Mediterranean-type climate with warm to hot, dry summers, and mild to wet winters. The average rainfall is approximately 410 mm per year.

3. Hydrogeology

Mingenew is located in the northern part of the Perth Basin and is underlain by the Parmelia Formation.

The Parmelia Formation overlies the Yarragadee Formation that consists of interbedded felspathic sandstone, siltstone and claystone. The Jurassic to lower Cretaceous Otorowiri Member of the Parmelia Formation occurs at the base of the formation.

Quaternary sand and clay overlay the eroded, weathered and lateritized surface of the Parmelia Formation.

The three major faults that occur in the Mingenew region are the Allanooka Fault (north), Urella Fault (east) and an unnamed fault (south) that can be traced from the Arrowsmith River area 25 km to the south. There are also several minor faults that may considerably affect the yield and quality of the groundwater from the local aquifer. Groundwater flow is northwards discharging to the Lockier River.

Groundwater recharge to the Parmelia Formation is by direct infiltration of rainfall and discharge occurs at springs where contact between the Parmelia Formation and the Otorowiri Member is close to the surface. The Parmelia Formation contains mainly fresh water while groundwater in the underlying Yarragadee Formation is either brackish or saline.

The geology of the area is complex, characterised by faulting, folding, lithological variations and weathering. These factors influence the water quality, with groundwater from some bores having a wide range in iron, chloride and aluminium concentrations.

The four Water Corporation production bores (13, 1/78, 5/86, and 3/87) abstract groundwater from the semi-confined aquifer of the Parmelia Formation and are therefore considered to have low to moderate vulnerability to contamination (Figure 2).

Groundwater salinities in the production bores have remained stable (less than 1000 mg/L TDS) with the exception of bore 13. Records indicate water samples from the Mingenew reticulation outlets have generally been within the Australian Drinking Water Guidelines (NH&MRC and ARMCANZ, 1996).

Water samples from the production bores have in some instances exceeded guideline values for pH, turbidity, chloride, sodium and iron concentrations. The groundwater scheme review (WAWA, 1994) indicated the current scheme may not have sufficient reserves to meet future demands of more than 4500 kL/week.

Due to mutual interference between bores 5/86 and 13 there is the potential to construct a new bore north of 3/87.

4. Existing and proposed land use

The Mingenew Water Reserve largely covers private rural-zoned land, mostly used for dryland grazing and cereal cropping (Plates 1 & 2). The Shire's waste transfer station is located on a Land Act Reserve south of the town between two Water Corporation wells. The waste transfer station replaces the open pit tip previously located at the same site. Waste disposal activities have the potential to degrade the water quality.

In the northern part of the Water Reserve, Land Act Reserves 20735 and 9693 are used as an aircraft landing strip and recreation area that includes a fair ground, racecourse and golf course.

Plate 1. Mingenew wellfield area.

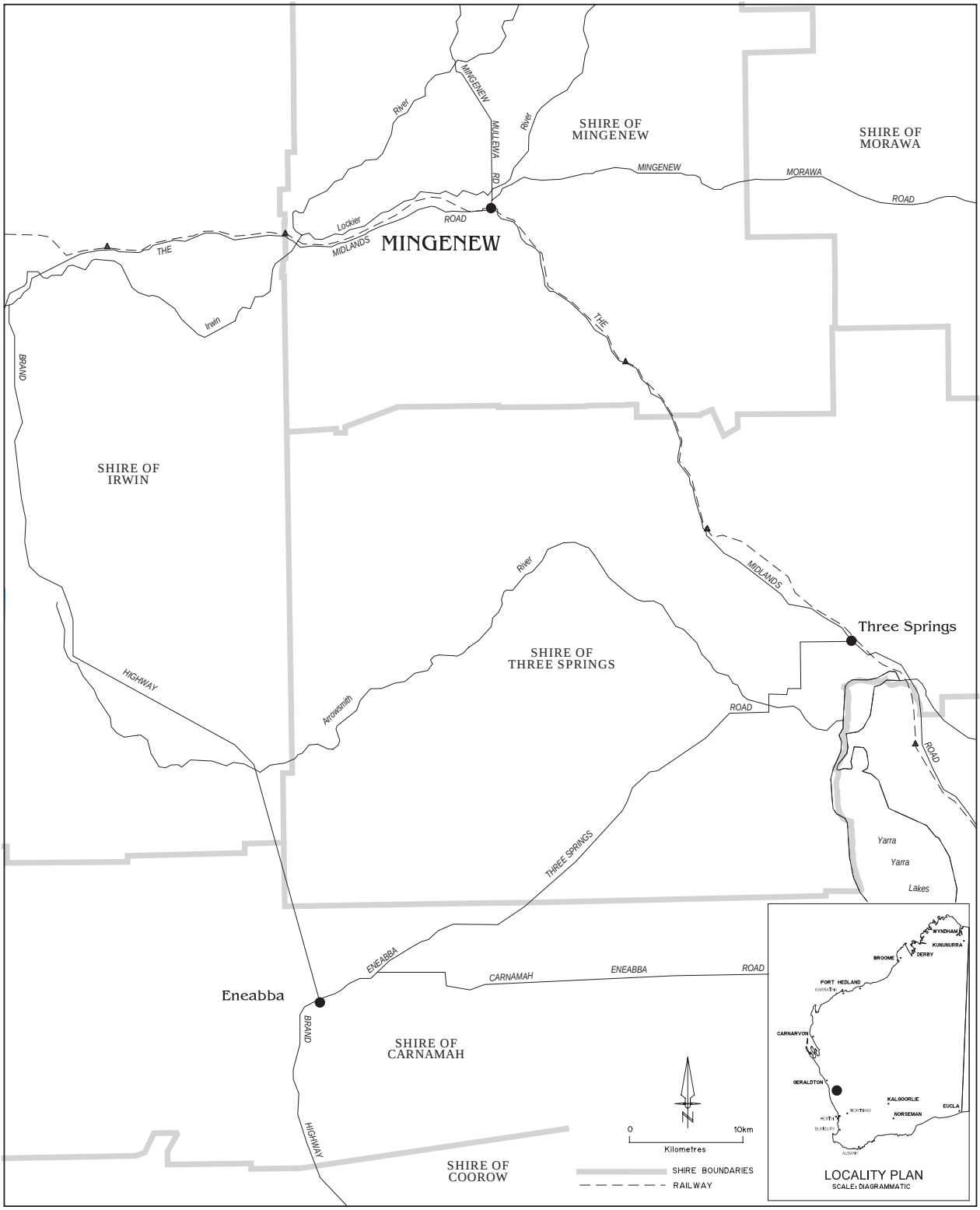


Figure 1. Mingenew location map

5. Potential for contamination

Wheat cropping and dryland grazing are the main land use activities within the water reserve. The risks associated with the present broad acre agricultural land

uses are considered low and manageable for the maintenance of water quality.

A waste transfer station, located at the former landfill site, is situated south of the town in the groundwater flow path of production wells No 13 and 5/86 (Plate 3). Assessment of the site's impact on water quality suggests the previous land use had the potential to adversely impact on the town water supply. The waste transfer station stores the waste that is then transported to Geraldton. The station may continue to pose a risk to groundwater if putrescible waste is allowed to remain on site for sustained lengths of time.

The recreational reserves are grassed and irregularly fertilised and irrigated, and therefore considered a manageable risk to the water quality.

5.1 Emergencies

Escape of chemicals during unforeseen incidents and use of chemicals during emergency response can cause groundwater contamination. The Shire of Mingenew Local Emergency Management Advisory Committee through the Geraldton Emergency Management District should be familiar with the location and purpose of the Mingenew 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 Mingenew 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 impacts of spills on the groundwater resource.

6. Management of water quality risks

6.1 Protection objectives

The objective of this plan is to protect drinking water in the interest of public health, however the right of existing approved land uses to continue in the reserve is recognised.

The P2 classification proposed for the reserve is based on the principle of minimising the risk of contamination to the water resources. The overall protection objective for the reserve is to maintain existing water quality and initiate measures to improve water quality where possible.

6.2 Best management practices

Best management practices for land use activities are encouraged to help protect water quality.

Best management practices can be developed for an individual enterprise or have a local or regional focus and must consider the full range of economic, social and environmental issues associated with land, water and vegetation use. Development of best management practices must also consider the needs and concerns of users, consumers and the wider community.

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.

6.3 Water Quality Protection Notes

The Commission has developed 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 Commission's website at: http://www.wrc.wa.gov.au/protect/policy.

6.4 Land use planning

It is recognised that the establishment of appropriate protection mechanisms in statutory land use planning processes are necessary to secure the long-term protection of water sources. It is appropriate to have the Water Reserve and priority classification incorporated into land planning strategies.

6.5 Land use, potential water quality risks and recommended strategies

The following table details the existing land uses in the water reserve, the potential water quality threats and recommends a strategy to manage the associated risks.

Plate 2. Land use on the Mingenew wellfield.

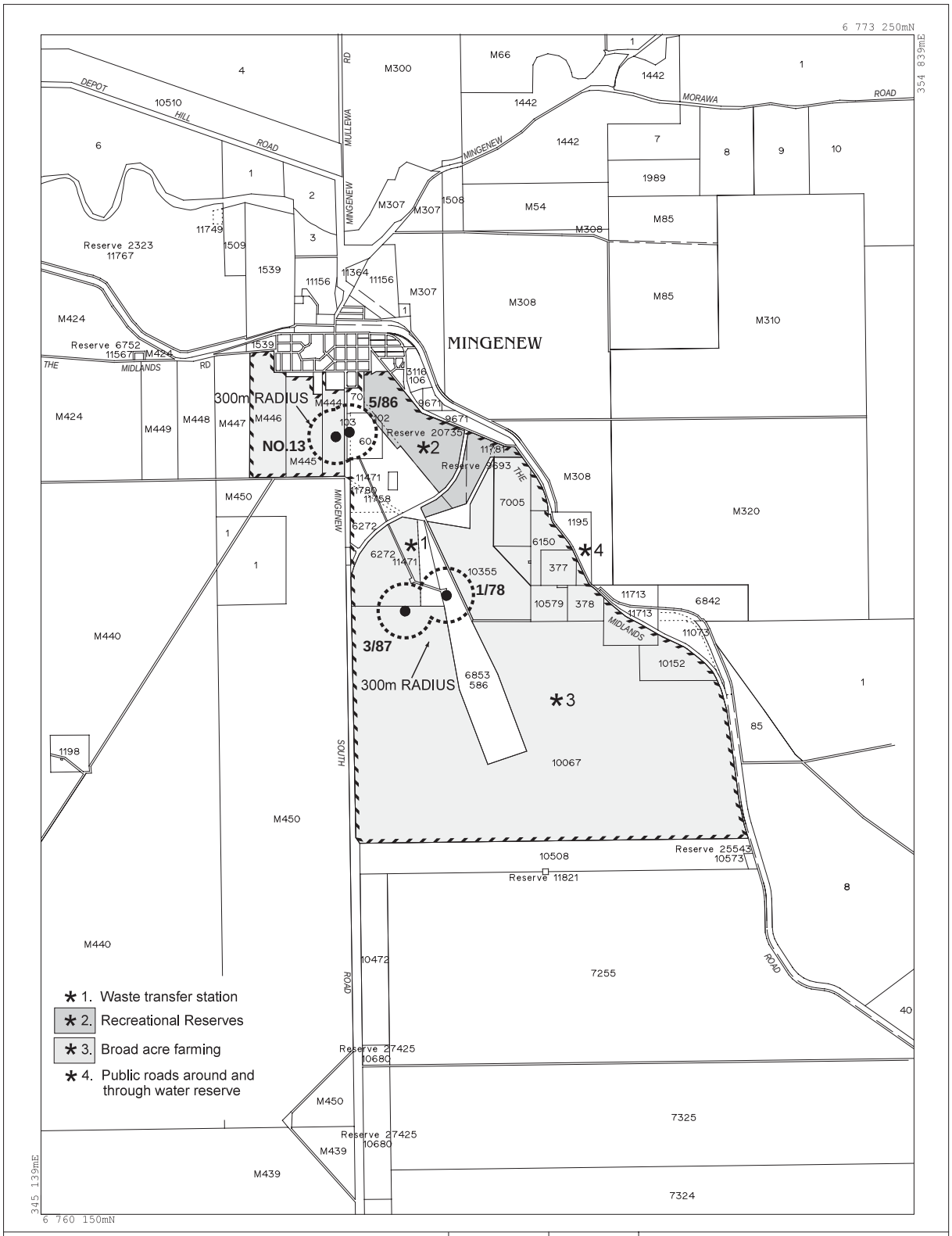
Plate 3. Mingenew waste transfer station.

Table 1. Land use, potential water quality risks and recommended strategies

The following table summarises the potential water quality risks associated with the land use activities in the Mingenew Water Reserve and recommends strategies for minimising the impact on the water quality to the Mingenew town water supply (see Figure 2).

Ref.	Issue	Risks/threats	Potential impact	Likelihood	Current preventative measures	Recommended protection strategies
1	Waste transfer station.	Waste transfer station built on former landfill site. Located up-gradient of two production bores. Potential to transmit pollutants to groundwater.	High	Medium	Regular removal of wastes to an approved landfill site. The site is licensed by the DEP.	Non-conforming use, medium risk to water quality. Relocation of the facility would be desirable. • Management of present activities with the implementation of best management practices; • Review DEP licence conditions of the waste transfer station to ensure risks to groundwater quality are addressed; • Review water quality monitoring program for production bores; and • Investigate opportunities for the relocation of the facility
2	Recreational reserve, golf course, race course, aerial landing strip.	The water quality issues associated with these activities are low. The recreational reserve and the golf course are irregularly fertilised and irrigated. The landing strip consists of a grassed/hard-finished landing strip. No toxic or hazardous substances are kept on site.	Low	Low		Present land use is manageable. Intensification would be undesirable. • Present activities to continue; and • Best management practices for the management of turf areas including any chemical or fuel storage.
Ref.	**Issue**	**Risks/threats**	**Potential impact**	**Likelihood**	**Current preventative measures**	**Recommended protection strategies**
3	Broad acre cropping and grazing.	The use and storage of toxic and hazardous materials including fuels and pesticides.	Low	Low/medium	Quality of reticulated water is regularly monitored.	The potential water quality risks associated with these private land uses are low and manageable for their continuation in the wellfield. • Landowners continue current activities with best management practices; and • Manage intensification of land uses through planning approval

		Manure from grazing stock contaminating groundwater with nutrients and microbiological contaminants.	Low	Low		
		On-farm disposal of waste and refuse.	Low – refuse site located in local vicinity.	Low		
4	Public and private roads.	Private roads throughout the wellfield, with the Midlands and Mingenew South road bordering the wellfield boundary. The potential risks from these roads are from a spill of a contaminating substance such as fuel, oil or chemicals.	Medium	Low	Local Emergency Management Advisory Committee trained to respond to HAZMAT incidents.	The roads are necessary for regional transport, therefore the best approach would be to take measures to minimise the impact of a spill through road maintenance and management measures. • Ensure emergency response process is in place and the local emergency management advisory committee is aware of the water reserve.



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7. Proposed proclaimed areas

The Mingenew Water Reserve was declared in December 1953 under the *Country Areas Water Supply Act, 1947*. The boundary was subsequently amended in 1983 when the wellfield was extended to incorporate more of the recharge area. This plan recommends the retention of the current proclaimed boundary.

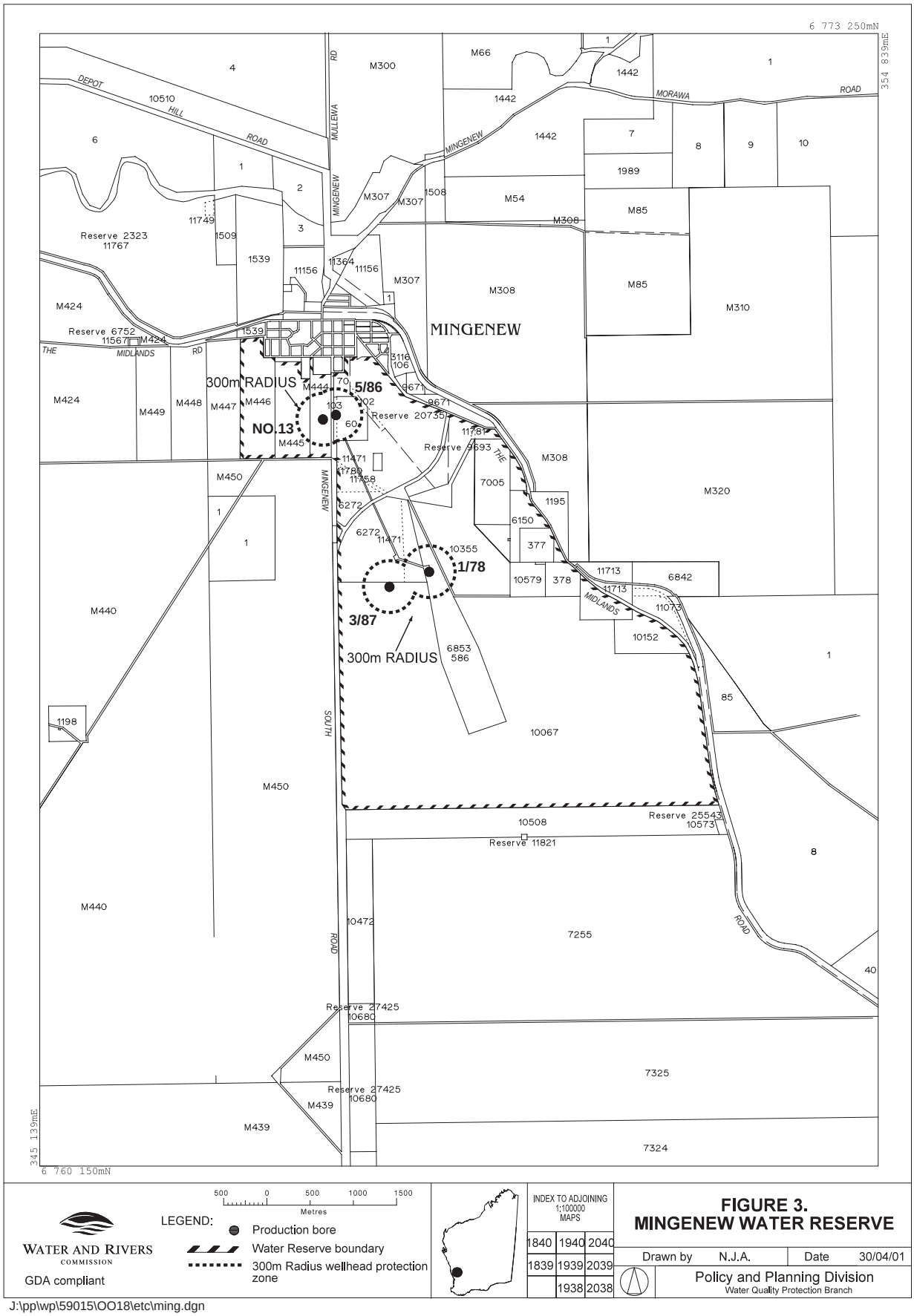
There is potential within the Water Reserve to augment existing supplies by drilling bores east and north of currently-used bores. Present abstraction rates are considerably below the capacity of the wellfield. Should existing supplies prove inadequate, these sites will be investigated further.

The boundary of the reserve is considered appropriate for the protection of the existing and future development of the wellfield.

It is proposed to classify the Mingenew Water Reserve for Priority 2 source protection (Figure 3). The P2 classification is based on the following:

- The Mingenew wellfield draws groundwater from a shallow, semi-confined aquifer that is considered to be vulnerable to contamination;
- The wellfield is of strategic importance to the Mingenew community as it is the closest potable water source;
- Current land planning strategies recognise the continuation of general rural activities; and
- The classification is compatible with the current low-intensity agricultural land uses in the water reserve. A non-conforming land use, the waste transfer station, will be managed to minimise impact to groundwater quality.

A circular wellhead protection zone of 300 m radius centred on each bore should be implemented.



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Recommendations

1. Planning strategies should incorporate the management principles outlined in this plan and reflect the Priority 2 classification given to the Water Reserve.

2. All development proposals in the Mingenew Water Reserve that are likely to impact on water quality should be referred to the Water and Rivers Commission for advice and recommendation.

3. Signs should be erected along the boundaries of the proposed Water Reserve and wellhead protection zones to define the areas and promote public awareness of the need to protect water quality.

4. Develop and implement an environmental guideline for broad hectare agriculture in consultation with peak industry bodies and landowners.

5. A surveillance program should be established to identify any incompatible land uses or potential contaminant threats within the Water Reserve. Surveillance and by-law enforcement responsibility should be delegated to the Water Corporation.

6. Incidents covered by WESTPLAN – HAZMAT in the Mingenew Water Reserve should be addressed through the following measures:

- The Local Emergency Management Advisory Committee (through the Geraldton Emergency Management District) being familiar with the location and purpose of the Mingenew Water Reserve;
- The locality plan for the Mingenew Water Reserve being provided to the Fire and Rescue Services headquarters for the HAZMAT Emergency Advisory Team;
- The Water and Rivers Commission advising the HAZMAT Emergency Advisory Team during incidents in the Mingenew Water Reserve; and
- Personnel dealing with WESTPLAN – HAZMAT incidents in the area given ready access to a locality map of the catchment area and training to understand the potential impacts of spills on the surface water resource.

7. Water Corporation to continue the groundwater quality monitoring program of production wells and routinely review water quality analysis results to detect any adverse trends.

8. Review DEP licence conditions of the waste transfer station to ensure risks to groundwater quality are addressed and investigate opportunities for the relocation of the facility.

9. Implementation of these recommendations should be reviewed annually after this plan is endorsed. A full review of this protection plan should be undertaken after five years.

Implementation strategy

No.	Description	Implemented by	Timing
1.	Incorporation into land planning strategies.	Shire of Mingenew and Ministry for Planning.	Ongoing
2.	Referral of development proposals: a) Provide guidelines for referral of development proposals. b) Referral of development proposals. c) Incorporate source protection strategy into town planning scheme for Mingenew.	a) Program Manager, Assessment and Advice (WRC). b) Shire of Mingenew, Ministry for Planning, Department of Environmental Protection and Department of Minerals and Energy. c) WRC and Shire of Mingenew.	a) 2001-02 b) Ongoing c) To be arranged
3.	Publicise the location, extent and implications of the Water Reserve to the Mingenew community. a) Development of guidelines for signage. b) Determine number and location of signs required. c) Erect and maintain signs.	a) Program Manager, Protection Planning, Water Quality Protection Branch (WRC). b) Regional Manager, Mid-West Gascoyne (WRC) and Regional Business Manager Mid-West (WC). c) Regional Manager, Mid-West Gascoyne (WRC) and Regional Business Manager Mid-West (WC).	a) 2001-02 b) 2001-02 c) To be arranged
4.	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 (WRC).	To be arranged

5.	Surveillance and by-law enforcement program: a) Develop guidelines for the surveillance of Water Reserves. b) Delegate by-law enforcement to the Water Corporation. c) Implement the surveillance program and enforce by-laws following delegation.	a) Program Manager, Protection Planning (WRC). b) Water and Rivers Commission. c) Regional Business Manager Mid-West (WC).	Ongoing
6.	Incidents covered by WESTPLAN – HAZMAT in the Mingenew Water Reserve should be addressed through the following measures: a) The Mingenew Local Emergency Management Advisory Committee (through the Geraldton Emergency Management District) being familiar with the location and purpose of the Mingenew Water Reserve. b) The locality plan for the Mingenew Water Reserve being provided to the Fire and Rescue Services headquarters for the HAZMAT Emergency Advisory Team. c) The Water and Rivers Commission advising the HAZMAT Emergency Advisory Team during incidents in the Mingenew Water Reserve. 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) Mingenew Local Emergency Management Advisory Committee through WRC (Mid-West Gascoyne Region). b) WRC (Mid-West Gascoyne Region). c) WRC (Mid-West Gascoyne Region). d) Mingenew Local Emergency Management Advisory Committee.	a) 2001 b) 2001 c) Ongoing d) Ongoing

7.	Monitoring program: a) Review monitoring program to address parameters associated with land use risks. b) Regularly review water quality data for adverse trends.	a) Water Corporation. b) Water Corporation.	a) Ongoing b) Ongoing
8.	Waste transfer station a) Review DEP licence conditions of the waste transfer station to ensure risks to groundwater quality are addressed. b) Investigate opportunities for the relocation of the facility.	a) Water Quality Protection Branch (WRC). b) WRC and Shire of Mingenew.	a) 2001-02 b) To be determined
9.	Review of this plan and recommendations: a) Review implementation strategy. b) Full review.	a) Water Quality Protection Branch (WRC). b) Water Quality Protection Branch (WRC).	a) Annually 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.
m AHD	Australian Height Datum. Height in metres above Mean Sea Level +0.026 m at Fremantle.
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.
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.
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 1909*, in which restrictions are put on activities that may pollute the groundwater.
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.

Appendix

Land use compatibility in Public Drinking Water Source Areas

LAND USE COMPATIBILITY IN PUBLIC DRINKING WATER SOURCE AREAS

Purpose

These notes provide the Commission's views on practices and activities related to the quality of the State's water resources. They are recommendations only and may be varied at the discretion of the Commission.

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

Scope

These notes provide guidance on 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*.

The notes are not intended to override the statutory role and policy of other State or local government authorities. Project proponents will need to fulfil their legal responsibilities including those covering land use planning, environmental, health and building permit matters.

PDWSA 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, **well-head protection zones** and **reservoir protection zones** are defined to protect the water source from contamination in the immediate vicinity of production wells and reservoirs. Well-head 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.

Existing activities

The Commission recognises that many activities were established before the introduction of these tables. The Commission will negotiate with the operators of non-conforming activities to develop agreed management practices to minimise the impact on water resources. The Commission may also provide information to operators on best management practices for existing compatible and conditional activities.

Proposed activities

These tables do not replace the need for assessment of proposed activities 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.
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.
Incompatible	The land use is incompatible with the management objectives of the priority classification. Any such development proposals received may be referred for formal Environmental Impact Assessment under Environmental Protection Act.
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 following 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	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 acre (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 / practices	Priority 1	Priority 2	Priority 3
Broad land 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
Soil amendment (clean sand, loam, clay, peat)	Incompatible	Conditional	Compatible
Soil amendment (industry byproducts & biosolids),	Incompatible	Incompatible	Conditional
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]
Chemical manufacture / formulation	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]
Dye works	Incompatible	Incompatible	Conditional[6]
Farm supply centres	Incompatible	Incompatible[7]	Conditional
Fertiliser manufacture / bulk storage depots	Incompatible	Incompatible	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 & municipal works 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]
Warehouses	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 / Gasworks	Incompatible	Incompatible	Incompatible
Petroleum refineries	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, veterinary, dental 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]

EXPLORATION, MINING AND MINERAL PROCESSING

Land use	Priority 1	Priority 2	Priority 3
Extractive industries (sand, clay, peat and rock)	Conditional[2]	Conditional[2]	Conditional[2]
Mineral and energy source exploration	Conditional[4]	Conditional[4]	Conditional[4]
Mining	Conditional[4]	Conditional[4]	Conditional[4]
Mineral processing	Incompatible	Incompatible	Conditional[4]
Oil or gas extraction / decontamination for transport	Conditional[4]	Conditional[4]	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]
Manure stockpiling / processing facilities	Incompatible	Incompatible[7]	Conditional
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
Forestry product processing- chip-mills, pulp / paper, timber preservation, wood / fibre works	Incompatible	Incompatible	Conditional
Vegetable / food processing	Incompatible	Incompatible	Conditional[6]
Wineries	Incompatible	Conditional[15, 18]	Conditional [15]

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[9]
Urban subdivision	Incompatible	Incompatible	Compatible[6]
Industrial subdivision	Incompatible	Incompatible	Conditional[6]

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, rural chalets	Incompatible	Conditional[16]	Compatible
Motels, hotels, lodging houses, hostels, resorts	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
Communications receivers / transmitters	Conditional	Conditional	Conditional
Construction projects (not shown elsewhere)	Conditional	Conditional	Conditional
Drinking water treatment plants	Conditional	Conditional	Conditional
Forestry	Conditional[1]	Compatible	Compatible
Major transport routes	Incompatible	Conditional[10]	Compatible
Construction /Mining camps	Conditional	Conditional	Conditional
Prisons	Incompatible	Incompatible	Conditional[6]
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 excavation in relation to the water table with specified guidelines for rehabilitation.

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

4. Conditions placed via the Department of Minerals and Energy lease and / or Environment Minister's /Department of Environmental Protection 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. May be accepted if this facility is necessary to support acceptable land use in the area and is consistent with State and local government 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 drainage 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 specified 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.

18. Size of annual grape crush does not exceed 500 tonnes and grapes sourced from operator's vineyards within the P2 area.