

WRP 32



MILLSTREAM WATER RESERVE

WATER SOURCE PROTECTION PLAN

West Pilbara Water Supply Scheme



WATER RESOURCE PROTECTION SERIES

WATER AND RIVERS COMMISSION REPORT WRP 32

1999



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COMMISSION

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Cover Photograph: Chinderwarriner Pool, Millstream



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West Pilbara Water Supply Scheme

Water and Rivers Commission
Policy and Planning Division

WATER AND RIVERS COMMISSION
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Foreword

Water Source Protection Plans

Water Source Protection Plans establish the level of protection required within 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 Millstream 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, **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 restrictions apply within these zones.



Contents

Summary	1	Figures	
1. Introduction	2	Figure 1. Millstream Water Reserve locality map	5
2. Hydrogeology	2	Figure 2. Millstream Wellfield Location	6
3. Proposed proclaimed area	3	Figure 3. Proposed Millstream Water Reserve	7
4. Existing and proposed land use	3	Figure 4. Potential contamination threats	13
5. Potential for contamination	8	Tables	
Recommendations	14	Table 1. Potential sources of contamination within the	
Implementation Strategy	16	Millstream Water Reserve.....	8
References	19		
Glossary	20		
Appendices	22		
Appendix 1: Inventory of fuel storage at Millstream wellfield	22		
Appendix 2: Above ground chemical storage tanks in Public Drinking Water Source Areas	23		
Appendix 3: Land use compatibility in Public Drinking Water Source Areas	24		
Appendix 4: Decommissioning of underground fuel and chemical storage tanks	29		
Appendix 5: Plates of potential contaminating threats	37		



Summary

The Millstream wellfield is located approximately 100 km south of Karratha in the Pilbara region of Western Australia. The wellfield is located within the Millstream Water Reserve and supplies water to the West Pilbara Water Supply Scheme. The Harding Dam is the other contributor to this scheme.

Use of the Millstream water supply depends on the water quality of the Harding Dam. Millstream is used for supply when the Harding Dam is offline due to poor water quality or low water levels.

The Millstream source has the potential to be contaminated from diesel storage at production bores and depots, transport of diesel on the Dampier-Paraburdoo railway, the Millstream rubbish tip site, recreational activities within the catchment and cattle grazing.

The existing Millstream Water Reserve should be modified to incorporate only the recharge areas of the Millstream aquifer. The modified reserve requires dual source protection classification. Government owned land containing the Millstream Dolomite outcrops and the surface water catchment recharging the dolomite should be classified for Priority 1 source protection. The remainder of the reserve should be classified as a Priority 2 source protection area.

This plan has undergone extensive consultation during the development process. Discussions were held with key stakeholders prior to the preparation of the draft plan. The draft plan was released for comment to key stakeholders including affected landowners, pastoral lease owners, Aboriginal communities, Water Corporation, Ministry for Planning, Department of Environmental Protection, Department of Land Administration, Department of Conservation and Land Management, Shire of Ashburton, Pastoralists and Graziers Association and the Conservation Council. Comments received were considered in the preparation of this plan.



1. Introduction

The Millstream wellfield is located approximately 100 km south of Karratha in the Pilbara region of Western Australia (see **Figure 1**). The existing Water Reserve lies within the administrative boundaries of the Shire of Ashburton and is overlain by Land Act Reserve 38991 which is vested in the Water and Rivers Commission and the Water Corporation.

Groundwater has been abstracted from the Millstream aquifer for Public Water Supply since 1968-69 (WAWA, 1992). The Water Corporation operates the Millstream scheme in conjunction with the Harding River Dam to supply water to the towns of Dampier, Karratha, Wickham, Roebourne, Point Sampson and Cape Lambert as part of the West Pilbara Water Supply Scheme. Water is drawn from the Millstream aquifer that mainly consists of calcrete and silcrete of the Millstream Dolomite. The aquifer is largely unconfined except where it is overlain by Kanjenjie Clay in the east.

The current conjunctive licensed allocation for the Millstream wellfield with the Harding Dam is 15 GL/annum. The wellfield (**Figure 2**) consists of twelve production bores (Millstream 1 to 12) drilled in 1969 and 1971. Bores 11 and 12 have recently been decommissioned due to increased salinity. Supplementation bores have also been installed to augment water levels in Deep Reach and Chinderwarriner Pools. Millstream has an extensive network of 79 monitoring bores that are mainly used to determine the impacts of abstraction on the environmentally significant pools in the area.

The use of the Millstream water supply has dropped significantly with the construction of Harding Dam in 1985 (WAWA, 1992). This has been due to the increase in use of the Harding Dam water supply, the reduction in population in the area and successful water conservation measures. Currently, the Millstream supply is used when the water quality of the Harding Dam deteriorates, often due to turbidity problems caused by inflow or seasonal destratification.

The climate of the region is arid and is characterised by high summer temperatures and variable but low rainfall. The annual average rainfall at Millstream is about 350 mm, most of which occurs between

November and March during tropical thunderstorms and from cold fronts between May and June.

2. Hydrogeology

The Millstream aquifer consists mainly of Millstream Dolomite (dolomite, calcrete, silcrete and clay). The aquifer has well-developed secondary porosity and solution cavities resulting in a highly transmissive aquifer. The Millstream aquifer has a saturated thickness of up to 33 m (Barnett and Commander, 1986). It is unconfined except in the east where it is confined by Kanjenjie Clay to a thickness of 47 m. Kanjenjie Clay consists of silty clay with interbeds of poorly sorted sand and pebbly gravel.

The water table is approximately 5 to 15 m below ground. Groundwater flows from the valley walls towards the centre and along the valley axis in an approximately west to northwesterly direction through the wellfield area.

Three mechanisms contribute to the recharge of the Millstream aquifer:

- Infiltration where the Fortescue River crosses the aquifer upstream of Deep Reach Pool, particularly in flood events.
- Direct infiltration of rain on outcropping Millstream Dolomite.
- Infiltration from small, episodic creeks draining the northern flank of the Hamersley Range and traversing the aquifer.

• Most aquifer recharge occurs when the Fortescue River is in flood.

The Millstream aquifer is highly vulnerable to contamination in areas of Millstream Dolomite where the wellfield is located. This is due to the unconfined nature of the aquifer as well as the shallow depth to groundwater over the dolomite.

The water quality at Millstream is generally within NH&MRC guidelines, although it can exceed the aesthetic guidelines for TDS (Total Dissolved Solids) and hardness. TDS varies depending on location of production bores. Bores 1 to 6 have TDS in the range 700 to 800 mg/L whereas bores 7 to 12 have TDS of approximately 1100 mg/L. Bores 11 and 12 have



recently been decommissioned due to increasing TDS. On occasions there have been high levels of dissolved iron in bores 7 and 8. The water at Millstream is high in carbonate with an increasing trend in hardness in water from bores 7 to 10

3. Proposed proclaimed area

The existing and proposed Water Reserves are shown in **Figure 3**. The proposed Water Reserve consists of the major recharge areas for the Millstream aquifer. The new boundary can be justified as follows:

- The western boundary coincides with a groundwater divide.
- The eastern boundary coincides with the catchment area of Weelumurra Creek. Only during flood events does the catchment for the Millstream aquifer extend beyond Weelumurra Creek.
- The remaining area comprises the surface water catchments which contribute to flow in the Fortescue River between the western and eastern boundaries. Due to large dilution factors based on surface and groundwater flows, proclamation of the whole catchment area of the Fortescue River was not necessary to protect the wellfield.

These modifications can be justified as the proposed Water Reserve only includes groundwater and surface water flows that are likely to contribute to the Millstream Dolomite aquifer, which is being utilised for water supply. The new boundary also allows for wellfield expansion in the area.

The proposed Water Reserve requires dual classification. The area of government owned land and the recharge area of the Millstream Dolomite outcrop requires Priority 1 source protection classification. This classification is justified for the following reasons:

- The Millstream groundwater source is of strategic importance to towns that are serviced by the West Pilbara Water Supply Scheme.
- A large portion of the Water Reserve lies within Land Act Reserve 38991, which is vested for water supply. Some areas of Reserve 38991 have been leased back to local pastoral stations for grazing. Pastoral grazing operations are considered compatible with P1 source protection objectives.

- The remaining land is Millstream National Park which is compatible with the water source protection objectives for Priority 1 areas.
- The reserve includes the unconfined part of the Millstream aquifer that is vulnerable to contamination.
- Intensification of land use has the potential to contaminate the water source.

The remainder of the reserve should be classified as a Priority 2 source protection area. This classification is based on the following points:

- The reserve includes Caliwingina Creek, Weelumurra Creek and short streams which drain from the Hamersley and Chichester Ranges and contribute to the aquifer recharge.
- The remaining land is under pastoral lease which is compatible with Priority 2 water source protection objectives.

In addition, wellhead protection zones consisting of a 500 m radius centred around each production bore should be established. Specific restrictions for fuel storage will apply in these zones.

4. Existing and proposed land use

The Millstream pastoral lease was purchased by the Public Works Department in 1982. Part of the pastoral lease was included in the Millstream-Chichester National Park with the remainder included as part of Land Act Reserve 38991. This Land Act Reserve is jointly vested with the Water and Rivers Commission and Water Corporation.

Areas within the Land Act Reserve 38991 have been leased as follows:

- Ieramugudu lease, which was leased to the Ngurin Aboriginal Group. The group is now defunct and it is likely that this portion of land will be leased to the Ngurrawanna Aboriginal Corporation.
- Yalleen lease which was leased to Cimbrone Park Pty Ltd for grazing purposes.
- Coolawanyah lease which was leased to the Coolawanyah Pastoral company for grazing purposes.
- A portion of land (Coodinnar Creek) has been excised from the reserve and vested in the



Aboriginal Lands Trust. The Trust has leased this portion of land to the Ngurrawanna Aboriginal Corporation for 99 years.

It has been proposed to rationalise the areas within the Land Act Reserve 38991 which includes merging some of the smaller reserves with the surrounding land tenure and amalgamating others (such as Ieramugudu North Block with the Ieramugudu lease). Additional areas are likely to be incorporated into the Millstream-Chichester National Park.

The southern section of the Millstream-Chichester National Park lies within the existing Millstream Water Reserve. The park has visitor facilities in this section including a visitors' centre at the old Millstream homestead and camping grounds at Crossing Pool and Deep Reach Pool. The Department of Conservation and Land Management (CALM) has a depot and on-site accommodation for rangers and workers in the National Park. A management plan for the Millstream-Chichester National Park is currently in preparation.

There is the potential to develop an Aboriginal Community at Kanjenjie Outstation. Approval was granted in the 1990s for excision of a portion of land known as the 'homestead block' for Aboriginal purposes. No development has occurred at the site but there is the possibility of a small community (30 to 40 people) and some commercial activities to be developed adjacent to the main road in the vicinity of the outstation.

The Ngurrawanna Community has developed a Community Plan with assistance from the Pilbara Development Commission. The plan aims to improve the living environment and social wellbeing of the Ngurrawanna Community. The group has expressed interest in expanding the community and possibly developing some tourist facilities and a cattle or emu farm on the lease. Most of these activities are likely to occur outside the proposed Water Reserve boundary.

Recreation activities are popular within the Millstream Water Reserve due to the beauty of the landscape. CALM is proposing to modify and further develop recreation facilities within the reserve including:

- Closing down the camping facilities at Crossing Pool,

- Establishing new camping facilities at Deep Reach Pool, Dawsons Creek and the 'Corroboree Ground', and
- Further development of visitor facilities including walks and picnic sites.

The Water Corporation maintains power generation and pumping facilities at its depot, approximately 1 km west of the Millstream homestead. Adjacent to the pump station are living quarters for permanent pumping and visiting maintenance personnel.

Two railways traverse Millstream Water Reserve and the Land Act Reserve 38991. The Pannawonica to Cape Lambert railway (operated by Robe River Co. Pty Ltd) cuts across the northwestern portion of the Reserve. This railway does not cross the aquifer at any point and crosses the Fortescue River downstream. The Dampier to Paraburdoo railway (operated by Hamersley Iron) runs roughly parallel to the Fortescue River and approximately 15 km north of the river and then crosses the river upstream.

Currently there is a proposal for a new road route from Karratha to Tom Price that is planned to be orientated through the Millstream Water Reserve. Negotiations are underway to align this new route in the existing Dampier to Paraburdoo railway transport corridor to negate the potential risk of contamination to the Millstream aquifer. Similar negotiations are underway to align the route for the proposed West Angelas railway.

5. Potential for contamination

Table 1. Identified potential contaminant threats in the proposed Water Reserve. Potential Impact indicates the level of risk the issue is to the water source and Likelihood indicates the chance of the issue contaminating the water source. **Figure 4** shows a map of potential contaminant threats.



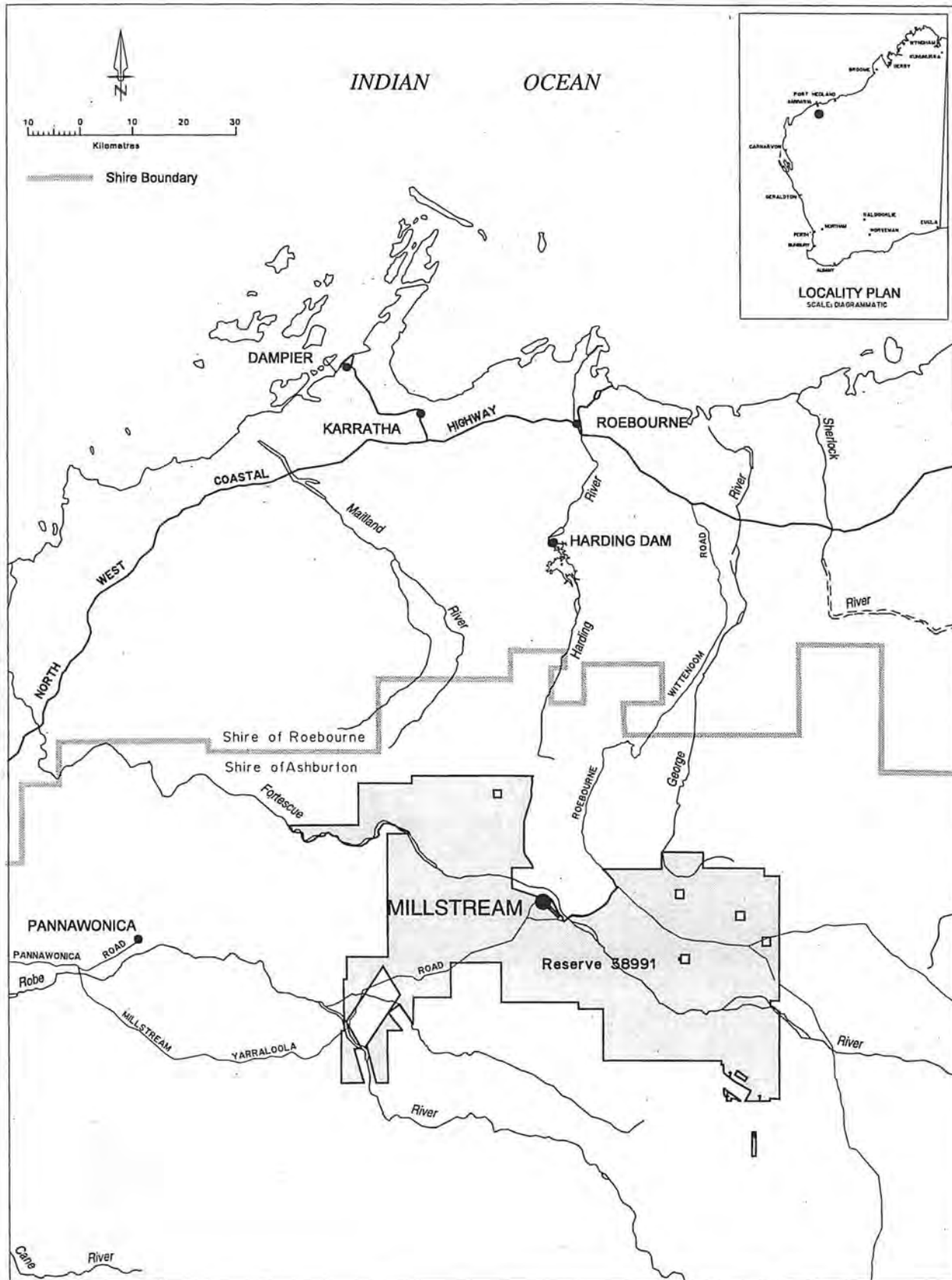


Figure 1. Millstream Water Reserve locality map



Figure 2. Millstream wellfield location

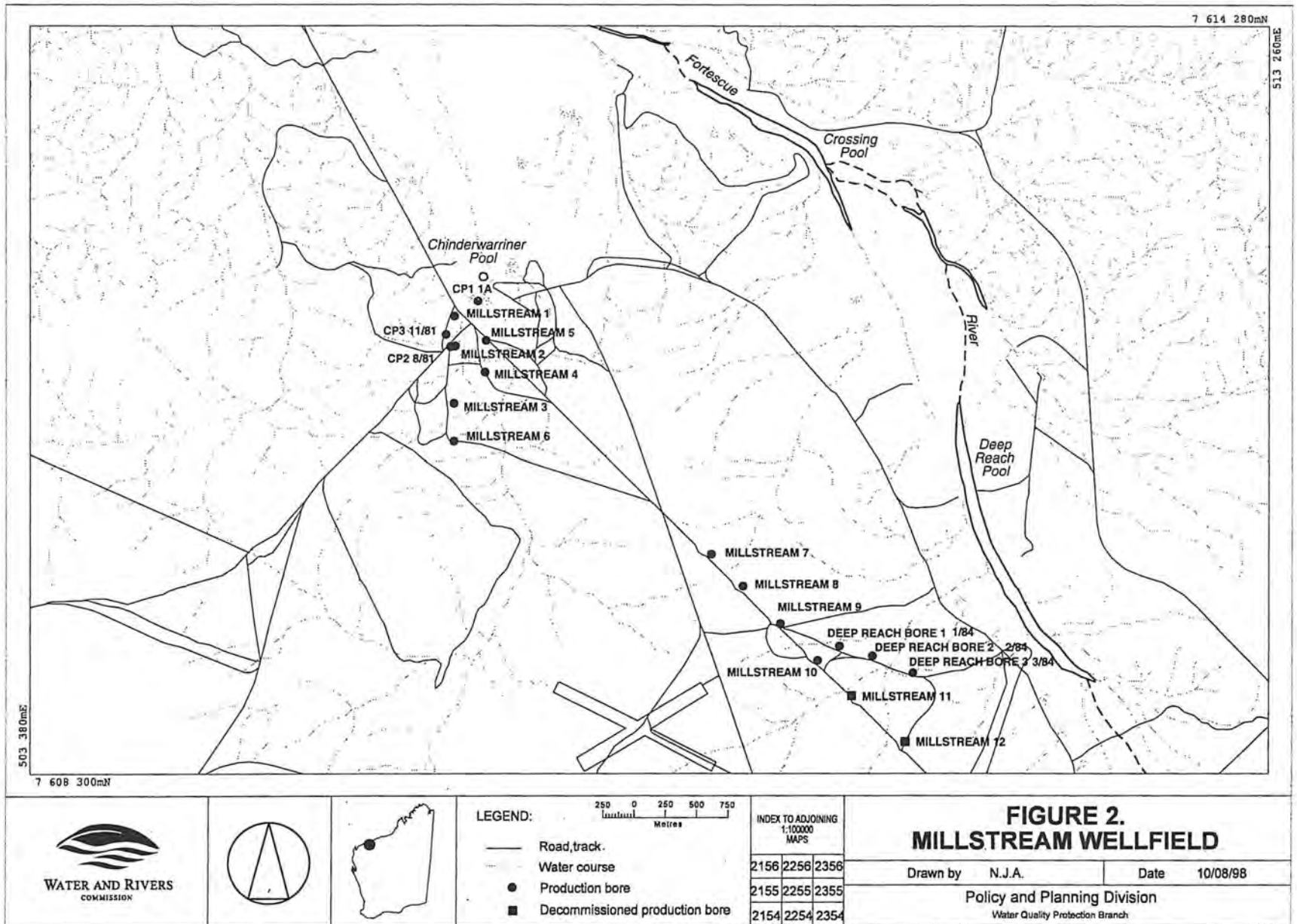
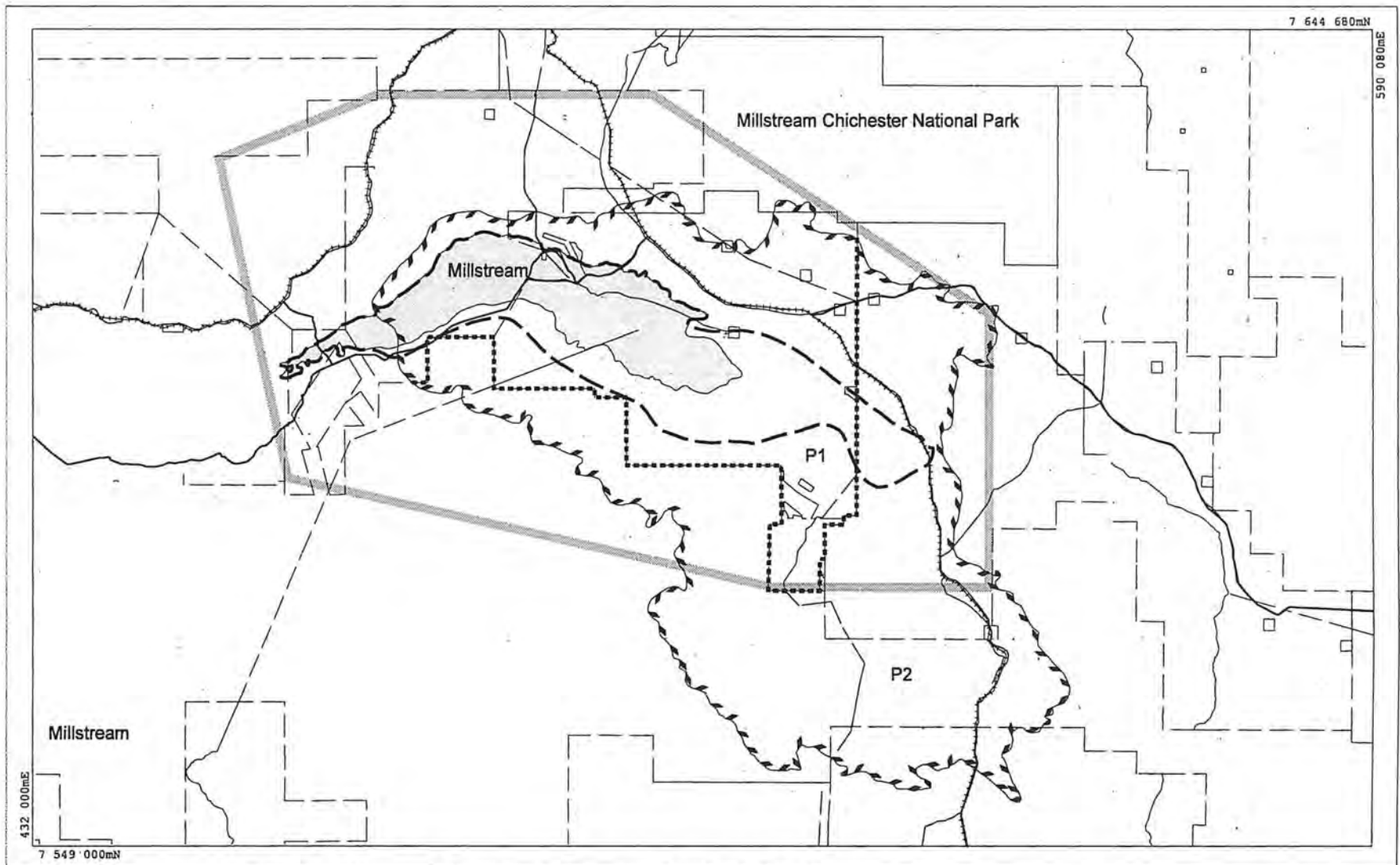



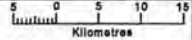


Figure 3. Proposed Millstream Water Reserve



 <p>WATER AND RIVERS COMMISSION</p>			LEGEND: <ul style="list-style-type: none"> ----- Priority area boundary ----- Extent of Millstream Dolomite Millstream Dolomite outcrop ----- Proposed Millstream Water Reserve boundary ----- Existing Water Reserve boundary 		INDEX TO ADJOINING 1:100000 MAPS 2156 2256 2356 2155 2255 2355 2154 2254 2354	FIGURE 3. PROPOSED MILLSTREAM WATER RESERVE	
				Drawn by N.J.A. Date 10/08/98		Policy and Planning Division Water Quality Protection Branch	

5. Potential for contamination

Map ref.	Issue	Threats	Risks	Potential Impact	Likelihood	Current Preventative Measures	Suggested Protection Measures
1	Diesel storage at production bores	Each of the production bores has a day tank of 500 L and a main tank ranging from 5000 to 20 000 L. A summary of diesel storage at production bores is included as Appendix 1.	Groundwater contamination by hydrocarbons	High	Medium, fuel system not fully bunded and regular transport of fuel.	<ul style="list-style-type: none"> Some partial bunding of fuel storage. Water Corporation currently rationalising all fuel storage at production bores and protection of fuel lines and day tanks. 	<ul style="list-style-type: none"> Upgrade bunding to meet the Commission's requirements (Appendix 2). Effective emergency response procedures in place to address fuel spillage's.
2	CALM depot	Septic tanks at rangers' residences, accommodation units and Millstream homestead.	Groundwater contamination by bacteria/nutrients	Medium	Medium	None	Investigate alternatives to septic tanks, particularly if pressure on facilities increases.
		<ul style="list-style-type: none"> Above ground bulk diesel storage (9000 L and 27 000 L) plus 1000 L day tank. Unleaded fuel & kerosene (400 L) drums on ground. Oils, detergents. 	Groundwater contamination by hydrocarbons and other chemicals	High	Low	Concrete bunding has been installed for above ground fuel storage and within storage sheds following the leakage of 2500 litres of diesel from the above ground tank in 1994.	Confirm bunding complies with Commission's requirements for bunding (Appendix 2).
		<ul style="list-style-type: none"> Mechanical washdown of generator 	Groundwater contamination by detergents/grease	Medium	Low	Generator shed drains to a sealed collection pit which is regularly maintained.	Collection pit should be upgraded to a triple interceptor pit (or superior treatment technology).

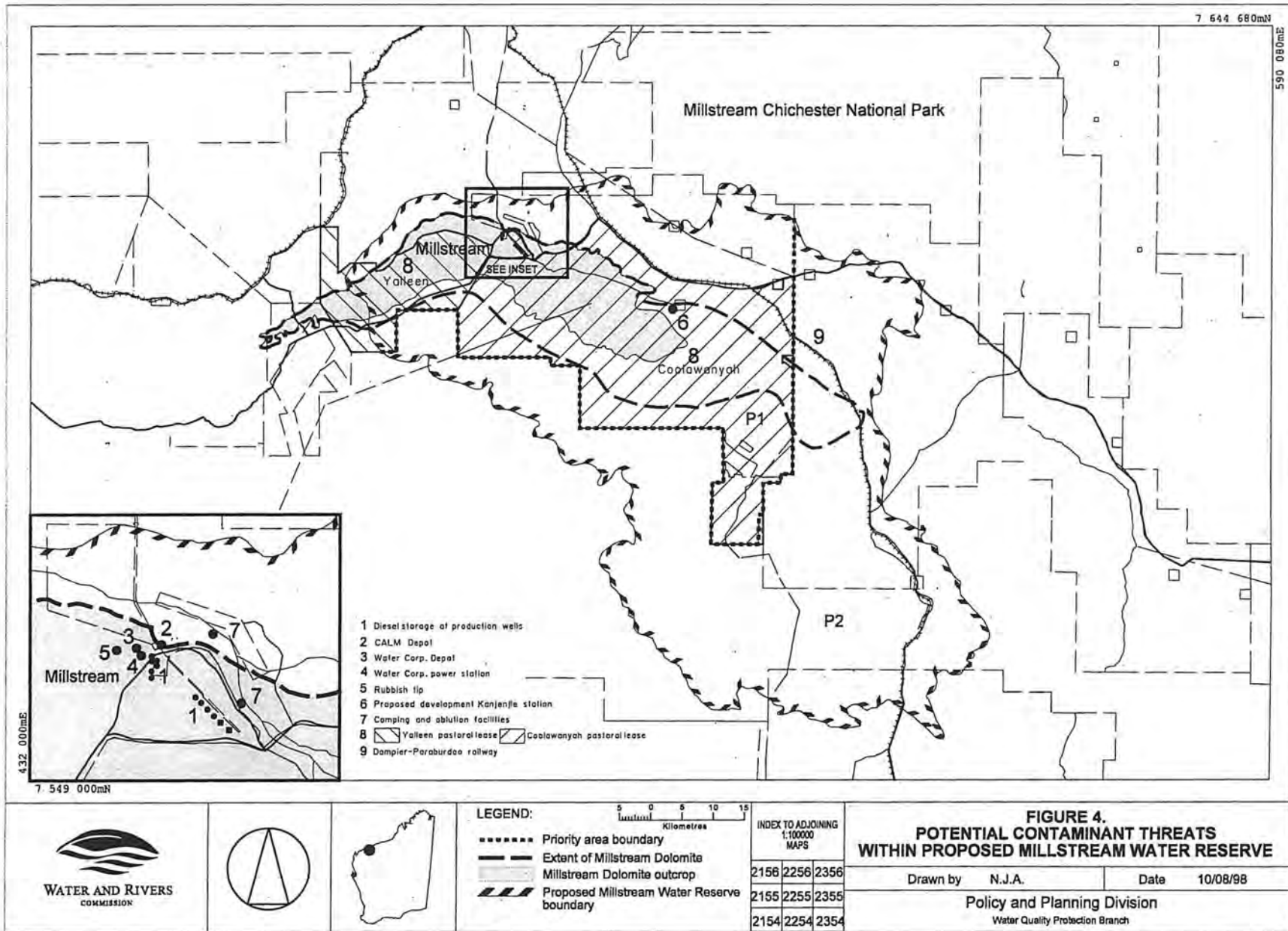
Map ref.	Issue	Threats	Risks	Potential Impact	Likelihood	Current Preventative Measures	Suggested Protection Measures
3	Water Corporation depot	<ul style="list-style-type: none"> Above ground diesel storage (two 46,000 litre tanks) Evidence of diesel spillage around bowser. Old below-ground fuel storage tank (not in use). 	Groundwater contamination by hydrocarbons	High	Low	<ul style="list-style-type: none"> Bunding of above ground fuel storage tanks. Water Corporation currently reviewing all fuel storage in Water Reserve and planning to relocate diesel bowser to banded area at bulk fuel storage site. Below ground fuel storage tank to be filled with liquefied sand and backfilled. 	<ul style="list-style-type: none"> Compliance of above ground fuel storage with Commission's requirements for bunding (Appendix 2). Removal of contaminated soil during bowser relocation. Decommission below ground fuel storage tank to Commission's requirements (Appendix 4).
		<ul style="list-style-type: none"> Sewerage treatment lagoon 	Groundwater contamination by nutrients and bacteria	Low	Low	<ul style="list-style-type: none"> Lagoon has a low input of waste. Vegetative growth within lagoon would provide biological filtering of waste. 	None
		<ul style="list-style-type: none"> Storage of waste oil, batteries and old infrastructure 	Groundwater contamination by hydrocarbons and chemicals	Medium	Low	<ul style="list-style-type: none"> Washdown drains into pit, provides natural degradation. Water Corporation reviewing storage facilities. 	<ul style="list-style-type: none"> Removal of chemicals and waste from site or moving to a banded facility. Pit to be upgraded to a triple interceptor (or superior treatment technology).

Map ref.	Issue	Threats	Risks	Potential Impact	Likelihood	Current Preventative Measures	Suggested Protection Measures
4	Water Corporation power station	<ul style="list-style-type: none"> Above ground diesel storage (two 4500 L tanks) and three 450 L day tanks Mechanical washdown of generator 	Groundwater contamination by hydrocarbons and detergents/grease	High	Low	<ul style="list-style-type: none"> Larger tanks bunded. Drainage gully used for wastewater to bunded area. 	<ul style="list-style-type: none"> Compliance with the Commission's requirements for bunding (Appendix 2).
5	Millstream rubbish tip	<ul style="list-style-type: none"> Migration of leachate towards production bores. 	Groundwater contamination by chemicals	Medium	Low	Tip is located in clays approximately 3 km northwest of wellfield.	None
n/a	Expansion of Ngurrawanna community	<p>Possible developments include:</p> <ul style="list-style-type: none"> Expansion of community Emu farm Pastoral enterprise Tourist facilities Sewage treatment system 	Groundwater contamination by nutrients/bacteria	Low, site is down-gradient of wellfield.	Low, down-gradient of wellfield.	Ministry for Planning is preparing an outline plan for the Ngurrawanna Aboriginal Community that will identify current and future land use. The Ministry will liaise with the Commission on these matters.	Land use developments in compliance with the objectives of priority source protection (Appendix 3).
6	Proposed Kanjenjie Community	<ul style="list-style-type: none"> Potential Aboriginal community of 30 to 40 people. Possible small commercial activities. 	Groundwater contamination by nutrients, bacteria and other chemicals	Medium, most aspects can be managed	Not applicable	Not applicable	Community should consult Commission for advice on land use activities to minimise impacts on water resources.

Map ref.	Issue	Threats	Risks	Potential Impact	Likelihood	Current Preventative Measures	Suggested Protection Measures
7	National Park camping facilities	Ablution facilities.	Groundwater contamination by nutrients/bacteria	Low	Low, well managed	Ablution facilities consist of a sealed pit system.	Any new facilities should be sealed and sited away from dolomite outcrops.
		Recreation activities including swimming, fishing, camping, canoeing and bushwalking.	Groundwater contamination by nutrients/bacteria	Low	Low	Specific areas for recreation are defined. CALM currently working with Commission on compatible recreation activities.	CALM should continue to work with Commission in the development of recreational activities.
8	Yalleen and Coolawanyah pastoral leases	Pastoral activities	Groundwater contamination by nutrients/bacteria	Low, depends on stocking rate	Low, fenced lease area	Pastoral Lease Provision 1(y) - the lessee may not engage in any activity that will adversely affect the quality of the ground and surface water. Only grazing is permitted and lessees required to fence lease boundary.	Establish management agreement which details how activities will be carried out to ensure Provision 1(y) is met.
n/a	Millstream Airstrip	Fuel/chemical storage	Groundwater contamination by hydrocarbons and chemicals	Low, no fixed fuel storage on site	Low, airstrip rarely used.	Department of Defence use Water Corporation's bunded compounds to store fuel when necessary.	None

Map ref.	Issue	Threats	Risks	Potential Impact	Likelihood	Current Preventative Measures	Suggested Protection Measures
9	Transport of diesel along Dampier - Paraburdoo railway	<ul style="list-style-type: none"> • Three diesel tankers (480 000 L each) dispatched weekly. • Two locomotives hauling iron ore (15 trips daily) carry up to 17 000 L of diesel. • Track maintenance equipment carrying 400 to 15 000 L of fuel. 	Groundwater contamination by hydrocarbons	Low, railway is 15 km from wellfield.	Low	Measures to prevent derailment include: broken rail detection, dragging equipment protection, hot bearing, wheel protectors, fail safe air brakes, regular ultrasonic monitoring, track flood flow indicators on key water crossings and track shutdown in cyclones.	<ul style="list-style-type: none"> • Shire of Ashburton Local Emergency Management Advisory Committee familiar with Water Reserve. • Water Reserve locality plan provided to HAZMAT Emergency Advisory Team. • The Water Corporation advising HAZMAT Emergency Advisory Team during incidents • Personnel dealing with WESTPLAN - HAZMAT incidents given training to understand potential impacts of spills on groundwater resources.

Figure 4. Potential contamination threats within the proposed Millstream Water Reserve



Recommendations

1. The proposed modifications to the Millstream Water Reserve should be gazetted under the *Country Areas Water Supply Act 1947*.
2. Planning Strategies should incorporate the management principles outlined in the Water and Rivers Commission's *Land Use Compatibility in Public Drinking Water Source Areas (Appendix 3)* and reflect the Priority 1 and Priority 2 classifications given to the Water Reserve.
3. All development proposals within the Water Reserve which are likely to impact on water quality should be referred to the Water and Rivers Commission.
4. The location of the recently installed signage around the catchment should be changed to coincide with the proposed boundary changes.
5. Incidents covered by WESTPLAN – HAZMAT in the Millstream Water Reserve should be addressed through the following measures:
 - The Shire of Ashburton Local Emergency Management Advisory Committee (through the Karratha Emergency Management District) being familiar with the location and purpose of the Millstream Water Reserve.
 - The locality plan for the Millstream Water Reserve being provided to the Fire and Rescue Services headquarters for the HAZMAT Emergency Advisory Team.
 - The Water Corporation advising the HAZMAT Emergency Advisory Team during incidents in the Millstream Water Reserve.
 - 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.
6. A surveillance program should be established to identify incompatible land uses or potential contamination threats within the Water Reserve.
7. The Water Corporation should upgrade their bunding and bund management procedures to ensure that the risk of fuel spills associated with the failure of tanks or pipework is contained within bunded areas (**Appendix 2**).
8. During rationalisation of diesel storage at the production bores, day tanks should be relocated within bunded areas.
9. The Water Corporation should decommission the underground storage tank at its depot in accordance with the Commission's requirements (**Appendix 4**) to prevent its re-use in the future or as a waste disposal point.
10. The Water Corporation should remove old batteries at the depot from the site and facilitate bunding of waste oil storage.
11. During bowser relocation and installation in the bunded area, the Water Corporation should ensure it removes all contaminated soil from the site in order to meet water source protection objectives.
12. The Water Corporation should upgrade the mechanical servicing pit to include a triple interceptor system (or superior treatment technology) which is covered to prevent the intrusion of stormwater.



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13. The Department of Conservation and Land Management should upgrade its chemical storage at its Millstream depot to ensure it meets water source protection objectives.
 14. The Department of Conservation and Land Management should upgrade its mechanical servicing pit to include a triple interceptor system (or superior treatment technology).
 15. The Department of Conservation and Land Management should investigate alternative sewage treatment to the use of septic tanks at the depot, particularly if the pressure on the facilities increases.
 16. The Ministry for Planning should consult with the Commission on compatible land activities at the Ngurrawanna Aboriginal Corporation.
 17. Development of conditions on the Kanjenjie Aboriginal Community lease to ensure compliance with the Commission's water source protection objectives for the Millstream Water Reserve.
 18. Any new ablution facilities within the Millstream-Chichester National Park should be sealed and sited away from the Millstream Dolomite.
 19. The Water Corporation in consultation with the Commission should develop a management agreement with the owners of the Yalleen and Coolawanyah pastoral leases which details how pastoral activities will be carried out to ensure Lease Provision 1(y) is met.
 20. Implementation of these recommendations should be reviewed one year after this plan is endorsed. A full review of this protection plan should be undertaken approximately every five years.



Implementation Strategy

No.	Description	Implemented by	Timing
1	Gazettal of reserve.	<ul style="list-style-type: none"> • Program Manager, Protection Planning, Water Quality Protection (WRC) 	On completion of protection plan
2	Incorporation into land planning strategies.	<ul style="list-style-type: none"> • Shire of Ashburton & Ministry for Planning 	On-going
3	Referral of development proposals: <ul style="list-style-type: none"> • Provide Shire of Ashburton with guidelines for referral of development proposals. • Referral of development proposals. 	<ul style="list-style-type: none"> • Program Manager, Assessment and Advice, Water Quality Protection (WRC) • Shire of Ashburton, Ministry for Planning, Department of Environmental Protection, Department of Minerals and Energy 	On-going
4	Erection of signs: <ul style="list-style-type: none"> • Review current catchment signage. • Develop guidelines for signage. • Determine location and quantity of signs (if required). • Erect signs (if required). 	<ul style="list-style-type: none"> • Water Corporation, WRC and CALM • Program Manager, Protection Planning, Water Quality Protection (WRC) in consultation with the Water Corporation • Water Corporation in consultation with WRC Regional Manager • Water Corporation 	1999/2000

(continued)

No.	Description	Implemented by	Timing
5	<p>Incidents covered by WESTPLAN – HAZMAT in the Millstream Water Reserve should be addressed through the following measures:</p> <p>(i) The Shire of Ashburton Local Emergency Management Advisory Committee (through the Karratha Emergency Management District) being familiar with the location and purpose of the Millstream Water Reserve.</p> <p>(ii) The locality plan for the proposed Millstream Water Reserve being provided to the Fire and Rescue Services headquarters for the HAZMAT Emergency Advisory Team</p> <p>(iii) The Water Corporation advising the HAZMAT Emergency Advisory Team during incidents in the Millstream Water Reserve.</p> <p>(iv) Personnel dealing with WESTPLAN - HAZMAT incidents in the area given ready access to a locality map of the proposed Water Reserve and training to understand the potential impacts of spills on the groundwater resource.</p>	<p>(i) Shire of Ashburton Local Emergency Management Advisory Committee through WRC (Karratha region)</p> <p>(ii) WRC (North West Region)</p> <p>(iii) Water Corporation</p> <p>(iv) Shire of Ashburton Local Emergency Management Advisory Committee</p>	<p>(i) 1998/99</p> <p>(ii) 1998/99</p> <p>(iii) Ongoing</p> <p>(iv) Ongoing</p>
6	<p>Surveillance:</p> <ul style="list-style-type: none">• Develop guidelines for surveillance of Water Reserves.• Implement surveillance program.	<ul style="list-style-type: none">• Program Manager, Assessment and Advice, Water Quality Protection (WRC)• Regional Manager, North West Region (WRC) and the Water Corporation	<p>1999/2000</p>
7	<p>Upgrade of bunding at bores.</p>	<ul style="list-style-type: none">• Water Corporation	<p>1999/2000</p>
8	<p>Relocation of day tanks to bunded areas.</p>	<ul style="list-style-type: none">• Water Corporation	<p>1999/2000</p>
9	<p>Decommissioning of underground storage tank.</p>	<ul style="list-style-type: none">• Water Corporation	<p>1999/2000</p>
10	<p>Review of waste storage procedures at Millstream depot.</p>	<ul style="list-style-type: none">• Water Corporation	<p>1998/99</p>
11	<p>Relocation of diesel bowser.</p>	<ul style="list-style-type: none">• Water Corporation	<p>1999/2000</p>
12	<p>Upgrade of mechanical servicing pit.</p>	<ul style="list-style-type: none">• Water Corporation	<p>1999/2000</p>
13	<p>Review chemical storage at CALM depot.</p>	<ul style="list-style-type: none">• CALM	<p>1998/99</p>

(continued)

No.	Description	Implemented by	Timing
14	Upgrade of mechanical servicing pit.	<ul style="list-style-type: none">CALM	1999/2000
15	Investigation of alternative sewage treatment systems	<ul style="list-style-type: none">CALM	To be arranged
16	Ngurrawanna Aboriginal Corporation Management Plan compatible with objectives of source protection.	<ul style="list-style-type: none">Ministry for Planning to liaise with WRC on lease conditions. Implementation by WRC through lease.	1998/99
17	Development of lease conditions of Kanjenjie Aboriginal Community to ensure compatibility with objectives of source protection.	<ul style="list-style-type: none">WRC and Water Corporation to advise Kanjenjie Aboriginal Community through lease conditions	1998/99
18	New ablution facilities within Millstream-Chichester National Park to be sited away from Millstream Dolomite	<ul style="list-style-type: none">CALM	As required
19	Establish a management agreement with owners of Yalleen and Coolawanyah pastoral leases.	<ul style="list-style-type: none">Water Corporation/WRC	1999/2000
20	Review of this plan and recommendations.	<ul style="list-style-type: none">Program Manager, Protection Planning, Water Quality Protection (WRC)	Initial review after 1 year. Full review after 5 years

References

Barnett, J. C. & Commander, D. P. 1986, *Hydrology of the Western Fortescue Valley, Pilbara Region Western Australia*, Western Australian Geological Survey, Record 1986/8.

NH&MRC 1996, *Australian Drinking Water Guidelines*: National Health and Medical Research Council and Agriculture and Resource Management Council of Australia and New Zealand.

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Water Corporation 1997, *West Pilbara Water Supply Scheme Source Review*: Water Corporation, Infrastructure Planning Branch, February 1997.



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.
Runoff	Water that flows over the surface from a catchment area, including streams.
Saltwater Intrusion	The inland intrusion of saltwater into a layer of fresh groundwater.
Scheme Supply	Water diverted from a source (or sources) by a water authority or private company and supplied via a distribution network to customers for urban, industrial or irrigation use.
Storage Reservoir	A major reservoir of water created in a river valley by building a dam.
Stormwater	Rainwater 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.



Appendix 1

Inventory of fuel storage at Millstream Wellfield

Bore	Volume of Diesel Storage (L)
Millstream 1	20 000
Millstream 2	20 000
Millstream 3	20 000
Millstream 4	20 000
Millstream 5	20 000
Millstream 6	20 000
Millstream 7	9000 + 4500
Millstream 8	9000 + 4500
Millstream 9	9000 + 4500
Millstream 10	4500
Millstream 11	9000 + 4500
Millstream 12	4500
CP2 8/81	2500
CP3 11/81	2500
DR 1/84	4500
DR 2/84	4500
DR 3/84	4500



Appendix 2

Above ground chemical storage tanks in Public Drinking Water Source Areas



ABOVE GROUND CHEMICAL STORAGE TANKS IN PUBLIC DRINKING WATER SOURCE AREAS

Purpose

To provide information for facilities 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.

Scope

These notes apply in Public Drinking Water Source Areas where chemicals that are potentially polluting, toxic or hazardous (including fuel) are stored in above ground tanks.

Chemicals covered by these notes include:

- Substances listed in Section 4 of the *Australian Water Quality Guidelines for Fresh and Marine Waters* published by the Australian and New Zealand Environment and Conservation Council (ANZECC), 1992.
- Substances described in the current Schedules of the *Poisons Act 1964*.
- Concentrates and substances listed in Schedule Classes 3 to 9 of the *Explosive and Dangerous Goods Act, Classification Order of 1988*.

Chemicals used for hygiene or similar non-commercial purposes in quantities less than 25 litres are excluded.

These notes apply to permanent facilities that will be used for 12 months or more. For temporary installations (used for less than 12 months) refer to Water Quality Protection Note – *Temporary Above Ground Fuel Storage in Public Drinking Water Source Areas*.

Public Drinking Water Source Areas (PDWSAs) describe areas declared under the *Metropolitan Water Supply, Sewerage and Drainage Act 1909* and the *Country Areas Water Supply Act 1947* for the management and protection of sources of water used for public drinking water supply. They include Underground Water Pollution Control Areas (UWPCAs), Water Reserves and Catchment Areas.

Three priority classification areas have been defined in PDWSAs. They are **P1, P2 and P3**. Priority is determined by land tenure, land use and water flow paths. Different management strategies apply in each priority area. For further details refer to Water Quality Protection Note – *Land Use Compatibility in Public Drinking Water Source Areas*.

Above ground chemical storage tanks also require approval from the Department of Minerals and Energy (DME).

General recommendations

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

Proposals for above ground chemical storage systems in PDWSAs will need to be assessed by the Water and Rivers Commission prior to DME approval. The proposal should include:

- A site plan showing the location of the facility.
- Construction details of tank containment compounds.
- An inspection and maintenance schedule for the facility to ensure effective containment of chemicals.

If the proposal is located in a UWPCA, permit approval from the Commission is also required.

Chemicals including petroleum products should not be stored within 2 kilometres of the top water level of public water supply reservoirs.

In P1 and P2 public drinking water source areas, elevated tanks are not permitted in wellhead protection zones.

In P1 and P2 public drinking water source areas, the total storage volume shall not exceed 5000 litres.

Containment Compound Design

Storage tanks and associated containment compounds should comply with the current Australian Standard 1940, the *Explosive and Dangerous Goods Act 1961* and its regulations.

Storage tanks should be located within containment compounds that effectively capture and contain chemical spills. These compounds should capture any leak or jet of liquid from any perforation of the tank or associated equipment. The Commission's minimum design criteria are appended to these notes as **Plan No. 1**.

Compounds should be constructed of waterproof reinforced concrete or approved equivalent, which is not adversely affected by contact with chemicals captured within them.

The minimum compound volume should be 110% of the capacity of the largest container system, plus 25% of the **total capacity of all** other separate containers within the compound.

Underground pipe-work carrying product from the tank external to the bund is unacceptable in P1 and P2 areas. Underground pipe-work should be secondary contained in P3 areas. In P1 and P2 areas, aboveground pipe-work must be secondary contained. Pipe-work within the bund does not require secondary containment.

Compounds should have sufficient capacity to contain spilt chemicals and not be overtopped during extreme rainfall events. Additional capacity for rainfall captured within the compound should be calculated using a 1 in 100 year return frequency storm event over 24 hours. Design methods should be used as described in the current edition of *Australian Rainfall and Runoff* produced by the Institution of Engineers, Australia.

Tank equipment such as dispensing hoses, valves, meters, pumps, and gauges should be located within the compound.

Security should be provided to guard against vandalism when the site is unattended. This should include:

- Fencing of the tank compound or adequate security controls at the site.
- Locks on unattended dispensing hoses.

The base of the compound should grade towards a liquid retention sump to facilitate recovery of spilt liquids. The sump should be emptied by pumping, **not** through a valved gravity outlet, which could inadvertently be left open.

Incompatible or reactive chemicals should be stored in separate bunded compounds.



All chemicals stored within the bunded compounds should be clearly labelled detailing the nature and quantity of chemicals stored within containers. Sight gauges indicating the current volume are recommended for tanks larger than 250 litres.

Chemical transfer areas

All chemical transfer activities (in and out of tanks) should occur on an impervious sealed area; kerbed, graded or bunded to prevent liquid runoff to the environment.

Chemical transfer areas should drain away from the perimeter bund to a containment pit. The pit should be capable of holding stormwater from at least a 48 hour, 2 year return frequency storm event, in addition to containing potential chemical spills. Designs should provide for the safe and efficient movement of vehicles.

Operation of containment compounds

Chemical spills should be cleaned up immediately. The spilt liquid and clean-up material should be removed, treated and disposed of outside any PDWSA in accordance with requirements of the Department of Environmental Protection's (DEP) Waste Management Division.

The compound should be maintained to prevent accumulation of stormwater and litter. Only stormwater assessed as uncontaminated by a suitably qualified and experienced person may be released to soaks or off-site drainage systems.

In **P1 and P2** areas, one of the following measures should be used to prevent accumulation of stormwater:

- A roofed structure that extends at least 1 metre past the edge of the compound. Side walls or vertical roof turn-downs should be used where necessary to prevent intrusion of wind-driven rainfall.
- A reliable assessment and management procedure for disposal of stormwater. The procedure should be documented and submitted to the Commission for approval.

In **P3** areas, adoption of one of the following measures is recommended:

- Collect and dispose of stormwater outside any PDWSA in accordance with the requirements of the DEP -Waste Management Division.
- Treat stormwater on-site in a separation unit capable of removing contaminating substances. The method of treatment will depend on whether effluent is discharged to sewer or disposed of on-site in soaks. Any liquid released to the environment should conform to the criteria for Raw Water for Drinking Water Supply given in *Australian Water Quality Guidelines for Fresh and Marine Waters – ANZECC (1992)*.

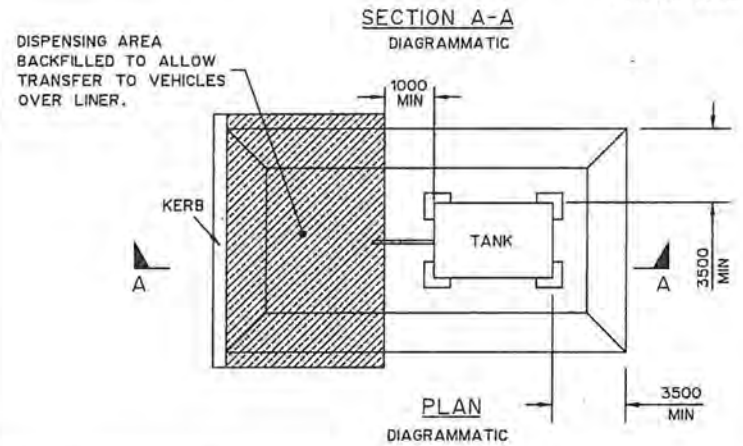
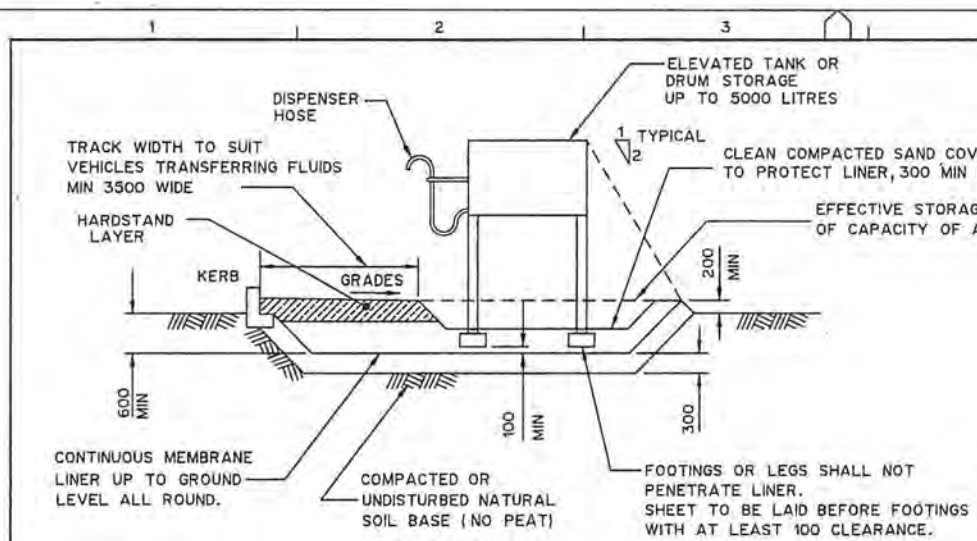
More information

We welcome your comment on these notes. They will be updated from time to time as comments are received or industry standards change.

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





APPLICATION

This specification applies to chemical storage tanks (including fuels) of 250 litres capacity and greater, located within Public Drinking Water Source Areas (i.e. Underground Water Pollution Control Areas, Water Reserves and Catchment Areas)

MINIMUM DESIGN CRITERIA:

1. Construction of flammable liquid storage tanks shall be in accordance with AS1940
2. The below ground liner shall be leakproof, resistant to chemical attack, and capable of retaining any spillage. The sheets must be continuously seam welded at edges, to form an impervious sheet over the specified area.
3. The membrane liner thickness required is 0.5mm minimum.
4. The membrane liner (or other impervious lining) must be approved by the Commission and installed in the presence of an authorised Commission Representative. Please contact the Commission's local regional office to arrange for inspections.
5. Footings of the tank, and other structures over the liner shall not puncture the sheet. A minimum clearance of 100mm is required.
6. On removal of the tank, all contaminated soil must be disposed of outside any Public Drinking Water Source area, at a waste disposal site approved by the D.E.P. - Waste Management division.
7. The tank dispenser and connections must be located over the liner. The minimum distance between the external edge of the liner and the end of the extended dispenser hose shall be 1.5 metres.
8. For clarification or discussion of this plan contact the Water Quality Protection Branch at the Commission.

LOCATION OF PUBLIC DRINKING WATER SOURCE AREAS
 Maps showing the boundaries of the Public Drinking Water Source areas are available from the Water and Rivers Commission. Please phone (08) 9278 0300 for more information.

NOTE : ALL DIMENSIONS IN MILLIMETRES UNLESS SHOWN OTHERWISE.

ISSUE DATE	REVISION	DRN	REC	APPD

DES REF	RECOMMENDED
DATE	
DRN	
CHD	APPROVED



PUBLIC DRINKING WATER SOURCE PROTECTION AREAS - SPECIFICATION FOR ELEVATED CHEMICAL AND FUEL STORAGE TANKS				ORIGINAL SHEET SIZE
FILE	PROJECT	PLAN	CAD	A4
		No. 1	ISSUE A	
				MF

394

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Appendix 3

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 existing and proposed 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 developed 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 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, **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 restrictions apply within these zones.

Tables showing Land Use Compatibility with the PDWSA protection strategy

These tables should be used as a guideline only. Further information relating to land use and development within PDWSAs including those not listed in the table, can be obtained from the Commission's Water Quality Protection Branch.

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

Definitions used in the following tables

<i>Compatible</i>	The land use is compatible with the management objectives of the priority classification.
<i>Incompatible</i>	The land use is incompatible with the management objectives of the priority classification.
<i>Restricted</i>	The land use may be compatible with the management objectives of the priority classification, with appropriate site management practices. Restricted developments /activities should be referred to the Commission for assessment on a case specific basis.
<i>Extensive</i>	Where limited additional inputs are required to the land to support the desired land use. eg supplementary animal feed only during seasonal dry periods.
<i>Intensive</i>	Where regular additional inputs are required to support the desired land use. eg irrigation, non forage animal feed dominates, fertilisers.



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

Tables showing Land use compatibility with PDWSA protection objectives

AGRICULTURE - ANIMALS

Land use	Priority 1	Priority 2	Priority 3
Apiaries	Restricted	Restricted	Restricted
Aquaculture eg. marron farms, fish farms, algae culture	Incompatible	Restricted	Restricted
Dairy Farming	Incompatible	Restricted	Restricted
Feedlots	Incompatible	Incompatible	Restricted
Livestock grazing (extensive)	Restricted	Compatible	Compatible
Livestock grazing (intensive)	Incompatible	Incompatible	Restricted ¹¹
Piggeries	Incompatible	Incompatible	Incompatible
Poultry farming (housed)	Incompatible	Restricted	Restricted
Stables	Incompatible	Restricted	Compatible
Stockholding and saleyards	Incompatible	Incompatible ⁷	Restricted ⁷

AGRICULTURE - PLANTS

Land use	Priority 1	Priority 2	Priority 3
Broad acre cropping i.e. non-irrigated	Incompatible	Restricted ¹	Compatible
Floriculture (extensive)	Incompatible	Restricted	Compatible
Floriculture (intensive)	Incompatible	Incompatible	Restricted
Field horticulture	Incompatible	Incompatible	Restricted
Hydroponic horticulture	Incompatible	Restricted	Restricted
Orchards	Incompatible	Restricted	Compatible
Potted Nurseries	Incompatible	Restricted	Compatible
Silviculture (tree farming)	Restricted	Restricted	Compatible
Turf Farms	Incompatible	Incompatible	Restricted
Viticulture (wine & table grapes)	Incompatible	Restricted	Compatible



DEVELOPMENT - COMMERCIAL

Land use	Priority 1	Priority 2	Priority 3
Aircraft Servicing	Incompatible	Incompatible	Restricted ⁶
Amusement Centres	Incompatible	Incompatible	Compatible ⁶
Automotive businesses	Incompatible	Incompatible	Restricted ⁶
Boat Servicing	Incompatible	Incompatible	Restricted ⁶
Caravan and trailer hire	Incompatible	Incompatible	Restricted ⁶
Vehicle parking (commercial)	Incompatible	Incompatible	Compatible
Consulting rooms	Incompatible	Incompatible ⁷	Compatible ⁶
Cottage Industries	Restricted	Restricted	Compatible
Drive in / take-away food shops	Incompatible	Incompatible	Compatible ⁶
Drive -in theatres	Incompatible	Incompatible	Compatible ⁶
Dry Cleaning Premises	Incompatible	Incompatible	Restricted ⁶
Farm supply centres	Incompatible	Incompatible ⁷	Restricted
Fuel depots	Incompatible	Incompatible	Restricted
Garden Centres	Incompatible	Incompatible	Compatible
Laboratories (analytical , photographic)	Incompatible	Incompatible	Compatible
Shops ⁷ and shopping centres	Incompatible	Incompatible ⁷	Compatible
Markets	Incompatible	Incompatible	Compatible ⁶
Milk depots	Incompatible	Incompatible	Restricted
Restaurants	Incompatible	Incompatible	Compatible
Service Stations	Incompatible	Incompatible	Restricted
Transport Depots	Incompatible	Incompatible	Restricted
Veterinary Clinics / hospitals	Incompatible	Incompatible ⁷	Restricted
Vehicle wrecking and machinery	Incompatible	Incompatible	Restricted

DEVELOPMENT - INDUSTRIAL

Land use	Priority 1	Priority 2	Priority 3
General Industry	Incompatible	Incompatible	Restricted ⁶
Heavy Industry	Incompatible	Incompatible	Incompatible
Light Industry	Incompatible	Incompatible	Restricted ⁶
Power Stations	Incompatible	Incompatible	Incompatible

DEVELOPMENT - URBAN

Land use	Priority 1	Priority 2	Priority 3
Aged and dependent persons	Incompatible	Incompatible	Compatible ⁶
Amenity buildings	Incompatible	Restricted	Compatible
Airports or landing grounds	Incompatible	Incompatible	Restricted ⁶
Cemeteries	Incompatible	Incompatible	Restricted
Civic buildings	Incompatible	Restricted	Compatible ⁶
Clubs -sporting, recreation or community	Restricted	Restricted	Compatible ⁶
Community halls	Restricted	Restricted	Compatible
Family Day Care Centres	Incompatible	Restricted	Compatible ⁶
Funeral parlours	Incompatible	Incompatible	Compatible ⁶
Health Centres	Incompatible	Incompatible	Compatible ⁶
Hospitals	Incompatible	Incompatible	Restricted ⁶
Medical centres	Incompatible	Incompatible	Compatible ⁶



EDUCATION / RESEARCH

Land use	Priority 1	Priority 2	Priority 3
Education centres	Restricted	Restricted	Compatible ⁶
Primary / Secondary Schools	Incompatible	Incompatible	Compatible ⁶
Scientific Research Institutions	Restricted	Restricted	Compatible
Universities	Incompatible	Incompatible	Restricted ⁶

MINING AND MINERAL PROCESSING

Land use	Priority 1	Priority 2	Priority 3
Extractive Industries	Restricted ²	Restricted ²	Restricted ²
Mineral Exploration	Restricted ⁴	Restricted ⁴	Restricted ⁴
Mining and mineral processing	Restricted ⁴	Restricted ⁴	Restricted ⁴
Tailings Dams	Incompatible	Incompatible	Restricted

PROCESSING OF ANIMALS / ANIMAL PRODUCTS

Land use	Priority 1	Priority 2	Priority 3
Abattoirs	Incompatible	Incompatible	Incompatible
Cheese / butter factories	Incompatible	Incompatible	Restricted ⁶
Food Processing	Incompatible	Incompatible	Restricted ⁶
Tanneries	Incompatible	Incompatible	Incompatible
Wool-scours	Incompatible	Incompatible	Incompatible

PROCESSING OF PLANTS / PLANT PRODUCTS

Land use	Priority 1	Priority 2	Priority 3
Breweries	Incompatible	Incompatible	Restricted ⁶
Composting / soil blending (commercial)	Incompatible	Incompatible	Restricted
Vegetable / food processing	Incompatible	Incompatible	Restricted ⁶
Wineries	Incompatible	Incompatible	Restricted

SUBDIVISION

Land use	Priority 1	Priority 2	Priority 3
Dog Kennel Subdivisions	Incompatible	Restricted	Restricted
Rural - minimum lot size = 4 hectares (un-sewered)	Incompatible	Compatible	Compatible
Rural - minimum lot size = 1 hectare (un-sewered)	Incompatible	Incompatible	Compatible
Special rural - minimum lot size = 2 hectares (un-sewered) ⁵	Incompatible	Restricted ⁸	Restricted ⁸
Special rural - minimum lot size = 1 hectare (un-sewered) ⁵	Incompatible	Incompatible	Restricted ⁸
Urban residential	Incompatible	Incompatible	Compatible ⁵

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



SPORT AND RECREATION

Land use	Priority 1	Priority 2	Priority 3
Equestrian centres	Incompatible	Incompatible	Compatible
Golf courses	Incompatible	Incompatible	Restricted
Irrigated recreational parks	Incompatible	Restricted	Restricted
Motor sports i.e permanent racing facilities	Incompatible	Incompatible	Restricted
Public Swimming Pools	Incompatible	Restricted	Restricted
Rifle Ranges	Restricted	Restricted	Compatible
Temporary recreational activities (active) eg four wheel driving, car rallies	Incompatible	Restricted ³	Restricted ³
Temporary recreational activities (passive) eg. horse riding, bush walking	Restricted	Restricted	Restricted

STORAGE OF TOXIC AND HAZARDOUS SUBSTANCES (THS)

Land use	Priority 1	Priority 2	Priority 3
Above ground storage of THS	Restricted ¹³	Restricted ¹³	Restricted ¹³
Bulk Storage Facilities for THS	Incompatible	Incompatible	Restricted ¹²
Underground storage tanks for THS	Incompatible	Incompatible	Restricted

TOURISM ACCOMMODATION

Land use	Priority 1	Priority 2	Priority 3
Bed and Breakfast accommodation	Incompatible	Restricted	Compatible
Caravan Parks	Incompatible	Incompatible	Restricted ⁶
Holiday accommodation eg farm chalets	Incompatible	Restricted ⁹	Compatible ⁶
Motels, lodging houses, hostels	Incompatible	Incompatible	Compatible ⁶

WASTE TREATMENT AND MANAGEMENT

Land use	Priority 1	Priority 2	Priority 3
Deep well injection of liquid wastes	Incompatible	Incompatible	Incompatible
Class I, II and III Landfills	Incompatible	Incompatible	Restricted
Class IV and V Landfills	Incompatible	Incompatible	Incompatible
Recycling depots	Incompatible	Incompatible	Restricted
Refuse transfer stations	Incompatible	Incompatible	Restricted
Sewers (Gravity)	Incompatible	Incompatible	Compatible
Sewers (Pressure Mains)	Incompatible	Restricted	Compatible
Sewage pump station	Incompatible	Restricted ¹³	Restricted
Used tyre storage / disposal facilities	Incompatible	Incompatible	Incompatible
Wastewater treatment plants	Incompatible	Incompatible	Restricted
Water treatment plants	Restricted	Restricted	Restricted



OTHER DEVELOPMENTS

Land use	Priority 1	Priority 2	Priority 3
Caretaker's housing	Restricted	Restricted	Compatible
Construction projects (not tabled)	Restricted	Restricted	Restricted
Forestry	Restricted ¹	Compatible	Compatible
National Parks	Compatible	Compatible	Compatible
Nature Reserves	Compatible	Compatible	Compatible
Communications receivers / transmitters	Restricted	Restricted	Restricted
Major Transport Routes	Incompatible	Restricted ¹⁰	Compatible

Table reference notes:

1. Restrictions apply to fertiliser application rates, with strict controls on the application of pesticides and field operations.
2. Restrictions apply to the storage of fuels and chemicals, with strict guidelines for rehabilitation.
3. Restrictions on the use of fuel and chemicals apply.
4. Subject to conditions placed on lease.
5. Special rural development requires appropriate planning justification, including provisions in the town planning scheme text.
6. Must be connected to deep sewerage, where practical, or otherwise to an approved waste disposal system that meets water quality protection objectives.
7. May be permitted if this use is incidental to the overall land use in the area and consistent with planning strategies.
8. Restrictions apply to siting of effluent disposal systems in areas with poor land capability and a shallow depth to groundwater.
9. Restrictions apply on density of accommodation.
10. Restrictions apply on road design and construction and the types of goods that may be carried.
11. Restrictions apply to stocking levels.
12. May be permitted if the type, volume and storage mechanisms for chemicals are compatible with water quality protection objectives.
13. Activity is incompatible in wellhead protection zones.



Appendix 4

Decommissioning of underground fuel and chemical storage tanks



DECOMMISSIONING OF UNDERGROUND FUEL AND CHEMICAL STORAGE TANKS

Purpose

To provide information for 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.

Scope

These notes apply to facilities that require to be closed at the direction of regulatory agencies.

General requirements

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

The Department of Minerals and Energy - Explosive and Dangerous Goods Division has also produced draft policy for decommissioning of disused underground petroleum systems. This policy should be read in parallel to these notes. Any apparent conflicts should be resolved by discussion with the two agencies.

The owner/operator of the site should provide the following information to the Commission at the time of tank decommissioning:

- Names of site owner and operator
- Plan showing the location of all underground storage tanks
- Capacity of and chemical type used in each tank
- Date of last use of the tanks
- Record of measures taken when each tank was taken out of service

Each tank and associated pipe-work should be fully emptied into other storage vessels by pumping or fluid displacement. Waste liquid and sludge should be transferred to a secure compatible container, then transported off site for disposal as approved by the Department of Environmental Protection's Division of Waste Management.



Decommissioning of underground storage tanks

Disused underground storage tank systems (i.e. tanks, pipework and other connected equipment) should be removed to an approved place in accordance with:

- Clause 9.8.13 (a) of Australian Standard 1940 for the storage and handling of combustible liquids, **and**
- The Australian Institute of Petroleum (AIP) Code of Practice CP22 for the removal and disposal of underground petroleum storage tanks, where the tank has been used for petroleum product storage. Only under exceptional circumstances and subject to approval from the Department of Minerals and Energy, should disused underground tanks be left in the ground. Refer to clause 9.8.13 (b) of AS 1940. If approved, the Commission recommends that the tank(s):
 - Be filled with clean inert solid material such as sand, concrete, or other approved material prior to abandoning the tank insitu.
 - Conform to AIP Code of Practice CP22, where the tank has been used to contain petroleum products.

Contamination Investigations and Remediation

Potential contamination of the soil and groundwater beneath the site should be investigated under the supervision of an independent consultant, who is qualified and experienced in such work. The consultant should conduct a thorough site investigation, determine the extent of any contamination and recommend necessary remedial action in a report to the Department of Environmental Protection (DEP). Separate Water Quality Protection Notes provide recommendations on contamination investigations and subsequent actions should contamination be found.

The DEP, in consultation with other relevant agencies, will confirm whether any remedial work is required before new tanks are installed or a formal approval for a change in land use is considered.

Subject to the present site owner/operator effectively undertaking the recommended actions, and there being no apparent residual site contamination, the Water and Rivers Commission has no objection to land rezoning processes proceeding concurrently with site investigation and remediation processes.

More information

The Commission welcomes your comment on these notes. They will be updated from time to time as comments are received or industry standards change.

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.

Please: phone: (08) 9278 0300 (business hours) or Fax: (08) 9278 0585



Appendix 5

Plates of potential contaminating threats



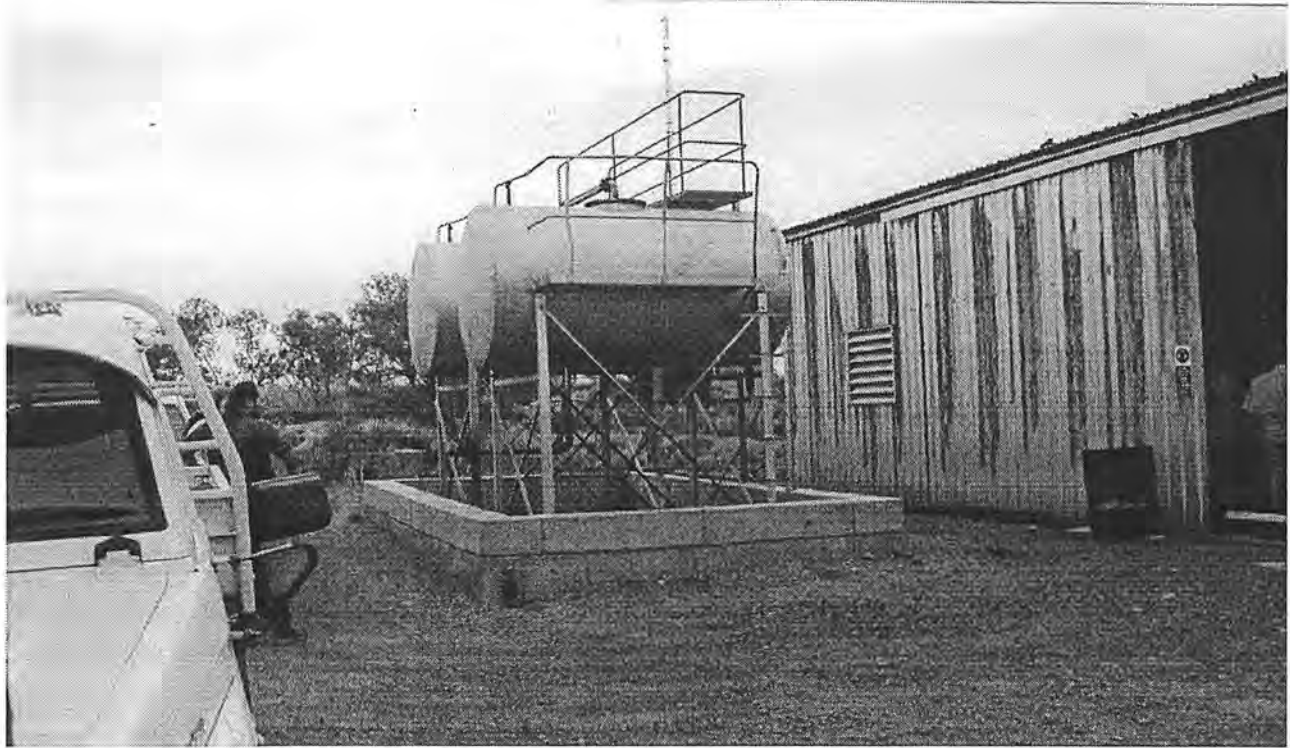


Plate 1: Water Corporation Powerhouse with above ground diesel storage (two 4500L tanks).



Plate 2: Water Corporation depot with diesel bowser.





Plate 3: Storage of diesel and other chemicals within Water Corporation depot compound.



Plate 4: The Millstream rubbish tip.

