



WQPN 02, FEBRUARY 2009

# Aquaculture

## Purpose

Aquaculture is gaining popularity in Western Australia as a result of the shortages, depletion or difficulty in harvesting wild stocks of aquatic plants, fish, crustaceans and shellfish. Aquaculture that is well-located and managed effectively can offer significant benefits to the community and environment by alleviating pressures on dwindling commercial stocks in the wild and preventing damage to aquatic ecology.

Aquaculture poses the following contamination risks to the quality and values of water resources:

- increase in nutrients, organic material, pathogens, pharmaceuticals and suspended solid concentrations
- vegetation loss adjacent to waterways and wetlands
- loss of embankments and pond contents during storm events
- release of exotic species from different genetic populations into local waters threatening the local aquatic ecology
- turbid stormwater from earthworks during pond construction
- pond discharges with increased salinity resulting from solar evaporation effects.

This department 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 current views on the location and safe environmental management for the commercial growing of aquatic animals and plants
- guidance on acceptable practices used to protect the quality of Western Australian water resources
- 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.

The 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 statements. Alternative practical environmental solutions suited to local conditions may be considered.

Regulatory agencies should not use the note's recommendations without a site-specific assessment of a project's setting and environmental risks. Any regulatory conditions set should consider the values of the surrounding environment, the safeguards in place, and take a precautionary approach. This note shall not be used as this department's policy position on a specific matter, unless confirmed in writing.

## Scope

This note applies to premises that propagate, grow or hold aquatic plants and/or animals (including fish, crustaceans, and shellfish) for commercial purposes and there is a risk of contamination from the premises or facilities to sensitive water resources ([Appendix A](#)).

This note is not intended to apply to marine or estuarine-based aquaculture, domestic or hobby-scale (not for profit) ponds or aquariums or aquaculture.

## Advice and recommendations

### Location

- 1 Where land-based aquaculture projects are situated on permeable soils, such as sand or gravel, or are located close to water resources, care should be taken at all stages of the project life to prevent water contamination. Wastes discharged into the local environment must not contain significant concentrations of either nuisance or harmful substances (see Table 1 later in this note).
- 2 Applications for approval of commercial aquaculture ventures should initially be made to the Executive Director of Fisheries ([Reference 5](#)). The Department of Fisheries may seek the views on the acceptability of the proposal from a number of natural resource managers, including this department.
- 3 Aquaculture development or expansion proposals should include information demonstrating how the following issues will be managed:
  - a definition of the ambient flow regime, quality and usage values of local water resources
  - b licence to take draw waters and efficiently use local water resources
  - c project infrastructure is unaffected by acidic soils, contaminated sites, flooding or unstable land
  - d potential for escape of exotic species and diseases into natural waters
  - e operational waste management that avoids significant contamination/harm to any natural water body associated with the aquaculture project
  - f adverse impacts on the water body and shoreline vegetation during the project construction and operation.

More information on our aquaculture project assessment needs is available at [Appendix C](#).

### *Within public drinking water source areas (PDWSA)*

PDWSA is a collective term used for proclaimed 'water reserves', 'catchment areas' and 'underground water pollution control areas' that are used as a source for drinking water scheme supply. PDWSA are proclaimed under the *Metropolitan Water Supply, Sewerage and Drainage Act 1909* or the *Country Areas Water Supply Act 1947*.

Various by-laws and regulations enable regulatory agencies to restrict high-risk land use and potentially polluting activities, inspect premises and take action if sites cause water contamination. PDWSA are managed using a system of protection areas designated in source protection plans. These areas are termed P1, P2, and P3. Additional constraints apply under catchment protection by-laws in the high risk areas close to the water source. These areas are called reservoir protection zones (RPZ) and wellhead protection zones (WHPZ).

- 4 Within P1 source protection areas, RPZ and WHPZ, the development of aquaculture activities is an incompatible activity and will normally be opposed by this department.
- 5 Within P2 and P3 areas, aquaculture is an activity that can be compatible with source protection objectives, subject to conditions. This department may provide advice on measures to protect water quality using appropriate pollutant containment and management practices. All aquaculture proposals within P2 and P3 source protection areas should be referred to this department for assessment and a written response in accordance with state planning policy 2.7 *Public drinking water source policy* and our water quality protection note 25 *Land use compatibility in PDWSA*.

### *On or near waterways*

Aquaculture projects are often established near waterways that can provide a suitable water supply source. Freshwater species may be grown in ponds, farm dams or tanks adjacent to these water resources.

- 6 Aquaculture projects should not operate in reservoirs constructed within natural waterways due to the risk of turbidity, nutrients, exotic species or disease being transferred downstream via spillways. During major storm events there is potential for overtopping of dams causing loss of earth embankments.
- 7 Aquaculture facilities should not be established on land that is seasonally flooded, needs to be artificially drained, where natural watercourses need to be diverted or construction will affect areas of fringing or riparian vegetation. These areas provide significant water quality benefits through their ability to sustain aquatic ecosystems and filter pollutants in stormwater runoff.
- 8 Ponds and facilities should be placed sufficiently high in the landscape to ensure negligible impact on waterways, wetlands and their dependant vegetation, and allow for the effective operation of runoff filter zones and sediment control measures.

### *Within proclaimed waterways management areas*

Five 'waterway management areas' have been declared under the *Waterways Conservation Act 1976*, to provide special protection for specific estuaries and their associated waterways that are considered especially vulnerable to water contamination. These managed areas are the Albany waterways, Avon River, Leschenault Inlet, Peel-Harvey Estuary and Wilson Inlet, and their immediate surrounds (see map at [Appendix D](#)).

- 9 If an aquaculture development is planned within a waterways management area, written approval from this department is needed. Management area regulatory information is available from our nearest regional office.

### *Near wetlands with defined conservation values*

- 10 Aquaculture facilities should not be constructed within natural wetlands with recognised conservation values, or impact on their associated vegetation buffer, unless approved by the Minister for the Environment on the advice of the Department of Environment and Conservation ([Reference 4](#)).
- 11 Any proposals likely to have a significant impact on the environment, including 'conservation category' wetlands should be referred to the Department of Environment and Conservation's nature conservation division for comment in accordance with Section 38 of the *Environmental Protection Act 1986*. Projects should utilise the advice given in the Environment Protection Authority (WA) draft guidance statement 33, chapter B4 *Wetlands*.
- 12 Where an impact on a wetland is approved, a target of no change in its function may be achieved through offsets, such as enhanced protection of a nearby equivalent wetland to provide, as a minimum, the same values. For additional information on wetland categories, boundaries and buffer definition, see [Appendix A](#) and [References 4](#) and [7](#).

### *Within the Swan River Trust management area*

- 13 The Swan River Trust (SRT) manages the Swan-Canning estuary and abutting reserves in accordance with the *Swan and Canning Rivers Management Act 2006*. Written approval from the SRT is normally required for any land or water-based development that may have an adverse effect on the estuary, its values or drainage systems entering the estuary. For detailed information contact the trust, see internet site < [www.swanrivertrust.wa.gov.au](http://www.swanrivertrust.wa.gov.au) >, select *Contact us*.

### *Infrastructure clearance to the water table*

- 14 Soil waterlogging should be avoided, while soil filtration and aerobic microbial action in free-draining soils should be encouraged by ensuring a minimum vertical separation distance of two metres. This buffer distance is measured between the base of aquaculture ponds or structures and the highest predicted water table, using local statistical data from the highest seasonal rainfall in a ten-year period.

### *Within floodways*

- 15 Land that is seasonally inundated or may be flooded during a 100-year average return interval storm event ([Reference 9](#)) is generally unsuited to aquaculture projects. Filling of land to raise structures above predicted flood levels is considered poor practice, as it is likely to increase the risk of upstream flooding and floodwater velocity, leading to soil and drainage channel erosion.

### *Buffers to sensitive water resources*

- 16 Perennial native vegetation buffers should be retained or be re-established between any land-based aquaculture facility and sensitive water resources ([Appendix A](#)). These natural buffers are crucial to the protection of the ecology of water resources, act as contaminant filters and should allow time for the effective remedial action in the event of contaminant spill incidents. Information on establishing appropriate buffers is given in our water quality protection note 06 *Vegetated buffers to sensitive water resources*.
- 17 Any proposals for facilities within these buffers should be referred to this department for detailed assessment and a written response. Supporting data should clearly demonstrate that these activities can be established and operated within any reduced buffer without posing a significant risk to water resource values.

### **Consultation at the project planning stage**

- 18 The location of sensitive water resources and recommended management criteria should be obtained by contacting our nearest regional office.
- 19 When any aquaculture facilities are proposed within or near any potentially sensitive water resources, this department should be consulted. This ensures that environmental controls and servicing requirements are negotiated well in advance of construction, allowing projects to be suitably located, built, operated and maintained with an appropriate balance of environmental, as well as social and economic planning. Any commercial facilities proposed within 500 metres upstream of a sensitive water resource should be referred to our nearest regional office for assessment, with supporting information addressing the environmental risks. Departmental staff should refer to the *Intranet > Manuals > Knowledge net* section 14 for information on aquaculture approvals.
- 20 Legally established, though currently non-compliant aquaculture activities, may remain near sensitive water resources. However, their operators should employ best environmental management practices (as outlined in this note) to limit the risk of environmental harm. Proposals to significantly alter or expand aquaculture sites should undergo both planning and environmental impact assessment, and gain written approval from the appropriate regulatory agencies ([Appendix B](#)).

### **Design measures**

- 21 Aquaculture project operations should be managed so process water is used efficiently and wastes are not released in sufficient quantities to harm the local environment.

Under Part V of the *Environmental Protection Act 1986*, it is an offence to release wastes that may pollute water resources.

- 22 Aquaculture projects should be operated so that fish or pond plant species, discoloured water, sludge, silt, toxic chemicals and/or unstable organic material are not discharged into waterways or wetlands as a result of pond overflow, cleaning or emptying. Provision should be made to contain these materials effectively on-site, pending treatment or offsite disposal.
- 23 Commonly used wastewater treatment methods include:
- a Stabilisation and settling of organic matter in facultative ponds. For more information see our water quality protection note 39 *Ponds for stabilising organic wastewater*.
  - b Filtration of solids and nutrients through bio-filters or artificial wetlands.
- 24 The CSIRO has conducted research into ammonia reduction from aquaculture using zeolites, which has proved to be promising. See internet site < [www.publish.csiro.au](http://www.publish.csiro.au) > for contact information.

### **Construction of land-based ponds**

- 25 Ponds should be designed and constructed by qualified and experienced personnel using very low permeability materials (leakage less than  $10^{-9}$  metres per second), such as clay or plastic-lined ponds, fibreglass, metal or concrete tanks. Native soils used for pond construction should be engineered to ensure their long-term secure operation. Our water quality protection note 27 *Liners for containing pollutants, using engineered soils* ([Reference 6a](#)) provides guidance on soil lining for ponds.
- 26 Ponds should not be established on steep slopes (greater than one in 10) or on unstable ground, as embankments may fail. The ponds should incorporate measures to divert storm event runoff e.g. cut-off drains without overtopping, eroding or breaching pond embankments or causing uncontrolled release/displacement of contents.
- 27 Scour valves should not be installed at the base of ponds, unless the operator can demonstrate that systems are available to prevent silt transfer or loss of pond aquatic species to external waters.
- 28 Sufficient pond freeboard (400 millimetres minimum) should be maintained to avoid overtopping during extreme rainfall events.

### **Water supplies**

- 29 Many groundwater aquifers and river systems in Western Australia are regulated via controls under the *Rights in Water and Irrigation Act 1914*. This statute protects the water usage rights of adjoining landowners. A licence may be required from this department to take water from proclaimed aquifers and streams, except where water draw is less than 1500 kilolitres per year and solely for domestic use. These licences may limit the quantity of water drawn, require routine flow metering and reporting, or impose other operational controls. For licensing advice contact our local regional office.

30 Aquaculture projects should not consume a significant portion of any water resource to counter evaporation or maintain pond system ecology as it may affect other water users, particularly during dry season (low flow) periods. Any site operator should not interfere with another person's rights, take actions that damage property or discernibly alter the flow or qualities of natural waters. Project operators should make themselves aware of downstream water uses and the likely effects their project may have on that stream's ecology and other's commercial and social interests in the water resource.

### Site management and waste disposal

31 Aquaculture operators should develop and implement an environmental management plan that adheres to best industry management practice for sustainable operation. Feed regimes should be well balanced/recorded against stock growth needs.

### Liquid waste

32 Wastewater discharges rich in organic matter, suspended solids and nutrients cause noxious odours, bacterial slime capable of fouling screens associated with water bores, and contribute to turbidity, silt deposits and algal blooms in waterways or wetlands. A computer model is available to predict aquaculture waste outputs ([Reference 5b](#)).

33 Small-scale aquaculture projects may discharge up to five kilolitres of wastewater/day to soakage or via land application, provided the wastewater quality consistently complies with Table 1 discharge criteria.

| <b>Table 1 Wastewater discharge criteria</b>   |  |
|--|--|
| <i>Description of management/effluent quality</i>  | <i>Maximum effluent concentration or impact on receiving waters</i>  |
| <b>Physical parameters</b>   |  |
| Algae, colour, floating matter, odour, sediment  | No discernible quality change to the water resource  |
| Temperature  | less than two degrees Celsius change to ambient water resource temperature   |
| pH   | Effluent within pH range 5 to 9  |
| Suspended solids   | Up to 100 milligrams/litre in effluent   |
| <b>Chemical parameters</b>   |  |
| Salinity (measured as electrical conductivity)   | Up to 10 per cent induced salinity concentration change in receiving waters  |
| Unstable organic waste measured as five-day biochemical oxygen demand  | Up to 50 milligrams/litre in effluent  |
| Nitrogen as ammonia  | Up to ten milligrams/litre in effluent   |
| Nitrogen as nitrate  | Up to 50 milligrams/litre in effluent  |
| Total phosphorus   | Up to one milligram/litre in effluent  |
| All other contaminants that may potentially harm aquatic ecosystems  | Effluent concentration up to ten times aquatic ecosystems guideline value (ANZECC table 3.4.1, 95% of species)   |
| <b>Microbiological parameters (pathogens)</b>  |  |
| Bacteria, virus, parasite control using effective disinfection that may include irradiation, filtration, chemical treatment and/or long-term detention | In waters that may be used for animal water supplies or direct contact recreation, up to 100 thermo-tolerant coliforms per 100 millilitres in effluent |

Table 1 notes:

- a Effluent concentration achieved via water treatment measures, not dilution.
- b Aquatic ecosystems guideline refers to the Australian government publication *Australian and New Zealand guidelines for fresh and marine water quality 2000*, chapter 3 *Aquatic ecosystem protection criteria* ([Reference 1a](#))
- c *Environmental monitoring and data records* section provides recommended monitoring protocols
- d Discharge of wastewater into drains, wetlands and waterways should not occur.

34 For larger scale aquaculture projects, wastewater should be fully contained within the project site or treated to a standard set by regulatory agencies e.g. licences issued by the departments of Fisheries and/or Environment and Conservation compatible with the intended water use/protection of the values of the receiving environment.

35 Low salinity stabilised pond effluent which has been tested to ensure safe concentrations of harmful chemicals (such as salts, nutrients, pharmaceuticals) may be applied to land to promote vegetation growth, typically onto turf, gardens, orchards or tree plantations.

36 For land application details, see our water quality protection note *22 Irrigating vegetated land with nutrient-rich wastewater* and *33 Nutrient and irrigation management plans* ([Reference 6a](#)).

37 Saline process waters (electrical conductivity exceeding 200 milli-Siemens/metre) should be contained for solar evaporation before salt disposal in a manner that does not affect the environment.

### *Solid waste*

38 Solid waste matter such as dead stock, dewatered pond sludge should be composted, then either applied to land as a soil conditioner, exported off site for a useful purpose, or if these options are not viable, disposed of at an approved putrescible waste landfill.

### **Contingency plans**

39 Site operators should develop and implement measures that minimise potential environmental impacts from:

- a equipment malfunctions
- b natural events such as storms and bushfires
- c inadequately trained staff
- d disease outbreaks
- e predators, pest species and poachers.

## Environmental monitoring and data records

- 40 Environmental data should be gathered to benefit project operations, including definition of the chemistry and microbial activity of aquaculture activities and adapting them to maximise the operational efficiency:
- a Pond parameters measured using calibrated on-site meters should include pH, dissolved oxygen (DO), salinity measured as electrical conductivity (EC), turbidity, and water temperature (all least weekly).
  - b Nutrients (total nitrogen and oxidised nitrogen, phosphorus as ortho-phosphate), volatile organic carbon or biochemical oxygen demand (BOD), pathogens, selected salts, metals, pharmaceuticals and disinfectants via representative sampling and laboratory analyses of pond water prior to any release, at end of a production cycle or on any change of stock quality (at least quarterly).
  - c Audit of receiving water quality encompassing relevant parameters provided at a and b (for surface waters or water table) at least each six months and immediately following any observed or reported changes to the quality of downstream natural waters.
- 41 Sampling should be conducted as recommended in the *Australian guidelines for water quality monitoring and reporting 2000* (Reference 1c). Any field testing equipment should be calibrated in accordance with the supplier's instructions. Recommended sample preservation methods should be used. Analyses should be conducted by laboratories accredited by the National Association of Testing Authorities (NATA) for the relevant tested parameters. Suitable laboratories may be located in the *Yellow Pages* telephone directory under *Analysts*.
- 42 Copies of monitoring data should be retained for at least two years for evaluation by regulatory agencies. Quality environmental data records can provide a defence for responsible operators against allegations of environmental harm.

## More information

We welcome your views on this note. Feedback provided is held on our file **13196**.

To comment on this note or for more information, please contact our water source protection branch as shown below, citing the note topic and version.

Department of Water  
168 St Georges Terrace  
PERTH, WESTERN AUSTRALIA 6000

PO Box K822 PERTH, WESTERN AUSTRALIA 6842

Telephone +61 8 6364 7600  
Facsimile +61 8 6364 7601  
Email [waterquality@water.wa.gov.au](mailto:waterquality@water.wa.gov.au)

This note will be updated periodically as new information is received or industry/activity standards change. Updated versions are placed online at < [www.water.wa.gov.au](http://www.water.wa.gov.au) > select *water quality > publications > water quality protection notes*.

## References and further reading

- 1 Australian Government – national water quality management strategy papers available online at < [www.environment.gov.au](http://www.environment.gov.au) > select *water > water quality > nwqms > nwqms guideline documents*:
  - a *Australian and New Zealand guidelines for fresh and marine water quality 4, 2000*
  - b *Australian drinking water guidelines 6, 2004*
  - c *Australian guidelines for water quality monitoring and reporting 7, 2000*
- 2 Australian Government - Fletcher, Chesson, Fisher, Sainsbury and Hundloe, Fisheries research and development corporation, see < [www.fisheries-esd.com](http://www.fisheries-esd.com) > select *publications*  
*The national ESD reporting framework: the 'How to' guide for aquaculture, Version 1.1, June 2004.*
- 3 Dallas J. Donovan, Kuruma Australia available online at < [www.aaq.com.au](http://www.aaq.com.au) > select *enter website > environmental code of practice : Industry environmental code of best practice for freshwater finfish aquaculture, Department of primary industries and Queensland finfish aquaculture industry* November 1999.
- 4 Department of Environment and Conservation (WA)
  - a Waste management online publications see <[www.dec.wa.gov.au](http://www.dec.wa.gov.au)>, select *pollution prevention > waste management > publications*.
    - *Landfill waste classification and waste definitions (as amended)*
    - *Guidelines for acceptance of solid waste to landfill 2001*
    - *Siting, design, operation and rehabilitation of landfills 2005*
    - *Western Australian waste reduction and recycling policy 1997*
  - b Wetlands online publications see < [www.dec.wa.gov.au](http://www.dec.wa.gov.au) > select *management and protection > wetlands > publications > policy*:  
Position statement *Wetlands, WRC 2001*; available.
  - c Native vegetation clearing control online publications at < [www.dec.wa.gov.au](http://www.dec.wa.gov.au) > select *management and protection > plants > native vegetation*.
- 5 Department of Fisheries (WA) online information at < [www.fish.wa.gov.au](http://www.fish.wa.gov.au) >, select *Pearling and aquaculture*:
  - a *Assessment of applications for aquaculture and pearling in coastal waters of WA*
  - b *Aquaculture waste output model*
  - c *Finfish aquaculture in Western Australia - ESD workshop report April 2006*
  - d *Pond aquaculture checklist 2000*
- 6 Department of Water (WA)
  - a Water quality protection notes available online at < [www.water.wa.gov.au](http://www.water.wa.gov.au) >, select *water quality > publications > water quality protection notes*:
    - *WQPN 06 Vegetated buffers to sensitive water resources*

- WQPN 10 *Contaminant spills - emergency response*
- WQPN 13 *De-watering of soils*
- WQPN 22 *Irrigation with nutrient-rich wastewater*
- WQPN 25 *Land use compatibility in public drinking water source areas*
- WQPN 26 *Liners for containing pollutants, using synthetic membranes*
- WQPN 27 *Liners for containing pollutants, using engineered soils*
- WQPN 33 *Nutrient and irrigation management plans*
- WQPN 39 *Ponds for stabilising organic wastewater*
- WQPN 52 *Stormwater run-off from industrial sites*
- WQPN 56 *Tanks - above ground chemical storage*
- WQPN 65 *Toxic and hazardous material storage*
- WQPN 68 *Wash-down of mechanical equipment.*

- b Waterways publications available online at <[www.water.wa.gov.au](http://www.water.wa.gov.au)>, select *water quality > publications > policy*  
*Foreshore policy 1 - Identifying the foreshore area.*

## 7 Environmental Protection Authority (WA)

- a Guidance statements available online at <[www.epa.wa.gov.au](http://www.epa.wa.gov.au)>, select *EIA > guidance statements*:
- Guidance statement 3 *Separation distances between industrial and sensitive land uses*
  - Guidance statement 33 *Environmental guidance for planning and development.*
- b Environmental protection policies or position statements available online at <[www.epa.wa.gov.au](http://www.epa.wa.gov.au)>, select *EIA > guidance statements*:
- *South-west agricultural zone wetlands policy 1998*
  - *Swan coastal plain lakes policy 1992*
  - *Revised draft environmental protection (Swan coastal plain wetlands) policy and regulations 2004*
  - *Position statement 4 Environmental protection of wetlands 2004*
  - *Position Statement 9 Environmental offsets 2006.*

- 8 Environmental Protection Authority, South Australia publication see web page <[www.epa.sa.gov.au](http://www.epa.sa.gov.au)> select *publications > water quality > policy*  
*Aquaculture management and environmental protection (water quality) policy 2003.*

- 9 Engineers Australia publication available for purchase at  
 <[www.engineersmedia.com.au](http://www.engineersmedia.com.au)> search *EA books*  
*Australian rainfall and runoff - A guide to flood estimation (current edition)*

- 10 Primary Industries and Fisheries Department, Queensland, 2007 publication available online at < <http://www2.dpi.qld.gov.au/fishweb/17803.html> >  
*Guidelines for constructing and maintaining aquaculture containment structures.*
- 11 Standards Australia publications available for purchase at < [www.saiglobal.com](http://www.saiglobal.com) >  
select *publications*
- AS 1726 *Geotechnical site investigations*
  - AS 5667 *Water quality – sampling.*
- 12 Western Australian Planning Commission policy available online at  
< [www.wapc.wa.gov.au](http://www.wapc.wa.gov.au) > select *publications*  
State planning policy 2.7 *Public drinking water source policy 2003.*

## Appendices

### Appendix A - 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. Water resources should remain within specific quality limits to retain their values, 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*, available online at < [www.environment.gov.au](http://www.environment.gov.au) > select *water > water quality > national water quality management strategy.*

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 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 discernible quantities. These waters include estuaries, waterways, wetlands and unconfined groundwater accessed by water supply wells.

Sensitive water resources support one or more of the environmental values described below:

- 1 Public drinking water sources (i.e. *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*.
- 2 Private sources, used for the following water supplies:
  - a human or stock (animal) drinking water
  - b commercial or industrial water (requiring specific qualities that support activities such as aquaculture, cooling, food or mineral processing or crop irrigation)
  - c urban irrigation (that could affect people's health or wellbeing).

- 3 Recognised ecological functions in groundwater aquifers such as soil or cave fauna.
- 4 Social values in natural waterways including aesthetic appeal, boating, fishing, tourism and swimming.
- 5 Ecological functions of waterways including:
  - a those of high conservation significance described in the Environmental Protection Authority's guidance statement 33 *Environmental guidance for planning and development* (section B5.2.2), available online at < [www.epa.wa.gov.au](http://www.epa.wa.gov.au) > select *EIA > guidance statements*
  - b waterways managed by the Department of Water under the *Waterways Conservation Act 1976*, including the Avon River, Peel-Harvey, Leschenault Inlet, Wilson Inlet and Albany waterways
  - c waterways managed by the Swan River Trust under the *Swan and Canning Rivers Management Act 2006*.

Engineered drains or constructed water features are excluded as functional and operational factors may outweigh their water quality values.

- 6 Conservation values in wetlands (assigned or recognised, excluding those highly disturbed unless actively managed to restore specified environmental values), including:
  - a Ramsar wetlands, described online at < [www.ramsar.org](http://www.ramsar.org) >.
  - b High conservation significance wetlands as described in the Environmental Protection Authority's guidance statement 33 *Environmental Guidance for Planning and Development* (section B4.2.2), available online at < [www.epa.wa.gov.au](http://www.epa.wa.gov.au) > select *Environmental impact assessment > guidance statements*.
  - c Wetlands defined by the Australian government in *A directory of important wetlands in Australia*, available online at < [www.environment.gov.au](http://www.environment.gov.au) > select *water > water for the environment > wetlands > wetlands publications, resources and links > books, reports directories*.
  - d Conservation valued and resource enhancement category wetlands identified in the *Geomorphic wetlands of the Swan coastal plain* dataset; all wetlands identified in the *South coast significant wetlands* dataset, and high value wetlands identified in the *Geomorphic wetlands Augusta to Walpole* dataset. The Augusta to Walpole wetland dataset awaits a detailed evaluation process. The Department of Environment and Conservation (DEC) is the custodian of wetland datasets and is responsible for maintaining and updating the information. The datasets can be viewed online at < [www.dec.wa.gov.au](http://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 website at *water > wetlands > data* or by phoning DEC's nature conservation division for assistance on 08 9334 0333.

Many aquifers, waterways and wetlands in this state still need a detailed scientific evaluation and their value remains to be classified. Any natural waters that are largely undisturbed by human activity, should be considered to have sensitive values, unless proven otherwise.

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

**Appendix B - Statutory requirements and approvals covering this activity include:**

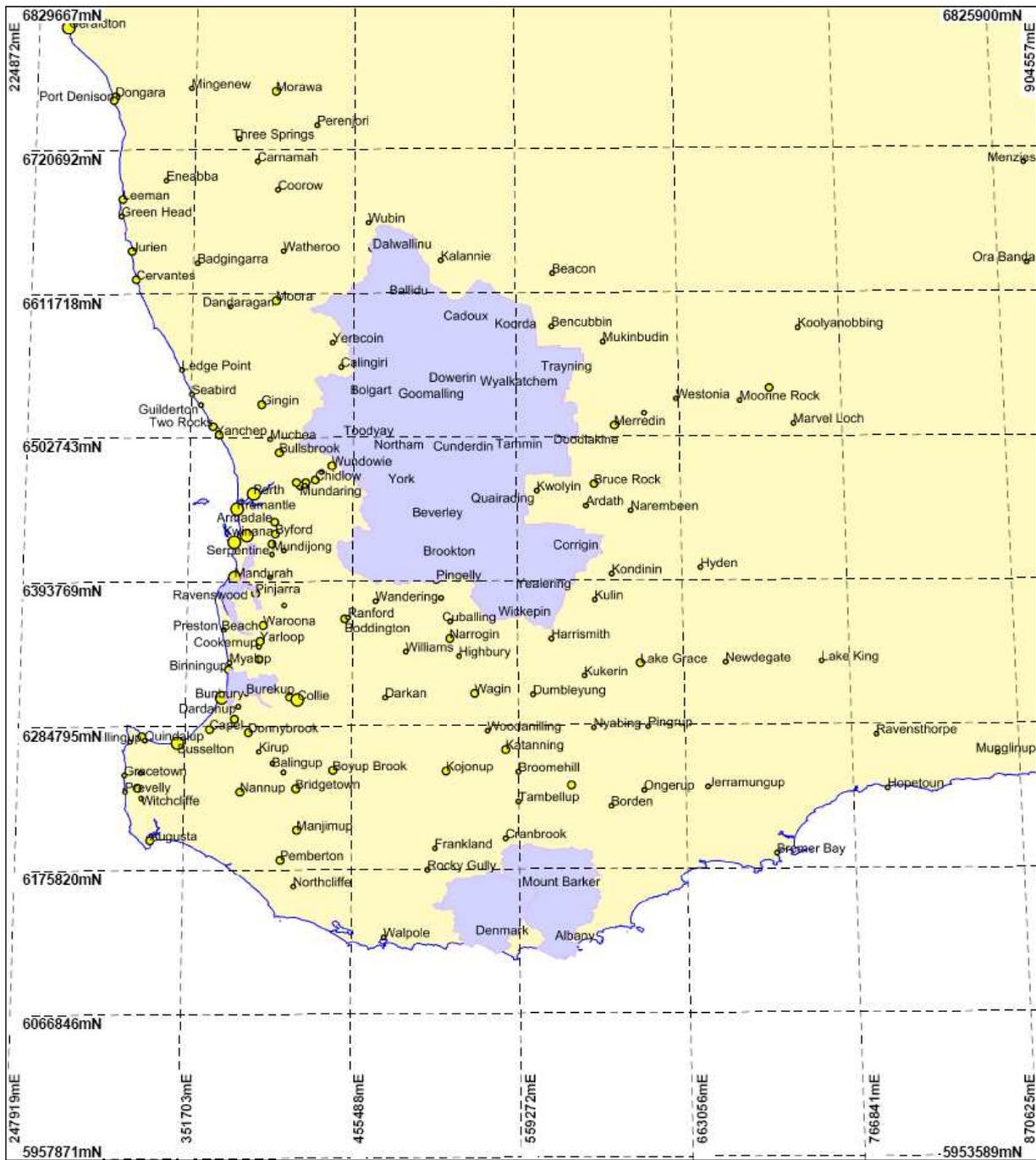
| <b>What is regulated</b>  | <b>Statute</b>  | <b>Regulatory agency</b>   |
|---|---|--|
| Land zoning and development approval  | <i>Planning and Development Act 2005</i>  | Local government (Council)   |
| Licensing of commercial aquaculture premises  | <i>Fish Resources Management Act 1994</i>   | Department of Fisheries<br>< <a href="http://www.fish.wa.gov.au">www.fish.wa.gov.au</a> >  |
| Environmental protection policies.<br><br>Impact on the values and ecology of natural waters  | <i>Environmental Protection Act 1986</i> ,<br>Part III Environmental protection policies<br>Part IV Environmental impact assessment | Minister for the Environment with advice from the EPA<br>< <a href="http://www.epa.wa.gov.au">www.epa.wa.gov.au</a> >                    |
| Regulation of prescribed premises (holding a biomass of fish or prawns equal to or greater than one tonne)                                    | <i>Environmental Protection Act 1986</i> ,<br>Part V: Prescribed premises Schedule 1 Category 3 and 4                               | Department of Environment and Conservation<br>< <a href="http://www.dec.wa.gov.au">www.dec.wa.gov.au</a> >                               |
| Clearing of native vegetation   | Environmental Protection (Clearing of Native Vegetation) Regulations 2004   |  |
| Clearing of native vegetation in clearing control catchments i.e. Mundaring, Wellington, Harris, Denmark, Warren or Kent Aquaculture in PDWSA | <i>Country Areas Water Supply Act, 1947</i><br><i>Metropolitan Water Supply, Sewerage and Drainage Act 1909</i>                     | Department of Water - regional office<br>< <a href="http://www.water.wa.gov.au">www.water.wa.gov.au</a> >                                |
| Licence to take surface water and groundwater from proclaimed areas   | <i>Rights in Water and Irrigation Act 1914</i>  |  |
| Licence to discharge waters into declared 'waterways'   | <i>Waterways Conservation Act 1976</i>  |  |
| Approval to discharge water into Swan–Canning Estuary and feeder drains   | <i>Swan and Canning Rivers Management Act 2006</i>  | Swan River Trust<br>< <a href="http://www.swanrivertrust.wa.gov.au">www.swanrivertrust.wa.gov.au</a> >                                   |
| Discharge to sewer via an industrial waste permit   | <i>Metropolitan Water Supply, Sewerage and Drainage Act 1909</i><br><i>Country Towns Sewerage Act 1948</i>                          | Water Corporation<br>< <a href="http://www.watercorporation.com.au">www.watercorporation.com.au</a> ><br>Local sewerage service provider |

Relevant statutes are available from the *state law publisher* at < [www.slp.wa.gov.au](http://www.slp.wa.gov.au) >.

## Appendix C - Key data used for assessment of aquaculture projects

- a Proponent's name and contact details.
- b Location of the aquaculture project and project layout plan.
- c Outline of the nature of the project, its scale, what is planned, and proposed environmental safeguards.
- d Present conditions at the project site such as soils, water table, drainage paths, water sources and established other land uses.
- e Development timeline proposed for the project.
- f Likely project effects on the bed, banks and fringing vegetation of waterways and wetlands.
- g Risks to established and potential downstream water uses, such as aquatic ecology, visual amenity, recreation and water supply sources.
- h Controls on potential introduction of diseases or exotic organisms to water resources.
- i Controls to protect local water resource quality as a result of the escape or disposal of organic waste (including nitrogen as ammonia and unstable sediment residues), coloured, algae or nutrient enriched, saline or turbid effluent.
- j Measures to manage risks from other wastes or by-products of farming procedures such as food, disinfectants and pharmaceuticals.
- k Details of how wastes will be managed and residue disposal locations.
- l Effluent discharge volume and effluent quality that may affect water resources from land-based facilities.
- m Potential for outbreaks of toxic and other harmful aquatic flora, including algae.
- n Proposal for monitoring environmental performance.
- o Contingency plans including employee training, equipment malfunctions and incidents affecting the operation of the project.

# Appendix D - Proclaimed management areas under Waterways Conservation Act 1976



**LEGEND**

- Australian Coastline - DOW
- Towns - DLI 8/04
- A
- B
- C
- Road Centrelines - DLI 1/5/04
- Waterways Conservation Act, Waterway Management Area - DOW



Scale 1:3618626  
(Approximate when reproduced at A4)

Geocentric Datum Australia 1994  
Note: the data in this map have not been projected. This may result in geometric distortion or measurement inaccuracies.

Prepared by: Ryanp  
Prepared for:  
Date: 20/11/2008 1:34:11 PM

Information derived from this map should be confirmed with the data custodian acknowledged by the agency acronym in the legend.



Government of Western Australia  
Department of Water

WA Crown Copyright 2002