



WQPN 35, November 2006

Pastoral activities within rangelands

Purpose

The Pastoral industry operates on a significant portion of Crown land termed rangelands within the semi arid inland and subtropical north of Western Australia. The industry is a significant contributor to the State's economy. It involves sheep, cattle and goats foraging widely on pastoral leases, prior to being sent to market. Risks to water resources include turbidity in waterways and wetlands caused by overgrazing or animal access to surface waters, disease and nutrient transmittal from animal wastes, chemical residues from parasite controls and harm to waterway and wetland vegetation.

The aim of this note is to provide members of the community, policy-makers and Departmental personnel with an overview of best environmental management practices for pastoral leases to protect the quality of water resources. We recognise that many pastoralists presently use their skills and experience to manage and protect water resources within constraints provided by their training, geographical and financial circumstances and availability of appropriate people and equipment.

The Department of Water is responsible for managing and protecting the State's water resources. It is also a lead agency for water conservation and reuse. This note offers:

- the Department's views on minimising degradation of water resources within the rangelands;
- guidance on acceptable practices used to protect the quality of Western Australian water resources; and
- a basis for the development of a multi-agency code or guideline designed to balance the views of industry, government and the community, while sustaining a healthy environment.

This note provides a general guide on issues of environmental concern, and offers potential solutions based on professional judgement and precedent. The recommendations made do not override any statutory obligation or Government policy statement. Alternative practical environmental solutions to suit local conditions may be considered. Regulatory agencies should not use this note's recommendations without a site-specific assessment of any project's environmental risks. Any conditions set should consider the values of the surrounding environment, the safeguards in place, and take a precautionary approach. The note shall not be used as this Department's policy position on a specific matter, unless confirmed in writing.

Scope

This note applies to pastoral activities within Western Australia's largely unfenced rangelands, which stretch from the Kimberley in the north to the Great Australian Bight in the south (see [Figure 1](#)). Pastoralism comprises approximately 40 per cent of the rangelands area and is predominantly made up of leasehold land. Pastoral enterprises are based on stock animals which survive mainly by grazing on native vegetation with occasional introduced supplements.

Background

Rangelands make up 87 per cent of Western Australia. They occupy the largest remaining group of semi-natural ecosystems in the State. Land tenure comprises pastoral leases, mining leases, unallocated Crown Land, National Parks, Conservation Reserves, Special Purpose Leases and Aboriginal Reserves. Pastoralism is the largest single land use within the rangelands. Other important land uses include indigenous settlements, mineral and energy resource development, tourism, conservation and the commercial use of flora and fauna, such as seed collection, wildflower picking and the kangaroo harvesting industry.

Inappropriate land management practices cause harm to this State's sensitive water resources (refer to [Appendix D](#)). For example, excessive grazing by livestock, native and introduced animals (including feral pests) puts pressure on waterways, wetlands and water holes by increasing erosion and turbidity, compacting soils, damaging vegetation fringing water bodies, and causing contamination by waste products. Over grazing can also restrict the natural regeneration of plant communities, worsen the effects of flood events and alter native vegetation community structure. Poor water quality may reduce stock productivity, inhibit the function of ecosystems and diminish the aesthetic appeal of an area.

Rangeland management should be consistent with existing Government policies and strategies including the *National Principles and Guidelines for Rangeland Management*, the State Government's *Policy on Rangelands* and the Environmental Protection Authority's *Position Statement No. 5 Environmental Protection Ecological Sustainability of the Rangelands in Western Australia*. The Rangelands Natural Resource Management Coordinating Group has recently been finalising the Natural Resource Management Strategy for the Rangeland Region of Western Australia. This Strategy will integrate the outcomes of sub-regional natural resource management community and stakeholder consultation in the Kimberley, Pilbara, Gascoyne/ Murchison and Goldfields/ Nullabor subregions.

Recommendations

Within Public Drinking Water Source Areas

Public Drinking Water Source Areas (PDWSA) are catchments declared for the management and protection of any water source used for public drinking water supplies. Within the rangelands, there are presently three surface Catchment Areas and twenty-five Water Reserves gazetted under the *Country Areas Water Supply (CAWS) Act 1947* (see [Figure 1](#) and list given in [Appendix A](#)).

Drinking Water Source Protection Plans and Assessments displaying catchment boundaries and recommending appropriate catchment protection strategies are prepared by this Department to assist in the management of PDWSA. See [Appendix A](#) for a list of rangeland Plans and Assessments.

Source protection plans and assessments are available from this Department's web page <http://drinkingwater.water.wa.gov.au>, select *Publications > Plans and Assessments*.

Within PDWSA, three priority classifications (Priority 1, 2 and 3) are used to protect water quality based on present land use, existing or approved land zoning, form of land tenure, strategic importance of the water source and the vulnerability of the water-body. Each Priority area is defined in a source protection plan and managed in a different way to provide for effective protection of the quality of the water resource.

Additional constraints may apply in zones closest to the point where drinking water is withdrawn or stored, described as Wellhead Protection Zones (WHPZ) or Reservoir Protection Zones (RPZ). For additional explanatory information on priority classifications, WHPZ and RPZ, see this Department's Water Quality Protection Note *Overview on Protecting Public Drinking Water Sources Areas*. For guidance on the acceptability of land uses within PDWSA, see our Water Quality Protection Note *Land use compatibility in Public Drinking Water Source Areas*.

1. Within WHPZ and RPZ, pastoral activities are considered incompatible with the management objectives for the water resource. This Department will oppose new pastoral leases or expansion of existing leases within these zones. Existing pastoral leases may continue, however operators should be encouraged to progressively implement source protection measures recommended in this note.
2. In Priority 1 areas, pastoral activities are compatible with conditions. The conditions should be compatible with the recommendations made in this note.
3. In Priority 2 and 3 areas, pastoral activities are a compatible activity provided best practice environmental management is used. Guidance on acceptable environmental management is given within this note, in specific Pastoral Lease conditions, in specific land use environmental guidelines or in regional natural resource management strategies.
4. Buffers between pastoral activities and drinking water sources are necessary to filter potential contaminants and to foster removal of any harmful microbes prior to their reaching water sources. The separation distance between water supply sources and the external boundary of infrastructure (eg waste pits, stockyards and chemical storage application areas) or areas where stock graze should be established using this Department's Water Quality Protection Note *Vegetated buffers to sensitive water resources*.

Near private water supply sources

Untreated drinking water drawn from unconfined aquifers or sourced directly from surface water-bodies may be unsafe for drinking due to potential contamination from minerals, chemicals, or harmful micro-organisms.

5. Buffers as described in the recommendation 4 should be established and maintained.
6. Water used for human drinking supplies should be sampled regularly to ensure the quality is consistent with the *Australian Drinking Water Guidelines 2004*, ie the aesthetic or health guidelines are not exceeded (see the *Fact sheets* in Part V of the Guidelines).

7. Stock water supplies should meet the criteria described in Chapter 4.3 of the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*.
8. Water sampling should be undertaken as recommended in the *Australian Guidelines for Water Quality Monitoring and Reporting* and Australian Standard AS/NZS 5667.1:1998 *Water Quality – Sampling*, or more specifically AS/NZS 5667.11:1998 *Water Quality – Sampling – Guidance on Sampling of Groundwaters*.
9. Water samples should be analysed in a National Association of Testing Authorities (NATA) certified laboratory using NATA certified methods. Details of analytical laboratories are located in the local Yellow Pages phone book under *Analysts*.
10. For further information see this Department's Water Quality Protection Note *Private water supplies*, the Department of Health's pamphlet *Using bore water safely* or contact a regional Department of Water office.

Artesian water bores

11. Artesian bores should be suitably equipped to control the natural pressure flow of groundwater and to prevent water running to waste. For further information, see the *Minimum Construction Requirements for Water Bores in Australia* ([Appendix C, Reference 2](#)).

Near conservation valued wetlands

12. Conservation wetlands are considered to have significant value and should be provided with a high level of protection from disturbance or contamination. Their location is described in [Appendix D](#).
13. The protection of wetlands should be consistent with the Environmental Protection Authority (WA) Position Statement No.4 *Environmental Protection of Wetlands 2004*.

Near natural waterways

14. Waterways provide pathways for stormwater runoff, host contain aquatic ecosystems, can be a source of water supplies, and offer recreational and aesthetic values. The management of waterways should be consistent with the Environmental Protection Authority's *Draft State-wide Policy No. 4 - Waterways (WA): A Policy for State-wide Management of Waterways in Western Australia*.

Stock access to natural waterways and wetlands (permanent and ephemeral)

Unrestricted stock access to pools within waterways and wetlands causes environmental disturbance through the loss of natural fringing vegetation, weed invasion, compacted soils, erosion and poor water quality. Faecal material build-up in natural waters causes nutrient enrichment, sometimes leading to algae blooms that may be toxic to stock. Restricting stock access to waterways and wetlands may reduce animal deaths through the provision of cleaner water and reduce the erosion loss of productive land through the preservation of a healthy fringing vegetation filter zone.

15. Stock should be excluded from natural water bodies where practical, particularly in near drinking water sources, erosion-prone areas, around conservation valued waters and focal areas for tourism. This may be achieved through dedicated stock watering points or fencing (see later text).
16. Adequate vegetated separation distances (buffers) should be maintained between areas where animals graze and natural water-bodies to minimise the risk of water quality degradation. Appropriate separation distances are determined on the basis of waterway or wetland values, vulnerability and biophysical criteria. For assistance in determining appropriate wetland buffers, see the EPA's Draft Guidance Statement No. 33 *Environmental guidance for Planning and Development, 2005* and the Department of Environment and Conservation's *Policies, Position Statements and Water Notes*.
17. Waterway buffers should be determined using the Department of Environment and Conservation's *Foreshore Policy No. 1 Identifying the Foreshore Area* and *Water Note 23: Determining Foreshore Reserves*. Under some circumstances it may be difficult to define site-specific buffers, eg where a river is ephemeral or the water-body seasonally extends over a large area and then generic buffers of at least 50 metres width should be applied.
18. Where practical, stock-proof fencing should be erected in ecologically important areas, such as feeder streams to drinking water reservoirs, conservation valued wetlands, permanent river pools or areas where water is retained some time after floodwaters from the main river channel have passed. Fencing should follow natural contours and allow for an appropriate buffer between the water-body and grazing areas. If fringing vegetation is absent, a buffer zone should still be maintained to allow vegetation to regenerate. For further information, see the Department of Environment and Conservation's *Water Note 18 – Livestock Management: Fence location and grazing control* and *Water Note 19 – Flood proofing fencing for waterways*.

Stock watering points

Congregation of stock around dams, waterways, wetlands, wells or troughs may lead to increased grazing pressure in a concentrated area and increase the potential for contamination from animal faeces or urine, which may cause a localised increase in nitrogen levels in any waterways receiving runoff.

19. Piping or pumping water from a waterway, wetland, dam or bore to a trough, rather than direct access to the source is considered best management practice. If not practicable, limited access points to natural water bodies should be constructed. For further information, see the Department of Environment and Conservation's *Water Note 7 – Livestock Management: Watering points and pumps*.
20. All water supply wells/ bores should be sealed at the surface to prevent debris, faeces, animals and other objects from washing or falling into them.
21. For information on watering point improvements, see the Department for Planning and Infrastructure's *Best Management Practice – The grazing of cattle in the northern pastoral areas of Western Australia* and *Best Management Practice - The grazing of sheep in the pastoral area of Western Australia*.

Stockyards

Animals concentrated within stockyards prior to transport to market produce waste such as dust, faeces, urine and spilt feed. If these contaminants are in significant amounts they can be harmful and will need to be adequately managed to avoid contamination of any nearby waters.

22. Stockyards should be located in a practical location to transport facilities, with measures to limit the stress on animals during handling, away from any surface water body and groundwater resources, in a well-drained area which is not seasonally boggy. For detailed advice, see this Department's Water Quality Protection Note *Stockyards near sensitive water resources*.
23. Where stockyards are located close to sensitive water resources they should have a hard-stand surface draining to sediment settling / manure stabilisation / evaporation pond systems. Accumulated waste should be periodically removed and spread over the land beyond the recommended buffers to water resources.

Stocking rates

Acceptable stocking rates are dependent on seasonal rainfall, condition of the vegetation and soil, and the intrinsic land capability related to land systems and pasture types. Pastoralists report stocking rates and the Department of Agriculture and Food undertakes rangeland condition monitoring. Total grazing pressure is much harder to control than stocking rates. Drought, varying seasonal conditions, fire events, the combined total grazing pressure of stock, feral and native animals can lead to a decline in land condition, degrade surface water and groundwater and increase in demand pressure on local water resources.

24. For information on appropriate stocking rates contact the Department of Agriculture and Food or visit their internet site www.agric.wa.gov.au. Alternatively, see the Department for Planning and Infrastructure's *Best Management Practice manuals* described at *Stock watering points*.
25. The total grazing pressure, which includes grazing from native and introduced animals (including feral animals), needs to be regularly monitored and managed by culling where necessary and approved.

Other important environmental concerns

26. Development and use of an appropriate Environmental Management System can assist in identifying and managing the environmental impacts associated with pastoral activities. For further information, see Department of Agriculture and Food's *Developing an Environmental Management System – A practical guide to pastoralists*.
27. A permit is required from the Department of Environment and Conservation under section 51c of the *Environmental Protection Act 1986* to clear native vegetation for any land use purposes deemed as pastoral diversification (as defined under section 106 of the *Land Administration Act 1997*). Permit applications are available from the Department's native vegetation protection web page <http://nvp.environment.wa.gov.au>. Grazing permits on Crown land are also required for introduction of animals onto previously non-grazed areas.

28. *Pastoral Diversification Permits* must be obtained through the Pastoral Lands Board (see web page <http://www.dpi.wa.gov.au/pastoral/1598.asp>) for any activities eg tourism ventures and enhanced pastures not covered via pastoral lease conditions. If diversification results in an increase in the number of visitors to a site, appropriate hygiene facilities should be provided. Ablution facilities should not be located within 100 metres of a water resource or areas subject to water retention and should be designed to handle the maximum predicted usage, to ensure the system functions effectively and to prevent sewage overflow.
29. Dead animals in stockyards, near watering points or natural waters should be disposed of promptly. Carcasses should be either burnt or buried. Carcass burial should not occur within 100 metres of any significant waterway or wetland, where the water table is less than two metres from the surface, in any proclaimed drinking water source area or in areas subject to waterlogging. Adequate soil should be used to cover the animal to avoid digging scavengers.
30. Existing roads and tracks should be used wherever possible to minimise vegetation damage, erosion and to prevent changes to surface hydrology and drainage. Where practical, dirt roads should be constructed parallel to the land contour, on slopes less than one in ten to minimise erosion and turbid runoff. Waterway crossings should be kept to a minimum. For further information, see our Water Quality Protection Note – *Roads near sensitive water resources*.
31. For information on land management processes which may affect water resources, ie. protection of native vegetation, feral animals, environmental weeds or fire, see the *Natural Resource Management Strategy for Rangelands*, or contact your regional office of the Department of Agriculture and Food.
32. Details of key statutes that apply to pastoral leases are included in [Appendix B](#).

Fuels and chemicals

Agricultural chemical use within the rangelands is normally minimal. However, leakage of fuel, oils and solvents can pose a serious contamination risk to water resources. Chemicals should be used, stored and handled in accordance with the regulatory requirements of the Department of Health, the Department of Consumer and Employment Protection and the supplier's directions.

33. Herbicide use in drinking water source areas should comply with the Department of Health's *PSC 88 Use of herbicides in water catchment areas* and this Department's Statewide policy No.2 *Pesticide use in Public Drinking Water Source Areas*. The Department of Health's Environmental Health Branch should be contacted for advice on the safe use of pesticides where these chemicals may come into contact with water supplies.
34. Sheep and cattle drenching or jetting should not be undertaken within 100 metres of surface waters. This Department does not support the establishment of traditional plunge dipping pools for parasite control. However if used, dipping should not occur within 200 metres of water resources, and be fully contained to prevent any chemicals reaching water resources.
35. Chemicals should be stored in accordance with *AS 2507-1998 The storage and handling of agricultural and veterinary chemicals*, in secure weather-proof containers with contained and bunded floors to limit pilferage, spillage into the environment, flooding or storm damage.

Incompatible materials (eg acids and alkalis), pesticides and fuel oil should be stored separately. For more information, see this Department's Water Quality Protection Note *Toxic and hazardous substances – storage and use*.

36. Chemical storage tanks should not be located close to drinking water tanks, dams, wetlands and waterways or within WHPZ or RPZ. Tanks should be installed properly to minimise the risk of leakage. For further information, see this Department's Water Quality Protection Notes *Tanks for above ground chemical storage; Tanks for underground chemical storage* and relevant Department of Consumer and Employment Protection Guidance Notes.
37. A licence may be required from the Department of Consumer and Employment Protection for the storage of 5,000 litres or more of diesel and 500 litres or more of petrol. For further information, see the internet site www.docep.wa.gov.au, select *Resources Safety > Dangerous Goods > Guidance Material and Publications*.
38. Chemical storage facilities should be inspected regularly (eg quarterly) to ensure any deterioration or leakage is identified and remedied at an early stage.
39. The re-fuelling areas of vehicles, helicopters or fixed-wing aircraft should be located away from water resources and bunded to prevent any spillage from contaminating soil or seeping into groundwater. Spillage should be directed towards a fully contained collection sump.

Accidents and emergency response

40. A contingency plan should be available on-site to address foreseeable emergency situations that may impact on water resources, eg floods, chemical spills, accidents or fires. Lease holders, station managers and farm hands should be trained and assigned roles in conducting effective emergency response procedures. For further information, see Department of Agriculture and Food's *Developing an Environmental Management System – A practical guide to pastoralists*, visit the Fire and Emergency Services Authority internet site www.fesa.wa.gov.au, select *Community Safety > Flood or Bushfire*; or contact your local government authority (Council).
41. Chemical and contaminated water spills of 250 litres or more that escape into the environment should be reported to the Department of Environment and Conservation (phone: 1300 784 782). If the spill is within a Public Drinking Water Source Area, the Water Corporation should also be advised immediately (phone: 1800 652 897). Data required will include date and time of incident, description of the escaped chemicals, their quantity, loss location and action taken on discovery to remedy the problem.

More Information

We welcome your views on this note. Feedback provided on this topic is held on file No. **8261**. This note will be updated periodically as new information is received or industry/activity standards change. Updates are placed on the Department's internet site www.water.wa.gov.au select *Drinking water > Water Quality Protection Notes* under the *Publications* heading.

To comment on this note or for more information, please contact the Water Source Protection Branch at our Atrium offices in Perth, phone (08) 6364 7600 (business hours), fax 6364 6524 or use *Contact us* at the Department's internet site, citing the note topic and version.

Where a conflict arises between this Department's recommendations and any proposed activity that may affect a sensitive water resource, this note may be used to assist negotiations with stakeholders. The negotiated outcome should not result in a greater risk to water quality than if the recommended protection measures were used.

In October 2005, the State Government announced the formation of the Department of Water. From January 2006, the Department of Water has assumed primary responsibility for managing the State's water resources. Once the Department of Water is legally established, it will replace many of the present functions of the Water and Rivers Commission and operate in parallel (with separate powers) to the Department of Environment and Conservation.

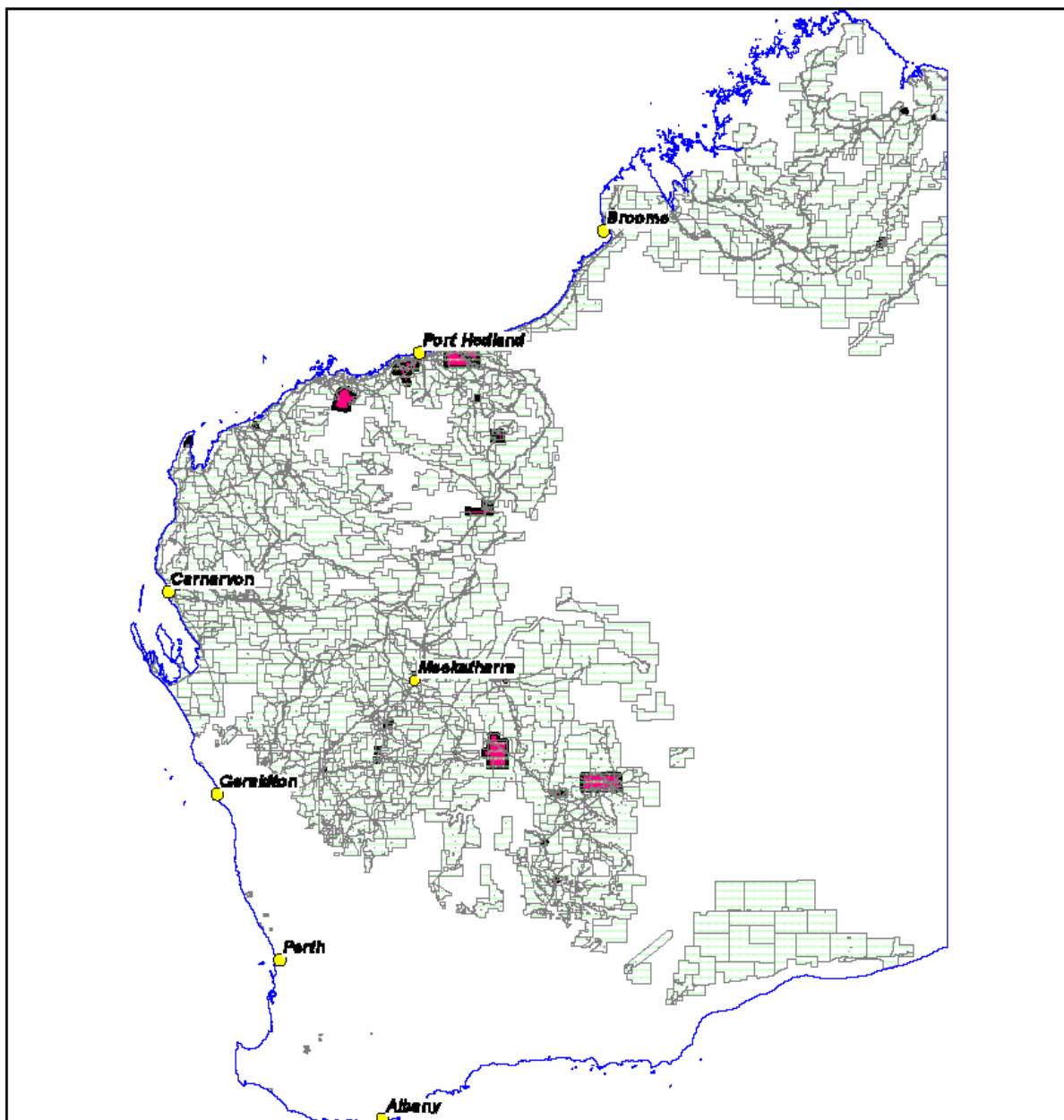




Figure 1: Pastoral leases and Public Drinking Water Source Areas in Western Australia

Legend

-  shows pastoral area
-  shows Public Drinking Water Source Areas



Department of Water
Department of Environment and Conservation

www.water.wa.gov.au
Telephone: (08) 6364 7600
Facsimile: (08) 6364 7601
Level 4, The Atrium
168 St Georges Terrace Perth
Western Australia 6000

www.dec.wa.gov.au
Telephone: (08) 6364 6500
Facsimile: (08) 6364 6525
Level 4, The Atrium
168 St Georges Terrace Perth
Western Australia 6000

Appendices

Appendix A - Public Drinking Water Source Areas within the Rangelands

No	Gazetted Public Drinking Water Source Area	Type	Drinking Water Source Protection Plans / Assessments (see web page http://drinkingwater.water.wa.gov.au)
1.	Broad Arrow Dam Catchment Area	SW	Not presently available (NPA)
2.	Harding Dam Catchment Area	SW	West Pilbara Water Supply
3.	Moochalabra Dam Catchment Area	SW	Wyndham Town Water Supply
4.	Broome Water Reserve	GW	Broome Town Water Supply
5.	Cane River Water Reserve	GW	Onslow Town Water Supply
6.	Carnarvon Water Reserve	GW	Carnarvon Town Water Supply
7.	Cue Water Reserve	GW	Cue Town Water Supply
8.	De Grey River Water Reserve	GW	Port Hedland Regional Water Supply
9.	Depot Springs Water Reserve	GW	NPA
10.	Exmouth Water Reserve	GW	Exmouth Town Water Supply
11.	Fitzroy Crossing Water Reserve	GW	Fitzroy Cross Town Water Supply
12.	Gascoyne Junction Water Reserve	GW	NPA
13.	Halls Creek Water Reserve	GW	Halls Creek Town Water Supply
14.	Kununurra Water Reserve	GW	Kununurra Town Water Supply Interim Plan
15.	Laverton Water Reserve	GW	Laverton Town Water Supply
16.	Leonora Water Reserve	GW	Leonora Town Water Supply (draft – available on request)
17.	Marble Bar Water Reserve	GW	Marble Bar Town Water Supply (draft – available on request)
18.	Meekatharra Water Reserve	GW	Meekatharra Town Water Supply
19.	Menzies Water Reserve	GW	Menzies Town Water Supply
20.	Millstream Water Reserve	GW	West Pilbara Water Supply
21.	Mt Magnet Water Reserve	GW	Mt Magnet Town Water Supply (draft)
22.	Newman Water Reserve	GW	NPA
23.	Nullagine Water Reserve	GW	Nullagine Town Water Supply
24.	Sandstone Water Reserve	GW	Sandstone Town Water Supply
25.	Turner River Water Reserve	GW	NPA

No	Gazetted Public Drinking Water Source Area	Type	Drinking Water Source Protection Plans / Assessments (see web page http://drinkingwater.water.wa.gov.au)
26.	Wiluna Water Reserve	GW	Wiluna Town Water Supply and Bondini Aboriginal community
27.	Yalgoo Water Reserve	GW	Yalgoo Town Water Supply (available on request)
28.	Yule River Water Reserve	GW	Port Hedland Regional Water Supply

Legend: GW = Groundwater Source; SW = Surface water Source

Appendix B - Statutory requirements and approvals include:

What's regulated	Relevant Acts and Policy	Regulatory Agency
Pastoral Leases Pastoral Diversification Taking of groundwater outside of <i>RIWI Act</i> proclaimed areas.	<i>Land Administration Act 1997</i>	Pastoral Lands Board of Western Australia (c/- Department for Planning and Infrastructure).
Storage of fuels, solvents, explosive and dangerous goods	<i>Explosives and Dangerous Goods Act 1961</i>	Department of Consumer and Employment Protection
Impact on the values and ecology of land or natural waters	<i>Environmental Protection Act 1986 - Part IV Environmental Impact Assessment</i>	Minister for the Environment, as advised by the Environmental Protection Authority
Permit to clear land, limiting effects of erosion, salinity, land drainage and flooding	<i>Environmental Protection (Clearing of Native Vegetation) Regulations) 2004</i>	Department of Environment and Conservation – regional office
Licensing of prescribed premises that pollute (ie stockyards holding more than 10,000 animals per year)	<i>Environmental Protection Act 1986, Part V Environmental Regulation</i>	
Licence to take groundwater (from artesian bores), Licence to take surface water (from proclaimed surface water areas) Permit to interfere with bed and banks (for proclaimed surface water areas)	<i>Rights in Water and Irrigation Act 1914</i>	Department of Water - regional offices
Development within Public Drinking Water Source Areas	<i>Country Areas Water Supply Act 1947</i>	
Provision of sewerage management facilities. Drinking water for humans.	<i>Health Act 1911</i>	Department of Health
Use, storage and disposal of chemicals and their containers	<i>Health (Pesticide) Regulations 1956</i>	

Appendix C - References and further reading

1. Australian Government - National Water Quality Management Strategy
 - a. *Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000, Volume 1 Chapter 4 (Primary Industries), and Volume 3 Chapter 9 (Primary Industries - Rationale and Background Information)*; see web page www.deh.gov.au/water/quality/nwqms/volume3.html.
 - b. *Australian and Guidelines for Water Quality Monitoring and Reporting. 2000*; see web page www.deh.gov.au/water/quality/nwqms/monitoring.html.
 - c. *National Principles and Guidelines for Rangeland Management 1999*; see web page. http://www.affa.gov.au/corporate_docs/publications/pdf/oper_env/armcanz/armcanz-may28.pdf
 - d. *Australian Drinking Water Guidelines; 2004*
see web page www.waterquality.crc.org.au/AboutDW_ADWG.htm
2. Australian Government – Natural Resource Management – Land and Water Biodiversity Committee *Minimum Construction Requirements for Water Bores in Australia*; see web page <http://www.iah.org.au/pdfs/mcrwba.pdf>.
3. Standards Australia
 - a. AS 2507-1998, *The storage and handling of agricultural and veterinary chemicals*.
 - b. AS/NZS 5667.1: 1998, *Water Quality – Sampling – Guidance on the Design of Sampling Programs, Sampling Techniques and the Preservation and Handling of Samples*.
 - c. AS/NZS 5667.11:1998, *Water Quality – Sampling – Guidance on Sampling of Groundwaters*.available for purchase via web page <http://www.saiglobal.com/shop/Script/search.asp>
4. Government of Western Australia
Policy on Rangelands 1997, see web page <http://www.nht.gov.au/publications/partnership/pubs/cwa.pdf>
5. Environmental Protection Authority (WA)
 - a. Position Statement No. 4 *Environmental Protection of Wetlands 2004*;
 - b. Position Statement No. 5 *Environmental Protection and Ecological Sustainability of the Rangelands in Western Australia. 2004*; and
 - c. *Draft Guidance statement No. 33 Environmental guidance for Planning and Development, 2005*.see internet site www.epa.wa.gov.au, select *Policies, Position Statements or Guidance Statements*
6. Rangelands Natural Resource Management Coordinating Group
Draft Rangelands Natural Resource Management Strategy 2005;
available from internet site www.rangelandswa.info.

7. Department of Agriculture and Food (WA)
- a. *Developing an Environmental Management System – A practical guide for pastoralists;*
 - b. *Bulletin 4547 Total Grazing Management Field Guide – Self mustering systems for cattle, sheep and goats; June 2002; see internet site www.agric.wa.gov.au, select search*
8. Department of Environment and Conservation (WA)
- a. Policies and Position Statements
 - *Foreshore Policy No 1 – Identifying the Foreshore Area*
 - *Draft State-wide Policy No 4 Waterways WA: A Policy of State-wide Management of Waterways in Western Australia;*see web page <http://waterways.environment.wa.gov.au> select *Publications > Policy*.
 - b. Water Notes
 - *Water Note 7 – Livestock management: Watering points and pumps*
 - *Water Note 18 – Livestock management: Fence location and grazing control*
 - *Water Note 19 – Flood proofing fencing for waterways*
 - *Water Note 23 – Determining foreshore reserves*Water Notes focus on the south west of Western Australia, however they contain generic information that may be applicable to rangeland environments. They are available from <http://waterways.environment.wa.gov.au>, select *Publications > Water Notes*.
9. Department for Planning and Infrastructure (WA)
- a. *Best Management Practice – The Grazing of Cattle in the northern pastoral area of Western Australia.*
 - b. *Best Management Practice – The Grazing of sheep in the pastoral areas of Western Australia.*
 - c. *Best Management Practice – Fire Management Guidelines for Kimberley Pastoral Properties.*
 - d. *A Land Use Planning Guideline for the Determination of Wetland Buffer Requirements (in preparation).*
- see internet site
- www.dpi.wa.gov.au
- , select
- Pastoral leases > Policies*
- .
10. Department of Water (WA)
- a. Policies
 - *State-wide Policy No 2 – Pesticide use in Public Drinking Water Source Areas, see web page <http://drinkingwater.water.wa.gov.au>, select Policy*
 - b. Water Quality Protection Notes
 - *Chemical spills – emergency response planning*
 - *Community drinking water sources (in prep)*
 - *Land Use Compatibility in Public Drinking Water Source Areas*
 - *Overview on protecting Public Drinking Water Source Areas*
 - *Private water supplies*
 - *Stockyards near sensitive water resources*
 - *Toxic and hazardous substances – storage and use*
 - *Tanks for above ground storage*

- *Tanks for underground chemical storage*
- *Roads near sensitive water resources*
- *Vegetated buffers to sensitive water resources*

see web page <http://drinkingwater.environment.wa.gov.au>, select *Publications > Water Quality Protection Notes*.

11. Department of Health (WA)

- Public Service Circular 88 – Use of Herbicides in Water Catchment Areas*, see web page www.population.health.wa.gov.au/environmental/resources/Use%20of%20herbicides%20in%20water%20catchment%20areas.pdf.
- Using Bore Water Safely*, 2004. see web page www.population.health.wa.gov.au/environmental/resources/Using%20Bore%20Water%20Safely.pdf.
- Guidelines for bulk cartage of drinking water
www.population.health.wa.gov.au/Environmental/resources_environ.cfm

12. Department of Consumer and Employment Protection (WA)

- Guidance Notes on Dangerous Goods Storage*
- Guidelines and Environmental Notes*

see internet site www.docep.wa.gov.au, select *Resources safety > Dangerous Goods > Storage and Handling*; or *Environment > Mining > Guidance material*

Appendix D - Sensitive water resources

Clean water resources used for drinking, sustaining aquatic and terrestrial ecology, industry and aesthetic values, along with breathable air, rank as the most fundamental and important needs for viable communities. These water resources should remain within specific quality limits, and therefore require stringent and conservative protection measures. Guidance on water quality parameters necessary to maintain water values are published in the Australian Government's *National Water Quality Management Strategy Guidelines* (see web page www.deh.gov.au/water/quality/nwqms/index.html).

The Department of Water strives to improve community awareness of catchment protection measures for both surface water and groundwater aquifers as part of a multi-barrier protection approach to maintain the quality of water resources and their values.

To be considered sensitive, water resources must support one or more of the environmental values described below. Human activity or land use poses a risk to water quality if contaminants could be washed or leached into sensitive water resources in discernible quantities. These water resources include waterways, wetlands and groundwater accessible by water supply wells. Community support for these values, setting of practical management objectives and implementation of a sustainable protection strategy are seen as key elements in protecting and restoring the values of these water resources.

Sensitive water resource values include:

- a. Public Drinking Water Source Areas (ie Water Reserves, Catchment Areas or Underground Water Pollution Control Areas) proclaimed or assigned under the *Metropolitan Water Supply, Sewerage and Drainage Act 1909*, the *Country Areas Water Supply Act 1947* or the *Health Act 1911*.
- b. Private drinking water supply sources, including the following uses:
 - human or stock consumption;
 - commercial or industrial water supplies (with specific qualities that support the activities eg aquaculture, food processing or crop irrigation); and
 - garden or municipal water supplies (which can affect people's health or well-being).
- c. Groundwater aquifers that sustain important ecological functions eg cave ecology.
- d. Waterways (excluding engineered drains or constructed features) with ecological and / or social values such as swimming, fishing, boating and aesthetic appeal, including:
 - waterways managed under the *Waterways Conservation Act 1976*, ie the Avon, Peel-Harvey, Leschenault, Wilson Inlet and Albany Waterways Management Areas; and
 - the Swan-Canning Estuary and lands managed under the *Swan River Trust Act 1988*.
- e. Wetlands possessing conservation values (except those highly disturbed, unless subject to active management to restore specified environmental values) and including:
 - RAMSAR wetlands (see internet site www.ramsar.org);
 - Policy areas covering water resources defined via Part III of the *Environmental Protection Act 1986* eg *Environmental Protection (Swan Coastal Plain Lakes) Policy 1992*;
 - Wetlands described by Department of the Environment and Heritage (Australia) in *A Directory of important wetlands in Australia*, (see web page www.deh.gov.au/water/wetlands/databases.html, or the Department of Conservation and Land Management (WA) web page www.naturebase.net/national_parks/wetlands/wa_wetlands.html);
 - *Geomorphic wetlands of the Swan Coastal Plain* dataset that displays wetland locations, boundaries, geomorphic classification (wetland type) and management categories. The dataset and maps are available from the following sources:
 - WA Land Information System at internet site www.walis.wa.gov.au. This site should be used in conjunction with a *guide to viewing the WALIS dataset* available at web page <http://wetlands.environment.wa.gov.au/>, select *Data > Wetland mapping*;
 - *Perth Groundwater Atlas*, see internet site www.water.wa.gov.au, select *Tools, System & Data*. For additional information contact this Department's Measurement and Water Information Branch; and
 - Publication *Wetlands of the Swan Coastal Plain*, volume 2B *Wetland mapping, classification and evaluation - wetlands atlas* (Hill, Semeniuk, Del Marco 1996). Reference copies are available from the Department of Environment and Conservation library in Perth;

- *Geomorphic wetlands Augusta to Walpole* available from the following sources:
 - Publication *Mapping and Classification of Wetlands from Augusta to Walpole in the South West of Western Australia* (V & C Semeniuk Research Group for the Water and Rivers Commission 1997). Reference copies are available from the Department of Environment and Conservation's library in Perth;
 - Dataset is available from the *Information Services Branch – GIS support analyst* at the Department of the Environment and Conservation (WA), phone 6364 6500;
- *South Coast Significant Wetlands* dataset which supports the South Coast Natural Resource Management Strategy. This is available from the *Information Services Branch – GIS support analyst* at the Department of the Environment and Conservation (WA) phone 6364 6500.