Water quality protection note 9
November 2012

Looking after all our water needs

Community drinking water sources - protection and management

Purpose

Water is Western Australia's most valuable natural resource on which all life depends. Few Western Australian water resources however would meet national drinking water quality criteria without treatment prior to consumption. All drinking water sources need both adequate protection from potential contamination by land uses in the catchment and treatment. This note describes the issues and measures needed to protect the quality of community-managed drinking water sources that normally do not have the statutory protection provided to proclaimed public drinking water supply sources.

Contamination risks to water sources arise from:

- natural chemicals in soils through which storm water passes
- poor land management practices, such as over-clearing followed by intensive use beyond sustainable limits
- excessive groundwater draw, leading to aeration of formerly wet soils and release of contaminants into water sources from acid sulphate soils
- natural disasters such as severe storms or wildfires (with increased risk of turbid runoff)
- poorly located domestic sewage or animal waste management and disposal facilities
- poorly located commercial and industrial land uses that discharge wastes to soils
- agricultural chemicals stored or used inappropriately, such as fertilisers and pesticides
- unsafe storage or spillage of chemicals used for servicing equipment (including coolants, fuels, lubricants and solvents)
- on-site disposal of waste materials, such as domestic rubbish or discarded equipment
- human and animal recreational contact with waters that can result in disease-causing microbial contamination
- toxic algae blooms associated with excess nutrients in surface waters and storage tanks
- inadequate vegetated buffers needed for contaminant-filtering around the water source.

Water source protection measures offer the following benefits:

- reduce health risks linked to the water source. Catchment protection is the most effective means of limiting contamination by land usage of drinking water supplies
- contamination prevention is normally less expensive than expanded water treatment processes, or development of a new water source should an existing source become severely contaminated and need to be taken out of service

- communities may find it inconvenient, costly or impractical to replace a water source that has become polluted
- water treatment and system monitoring may not be adequate to continuously guarantee a safe water supply.

The recommendations in this note aim to lessen the risk of contamination to community drinking water supplies and avoid the substantial cost of treating polluted water to an acceptable standard.

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:

- our views on management of drinking water sources for communities of less than 1000 people that are not connected to a proclaimed public drinking water supply scheme (where rates are levied on consumers to fund the scheme)
- guidance on measures used to protect the quality of sensitive water resources (as described in Appendix A).

This note is intended to inform water supply operators, government officers, environmental consultants and community members on water quality protection aspects of community water supplies covering the initial design, construction, operation and potential closure.

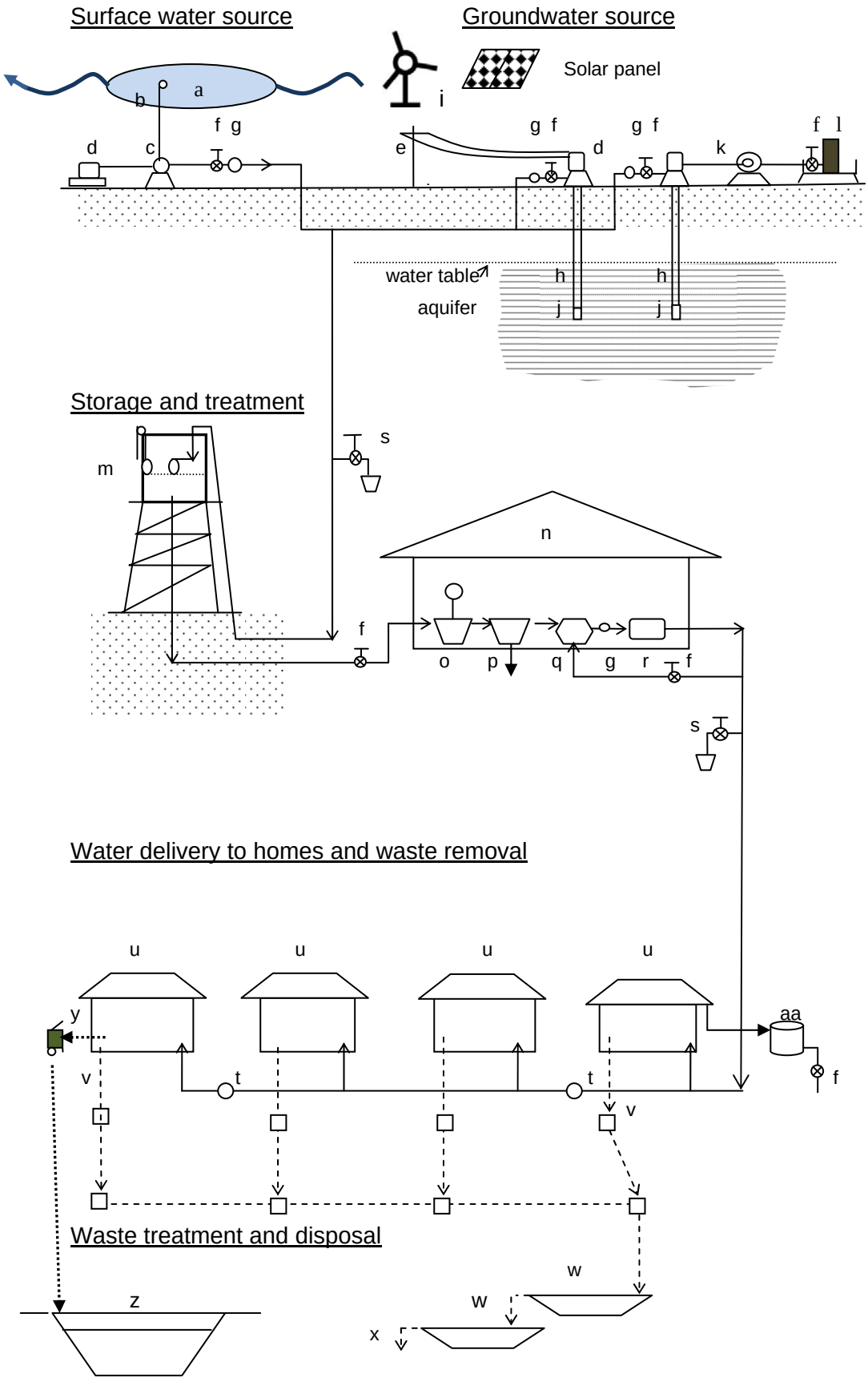
Appendices provide supporting information to this note, including a description of sensitive water resources, intended note usage and disclaimers, relevant statutory controls with administering agencies and information for assessment of development proposals. They may also include relevant case studies, checklists, contacts and explanatory diagrams.

Scope

A community drinking water source is any surface water body or groundwater resource used to supply drinking and household water for humans. It is normally managed by a local corporation or community group rather than a licensed water service provider. These sources generally serve communities of less than 1,000 people (such as mining camps, indigenous communities, caravan parks, roadhouses, farm-stays or tourism facilities). They are normally located outside of gazetted towns that have government-managed reticulated water services. The water resource may be accessed by wells, pumps located in waterways or reservoirs that collect surface water run-off (see schematic diagram overleaf Figure 1 *Typical water and waste management system diagram for a small community*).

Water supplies provided for those not part of a family group (self supply) may require a licence under the *Water Services Licensing Act 1995* (Appendix B). The Department of Health (WA) requires all drinking water supplies that are available to the public (as community drinking water sources) to be monitored and results made available to local or state health regulators to audit their safety.

Owners or operators of water supply systems must consider water source protection needs and their legal liability when providing non-scheme water supplies at any site.



Legend

a	Surface water source (stream, dam or pond)
b	Floating water intake and basket screen
c	Centrifugal pump
d	Electric motor and control box (or wind generator if no power available)
e	Electric power supply
f	Stop valve
g	Water flow meter
h	Water supply bore
i	Wind or solar powered generator
j	Submersible pump & inlet screen
k	Diesel motor
l	Fuel tank with spill box
m	Elevated water storage tank on stable foundation (5 days minimum supply capacity), float level gauge and overfill control valve
n	Secure water treatment building & chemical store
o	Chemical dosing and mixing/ aeration tank
p	Settling tank with solids removal to landfill
q	Water filter vessel and backwash
r	Disinfection using UV, ozone or chorine (gas or pool chlorine tablets)
s	Water sampling point
t	Fire hydrants
u	House (with kitchen sink, bath, shower, flush toilet, hand basin and laundry)
v	Sink, toilet, bathroom & laundry discharge to sewer with maintenance access points
w	Sewerage treatment (septic tank and leach drains or waste stabilisation ponds)
x	Treated effluent discharge to soakage or reuse
y	Domestic wastes to rubbish bin
z	Bins emptied at least weekly at landfill. Waste covered with soil to discourage animals, birds and insect access
aa	Rainwater tank (independent source)

Figure 1 - Typical water supply and waste management system for small communities

This note does not focus on private water supplies for individual households, such as farmhouses, although it may assist in awareness of issues and help with water supply decision-making. For advice on private water supply systems, see our Water quality protection note (WQPN) 41 *Private water supplies* (reference 6b). For waters used for agricultural water supplies such as crop irrigation or stock water, see our WQPN 45 *Rural land use and water quality.*

Advice and recommendations

Commitment to providing a safe drinking water supply

1 Those developing or operating drinking water sources should be aware of the risks of contamination to the sources, and provide effective protective measures to ensure the safety of water consumers.

The *Australian drinking water guidelines* (ADWG) (reference 1d) define an effective framework for developing and operating a drinking water supply system that can reliably deliver safe water supplies. The process for assessing system requirements and then applying an effective management and monitoring system to small and remote systems is covered in the ADWG. The guidelines recommend 12 framework elements for a safe supply system. A *Community water planner* has been developed (supporting implementation of the ADWG) to assist community water supply operators manage their sources (reference 2a).

Assessment of the drinking water source supply system

2 The location and details of any wells, bores, soaks, reservoirs or waterways used for water supplies and water storage should be defined surveying relationship to cadastral boundaries or by use of a hand-held global positioning system.

3 The water source availability (especially during dry seasons) should be determined. If local public records are not available, local surface water flows will need to be measured or pump testing of groundwater bore draw-down arranged.

4 Adequate water should be retained in the environment to sustain the aquatic ecosystems of local wetlands and waterways.

5 The quality of water sources at the end of the wet and dry seasons should be sampled and analysed. There may be contaminants in the water that exceed health or aesthetic criteria described in the ADWG (reference 1d). These should be reduced by treatment to meet guideline criteria prior to water use.

6 Water source use by those on surrounding properties may affect water availability and should be evaluated (see information on water allocation licensing below).

7 Local weather-related factors (average monthly rainfall and evaporation) should be evaluated as they are likely to affect the source capacity. This data is available online from the Bureau of Meteorology, see <http://www.bom.gov.au/weather/wa/>.

8 Estimated catchment run-off into surface storage may be calculated using methods recommended by Engineers Australia in *Australian rainfall and runoff* (reference 8).

The slope of the land, soil type, extent and density of vegetation cover and soil moisture will all affect the extent of stormwater infiltration and run-off.

9 Water storage requirements should take into account probability of prolonged dry seasons and equipment failures. Design of facilities to cope with these issues should minimise the need for water cartage from other sources.

10 Plans of the existing and proposed water supply delivery system should be prepared incorporating water source, storage, treatment system and connecting pipe-work (see Figure 1 for a typical layout).

11 Any probable future expansion of water supply demand should be determined and the scheme capacity reviewed regularly (typically at five yearly intervals). Indoor water use ranges from 150 to 180 litres/person/day (but could be less if water efficient practices are used).

Licences to take and supply water from groundwater or waterways

12 This department prepares water allocation plans in accord with the *Rights in Water and Irrigation Act 1914*. This statute requires that taking water from the environment or disturbing waterways be licensed within proclaimed management areas and from all artesian and confined aquifer sources within Western Australia.

A water allocation licence apportions available water resources between competing users in a sustainable manner, including a community's water source, other water users in the local catchment and the ecosystem support. Information on licensing is available from the Department of Water's regional offices and online at <www.water.wa.gov.au> select *managing our water*.

13 Under the *Water Services Licensing Act 1995* licences are required (there are some exemptions) for operators who provide water, sewerage or drainage services (normally on a commercial basis) to anyone outside their own family group (see Appendix B).

Drinking water source protection plans

14 A drinking water source protection plan (DWSPP) is a key component of a strategy to protect a community's domestic water supply source. The plan is a concise document that describes the water source and its environment, defines the contamination risks to water source quality and provides protection strategies to minimise water contamination including their implementation. The process of preparing a plan should increase awareness of both the user and regulatory authorities of the water source and its vulnerability. Information on protection issues and the content of a plan is described later in this note. For online examples of plans used for protecting public water supplies, see <www.water.wa.gov.au> select *managing our water* > *drinking water* > *plans and assessments*.

Land use planning

15 Appropriate land use zoning under the local government planning scheme is an effective way of reducing the long-term contamination risk to water sources from human activities. This option does not apply to lands without zoning provisions such as

communities on pastoral leases, Crown land or reserves. A *Community layout (development) plan* recorded with planning authorities is recommended where formal local or regional planning schemes don't apply. A development referral and assessment framework should be implemented by the catchment manager to influence any land use change that may affect the water source.

16 Subdivision proponents should be guided by the Western Australian Planning Commission bulletin 45 *Subdivision referrals to service providers* (reference 12) prior to submitting an application to subdivide.

17 Where local government acts as a planning regulator of land developments which cater for residential communities or tourist accommodation, a project approval condition should include: '*Provision of a safe drinking water supply that meets the Australian Drinking Water guidelines 2004 recommendations and is managed by a trained operator approved by the Economic Regulation Authority or the Department of Health (WA).*

Implementation schedule

18 An implementation schedule which identifies the timing and who is responsible for each action—recommended in the drinking water source protection plan—should be prepared. This should be incorporated into local land planning controls. Water system operators should have appropriate training, equipment and resources to effectively implement the plan.

Define the area requiring protection

19 The catchment area or groundwater area for the community drinking water source should be defined by mapping. Methods used and justification for selection should be documented. Surface water catchments and shallow, sand or gravel aquifers are considered most vulnerable to contamination. Deep aquifers fully confined by clay, shale or low-permeability rock and protected from contamination via well designed bores (reference 10) may require a smaller protection area.

20 A map of the proposed protection area should be prepared. These areas are most effectively protected when owned by the water service operator, leased or subject to a written legal agreement covering protection measures, unless the community agrees to cooperate to achieve the common goal of source protection. This protected area should generally include all water sources, any groundwater recharge zone and catchment portion that produces run-off into any surface water source.

Catchment protection measures

Water source vulnerability to on-site contamination

21 All on-site activities that could release contaminants into the environment, such as sewage disposal systems, fuel storage, chemical residue from crops or gardens, wastes from animals, compost heaps, workshop residues and waste landfills should be listed, and measures to control contaminant losses installed and maintained.

22 Any potentially contaminating activities (where fluids can move through soils) should all be located down the hydraulic gradient from drinking water sources.

23 The types of local soils, drainage paths and hydro-geological features (including the presence of clay or rock barriers that may affect water movement into aquifers) should be defined.

24 Technical advice from a qualified and experienced environmental consultant should be sought on measures to limit contaminant loss or movement in the environment towards the water supply source. Measures that could be used include chemical spill containment measures, wastewater treatment and stormwater diversion drains.

25 Water storage tanks should be roofed to exclude algae growth, dust and bird entry and provided with security to prevent uncontrolled access.

26 The type and width of any native vegetation buffers between potentially contaminating land uses and the water supply source should be determined. Buffers should be retained or reinstated if necessary. For recommended buffer details, see our WQPN 6 *Vegetated buffers to sensitive water resources* (reference 6b).

Water source vulnerability to off-site contamination

27 For any groundwater source, information on the surrounding land uses within at least a 500 metre radius of supply bores, their zoning in the local council planning scheme, details of actual land use activities and any materials (used such as agricultural chemicals) that may leach contaminants into soils should be obtained.

28 For surface water sources, all land use activities (permanent or transient) within 5 km up-slope of the water source should be assessed for their contamination risk. Our WQPN 77 *Risk assessment in public drinking water source areas* provides guidance information (reference 6b). It should be noted that stormwater runoff containing contaminants from a saturated catchment travelling in a waterway at one metre per second for 5 km can arrive within two hours at a reservoir used as a water source.

29 Protective buffer zones should be maintained from land uses that may contaminate the water source (such as farmland, animal holdings, chemical storage and use, industrial /commercial areas, septic tanks, and waste disposal sites) to any drinking water source bores or dams. Adequate contaminant containment measures should also be in place.

30 Technical advice on the risks (high, medium, or low) to water quality from surrounding land uses should be obtained based on:

a current management practices in place

b likelihood of contaminant escape

c whether the contaminant will be intercepted or immobilised before it reaches the water source

d the probable fate of the contaminant in the environment

e the level of harm to water quality that may be caused.

For more information, see section 3.2 in the *Australian drinking water guidelines* (reference 1d).

Operational protection strategy

Rural activities, animal management and gardens

31 The use of agricultural chemicals that are toxic and persistent in the environment should be minimised or avoided where practical. The Department of Health's Environmental health branch (reference 4) can advise on the use of pesticides in the vicinity of drinking water sources.

32 Agricultural activities should be operated with native vegetation buffers to water sources. Stock should not have access to surface waters, wells, or bores that are used for domestic water supplies. For more information on buffers see our WQPN 6 *Vegetated buffers to sensitive water resources* (reference 6b).

33 Feral animals, such as cats, dogs, camels, goats, pigs or escaped stock may pose a contamination risk to waters from their droppings and soil erosion. These animals should be captured or culled. For more detailed advice, see our WQPN 96 *Pest animal management in public drinking water source areas* (reference 6b).

Rubbish disposal

34 In remote areas, where local government waste collection services are often not available, household and non-hazardous industrial wastes generated on-site should be disposed of by land-filling within low permeability soils (such as clay) where practical or otherwise within a resilient synthetic liner (reference 6b). Landfills should be situated downstream or as remote as practical from any drinking water source.

35 Hazardous wastes, including farm chemicals, pesticides, solvents and waste oils, should be separated from general rubbish, placed in sealed drums and sent to a controlled recycling or disposal facility. Landfills should be operated in accordance with the environmental and health regulations, and the recommendations of the Department of Environment and Conservation and the local government authority.

Fuel and chemical storage

36 Where fuel or chemicals are to be stored or used in the area, they should be managed as recommended in our water quality protection notes (reference 6b):

a WQPN 56 *Tanks for above ground chemical storage*

b WQPN 65 *Toxic and hazardous substances - storage and use.*

Uncontained fuel spills from diesel-driven water pumps pose a significant risk to water quality. These facilities should be double contained and be well maintained to prevent spills.

Managing risks from recreation

Human or animal contact with drinking water sources and their presence near a water source creates a potential disease risk to drinking water quality and hence human health. There are many harmful pathogenic microbes hosted by people and animals that can

contaminate drinking water sources and a number that commonly affect water supplies worldwide. These organisms include bacteria, such as *Salmonella*, *Campylobacter, Escherichia coli* (*E. coli*) and *Cholera*, viruses such as hepatitis and polio, and parasites such as hookworm, *Cryptosporidium* and *Giardia.*

Other risks from recreation in surface water catchments include fuel residue from powered watercraft, increased turbidity due to disturbance of catchment soils, wild fires (erosion/turbidity risk) and disturbance to fringing vegetation or waterways. Increased turbidity can reduce the effectiveness of the disinfectants used to treat drinking water.

37 While disinfection effectively kills many pathogens, it may not eliminate all of them. Based on the potential risk posed by human or domestic animal contact with the water and the number of people that could be affected, activities that require contact with the water body should be discouraged. These activities include recreation, such as swimming, wading, canoeing, boating, fishing, harvesting of shellfish or crustaceans and water sports. Where such risks are unavoidable, multiple treatment barriers such as water filtration treatment coupled with disinfection should be used to minimise microbes in a drinking water supply.

Domestic wastewater disposal

38 Septic tank systems or any other approved sewage treatment and disposal systems for managing toilet, bathroom, laundry or kitchen wastewater should be located at least 200 m from any waterway, wetland or water supply well, and preferably downstream from the source.

39 Waste systems should be installed as approved by the Department of Health (WA) and operated to a standard accepted by the local government authority. Restrictions apply to the location of effluent disposal systems in areas with poor drainage capability or where the watertable depth is less than 1.2 m. Effective measures should be in place to prevent effluent from draining into the water resource. Generally the higher the density of development (dwellings or land use intensity per hectare) the greater the risk of water resource contamination that will apply.

Water source management

40 A source protection strategy should be chosen that is compatible with local government authority land use planning controls for nearby land holdings.

41 For large permanent communities of more than 1000 people, a *country water area* should be defined. This area would be serviced by a catchment area or water reserve proclaimed under the *Country Areas Water Supply Act 1947*. This involves negotiation and agreement with the Department of Water to arrange for proclamation of the area. A water service provider authorised by the Economic Regulation Authority should manage the water area.

42 The site operator should determine if any catchment land use activities need to be relocated or modified to protect the water source. Our WQPN 25 *Land use compatibility in public drinking water source areas* (reference 6b) offers advice on particular types of land use or activity posing a risk to drinking water sources.

43 Environmental management guidelines or codes of practice that may assist in reducing the risk of water contamination should be used (references 3, 4, 5, 6 and 9).

44 All water supply components should conform to the relevant Australian standards (reference 11) and government guideline criteria covering materials, design and operation.

Water treatment

45 Water treatment should be arranged before supply to the tap. Such treatment may include aeration, filtration, chemical dosing, settling, ion exchange to remove dissolved contaminants, followed by effective disinfection (see figure 1).

Operational procedures and process control

Water quality acceptability criteria

46 The *Australian drinking water guidelines* provide criteria for acceptable quality of drinking water (reference 1d).

47 The state government's *Advisory committee for the purity of water* chaired by a nominee of the Department of Health oversees the performance of all drinking water supplies provided to the Western Australian community. The Department of Water is represented on this committee.

Verification of safe water quality

48 The ADWG recommends that the scheme operator identify the water quality risks present. A water quality monitoring program involving sampling and analysis of physical, chemical and microbiological parameters should ensure that contamination of the water source (if present) is detected and safeguards are arranged.

49 Key indicators should be identified and monitored at the frequency recommended in Chapter 4 of the ADWG *Framework for the management of drinking water quality-application to small water supplies*. Analyses should focus on physical, chemical and microbiological quality indicators likely to be either naturally present or used in the water source catchment. Contact the Department of Health (WA) for more information on recommended monitoring programs (reference 4).

50 If an adequate monitoring program is not economically viable, or there is a significant risk of chemical or microbiological water contamination, then the community should consider drawing its drinking water supplies from a safe alternative source. Options include commercially bottled drinking water, scheme water delivered by tanker or rainfall directly harvested from roof to tank. Any unsafe water outlets accessible to the public should have a warning sign or pictogram showing *Water unsafe for drinking*.

Incidents and emergency response

51 The types of hazards and incidents that could affect local water sources should be defined, such as storms, drought, floods, fires, chemical spills, operator error and vandalism.

52 Strategies should be developed to manage any incidents within the area defined as requiring water source protection.

53 Contact details for people or agencies expected to respond to significant emergencies should be determined and publicised within the local community.

54 Operators should liaise with neighbours and relevant government agencies and erect signs to ensure they are made aware of the water resource protection area, its value and vulnerability to contamination.

55 A contingency plan including back-up water storage (up to two weeks supply) should be available. Water from alternate sources (if practical) should be organised prior to a water source becoming depleted, contaminated or compromised by supply equipment failure.

Source protection planning and government liaison

56 Drinking water source protection plans should be prepared that cover both existing and future water sources. Depending on the complexity of the water supply system, the scheme owner/operator or an experienced environmental consultant or contractor engaged to manage the scheme, should prepare the protection plan.

57 Owners/operators of multiple sites should assess priorities based on source vulnerability and initiate a program to progressively prepare and implement each plan.

58 The operator or contractor preparing a protection plan should consult with the West Australian Departments of Environment and Conservation, Health, Planning and Water to determine any regulatory controls and the extent of subsequent involvement needed.

Community consultation

59 Consultation with the local community is an essential component of the source protection planning process. The views of any groups that may be affected by proposed protection strategies should be sought, such as other local water users, indigenous communities, mining companies and pastoralists, adjoining landowners and tenants and other local water service providers. All issues should be openly discussed, the outcomes written down and copies circulated to all participants.

60 The consultation strategy should:

- a Inform affected groups and land holders of the need for long term protection of the water resource
- b Obtain stakeholders' views on issues concerning source protection options
- c Gain acceptance/commitment from stakeholders affected by any recommended protection strategies.

61 Existing land uses may put the quality of a drinking water supply at risk. The potential for considerable conflict exists between stakeholders in these situations. The Department of Water should be consulted for advice on ways of resolving these issues. This department may occasionally become involved in negotiating strategies for a

drinking water source protection plan where the issues and/or water source are particularly significant.

Operator awareness and training

62 Operators of water supply schemes should be adequately trained and equipped to ensure that the system continuously delivers an adequate, safe and aesthetically acceptable water supply. Training may be obtained from established water service providers, technical and further education colleges or water equipment suppliers.

Community involvement and awareness

63 The community should be encouraged to effectively support the source protection strategy by:

- a Raising local awareness of the need for, and benefits of water source protection
- b Erecting and maintain clearly visible signs depicting key areas subject to protection (such as wellheads, reservoirs and where necessary and practical, water bodies in the catchment), using wording or symbols alerting people to aspects of the source protection strategy
- c Encouraging people to change practices or locations of activities that pose a significant risk to water sources
- d Leave native vegetation buffers of at least 50 m width (where practical) around water sources
- e Install and maintain security fences around areas that are particularly vulnerable to contamination, such as well-heads and reservoirs (where practical) to prevent access by people and domestic animals
- f For surface water catchments, divert initial wet season run-off to waste (if severely contaminated with sediment and litter) and screen water supply system inlets
- g Ensure water supply infrastructure serving each dwelling including pipe-work, hot water systems tanks and fixtures, is constructed of materials compatible with the water characteristics, and equipment is designed and regularly maintained, such as sediment and algae controlled within tanks, to sustain acceptable water supply quality.

Documentation and reporting

64 Records of water analysis results, equipment maintenance and system checks should be held on-site for at least two years. The Department of Health's environmental health branch should be immediately advised of any water analyses not complying with the health guideline values described in the current *Australian drinking water guidelines* (reference 1d).

Evaluation and audit

65 The operation of the water supply system, its reliability, the extent of compliance of water monitoring results with government regulatory requirements and operator response to equipment malfunctions or related incidents should be assessed at least annually.

66 An annual report should be prepared that defines system and operator performance. Any deficiencies should be determined and a program proposed to remedy these deficiencies. This information should be shared and discussed with water users.

Review and enhancement

67 The annual report on the water supply system should be assessed independently of the operator and any need for improvements and their priority defined. The system operator should implement these improvements immediately and then monitor their effectiveness.

Appendix A: Information on public drinking water source areas, note limitations and updates

Sensitive water resources

Water resources are used for drinking and sustaining ecological systems, industry and aesthetic values. Along with breathable air, uncontaminated water is essential for viable communities. Natural water resources must remain within specific quality limits to retain their ecological, social and economic values. They therefore require stringent and conservative protection measures to minimise contamination.

Information on water quality parameters and processes to maintain water values are published in the Australian Government's National water quality management strategy papers. These papers are available online at <www.environment.gov.au> select *water* > *water policy and programs* > *water quality*.

The Department of Water strives to improve community awareness of catchment protection measures (for both surface water and groundwater), as part of a multi-barrier protection approach to sustain acceptable water resource quality. Human activity and many land uses pose a risk to water quality if contaminants are washed or leached into sensitive water resources in significant quantities.

Sensitive waters include estuaries, natural waterways, wetlands and unconfined groundwater. Sensitive waters support one or more of the environmental values described below.

1 Public drinking water sources

Public drinking water source area (PDWSA) is the collective name given to any area proclaimed to manage and protect a water source used for community drinking water supplies. PDWSA include *underground water pollution control areas, water reserves* and *catchment areas* administered under the provisions of the *Metropolitan Water Supply, Sewerage and Drainage Act 1909* (WA) or the *Country Areas Water Supply Act 1947* (WA). For online information on the location of PDWSA, see <www.water.wa.gov.au> select *tools and data* > *maps and atlases* > *geographic data atlas,* then open *environment* > *public drinking water source areas*.

For land planning and development purposes, three priority areas (P1, P2 and P3) have been defined for use within PDWSA. They are assigned based on present land use, tenure, planning scheme zoning and the vulnerability of the water body to harm.

These areas are each managed with a different strategy to provide for effective water resource protection. P1, P2 and P3 areas are assigned in *drinking water source protection plans* or *land use and water management strategies.*

These documents are prepared by this department in consultation with other government agencies, landowners, industry and the community.

P1 areas are defined to ensure that there is *no degradation* of the water source. These areas are declared over land where the provision of the high quality drinking water for public use is the prime beneficial land value. P1 areas typically cover land under state agency control. P1 areas are managed in accordance with the principle of *risk avoidance* and so most land development and activity is normally opposed.

P2 areas are defined to ensure that there is *no increased risk of pollution* to the water source once a source protection plan has been published. These areas are declared over land where low intensity development (such as rural use) 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 restricted intensity development (with management conditions) and activities with a low contamination risk are accepted.

P3 areas are defined to *manage the risk of pollution* to the water source. These areas are declared over land where public water supply sources must coexist with other land uses such as residential, commercial and light industrial development. Protection of P3 areas is achieved through management measures defined via environmental guidelines (such as these notes) or via site-specific conditions that limit the contamination risk to water resources from the land use or activity.

If, however, the water source becomes significantly contaminated, then water supplied from P3 sources may need to be treated or an alternative water source found.

Protection zones are also defined close to the point where drinking water is harvested or stored. These zones are known as *wellhead protection zones* (WHPZ) and *reservoir protection zones (RPZ)*. Additional constraints apply to activities in these zones to safeguard the area immediately surrounding these vulnerable water sources.

WHPZ are assigned within the immediate surrounds of water production wells and special land use restrictions apply. In these zones, groundwater moves rapidly towards wells due to aquifer depressurisation from pumping. Any contamination leaching from the ground surface could rapidly migrate into scheme water supplies (before effective remedial action can occur). In sedimentary basins, WHPZ are usually circular, with a radius of 500 m in P1 areas and 300 m in P2 and P3 areas. These zones do not extend outside PDWSA boundaries.

RPZ are defined over and around public water supply reservoirs or pipe-heads. Special access and land use restrictions apply. The aim is to restrict the likelihood of contaminants being deposited or washing into water sources following rainfall. RPZ within state controlled land cover an area of up to 2 km from the reservoir top water level.

For additional explanatory information on PDWSA, see this department's water quality protection note 25 *Land use compatibility in public drinking water source areas* and note 36 *Protecting of public drinking water source areas.*

Buffers to water supply sources

Vegetation buffers should separate compatible land use operation areas from the full supply level of reservoirs, their primary feeder streams and production bores used as a source of drinking water. Advice is provided on buffer form and dimensions in our water quality protection note 6 *Vegetated buffers to sensitive water resources*.

Clearing control catchments

Special controls on vegetation clearing for salinity management purposes are provided under part IIA of the *Country Areas Water Supply Act 1947* (WA). These controls apply in the Wellington Dam, Harris River Dam, Mundaring Weir and Denmark River catchment areas and the Kent River and Warren River water reserves.

Details on clearing controls may be obtained from our local regional office, see <www.water.wa.gov.au>, select *Contact us*.

Established activities in PDWSA

Many land use activities were approved and established before publication of a source protection plan or strategy. We encourage the operators of all land use activities to progressively improve their environmental management facilities and practices so the risk to water resources is minimised (factoring in practical and economic constraints).

New or expanded activities in PDWSA

Any proposed new or expanded activities that could affect drinking water sources should be referred to this department's regional office for assessment and written response.

The development proposal may be approved (with or without conditions); additional relevant information sought prior to making a decision; or rejected due to a policy conflict or inadequate protective measures to safeguard the water source. To facilitate environmental approval, operators should demonstrate that under all operating conditions the materials and processes used on site do not pose a significant contamination risk to the local waters.

2 Private water supply sources

These water sources include:

a human or stock (animal) drinking water sources

b commercial or industrial water sources (requiring specific qualities that support activities such as aquaculture, cooling, food or mineral processing or crop irrigation)

c urban or municipal irrigation sources (where water quality may affect vegetation performance or people's health or wellbeing).

3 Underground ecological functions

Important underground ecological functions that may be at risk include stygofauna and microorganisms in aquifers (within sand, gravel and karst soils).

4 Waterway ecological and social values

a Maintenance of waterways of high conservation significance described in the WA Environmental Protection Authority's guidance statement 33 *Environmental guidance for planning and development* (section B5.2.2). This statement is available online at <www.epa.wa.gov.au> select *EIA > guidance statements.*

b Waterways managed by the Department of Water under the *Waterways Conservation Act 1976* (WA). These including the Avon River, Peel-Harvey Inlet, Leschenault Inlet, Wilson Inlet and Albany waterways.

c Waterways managed under Section 9 of the *Water Agencies (Powers) Act 1984* (WA). For online advice, see <www.water.wa.gov.au> select *managing our water > managing our rivers and estuaries*.

d Waterways managed by the Swan River Trust under the *Swan and Canning Rivers Management Act 2006 (WA)*. For online advice, refer to <www.swanrivertrust.wa.gov.au>.

e Social values in natural waterways include their aesthetic appeal, use of watercraft, fishing, tourism, swimming and other aquatic activities.

Engineered drains and constructed water features are normally not assigned ecological values because their function and operational factors override these water values.

5 Wetland ecology

a Ramsar wetlands, described online at <www.ramsar.org>.

b Wetlands defined by the Australian government in the *Directory of important wetlands in Australia,* available online at <www.environment.gov.au> select *water > water topics > wetlands.*

c Wetlands of high conservation significance described in the Environmental Protection Authority (WA) guidance statement 33 *Environmental guidance for planning and development (section B4.2.2).* This is available online at <www.epa.wa.gov.au> select *Environmental impact assessment > guidance statements.*

d Wetlands identified for conservation value or for resource enhancement via:

- *Geomorphic wetlands of the Swan coastal plain* dataset
- *South coast significant wetlands* dataset
- *Geomorphic wetlands Augusta to Walpole* dataset.

The *Geomorphic wetlands Augusta to Walpole* dataset awaits detailed evaluation.

The Department of Environment and Conservation (DEC) is the custodian of state wetland datasets, and is responsible for maintaining and updating the information. These datasets are available online at <www.dec.wa.gov.au> search *maps wetlands,* or select *management and protection > wetlands > wetlands data.* Guidance on viewing the

wetlands is provided on the same site at *water* > *wetlands* > *data;* or by phoning DEC's nature conservation division on 08 9334 0333.

Wetlands that are highly disturbed by rural land use, or have been landscaped to provide a social amenity or drainage control function in urban settings, may not have ecological conservation values unless they are being actively managed to restore these values.

Note interpretation

Many aquifers, waterways and wetlands in Western Australia require detailed scientific evaluation and their values remain unclassified. Unless proven otherwise, any natural waters that are slightly disturbed by human activity are considered to have sensitive values.

Community support for water values, the setting of practical management objectives, providing sustainable protection strategies and effective implementation are vital to protecting or restoring our water resources for current needs and those of future generations.

This note provides a general guide on issues of environmental concern, and offers solutions based on professional judgement and precedent. Recommendations made in this note do not override any statutory obligation or government policy statement. Alternative practical environmental solutions suited to local conditions may be considered.

This note shall not be used as this department's policy position on a specific matter, unless confirmed in writing. The note may be amended as needed, when new data is available. Regulatory agencies should not use recommendations made in this note in place of site-specific conditions based on a project's environmental risks. Any regulatory conditions should consider the values of the surrounding environment, the safeguards in place and take a precautionary approach.

Where a conflict arises between recommendations made in this note 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 would apply if our recommended protection measures were used.

This note will be updated as new information is received or industry/activity standards change. The currently approved version is available online at <www.water.wa.gov.au> select *publications* > *find a publication* > *series browse* > *water quality protection notes*.

Appendix B: Relevant statutory controls include:

What is regulated?	Western Australian statutes	Regulatory agency
Development approval	*Planning and Development Act 2005*	Local Government Authority Department of Planning <www.planning.wa.gov.au>
Impact on the values and ecology of the environment, including waters; licensed	*Environmental Protection Act 1986,*Part IV Environmental Impact Assessment	Environmental Protection Authority <www.epa.wa.gov.au>

What is regulated?	Western Australian statutes	Regulatory agency
landfills		Department of Environment and Conservation <www.dec.wa.gov.au>
Supply of potable water supplies to communities of more than 250 people	*Water Services Licensing Act 1995,* and Water Services Coordination Regulations 1996 (WA)	Economic Regulation Authority <www.era.wa.gov.au>
Licence to use surface water and groundwater from declared areas	*Rights in Water and Irrigation Act 1914*	Department of Water – regional office <www.water.wa.gov.au>
Activities in Waterways Management areas	*Waterways Conservation Act 1976*	
Development and operations in Public Drinking Water Source Areas	*Metropolitan Water Supply, Sewerage and Drainage Act 1909* *Country Areas Water Supply Act 1947*	
Supply of drinking water in food premises, packaged water, ice	*Health Act 1911* Health (Australian & New Zealand Food Standards Code Adoption) Regulations 2001	Department of Health <www.health.wa.gov.au> Local Government Authority
Safe drinking water to homes guided by the *Australian Drinking Water Guidelines*	*Health Act 1911* Local government health by-laws	
Disposal of materials that may affect human health	*Health Act 1911*	

Relevant statutes are available from the *state law publisher* at <www.slp.wa.gov.au>.

References and further reading

1 Australian government - national water quality management strategy publications available online at <www.environment.gov.au> select *water > water policy and programs > water quality > national water quality management strategy*

   a *Paper 2 Policies and principles, 1994*

   b *Paper 3 Implementation guidelines, 1998*

   c *Paper 4 Australian and New Zealand guidelines for fresh and marine water quality, 2000*

   d *Paper 6 Australian drinking water guidelines, 2011*

   e *Paper 7 Australian guidelines for water quality monitoring and reporting, 2000*

   f *Paper 9 Rural land uses and water quality - a community resource, 2000.*

   Email request to <bookshop@awa.asn.au>, or access from a library service.

2 Australian government - National health and medical research council publications available online at <www.nhmrc.gov.au> search *drinking water*

   a *Australian drinking water guidelines community water planner,* available on CD

b *Draft electronic decision-support tool for the management of drinking water quality in rural and remote communities.*

3 Department of Environment and Conservation (WA)

a Contaminated sites management publications available online at <www.dec.wa.gov.au> select *pollution prevention > contaminated sites*

b Clearing of native vegetation publications available online at <www.dec.wa.gov.au> select *plants > native vegetation > publications*

c Wetlands policy available online at <www.dec.wa.gov.au> select *Management and protection > wetlands > publications*

Position statement: wetlands WRC 2001

d *Draft code of practice for rural landfills*

see online information at <www.zerowastewa.com.au>.

4 Department of Health (WA) – environmental health branch publications available online at <www.public.health.wa.gov.au> select *water*

a *Drinking water supplies - emergency treatment*

b *Monitoring drinking water*

c *Standard water sampling techniques (microbiological)*

d *Using bore-water safely*

e *Water filters*

f PSC 88 - *Use of herbicides in water catchment areas.*

5 Department of Indigenous Affairs (WA) see online information at <www.dia.wa.gov.au> select *Publications*

a *Environmental health needs survey report,1997*

b *Services to discrete indigenous communities in WA, discussion paper 2002.*

6 Department of Water (WA) publications available online at <www.water.wa.gov.au> select *publications > find a publication > series browse > statewide policy* or *water quality protection notes.* Alternately contact this department for copies by fax or mail.

a Policies and guidelines

- *Land use compatibility in public drinking water source areas, 2004*
- *Pesticide use in public drinking water source areas, 2000*
- Water licensing note 10 - *Drinking water source licensing in indigenous and remote communities, 2010.*

b Water quality protection notes

- WQPN 06 *Vegetated buffers to sensitive water resources*
- WQPN 10 *Contaminant spills - emergency response*
- WQPN 25 *Land use compatibility in public drinking water source areas*
- WQPN 26 *Liners for containing pollutants, using synthetic membranes*
- WQPN 26 *Liners for containing pollutants, using engineered soils*
- WQPN 35 *Pastoral activities within rangelands*

- WQPN 41 *Private water supplies*
- WQPN 45 *Rural land use and water quality*
- WQPN 56 *Tanks for above ground chemical storage*
- WQPN 62 *Tanks for underground chemical storage*
- WQPN 65 *Toxic and hazardous substances - storage and use*
- WQPN 77 *Risk assessment in public drinking water source areas*
- WQPN 78 *The Australian drinking water guidelines - an overview*
- WQPN 96 *Pest animal management in PDWSA.*

7 Food Standards Australia and New Zealand publication available online at <www.foodstandards.gov.au/foodstandardscode>

Food standards code.

8 Engineers Australia publication available online at <http://www.engineersmedia.com.au/bookshop/arr.html>

Australian rainfall and runoff.

9 National Water Commission —Australian government publication available online at <http://www.wqra.com.au/cwplanner/CWPlanner.htm>

Raising national water standards program –Community water planner –field guide. 2009.

10 Natural Resource Management Ministerial Council (Australia) publication available online at <http://www.iah.asn.au/pdfs/mcrwba.pdf>

Minimum construction requirements for water bores in Australia, September 2003.

11 Standards Australia publication available for purchase at <www.saiglobal.com> select *publications*

AS 5667 *Water quality – sampling.*

12 Western Australian Planning Commission publication available online at <www.planning.wa.gov.au>

Planning bulletin 45 *Subdivision referrals to service providers.*

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Feedback

We welcome your thoughts on this note. Feedback will help us prepare future versions.

To comment on this note or seek any clarification, please contact our water source protection branch (details below), citing the note topic and version.

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