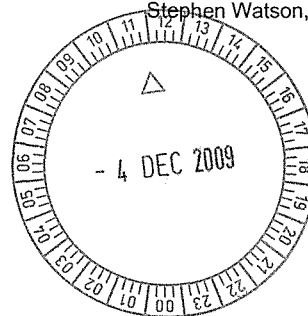




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**DEPARTMENT OF WATER SUBMISSION TO THE LEGISLATIVE COUNCIL'S
INQUIRY ON RECREATION ACTIVITIES WITHIN PUBLIC DRINKING WATER
SOURCE AREAS**

Please accept the attached submission from the Department of Water on the above inquiry.

All stakeholders agree that the provision of safe drinking water and recreation opportunities is important for the physical and mental wellbeing of the community. The degree to which these values can occur at the same location is however not agreed.

The expectation is that this inquiry will allow important facts to be established, thus providing a sound basis to consider how recreation can be supported in public drinking water source areas.

The Department of Water understands that other government agencies are not advocating recreation access to existing drinking water reservoirs, but they are supportive of some passive land-based recreation occurring in the outer catchments. For example, the Department of Sport and Recreation presented their 'Recreation Strategy' to a public forum on 12 November 2009. Their strategy aims to ensure a diverse mix of recreation opportunities for the public. It recommends that land-based recreation is zoned and managed so that it does not pose a risk to drinking water quality, and that water-based recreation is restricted to non-drinking water dams (e.g. irrigation dams and mining voids). The Department of Water supports this approach.

The Department of Water will ensure a planned review of its existing recreation access policy achieves a safe drinking water supply and appropriate recreation opportunities.

Yours sincerely

John Ruprecht
Director Water Resource Management

4 December 2009



Department of Water's submission to the Legislative Council's inquiry on recreation activities within public drinking water source areas

4 December 2009

Introduction

This submission has been prepared in response to the Legislative Council of Western Australia's Standing Committee on Public Administration's advertisement dated 26 September 2009, inviting submissions on the above inquiry.

It is also noted that drinking water legislation and policy has been the focus of two previous Parliamentary Committee reports in 1994 (see Water quality information sheet (WQIS) No. 7) and 2000 (see WQIS No. 8). The findings of those reports have been considered in the preparation of this submission.

The Department of Water (DoW) welcomes the opportunity to provide this submission to help the Committee understand the complex issues that exist. It is expected that many different views will be expressed by stakeholders and that it will be critical for the facts to be established to allow those views to be considered.

The DoW is responsible for managing and protecting the state's water resources. In relation to drinking water the DoW aims to ensure the availability of a 'reliable, safe, good quality drinking water supply to protect public health now and in the future'. This aim is currently achieved through implementation of the *Australian drinking water guidelines 2004* (ADWG), including its preventive risk-based, multiple barrier framework, which has been adopted throughout Australia (see WQIS No. 18). This framework recommends the adoption of 'catchment protection and treatment' measures together for the supply of safe drinking water to consumers.

The first and most important barrier is catchment protection. The achievement of low 'water quality contamination' risk catchments is also important because it sets the scene for lower cost, less complex (and therefore lower risk) treatment plants.

Key issues that need to be considered in response to the inquiries terms of reference include:

- Lessons learned from around the world (e.g. Can we rely on treatment to make water safe to drink? What is recommended by the ADWG?)
- The nature of existing public drinking water source areas (PDWSA) (e.g. Developed versus undeveloped/pristine catchments. Should the primary value of a catchment be for drinking water, the environment and/or recreation?)

- Existing access approvals (e.g. What is currently allowed/restricted under existing legislation and policy? Why is it allowed/restricted? Is the legislation and policy still current for today's technology and needs?)
- The relative risks of different recreation types (e.g. Land-based versus water-based recreation)
- Existing pressures for recreation access and the availability of alternative sites (i.e. How many recreation sites and options already exist? Are they fully utilised? Are there new sites that can be created that are not in a PDWSA?)
- Costs of increased treatment and supply if water quality contamination risks are increased (i.e. What will be the costs to consumers for additional treatment? Will a user pays system be introduced and will this cover the full costs?)
- Costs of increased recreation management policy/plans (What will be the costs for new management plans and active recreation management at new or enhanced sites? Who will be responsible for ongoing management/approvals etc?)
- The community's view (Does the community want more recreation sites? Are they willing to accept the increased risks providing more treatment is added? Are they willing to pay for more treatment? Do they prefer to keep recreation out of PDWSA reservoirs?)

In response to these issues this submission comprises:

1. A summary of the department's position in relation to recreation access to PDWSA;
2. Key findings from the literature, workshops and our own experiences;
3. Key points addressing each of the inquiries five terms of reference;
4. The DoW's response to eleven questions from a private hearing held on the 21 October 2009 (Attachment 1);
5. Frequently asked questions and answers (Attachment 2);
6. A number of water quality information sheets (WQIS) that provide further information on drinking water protection and recreation issues in WA (Attachment 3);
7. An unpublished DoW report: *Drinking water, irrigation and recreational catchments from Perth Hills to South West* (2009) (Attachment 4); and
8. Figures showing public drinking water source areas across the state and in the Perth Hills to South West.

1. A summary of the department's position in relation to recreation access to public drinking water source areas

It is indisputable that physical and mental health benefits can be achieved by increased recreation in the community. However, when considering recreation access to PDWSA key questions that need to be considered are 'what are the public health risks of increased recreation to drinking water quality in these areas?', 'will the community accept those risks?' and, 'does more recreation need to occur in PDWSA or are other more appropriate locations available?'

Although recreation activities have been conclusively shown to have negative impacts on water quality this finding has not prevented recreation from occurring in Western Australia's (WA's) PDWSA. The legislation and policy in WA currently supports 'lower risk' (generally passive land-based) controlled recreation access in the outer catchment of PDWSA. However, it does not support public access to the reservoir and land within 2 km of the

reservoirs high water mark (referred to as the reservoir protection zone – see WQIS No. 26). This 'controlled access' approach to recreation is midway between the 'closed catchment' approach and 'open catchment' approach employed in other parts of Australia and around the world. It has helped WA achieve a reliable, safe, good quality drinking water supply. These surface water catchments form a major component of Perth's Integrated Water Supply Scheme and provide diversity of supply and significant cost benefit offsets against more expensive, higher energy dependent sources of drinking water.

The three basic catchment access approaches (i.e. open, controlled and closed – see WQIS No. 22) reflect the varied decisions by governments in Australia and around the world to the issue of recreation access in drinking water catchments. It is clear that the many factors that need to be considered do not allow for one approach to fit all circumstances. This also means that care must be taken when comparing what happens in WA to other parts of Australia and around the world. For example, current recreation opportunities at some reservoirs are the result of historic access approvals, and/or the multiple land use developments that already existed in those catchments. This means that comparing those sources to WA's PDWSA is not appropriate because we have not historically approved recreation on drinking water reservoirs, and our PDWSA catchments are not developed and mostly occur over high value ecosystems. The pristine (undeveloped) nature of our drinking water catchments is envied by others, both within Australia and internationally. This protection was the intention of government in the early 1900's when it determined that drinking water catchments should be protected through reservation in state forest (see WQIS No. 16).

The focus of information in this submission is on PDWSA from the Perth Hills to South West (i.e. PDWSA from Mundaring to Collie). This area has been the subject of a number of investigations into recreation and drinking water management since 1977 (see WQIS No. 11), and it still remains the focus of most recreation access proposals.

In 2003, the DoW published its *Policy and guidelines for recreation within public drinking water source areas on crown land* (Policy 13) to deal with recreation access proposals in PDWSA. This policy was publicly consulted and was recommended to be reviewed after 5 years. That review was put on hold in 2008 pending the State Government election outcome (which resulted in a change of Government).

The Department of Water plans to review its recreation access to PDWSA policy. This review would look at low risk recreation opportunities in the outer catchment of PDWSA where no significant increase in water quality contamination and treatment costs are expected. This review would require a public consultation process to ensure all stakeholder views are considered.

2. Key findings from the literature, workshops and our own experiences

The many years of learning and experience by the DoW in catchment protection legislation, policy and implementation has resulted in some key findings. These include:

- The greatest threat to drinking water quality is from microbiological contaminants (pathogens) in the drinking water system (see WQIS No. 23 and DoW's brochure *Risks from pathogenic micro-organisms in public drinking water source areas* for more information on pathogens). This finding is also the first of six guiding principles in the ADWG.

- Drinking water source catchments have many values. Previous Australian and WAN reviews of recreation access to water supply storages (see WQIS No. 11) have highlighted that the primary purpose of urban water storages must always be to provide a reliable, safe water supply. In general, drinking water and conservation/biodiversity values are complimentary, as limiting public access protects both drinking water quality and natural ecosystems.
- The community has an absolute trust in the safety and reliability (24/7 supply) of water delivered to their homes. It should be appreciated that the general public is typically complacent about the safety of their drinking water because WA has not had a major public health drinking water quality incident for more than a century (WQIS No. 16). However, recent survey results (Bruce 2006) show that the community is 'risk averse' in relation to protection of their drinking water source catchments and support continued source protection measures over increased recreation access (see WQIS No. 4). The DoW is planning to repeat this survey to confirm this finding.
- Recreation has been proven to have negative impacts on water quality. These impacts can increase risks to drinking water (see WQIS No. 9, 10, 13 and 21).
- 'Prevention is better than cure.' This is highlighted in the ADWG (see WQIS No. 18), World Health Organisation's *Guidelines for drinking-water quality* (see WQIS No. 19) and previous parliamentary committee reports in 1994 (see WQIS No. 7) and 2000 (see WQIS No. 8).
- A drinking water source protection program must be robust enough to deal with abnormal conditions because existing monitoring systems do not provide protection from rare episodes, and treatment systems do not cope well with sudden change. This is an important point in relation to any proposal that increases risks to a PDWSA because it means that those increased risks can impact on drinking water quality if barriers fail (see WQIS No. 15 for further explanation).
- A 'preventive risk-based assessment' process coupled with a multiple barrier approach is considered to be international best practice for management of drinking water supplies. Reliance on treatment to make drinking water safe is not recommended because treatment can only reduce contaminant levels, not remove contaminants completely.

The Department of Water supports a review of recreation opportunities in the outer catchment of PDWSA, and recommends investigation of new or enhanced recreation sites/activities outside PDWSA.

3. Key points addressing each of the five terms of reference

Term of reference 1

The social, economic and environmental values and costs of recreation access, where possible, to the Perth hills and south west drinking water catchments, including the costs and benefits to public health, water quality, recreation, Indigenous culture and management options.

Potential benefits of increased recreation access to PDWSA include:

- increased number of recreation sites close to major population centres
- increased ability to separate different recreation types and avoid conflicts (due to the greater number of sites available)

- physical (e.g. reduced obesity and risk of heart disease) and mental (e.g. reduced depression) health benefits
- decreased costs on the medical system
- increased revenue for nearby towns through tourism
- social and cultural benefits (e.g. improved sense of community)
- increased appreciation of the environment and potential increase in willingness to protect it.

Potential costs of increased recreational access to PDWSA include:

- increased risk of water quality contamination of the drinking water source. Recreation has been proven to have a negative impact on water quality. WQIS No. 21 provides a summary of the impacts of recreation. WQIS No. 9, 10 and 13 provide summaries of some key documents and reports in the literature dealing with recreation in PDWSA.
- increased maximum risk of contamination in the drinking water supply
- increased risk to public health
- increased reliance on treatment. Treatment is prone to intermittent failure and can only be relied upon to reduce contaminants, not remove them.
- increased cost of water supply (due to increased treatment costs and increased on-ground management costs)
- increased use of chemicals and potential increase in harmful by-products produced
- increased threats to biodiversity and conservation
- potential reductions in the use of existing recreation and tourism sites.

When considering the above costs and benefits of increasing access to PDWSA the following points also need to be borne in mind:

- The public expects a reliable (24/7), safe, good quality drinking water supply to protect public health now and in the future.
- Drinking water source catchments in the Perth Hills to South West are largely native bushland (without substantial urban, rural or commercial land use risks) with high biodiversity ecosystems that are vulnerable to impacts from public access.
- Many existing recreation sites outside PDWSA are not utilised to capacity and their use/management could be enhanced. In addition, a number of new potential recreation opportunities outside of PDWSA have not yet been developed (e.g. Lake Kepwari and Harvey dam).
- Catchment protection and treatment together provide a more reliable and safe drinking water supply to consumers than either can deliver on its own.

Term of reference 2

State, interstate and international legislation, policy and practice for recreation within public drinking water source areas, including information relating to population health benefits and impacts

Legislation in WA:

- The major acts dealing with PDWSA are the *Country Areas Water Supply Act 1947* and *Metropolitan Water Supply, Sewerage and Drainage (MWSSD) Act 1909*. By-laws associated with these acts (*Country Areas Water Supply By-laws 1957* and *Metropolitan Water Supply, Sewerage and Drainage By-laws 1981*) contain a number of restrictions on recreation and public access to drinking water catchments. This

includes provision for a 2 km prohibited zone around a reservoir (under the *MWSSD By-laws*).

- Other legislation, such as the *Conservation and Land Management Regulations 2002*; *Environmental Protection Act 1986* and associated regulations; *Fish Resource Management Regulations 1995*; and *Health Act 1911* and associated regulations also contain provisions to control pollution and/or recreation in PDWSA.
- More information on WA's drinking water protection legislation can be found in WQIS No. 14. Information on the surveillance and enforcement of this legislation can be found in WQIS No. 5.
- The existing legislation is outdated in terms of the matters that are dealt with and penalties that can be applied for a breach of existing by-laws. The review of this legislation should be a priority to bring legislative powers for the protection of PDWSA up to modern standards. Previous work on this matter received strong community support. WQIS No. 33 provides more information on the by-law review.

Policy in WA:

- The major policy for recreation in WA is Policy 13. This policy advises that no recreation access (other than along public roads and some icon well-managed walking and cycling tracks e.g. Bibbulmun Track and Munda Biddi Trail) should occur within reservoir protection zones. Some 'controlled access' for recreation is permitted in the outer catchment. This includes activities such as bushwalking, mountain bike riding, bird watching, orienteering, and barbecue and/or picnicking.
- Policy 13 was developed based on public consultation, the principles of the ADWG, findings of previous parliamentary committees in 1994 and 2000, existing legislation, other state and international practices and risk assessments.
- Copies of Policy 13 have been provided for your information, and WQIS No. 12 provides some background information on this policy.

Practice interstate and internationally:

- Practices vary across Australia and internationally and range from completely closed catchments with no access, to 'controlled access' catchments (no access to the reservoir or designated area around the reservoir but some access to the outer catchment) to open catchments with access provided on and/or around the reservoir and in the catchment. In general, where there is limited development in the catchment and low levels of treatment, there will be restrictions on recreation access (e.g. Melbourne's forested catchments, Canberra's forested catchments). In contrast, catchments where high levels of urban or agricultural development exist and consequently additional treatment is already required, it is more common for greater recreation access to occur (e.g. Brisbane's mixed land use catchments). Greater recreation access is also sometimes permitted when the source is for emergency use only or where it is a pump-back source.
- Many of the examples often cited to support recreation in PDWSA need to be considered in the context that they may reflect very different histories than is the experience in WA. For many cited examples, recreation and development was already in place alongside the use of the water resource for drinking water supply. This meant that the option to keep them separate was not available.
- More information on policy and practice in other states is provided in WQIS No. 29.

Term of reference 3

The range of community views on the value of water and recreation in public drinking water source areas.

- Safe drinking water and recreation opportunities both need to be provided to meet modern community needs.
- The community of WA has a high trust and confidence in its drinking water. They expect it to be safe and available 24/7; now and in the future.
- The integrated water supply system in WA means that many more people benefit from the drinking water captured in a PDWSA (around 2 million people) than would benefit from increased recreation access to PDWSA.
- Results of a 2006 community wide survey (Bruce 2006) looking at the values of Perth Hills and South West dams showed:
 - 68% of respondents thought that drinking water dams should be used for no other purpose. Only 5% supported their use for water-based recreation, and 14% for land-based recreation
 - 83% of respondents preferred to protect drinking water by taking a preventative approach rather than relying on treatment
 - 70% of respondents felt that achieving the lowest possible risk to drinking water should take precedence over all other issues or uses of dams and their water.
 - 67% of respondents preferred to retain the existing policy of keeping recreation and drinking water activities separate.

A copy of this report has been supplied with this submission and a summary of the report is provided in WQIS No. 4. DoW proposes to repeat the above survey to ensure that it still reflects the community's current views.

Term of reference 4

The costs and benefits of alternative water quality management strategies and treatment for water catchments containing recreation.

- The ADWG recommend the maximum protection of a PDWSA (within the context of what is reasonable given the circumstances) to reduce the pressures on subsequent barriers, and minimise risks to water quality and public health. At the same time recreation opportunities need to be provided, in appropriate locations, to help improve public health.
- In WA, chlorination is generally the only form of treatment used. If recreation access on and around drinking water reservoirs were to increase, more sophisticated and therefore costly treatment would be required. For example, in 2000 consideration was given to allowing recreation on a Californian reservoir and increased treatment costs were modelled. For the scenario of only allowing recreation in a portion of the reservoir treatment costs were found to be an additional \$2.6-7.7 million per year. It should be noted that as the treatment plant in this example was already planned to be upgraded to ozone disinfection (regardless of whether recreation was allowed) these costs only related to additional costs associated with increased dosage requirements and capital costs (Beuhler et al. 2000). The DoW is aware from discussions with Water Corporation that depending on the level of access allowed, the costs of higher level treatment across PDWSA in WA could be hundreds of millions of dollars.

- The DoW considers that the following hierarchy should be considered:
 - development of new or enhanced recreation opportunities close to the public (e.g. pools and other recreation infrastructure close to population centres)
 - development of new or enhanced recreation opportunities outside PDWSA (e.g. in irrigation dam catchments or rehabilitated mine voids)
 - a review of proclaimed PDWSA (Perth Hills to South West) to determine if they are all required to meet future water supply needs. If any are not, they could be made available for recreation use.
 - controlled recreation access to the outer catchments only of PDWSA in accordance with existing legislation, revised policy and publicly consulted drinking water source protection plans.
- If a recommendation is made to further consider recreation access to PDWSA reservoirs, the DoW would recommend that increased recreation occurs only on one or two existing PDWSA (rather than increase recreation access and risks to all PDWSA reservoirs), and that existing legislation and policy is strengthened for the remaining PDWSA.

Term of reference 5

Possible recreation sites or opportunities available outside the Perth hills and south west drinking water catchments

The following recreation alternatives (outside PDWSA) are within easy travelling distance from Perth (i.e. 30 minutes to 3 hours), with many along the new Forrest highway:

- 14 National Parks within the Perth Hills to South West study area (e.g. Serpentine National Park, Helena National Park and Wellington National Park)
- the Regional parks of the Darling Range, which cover large areas of the cities of Gosnells, Swan and Armadale and the shires of Serpentine Jarrahdale, Mundaring and Kalamunda
- other DEC managed reserves e.g. Lane Pool Reserve
- irrigation dams (e.g. Waroona, Drakesbrook and Glen Mervyn dams) – these may require proactive management and enhanced facilities to address opportunities for best/fair mix of water-based activities
- rehabilitated and inundated mining voids (e.g. Lake Kepwari, Black diamond)
- dams previously designated for public drinking water supply that are now not required to be used for this purpose (e.g. Harvey Dam, Logue Brook Dam)
- private impoundments (e.g. farm and horticultural impoundments) – these could offer recreation opportunities with economic benefits to land owners
- other recreational water bodies (e.g. Champion Lakes, Lake Leschenaultia, Oakley Dam, Scarp Pool, Minninup Pool)
- 13 recreation sites (picnic areas and rivers) downstream of drinking water supply dams (e.g. at Mundaring Weir, Canning Reservoir, Wungong Reservoir).

The above listed sites do not include many other recreation opportunities that are available outside of the Perth Hills to South West area (e.g. within the Perth Metropolitan area, along the coastline or within estuarine systems).

Further information on recreation opportunities in the Perth Hills to South West is provided in DoW's pamphlet: *Protecting our drinking water catchments: Recreation in the Perth hills and south west*, and WQIS No. 31 and 32.

In conclusion:

The Department of Water:

- Notes that recreation has been conclusively shown to have negative impacts on water quality.
- Notes that government agencies are implementing existing, publicly consulted legislation and policy for recreation access and management in drinking water catchments.
- Notes that many of the risks from recreation activities could be mitigated by additional high level water treatment.
- Encourages new or enhanced recreation opportunities outside public drinking water source areas.
- Recognises that there is potential for recreation opportunities in the outer catchment of public drinking water source areas where no significant increase in water quality contamination and treatment costs are incurred. This potential would be explored through a review of DoW Policy 13, 2003.
- Considers that recreation leading to significant water quality impacts, additional treatment, higher water supply costs and more management costs should be fully assessed against alternatives before a final decision is made.

The Department of Water submits this information in the knowledge that it will be used by the Legislative Council's Standing Committee on Public Administration to address its inquiry into recreation activities within public drinking water source areas, and that it may be made public.

Please do not hesitate to contact the department if more information is required.



John Ruprecht
Director
Water Resource Management Division
Department of Water

References for this submission

- Beuhler, MD, Stewart MH and Kostelecky, JD 2000, *Impact of recreation in a drinking water reservoir on treatment requirements*, Water Supply, Volume 18, No.1, pp. 595-598, IWA Publishing, London, UK.
- Board M (MLA Member for Jandakot and Chairman of the Select Committee) 1994, *The Select Committee on Metropolitan Development and Groundwater Supplies – Report*, Legislative Assembly, Perth WA. You can obtain a copy of the select committee report from the State Law Publisher phone (08) 9426 0000 or visit <www.slp.wa.gov.au>.
- Bruce, D 2006, South West of WA water catchment management issues, drinking water policy and Logue Brook dam: Community survey results, Prepared for Department of Water, October 2006, available <<http://drinkingwater.water.wa.gov.au>> then scroll down to Logue Brook dam link web page.
- Department of Water and Department of Health 2008, *Risks from pathogenic micro-organisms in public drinking water source areas*, Department of Water, Perth, available <<http://drinkingwater.water.wa.gov.au>> then scroll down to view our advisory brochures relevant to drinking water link web page.
- National Health and Medical Research Council (NHMRC) & Natural Resource Management Ministerial Council (NRMCC) 2004, National Water Quality Management Strategy: *Australian drinking water guidelines*, Australian Government, Canberra, available <www.nhmrc.gov.au/publications/synopses/eh19syn.htm>.
- Sharp Hon. C (MLC and Chairman of the Standing Committee) 2000, *Report of the Standing Committee on Ecologically Sustainable Development in relation to the quality of Perth's water supply*. Legislative Council, Perth WA. You can obtain a copy of the standing committee report from the State Law Publisher phone (08) 9426 0000 or visit <www.slp.wa.gov.au>.
- Water and Rivers Commission 2003, Statewide Policy No.13: *Policy and guidelines for recreation within public drinking water source areas on crown land*, Water and Rivers Commission, Perth, available <<http://drinkingwater.water.wa.gov.au>> then scroll down to view our policy link web page.
- World Health Organisation 2004, *Guidelines for drinking-water quality*, Volume 1, Recommendations, 3rd edition, World Health Organisation, Geneva, available <www.who.int/water_sanitation_health/dwq/gdwq3rev/en/index.html>.

Attachments to this submission

1. Department of Water's supplementary responses to eleven questions asked in the private hearing held by the Standing Committee on Public Administration at the Legislative Council Committee Office, Perth, WA on 21 October 2009
2. Frequently asked questions about recreation access to public drinking water source areas (PDWSA)
3. Water quality information sheets
4. An unpublished DoW report: *Drinking water, irrigation and recreational catchments from Perth Hills to South West* (2009)

Figures for this submission

1. Public drinking water source areas – WA, Department of Water – Water Resource Management, 2009.
2. Public drinking water source areas – South West, Department of Water – Water Resource Management, 2009.
3. Public drinking water source areas – Reservoir protection zones - Perth Hills to Collie, Department of Water - Resource Management, 2009.

Enclosures provided with this submission

Australian Water Association and American Water Works Association 2008, *Watershed management for drinking water protection*, Australian Water Association and American Water Works Association.

Bruce, D 2006, *South West of WA water catchment management issues, drinking water policy and Logue Brook dam: Community survey results*, Prepared for Department of Water, October 2006, available <<http://drinkingwater.water.wa.gov.au>> then scroll down to Logue Brook dam link web page.

Documentation and figures provided on 21 October 2009

Documents and reports

Cooperative Research Centre (CRC) for Water Quality and Treatment 2006, *Recreational access to drinking water catchments and storages in Australia*, Research Report 24, CRC for Water Quality and Treatment, available at <www.waterquality.crc.org.au/Publication_OccPpr_ResRpts.htm>.

Hrudey, SE and Hrudey, EJ 2004, *Safe drinking water – Lessons from recent outbreaks in affluent nations*, IWA Publishing, Cornwall, UK.

Department of Water and Department of Health 2008, *Risks from pathogenic micro-organisms in public drinking water source areas*, Department of Water, Perth, available <<http://drinkingwater.water.wa.gov.au>> then scroll down to view our advisory brochures relevant to drinking water link web page.

Krogh M, Davison A, Miller R, O'Connor N, Ferguson C, McClaughlin V and Deere D 2008, *Effects of Recreational Activities on Source Water Protection Areas – Literature Review*, Water Services Association of Australia, Melbourne, Australia. You can download Occasional paper no.22 from the Water Services Association of Australia website <www.wsaa.asn.au> for a cost. Search for product code PP058.

Water and Rivers Commission 2003, *Statewide Policy No.13: Policy and guidelines for recreation within public drinking water source areas on crown land*, Water and Rivers Commission, Perth, available <<http://drinkingwater.water.wa.gov.au>> then scroll down to view our policy link web page.

Water Corporation and Department of Environment 2004, *Protecting our drinking water catchments*, Department of Land Information for Water Corporation and Department of Environment, Perth, Australia.

Figures

1. Public drinking water source areas – WA, Department of Water – Water Resource Management, 2009.
2. Public drinking water source areas – South West, Department of Water – Water Resource Management, 2009.
3. Public drinking water source areas – Reservoir protection zones - Perth Hills to Collie, Department of Water - Resource Management, 2009.
4. Public drinking water source areas – Reservoir protection zones - Perth Hills to Collie (this figure includes total area and percentage of surface water catchments and reservoir protection zones shown on this map) Department of Water - Resource Management, 2009.
5. Public drinking water source areas – Mundaring to Collie, Department of Water - Resource Management, October 2009.

Attachments to this submission have been excluded as they exceed the file size limit. However, they may be available upon request.