

Code of Practice for the environmental management of the South Australian abalone aquaculture industry



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ABBREVIATIONS

(The) Act	Environment Protection Act 1993
APVMA	Australian Pesticides and Veterinary Medicines Authority
DEH	Department for Environment and Heritage
EMS	Environmental Management System
EPA	South Australian Environment Protection Authority
PIRSA	Department of Primary Industries and Resources South Australia

1 INTRODUCTION

The abalone aquaculture industry in South Australia began in the late 1980s. Farming of abalone predominantly occurs in land-based facilities; however, a number of marine culture systems are being used incorporating barrels, sub-tidal cages and navigable vessels.

The two main species of abalone commercially cultured in South Australia are the greenlip abalone, *Haliotis laevis*, and blacklip abalone, *H. rubra*. There is also interest in a number of other species including roes abalone (*H. roei*), cyclobates abalone (*H. cyclobates*), scalaris abalone (*H. scalaris*) and various hybrid species.

Although many aspects of abalone propagation vary between different farms, there are a number of environmental issues that are relevant to the sector as a whole. These are typically associated with the operation of the farms or the service depots that support abalone farming facilities. If the operation is designed or managed inappropriately, there is the potential for environmental harm to occur.

Every abalone farmer has a general environmental duty, described in Section 25 of the *Environment Protection Act 1993* (the Act), to avoid causing environmental harm. All farmers are required to comply with the Act and associated environment protection policies (EPPs) in particular, the *Environment Protection (Water Quality) Policy 2003* or Water Quality EPP as well as a range of other legislation administered by agencies other than EPA. A code of practice provides a set of guidelines containing specific requirements, advice and information that describe how a person undertaking a particular activity (eg abalone farming) can comply with their general environmental duty. Figure 1 illustrates the links between codes of practice, the EPPs and the Act.

The objectives of the *Code of Practice for the environmental management of the South Australian abalone aquaculture industry* (the Code) are to highlight potential environmental issues relevant to abalone farming and provide the industry with recommendations on how they can comply with the Act and associated EPPs.



Figure 1 Relationships between the Environment Protection Act, environment protection policies, codes of practice and guidelines

2 ABOUT THIS CODE

2.1 Purpose and application of the Code

Abalone farmers have obligations under the Act and the Policies made under it. These include obligations not to cause environmental harm and to comply with the specific obligations set out in the EPPs (for example, those relating to water, air and noise).

The purpose of this Code is to provide advice on how abalone farmers can comply with their environmental obligations, particularly the general duty in the Act not to cause harm. In particular, it identifies potential environmental issues associated with abalone aquaculture and presents management strategies to address these issues.

The Code applies to the management of all relevant environmental issues associated with land- and sea-based abalone farming operations in South Australia. It also applies to land-based support facilities for abalone farming operations which may include premises for post-harvest activities, equipment cleaning, maintenance and storage, storage of supplies (eg chemicals and feed), etc.

The Code is outcome based and not prescriptive and therefore supports farmers to continue with their own individual methods of farming abalone, provided that the overall environmental objectives of the Code are met.

2.2 Benefits of using this Code

The Code draws together a range of issues and obligations that are associated with abalone farming. In doing so it aims to provide the details that will help farmers deal with those obligations. Most importantly, Section 25 of the Act provides a general duty to care for the environment. It requires that any person who undertakes an activity 'that pollutes, or might pollute, the environment' must take 'all reasonable and practicable measures' to prevent or minimise harm that might result from their activities. This Code provides advice on the measures that will help abalone farmers undertake their duty of care to the environment. It aims to set out 'best practice' which, if followed, will imply that farmers have taken all 'reasonable and practical' measure to avoid causing harm.

There are additional benefits to farmers in complying with this Code. These include:

- providing a positive image to the community and other interested stakeholders demonstrating the environmental responsibility of the industry
- improved marketing capacity with the production of an environmentally sustainable product
- providing a smoother pathway in gaining relevant approvals should the farmer wish to expand or diversify
- assisting with the production of environmental management systems (EMS) for individual businesses
- helping to provide a cleaner environment for everyone.

2.3 Compliance with the code

The Code's function is to provide advice to farmers. As such, non-compliance is not, in itself, an offence. But since it brings together all of the issues that, in the opinion of the EPA, amount to

good environmental practice, an abalone farmer who complies with the Code can be confident that he or she is acting responsibly and doing all of the things necessary to satisfy the general obligations of the Act.

Failure to comply with this Code may result in the issuing of an Environment Protection Order (EPO) if, in the EPA's opinion, the consequence of the failure is such as to amount to a breach of the general duty. An EPO typically requires a farmer to take specified action within a certain period of time. Failure to comply with an EPO can lead to prosecution.

It should also be noted that, in addition to the Code, farmers are still required by law to ensure that their operations comply with the Environment Protection Act and relevant EPPs. For further legislative information refer to the Appendix.

2.4 Other relevant and important legislation

The primary legislation controlling aquaculture activities in South Australia is the *Aquaculture Act 2001* and is administered by Primary Industries and Resources SA (PIRSA). The Aquaculture Act manages aquaculture licensing and other functions, several of which are environmentally focussed. Consequently, in parallel with this Code, all abalone farmers are required to meet all legislative requirements including those specified in their aquaculture licence.

Every aquaculture licensee must undertake or participate in, as the case requires, an environmental monitoring program (EMP) approved by the Minister for Agriculture, Food and Fisheries. An EMP for each industry sector is specified in the *Aquaculture Regulations 2005*.

In addition to the Act and Aquaculture Act, all abalone farmers need to be aware of other important legislation that may impact on their farming activities. This legislation is administered by other agencies which includes:

- PIRSA
- Department for Environment and Heritage (DEH)
- Planning SA
- local government.

It is important for abalone farmers to recognise that this Code may not identify all environmental legislation that might apply to their abalone farming facility. It remains the abalone farmers' responsibility to comply with all legislation, whether or not that legislation is referred to in this document.

2.5 A note on terminology

As indicated in 2.3, compliance with the Code is not compulsory. But, abalone farmers are strongly advised to comply with it and failure to do so may lead to circumstances where an EPO is issued or a prosecution for causing environmental harm is brought. In particular:

- Where 'must' is used in this Code, the EPA is of the view that failure to comply will have caused, or is likely to cause, a situation where the person is in breach of his or her general duty or even in breach of the Act, an EPP or potentially other legislation.
- Where 'should' is used, the EPA advocates that farmers comply in order to keep within best practice. Failure to comply may suggest that the farmer's activities may be such as to make him or her in breach of the general duty.

3 SCOPE OF THE ABALONE CODE OF PRACTICE

Abalone farming is a primary industry, thus many general environmental issues applicable to other primary industries may also apply to abalone farming.

Principally, the four types of abalone facilities that need to be considered for the environmental code of practice are:

- land-based production (hatchery and grow out)
- sea-based production
- navigable vessels
- land-based support facility (ie depot) for servicing abalone production facilities and undertaking post-harvest activities.

Section 4 will discuss activities involved with abalone farming along with potential environmental issues that may be associated with these activities. In addition, the information aims to assist farmers in achieving best practice environmental management and consequently meet their general environmental duty.

It should be noted that environmental issues addressed within particular activities could also be applicable to other activities associated with abalone farming even though they may not be highlighted within that section of the Code.

The broad environmental issues that are of particular legislative concern¹ to the EPA include:

- water quality
- noise
- air quality
- solid waste disposal
- storage, use and disposal of hazardous substances
- ecological effects.

Section 5 provides further information on these environmental issues that may potentially be associated with abalone farming activities.

3.1 Types of abalone facilities

Land-based production

Land-based farms are used for the hatchery production or grow out of abalone. Facilities are located on the coast to enable seawater to be pumped through the farm and then discharged back out to sea. Abalone are cultured in purpose-built tanks and fed a diet of pellets and/or algae. Hatcheries also use smaller tanks and aquaria for the purpose of spawning and larval rearing.

¹ Either through objects of the Act or relevant EPPs.

Examples of the key environmental issues that may be associated with land-based farms are detailed in Section 5 but include the following:

- wastewater discharge—in particular nutrients from uneaten feed, abalone faeces, spat settlement plate tanks, and chemicals used to treat disease, cleaning equipment and stock management
- management of waste—organic waste including mortalities and other solid waste
- noise and odour issues—potentially when the farm is located close to neighbouring properties
- storage, use and disposal of hazardous substances—these substances include chemicals, fuels and oils
- disease management and stock escape
- impact on sensitive habitats such as foreshore areas, native vegetation, sand dunes, seagrass and rocky reefs.

Sea-based production

The offshore culture of abalone incorporates the use of barrels and sub-tidal cages. Abalone either graze on algae naturally growing on the culture substrate or are fed an artificial diet.

Examples of the key environmental issues that may be associated with marine farms include the following:

- deterioration of water quality resulting from the addition of supplementary feed and abalone faecal matter
- sedimentation under sea cages resulting from uneaten feed and abalone faeces
- management and disposal of biofouling and mortalities
- equipment loss
- use of chemicals to treat disease and the use of antifoulants
- disease management and stock escape
- scouring and shading of the seafloor from culture structures
- marine animal interactions
- use of service vessels—refuelling practices, waste management on vessels
- rubbish such as feed bags, floats and rope offcuts.

Navigable vessels

Navigable vessels refer to large vessels (eg ocean-going ships) that have been purposely fitted to accommodate systems for the culture of abalone. These vessels can respond to seasonal changes in water quality and temperatures by relocating to provide optimum conditions for the growth of abalone.

Examples of the key environmental issues that may be associated with navigable vessels include the following:

- wastewater discharge—in particular nutrients from uneaten feed, abalone faeces, and chemicals
- management of waste—mortalities and other solid waste

- storage, use and disposal of hazardous substances—these substances include chemicals, fuels and oils
- disease management and stock escape.

Land-based support facilities

Land-based support facilities for abalone farming operations may be used for a number of activities including: post-harvest handling, equipment cleaning, maintenance and storage, storage of supplies (eg feed and chemicals), etc.

Examples of the key environmental issues that may be associated with support facilities include the following:

- management and disposal of biofouling and other waste resulting from the cleaning of equipment
- disposal of wastewater and waste from fish processing activities
- noise and odour issues—mainly when the support facility is located close to neighbouring properties
- storage, use and disposal of hazardous substances—these substances includes chemicals, fuels and oils
- disposal of general waste products eg disused equipment, machinery parts, etc.

4 ACHIEVING BEST PRACTICE ENVIRONMENTAL MANAGEMENT

Information presented in Section 4 of the Code of Practice aims to assist abalone farmers in complying with the Act and associated EPPs, and ultimately achieves best practice environmental management.

Activities involved with abalone farming and the potential environmental issues associated with each activity are briefly discussed below. In addition, operational requirements are also included to assist farmers in meeting their general environmental duty.

It should be noted that environmental issues addressed within particular activities could also be applicable to other activities associated with abalone farming even though it may not be highlighted within that section of the Code.

The two key words used throughout this section are 'MUST' and 'SHOULD'. A detailed description of this terminology is include in Section 2.5, but in summary:

- **MUST**—indicates a requirement² in this Code which if ignored, is likely to lead to a breach of relevant EPPs or potentially a breach of other legislation
- **SHOULD**—represents a recommended practice.

It is important to note that not all of the operational requirements listed will be applicable to all farmers or operations. Some farmers may already use similar practices that achieve the same environmental objective.

Farmers should also ensure that all staff members employed on the farm are aware of their obligations to comply with the requirements specified in this Code and in other legislation.

4.1 Design and construction of abalone farms and support facilities

New abalone farming facilities need to be designed and constructed in a manner that minimises the potential for environmental harm. When planning a facility, it is important to ensure the location is suitable, the culture equipment is designed to withstand local conditions, potentially noisy equipment is housed to minimise noise impacts and there is appropriate controls for stormwater runoff. Environmental issues associated with the construction of abalone farms and facilities may include machinery noise, waste from excess or broken equipment, ecological issues such as impact on vegetation (both aquatic and terrestrial), marine animal interactions, and general waste. Development approval must be obtained from the relevant planning authority before any construction work commences.

Operational requirements and advice

Farmers must:

Water quality

- Design a culture system and use materials that avoids uncontrolled water leakage/seepage into the environment

² Mandatory practice in accordance with requirements of the Act. Other legislation, such as that administered by PIRSA and DEH, also contain mandatory practices that may not be specified in this document.

- Incorporate mechanisms into the system design to ensure that discharged water meets the requirements of the Water Quality EPP at the receiving waters, in particular nutrient and sediment levels
- Ensure the construction and maintenance of any septic system used on site prevents seepage into the environment
- Ensure that any soil or sand that is removed for the construction of the farm or any support facilities is managed to minimise the potential for contamination of any waters
- Ensure that material (including treated timber) stockpiled for building and construction is prevented from entering the stormwater system or other waters, eg by wind or rain erosion
- Where applicable, incorporate measures to ensure all stormwater runoff from hardstand areas (eg concrete car parks) is diverted into a stormwater treatment system capable of removing litter, sediment and oil products (see *EPA Stormwater Pollution Prevention: Code of Practice for the building and construction industry, 1997*)

Noise

- Limit construction work to between 7 am to 7 pm Monday to Saturday, and avoid any construction activity at other times, including Sundays or public holidays. This only applies where construction activity results in noise with an adverse impact on amenity
- Ensure that any potentially noisy equipment is housed or sited appropriately if there is potential for impact on neighbouring properties. Noisy equipment may include pumps, generators, aerators, air-conditioners, etc
- Take all reasonable and practical measures to minimise the adverse effect noise from construction of abalone facilities may have on neighbouring properties

Air quality

- Ensure that dust plumes produced from construction does not affect neighbouring properties

Solid waste

- Ensure that any surplus equipment not used in the construction of the system is stored or disposed of appropriately
- Recover any lost equipment or waste as soon as possible

Hazardous substances

- Ensure generators and other similar equipment are located/housed in such a manner as to contain any fuel spills and/or leakages (see EPA Guideline: Bunding and spill management, 2004)

Ecological effects

- Ensure pipes are installed in a manner that does not lead to foreshore or sub-tidal erosion issues (DEH)
- Comply with relevant legislation associated with native vegetation clearance, and dune and foreshore excavation and rehabilitation (DEH)

Farmers should:

Water quality

- Where applicable, construct sediment/settlement ponds/wastewater storage lagoons so they are adequately sized to hold necessary volumes of wastewater and ensure adequate retention of nutrients and sediments that are discharged from abalone facilities

Noise

- House potentially noisy equipment in an insulated facility

Solid waste

- Ensure there are appropriate rubbish containers located on site to receive office waste and other general rubbish (eg food wrappers, drink containers, etc)

Ecological effects

- Incorporate measures into the farm that will minimise the potential for stock escapes (eg appropriately sized cage mesh, grids on outlet pipes, etc)
- Have the ability to isolate culture tanks for the purpose of treating or isolating animals in the event of a disease
- Ensure that ropes and anchors are secured and managed to prevent scouring and shading of the seafloor, or disturbances to seagrass and other sensitive habitats
- Use culture equipment that will minimise the potential for scouring of the seafloor
- Avoid placing culture structures and pipes over seagrass beds
- Include measures in the design of the culture system that will minimise the potential for marine wildlife entanglement
- Avoid clearing native vegetation when constructing any premises associated with abalone aquaculture (DEH)
- Aim to minimise disruption to sand dunes, foreshore areas and vegetation during the placement of pipes and other associated infrastructure (DEH)
- Stabilise and/or rehabilitate sand dunes and foreshore areas upon the completion of any earthworks undertaken during the construction process
- Investigate the potential for revegetating cleared land-based areas with local species

Other recommendations

- Use durable, long-life materials for the construction of the farm that will not readily deteriorate
- Ensure that equipment is appropriately secured to minimise the potential for equipment loss in the event of storms, wave action, currents, wind, etc
- Recognise the global trend towards prohibiting the use of copper chromated arsenate (CCA) treated timber for residential and, in some instances, marine and agricultural uses
- Investigate alternatives to treated timber for construction of infrastructure
- Avoid disturbing acid sulphate soils if they are found to occur on the site, and remediate if disturbed

- Construct support facilities (for undertaking equipment maintenance, processing, net assembly and cleaning etc) only in areas that have been granted permission by relevant planning authorities (see EPA Stormwater Pollution Prevention: Code of Practice for the building and construction industry)

4.2 Stock Management

Feeding

Abalone usually require supplementary feeding in the form of pellets or algae. The production of algae for land-based systems may be achieved by the addition of fertilisers to stimulate algal growth. Fertilisers may be added directly into culture tanks or through the use of purpose-built algae culture containers. The addition of feed into the culture system may contribute to an increase in nutrient levels in the water column and/or sedimentation under cages or at the end of discharge pipes resulting from excess feed and faeces from the abalone.

The release of nutrients into the marine environment may result in algal blooms or the growth of epiphytes on aquatic vegetation such as seagrass. Additionally, sedimentation may affect the composition and function of benthic fauna and flora (biodeposition), the formation of anoxic sediments and/or result in the smothering of seagrass and other aquatic habitats. This is deemed to be environmental harm according to the Water Quality EPP.

Farmers should also consider how they store feed to prevent it from going rancid and to minimise the potential for the development of odour and vermin issues.

Operational requirements and advice

Farmers must:

Water quality

- Ensure that nutrient and sediment levels in the discharge water do not contravene the water quality criteria of the receiving waters as specified in the Water Quality EPP
- Not cause harm to seagrass or other aquatic vegetation resulting from sedimentation or increased nutrient levels
- Not permit the build-up of biodepositions or the formation of anoxic sediments on marine sites or at the end of the discharge pipes for land-based facilities
- Not use fertilisers to promote algal growth in offshore marine systems

Solid waste

- Ensure that they dispose of rancid feed via composting, licensed land-based waste facilities or employ any other method that does not create site contamination, attraction of vermin, or odour issues both on and off site
- Ensure that feed bags or wrappers do not end up in the marine ecosystem

Farmers should:

Water quality

- Monitor discharge water and/or benthic environment surrounding culture structures (ie outlet pipe or cages) for the presence of uneaten feed and amend feeding practices if uneaten feed is detected
- Incorporate mechanisms to remove uneaten feed from culture tanks prior to it reaching discharge waters (eg via hand, filtration devices, sedimentation traps, etc)
- Aim to promote the use of naturally occurring algae on marine culture structures for abalone feed to reduce reliance on supplementary feeding
- Place culture structures in areas of suitable depth and current flow to assist with the dissipation of faeces and uneaten feed

Air quality

- Store feed in a manner to prevent deterioration and potential odour issues

Site contamination

- Incorporate a fallowing regime into their farming practices to assist the site in returning to its pre-farming condition
- Implement feeding strategies aimed at optimising food conversion ratios (FCRs).

General husbandry

Stock management incorporates husbandry practices such as spawning, grading, health management and harvesting. Optimal stock management will reduce the potential for disease outbreaks, mortalities and stock escape.

Farmers must also ensure they incorporate measures into their farm that will protect the genetics and health of nearby wild populations of abalone. This includes: obtaining broodstock and juveniles from suitable sources in accordance with PIRSA requirements, preventing abalone from escaping, managing any disease outbreaks on the farm efficiently and managing the risk of introduced pests.

Operational requirements and advice

Farmers must:

Ecological effects

- Comply with PIRSA regulations and policies for the translocation of stock and broodstock collection
- Comply with PIRSA Aquaculture Regulations and Policy with respect to reporting disease outbreaks and chemical use for disease prevention and treatment

Farmers should:

Ecological effects

- Aim to provide optimal conditions to minimise the potential for animal stress and the spread of disease. Management strategies may include using appropriate stocking densities and managing water quality
- Investigate the option of incorporating a quarantine facility if stock sourced from other locations are to be brought onto the premises
- Destroy unwanted larvae spawned in abalone hatcheries prior to disposal
- Not deposit unwanted abalone larvae back into the marine environment
- Include measures to ensure equipment can contain stock within the culture system (eg appropriate size cage mesh, mesh on outlet areas in tanks and pipes etc)
- Frequently check the region surrounding discharge pipes for escapees and take appropriate action if necessary
- Undertake harvesting and grading under suitable conditions to minimise the potential for stock losses
- Ensure that procedures are in place to minimise the potential of introducing marine pests/disease into the culture system (eg *Perkinsus*, *Vibrio*, mudworm, ganglioneuritis)
- Establish an emergency response plan for disease management and outbreaks

Chemical use³

Chemicals may potentially be used on farms to treat (therapeutants) or prevent (prophylactants) disease. Such chemicals include anti-microbial veterinary medicines (eg antibiotics). All aquaculture licence holders must only use registered chemicals and chemicals for which a minor permit is issued in accordance with the label or permit. Written approval from PIRSA is required before any off-label chemical use as required in Regulation 10 of the Aquaculture Regulations.

Anaesthetics such as benzocaine and AQUI-S are used to assist in harvesting stock. Hatcheries could potentially use hormones to induce spawning and disinfectants to sterilise hatchery equipment. Hormones also need to be registered, have minor use permits or if used off-label, be issued an approval by PIRSA.

³ Many chemicals may be listed pollutants in accordance with provisions of the Act and the Water Quality EPP and must not be discharged into any waters. Inappropriate chemical use may contaminate the surrounding environment or affect other faunal species. When discharges contain antibiotic or chemical water treatments, and the total volume of the discharges exceeds 50 kilolitres per day, then appropriate authorisation from the EPA is required.

*Operational requirements and advice***Farmers must:***Water quality/hazardous substances*

- Use chemicals in a manner that prevents spillage/runoff into stormwater and other waters
- Only use chemicals that are permitted by the Australian Pesticide and Veterinary Management Authority (APVMA)
- Use chemicals as per label directions and as prescribed by a veterinarian (PIRSA/APVMA)
- Use chemicals approved by PIRSA in accordance with Aquaculture Regulations or as directed by PIRSA

4.3 Site and culture equipment maintenance and operation

Cleaning of culture equipment will produce waste predominantly in the form of biofouling (marine) and sludge (land-based). It is important that waste material produced from cleaning activities is managed to ensure it does not impact water quality or cause site contamination.

Maintenance will also be required for equipment used in the culture system (eg pumps, generators, nets, ropes) and service equipment (eg compressors, vessels, vehicles). Servicing equipment is important as poorly functioning equipment can increase the potential for oil/fuel leaks, fumes and excessive noise.

Waste products generated from equipment maintenance may include disused, broken or replaced equipment and waste oils and fuels. Inappropriate disposal, leakages or losses of these products may cause site contamination or affect water quality.

It should be noted that aquaculture equipment should not be maintained or stored in public areas (ie foreshore) unless appropriate approvals are obtained from the local planning authority.

*Operational requirements and advice***Farmers must:***Water quality*

- Ensure equipment is cleaned within an area that is designed to:
 - contain all wastewater and waste (eg biofouling and sludge) likely to pollute stormwater and other waters
 - exclude entry of stormwater runoff
- Clean equipment in a location and manner that allows the effective collection of solid waste (eg biofouling, sludge) and wastewater
- Not discharge chemicals (as listed pollutants specified under Schedule 4, Water Quality EPP) used for cleaning equipment into the aquatic environment

- Maintain equipment (eg tanks, pipes, drains) to prevent the leakage of seawater into the environment (particularly onto land)
- Ensure that contaminated stormwater does not flow into the marine or land-based aquatic environment

Noise

- Take all reasonable and practical measures to minimise the adverse effect noise may have on neighbouring properties

Air quality

- Implement measures to manage dust emissions on the site from the operation of machinery (eg vehicles) so not to affect neighbouring properties

Solid waste

- Store and/or dispose of any waste (eg biofouling, sludge) produced from the cleaning process appropriately (eg licensed landfill, composting, etc) so that it does not cause site contamination, odour or attract vermin (eg enclosed receptacles, refrigerated facilities, regular disposal)
- Not dispose of any waste resulting from cleaning culture equipment in a manner that will result in contamination of surrounding waters
- Not dispose of biofouling in a manner that will result in sedimentation of the benthic environment or damage to seagrass and other aquatic vegetation
- Appropriately secure any equipment (eg hard wastes such as ropes, netting, etc) to prevent it from entering the sea
- Recover any lost equipment as soon as possible
- Dispose of used machinery parts (eg oil and fuel filters, hoses, etc) via general rubbish or other appropriate means

Hazardous substances

- Use fuels, oils, cleaning agents and other hazardous substances in a manner that prevents spillage/runoff into stormwater and other waters (see EPA Guideline: Bunding and spill management)
- Contain and use fuels, oils and other hazardous substances in a manner that prevents spillage/runoff into stormwater and other waters
- Ensure generators and other similar equipment are located/housed in such a manner to contain any fuel spills and/or leakages
- Not allow any direct or indirect (eg from hosing down spills) discharge of hazardous substances to the stormwater system or marine environment from land-based cleaning operations or processes
- Not use general rubbish to dispose of used oil or fuel. These substances must be disposed of via a licensed contractor or treated by a facility licensed by the EPA to manage these wastes (refer Section 4.7 Storage and disposal of hazardous substances)
- Use antifoulants in accordance with the Clause 22 of the Water Quality EPP (refer to Section 5.5 of the Code)

- Comply with PIRSA Aquaculture Regulations with regards to using chemicals as disinfectants for cleaning and equipment maintenance

Ecological effects

- Comply with PIRSA Aquaculture Regulations with regards to the reporting of marine animal entanglements
- Maintain pipes and drains to prevent erosion of foreshore or sub-tidal areas (DEH)

Farmers should:

Air quality

- Ensure that biofouling and other organic matter is removed from any culture equipment prior to storage to prevent odour issues

Solid waste

- Patrol the region surrounding the farm (eg foreshore) regularly for rubbish, waste, dead shells, etc and take appropriate action if necessary
- Routinely take ashore any hard waste equipment removed from the culture system for maintenance purposes (eg ropes, netting, etc) and dispose of lawfully
- Investigate alternative methods such as recycling or reusing (eg composting) for the disposal of organic waste (eg biofouling, sludge) produced from cleaning equipment

Ecological effects

- Ensure that ropes and anchors are secured and managed to prevent scouring of the seafloor
- Ensure that equipment is kept appropriately secured to minimise the potential for equipment loss in the event of storms, wave action, current etc.
- Avoid practices that disturb or remove seagrass and other sensitive habitats (eg excessive shading, boat propeller scour, anchor scour)
- Maintain equipment in a manner that prevents marine animal interactions
- Establish emergency response plans for marine animal entanglements
- Rehabilitate foreshore areas that have been subject to erosion from discharge pipes
- Regularly inspect foreshore areas and recover and lawfully dispose of any farm waste (equipment, rubbish, mortalities, etc) that has originated from the farming activity

Other recommendations

- Maintain and service equipment regularly to prevent noise issues, fumes and leakages
- Ensure all aquaculture equipment (floatation rings, nets, floats, etc) are stored appropriately when not in use

4.4 Water use, treatment and disposal

The majority of land-based abalone farms use flow through culture systems where water is pumped from the marine environment and then discharged back out to sea after it circulates through the farm. Discharged water is likely to contain uneaten feed and abalone faeces

therefore may be elevated in nutrient and sediment levels. This may result in sedimentation or excessive algal growth (in particular *Ulva sp.*) at the point of discharge and receiving environment, epiphyte growth or other impacts on aquatic vegetation and algal blooms.

Some farms have incorporated settlement/sediment ponds into their farm design to assist with nutrient and sediment removal prior to discharge. The EPA now stipulates that all new abalone farms must demonstrate how they intend to reduce the levels of sediment and nutrients in their discharge water to ensure they meet the requirements of the Water Quality Policy.

Operational requirements and advice

Farmers must:

Water quality

- Ensure that nutrient and sediment levels in the discharge water do not contravene the water quality criteria of the receiving waters as specified in the Water Quality Policy
- Take reasonable and practical measures to ensure that discharged wastewater from the culture system does not cause environmental harm⁴
- Incorporate mechanisms into the culture system to assist with adequate removal of solid waste from wastewater prior to disposal
- Line any sediment/settlement pond/wastewater storage lagoon with an impervious material to prevent seepage

Farmers should:

Water quality

- Monitor aquatic vegetation and sedimentation at the point of discharge and adjacent marine environment
- Amend management practices such as feeding rates, water treatment, etc if uneaten feed, sedimentation, excessive algal/epiphyte growth or other adverse ecological effects is noted at the discharge point
- Ensure that sediment/settlement ponds are adequately sized to hold necessary volumes of wastewater and to provide sufficient time for the retention of nutrients and sediments discharged from the farms
- Where applicable, construct sediment/settlement ponds/wastewater storage lagoons in accordance with the *EPA Guideline: Wastewater and evaporation lagoon construction, 2004*

⁴ Section 12 Water Quality EPP. A person must not, by discharging or depositing a pollutant into any waters, cause any of the following: (a) loss of seagrass or other native aquatic vegetation; or (b) a reduction in numbers of any native species of aquatic animal or insect; or (c) an increase in numbers of any non-native species of aquatic animal or insect; or (d) a reduction in numbers of aquatic organisms necessary to a healthy aquatic ecosystem; or (e) an increase in algal or aquatic plant growth; or (f) the water to become toxic to vegetation on land; or (g) the water to become harmful or offensive to humans, livestock or native animals; or (h) an increase in turbidity or sediment levels.

4.5 Management of mortalities and fish processing waste

Stock mortalities are inevitable on abalone farms. In any primary industry it is inevitable that some level of stock mortalities will occur throughout the culture cycle. Stock mortalities on abalone farms can result from disease, poor fish health, mismanagement, sub-optimum water quality and a variety of other reasons. The extent of mortalities may range from day-to-day mortalities of a few fish to large-scale mortalities resulting from disease or an environmental event (eg algal bloom).

It should be noted that PIRSA has a specific interest in fish health, and the Aquaculture Regulations requires farmers to contact PIRSA when unusually high numbers of mortalities are experienced.

Some farms may also conduct processing on site, therefore generating fish waste such as offal and shells.

Inappropriate disposal of stock mortalities and fish waste from processing may result in site and water contamination, odour and attraction of vermin.

Operational requirements and advice

Farmers must:
<p><i>Water quality</i></p> <ul style="list-style-type: none"> • Not dispose of any mortalities or waste (including wastewater) from fish processing into any waters
<p><i>Air quality</i></p> <ul style="list-style-type: none"> • Dispose or manage mortalities and waste from fish processing before an odour problem may develop
<p><i>Solid waste</i></p> <ul style="list-style-type: none"> • Contact the EPA for advice in the event of burying or composting of large volumes of organic waste on site as this may require EPA approval • Store any organic waste (preferably frozen) in contained receptacles that are sealed to prevent leakage or by any other method, that does not result in potential odour, contamination or vermin issues • Dispose of organic waste in a manner that does not result in site and water quality contamination, odour or vermin issues. Potential methods may include waste depot facilities licensed to receive specified wastes and composting (both off and on site)
<p><i>Other requirements</i></p> <ul style="list-style-type: none"> • Contact PIRSA when an unusually high number of mortalities are experienced (Aquaculture Regulations) • Obtain an environmental authorisation should fish processing reach a prescribed level (refer to Section 5.4)

Farmers should:

Solid waste

- Develop a contingency plan that deals with unexpected large volumes of mortalities that may occur in the event of a fish kill due to water quality, disease, etc
- Identify and implement suitable methods of storage and disposal for mortalities and fish waste prior to waste being generated. This may include identifying waste depots, composters, etc that are licensed to receive such waste
- Investigate the potential for composting organic waste on site or using methods to recycle or reuse organic waste
- Dispose of organic waste in accordance with *EPA Guideline: Management of aquaculture stock mortalities, 2007*

4.6 General waste disposal

General waste on farms may include office refuse, food wrappers and drink containers, etc. Inappropriate disposal of general waste may result in site contamination and affect water quality of surrounding waters.

For information regarding disposal of waste from equipment maintenance, putrescible waste and hazardous substances, please refer to: Section 4.3 Site and culture equipment maintenance and operation; Section 4.5 Management of mortalities and fish processing waste; and Section 4.7 Storage and disposal of hazardous substances, respectively.

Operational requirements and advice

Farmers must:

Water quality

- Prevent general rubbish from entering the stormwater system or any other waters

Air quality

- Obtain local council consent under Burning EPP prior to burning rubbish or other material on site
- Only resort to burning waste (principally office refuse) if other mechanisms for waste disposal are not an option
- Not burn treated timber waste under any circumstances

Solid waste

- Store solid wastes in appropriate waste storage receptacles that are:
 - covered to prevent stormwater contamination
 - located on hard-standing areas that prevent waste entering surface or groundwater
 - not used for oils, solvents, paint materials, flammable substances, toxic materials and sludges
- Dispose of waste via licensed waste depots when general rubbish collection does not occur at the farm, or is not suitable for the type of waste generated
- Not bury solid waste on site (on-site waste disposal may require an environmental authorisation)

Farmers should:*Air quality*

- Be familiar with burning restrictions throughout the year

Solid waste

- Implement a waste management plan that adopts the principles of the waste management hierarchy ie avoid, minimise, reuse, recycle, recover, treat and only then dispose of waste
- Develop waste disposal plans that clearly describe the responsibility for collection, storage and regular removal of solid waste
- Compact waste to minimise the area it may occupy in licensed waste depots
- Ensure that all staff members are trained and understand which wastes can and cannot be deposited in receptacles

4.7 Storage and disposal of hazardous substances

Hazardous substances such as chemicals, are used on abalone facilities for a number of reasons including stock management, cleaning of equipment and disease treatment. These chemicals must be stored and disposed of appropriately to ensure that they do not cause environmental harm. Appropriate use of chemicals is discussed in Section 4.2 Stock management and Section 4.3 Site and culture equipment maintenance and operation.

Fuels, oils, lubricants, grease, etc are used in the maintenance of equipment, vehicles and vessels and therefore may need to be stored on site for easy access. Inappropriate storage and disposal may result in site contamination, disturbance to the local ecology and affect water quality. For appropriate use of these substances, please refer to Section 4.3 Site and culture equipment maintenance and operation and Section 4.8 Use of vessels and vehicles.

*Operational requirements and advice***Farmers must:***Water quality*

- Store and use substances in a manner that prevents the potential for seepage, leakage, discharge or runoff into any waters (including stormwater)

Hazardous substances

- Ensure that hazardous substances are stored within secured areas, and where appropriate, are bunded and enclosed to prevent the accidental discharge or seepage of substances into the environment. For large quantities of liquid chemicals, ensure the bunded area is impervious and is able to contain 120% of the volume of the largest container within the bund (see EPA Guidelines: Bunding and spill management)
- Dispose of hazardous substances appropriately ie via a waste depot licensed by the EPA to receive these products
- Not use general rubbish containers for the purpose of disposing hazardous substances such as oils, solvents, flammable or toxic materials including paint

- Comply with the Aquaculture Regulations with regards to chemical use (PIRSA)
- Ensure that staff access to hazardous substances is limited and that appropriate staff members are trained in correct storage, handling and emergency procedures

Farmers should:

Hazardous substances

- Aim to minimise the use of hazardous substances
- Ensure bottles and containers containing hazardous substances are clearly labelled
- Establish a spill response plan for potential spills that may occur and induct new and existing staff to these plans
- Roof bunded areas to prevent rainfall collection within the bunded area (EPA Guidelines: Bunding and spill management)
- Incorporate a liquid waste management system within a bunded area to collect potentially contaminated rainfall which in turn must be disposed of lawfully (EPA Guidelines: Bunding and spill management)
- Ensure spillage kits are available to clean up any potential spills. Kits should contain appropriate equipment, information for notification of authorities and a training plan for staff
- Amend spill response kits wherever there is a change in the operation which potentially increases the risk of release of hazardous substances into the environment
- Ensure staff are informed and trained to adopt any spill kits and response plans that are available on site
- Store on site only fuels, lubricants, chemicals and other substances required for the operation of the facility, equipment, vehicles or vessels
- Use biodegradable products where possible
- Contact a licensed disposal contractor, manufacturer or prescribing veterinarian for information about appropriate disposal of unwanted veterinary chemicals

Note: The EPA operates a hazardous household waste depot which accepts numerous controlled substances from primary producers and householders (tel: 8204 2004 or freecall 1800 623 445 for more information). Additionally, ChemClear, an industry based chemical waste disposal program, provides a collection and disposal service for chemical users in Australia. Contact ChemClear on 1800 008 182, or visit the website <www.chemclear.com.au> for further information.

4.8 Use of vessels and vehicles

Vessels (ie boats) are primarily used to service in-sea abalone farming sites. However some land-based farms will use vessels to conduct water quality sampling and maintenance on inlet and outlet pipes. Vehicles on farms may include cars, trucks, quad bikes and motorcycles and may be used for a variety of reasons including transporting staff, stock and equipment.

Vehicles and vessels should be maintained in a manner that minimises the potential for fuel leakages and fumes. Farmers should also consider noise issues when operating vehicles and vessels in populated areas. Other environmental issues associated with the operation of vessels

and vehicles include: site and water contamination from spills and leaks, waste issues from inappropriate storage and disposal of general rubbish and inappropriate use of antifoulants on vessels.

Operational requirements and advice

Farmers must:

Water quality

- Ensure that vehicle and vessel refuelling practices prevent fuel and cleaning water from fuel dispensing being discharged directly or indirectly into stormwater or other waters
- Refuel vessel fuel tanks at designated fuel dispensing facilities and observe instructions for use or if refuelling with hand held containers cannot be avoided, undertake measures to ensure no fuel is spilt into the sea
- Conduct vessel and vehicle maintenance in areas as not to cause contamination of any waters by fuel, oils or other pollutants
- Clean vessels and vehicles in an area that will prevent wastewater from entering any waters
- Store fuels, oils, lubricants and other substances used in vessel and vehicle maintenance in an area which prevents the release of pollutants into any waters
- Contain and use fuels, oils, lubricants and other substances in a manner that prevents spillage/runoff into stormwater and other waters
- Only discharge untreated macerated black water (sewage) whilst the vessel is underway and is greater than three nautical miles from the nearest land, aquaculture lease, aquatic reserve, marine sanctuary or people in the water

Noise

- Take all reasonable and practical measures to minimise the adverse effect noise may have on neighbouring properties

Hazardous substances

- Apply antifoulants on vessels in accordance with clause 22 of the Water Quality EPP (refer to Section 5.5)
- Only use antifoulants that are registered by the APVMA

Farmers should:

Solid waste

- Include waste disposal containers (ie bins) on board vessels to receive general waste (eg food wrappers, drink containers, etc)

Hazardous substances

- Establish a spill response plan for potential spills that may occur
- Ensure spillage kits are available to clean up any potential spills

Ecological effects

- Launch vessels at established boat launching areas
- Consider the impacts of vehicles and vessels on sensitive coastal areas and the plants and animals these areas support, and in particular avoid disturbing resting shore birds

Other recommendations

- Undertake regular vessel and vehicle maintenance to minimise the potential for air quality issues resulting from fumes and site contamination issues resulting from engine leaks
- Keep all vessels and vehicles clean and well maintained at all times
- Where appropriate, follow the *EPA Code of Practice for material handling on wharves 2006* which addresses activities such as:
 - equipment cleaning
 - vehicles, equipment and machinery handling
 - transport of livestock, fisheries catch and feed
 - dry bulk and liquid bulk handling
- Where appropriate follow *the draft EPA Code of Practice for vessel and facility management: marine and inland waters* which addresses activities such as:
 - vessel cleaning and maintenance
 - refuelling practices
 - management and disposal of grey water and black water
 - engine maintenance and repair works

5 RELEVANT ENVIRONMENTAL ISSUES

The broad environmental issues that are of legislative concern to the EPA include:

- water quality
- noise
- air quality
- solid waste disposal
- storage, use and disposal of hazardous substances
- ecological effects.

This section aims to provide information on these issues that may be associated with many aspects of farming abalone.

5.1 Water quality

Objective: To take all reasonable and practicable measures to prevent the discharge or deposit of pollutants into the state's marine, estuarine and inland waters

Relevant documents

Environment Protection Act 1993

Aquaculture Act 2001

Environment Protection (Water Quality) Policy 2003

Stormwater Pollution Prevention Code of Practice for the community, 1997

Stormwater Pollution Prevention Code of Practice for the building and construction industry, 1997

EPA Guidelines: Wastewater and evaporation lagoon construction, 2004

EPA Guidelines: Bunding and spill management, 2004

The protection of water quality is relevant to both land- and sea-based abalone operations.

Issues for land-based facilities and navigable vessels may include inappropriate disposal of wastewater and for land-based facilities only, contamination of stormwater.

Other issues include the deposition of pollutants such as uneaten feed and faeces and human wastes, and inappropriate use of hazardous substances such as chemicals, antifoulants, fuels and grease.

Wastewater disposal

Reasonable and practical measures must be taken to avoid the discharge of untreated wastewater, in any form, into any waters (surface and underground) or onto land in a place from which it is reasonably likely to enter waters (including surface, underground and stormwater).

In the context of abalone farming, wastewater disposal is applicable to land-based farming facilities, land-based service facilities and navigable vessels.

Wastewater

The various forms of wastewater that may be produced by abalone facilities include the following:

- from cleaning culture equipment
- direct from tanks
- held in sediment/settlement ponds
- in the form of human sewage.

Wastewater originating from abalone farms may be contaminated by a variety of pollutants, depending on the operational and production practices of the facility. Some of these contaminants may include veterinary drugs, chemicals such as disinfectants, faecal matter and uneaten feed.

Stormwater (contaminated)

Stormwater includes rain that runs from roof-tops and buildings down gutters, into drains under the road and then into natural waterways. Thus abalone facilities have the potential to pollute stormwater through:

- inadequate containment of fuels/diesel/oil/grease
- building construction or demolition waste
- detergents/disinfectants washdown water
- inadequate containment of general rubbish (eg food scraps, cans, bottles, plastic items or materials).

Pollutants

The Water Quality Policy states that a person must not cause environmental harm⁵ by discharging or depositing a pollutant into any waters.

Any material or substance in the form of a solid, liquid or gas that is directly or indirectly deposited or discharged to any waters is classified as a pollutant under the Water Quality Policy. Pollutants that may emanate from abalone farming activities and service depots include:

- *Biodeposits (abalone faecal material, uneaten feed, and dislodged fouling organisms)*

Biodeposition is considered a polluting activity. Excessive amounts can lead to an increase in fine sediment suspended in the water and/or on the seabed, both of which have the potential to adversely affect the benthic environment (particularly aquatic vegetation). Biodepositions may also lead to elevated nutrient levels and hence excessive algal and epiphyte growth. Biodepositions may directly smother other marine organisms, or may organically enrich the sediments below, impacting on the organisms living in the sediments. For land-based facilities and navigable vessels, farmers must comply with the relevant water quality criteria specified in the Water Quality EPP for the discharge of nutrients and suspended solids. This is most likely to be achieved by incorporating water treatment systems into the farm such as sediment/settlement ponds, algal scrubbers or filtration devices.

⁵ See footnote 4 (pg 18).

- ***Biofouling and other cleaning waste material***

The cleaning of tanks, nets, vessels and other equipment used on abalone farms results in the production of organic waste such as sludge, biofouling and sediment. If not contained, these may contaminate stormwater, surrounding waters and/or the benthic environment.

- ***Application of antifoulants***

The Water Quality EPP specifies the requirements for persons applying antifoulants to vessels. Further information on this subject is provided in Section 5.5.

- ***Hazardous substance use***

Hazardous substances may contaminate water quality and be detrimental to the surrounding ecology. These substances may include chemicals, oils, fuels, lubricants, paints, etc. Further information on this subject is provided in Section 5.5.

5.2 Noise

Objective: To minimise the impact of noise on surrounding property owners and other resource users

Relevant documents

Environment Protection Act 1993
Environment Protection (Noise)
Policy 2007

Excessive noise is considered environmental harm or nuisance in accordance with the provisions of the Act. Consequently, all abalone operations should strive to ensure that noise generated from any activity is minimised and that neighbouring properties are not affected.

Noise issues are particularly relevant to land-based abalone farms and service facilities which use a variety of equipment and practices that emit noise, such as:

- operation of heavy machinery and vehicles
- cleaning and maintenance of equipment and vessels
- operation of filters, pumps, compressors and generators.

Noise emanating from a land-based farm or service facility must not exceed factors outlined in the Noise EPP. Noise factors are classified into day and night, 7 am to 10 pm, and 10 pm to 7 am respectively. Noise factors are site specific and vary, depending on local council development plan zoning. Abalone farmers should seek advice from their local council or the EPA to ensure compliance with the Noise EPP.

In summary, a balance needs to be found between the interests of those whose legitimate activities cause noise, and those who are exposed to and affected by the noise (Noise EPP).

5.3 Air quality

Objective: To protect and enhance air quality by minimising odours and burning related outputs

Relevant documents

Environment Protection Act
1993

Environment Protection (Air
Quality) Policy 1994

Environment Protection
(Burning) Policy 1994

Air pollution is defined as the emission of particles and gases, including dust, offensive odours and burning related odour and smoke. Abalone farming has the potential to contribute to poor air quality by the inappropriate disposal of wastes such as biofouling, mortalities and fish waste, and by incinerating wastes. Both odour and burning may be deemed as environmental harm or nuisance under the Act.

Odours

Sea-based abalone farms are not known to emit odours. However, land-based farming and service depot facilities may emit odours from inappropriate disposal of biofouling, stock mortalities and other organic waste. Consequently, farmers should be aware that odours are a form of air pollution and should take steps to reduce the potential for odour generation.

Burning

Burning of rubbish or other materials is not part of normal abalone farming practices. However, farmers may be tempted to burn items such as treated timber and office refuse at certain times. It should be noted the burning of treated timber is not permitted under any circumstances.

Burning restrictions on other materials depend on whether the premises are domestic or non-domestic. Abalone farming and support facilities are considered non-domestic. Apart from a few exceptions, a person must not cause or allow burning in the open on any non-domestic premises without a permit granted by local councils under the Burning EPP.

Dust Emissions

Dust plumes may also arise during the construction of the farm. These should be controlled in a manner that protects the amenity of the area and minimises nuisance off site.

5.4 Solid waste management and disposal

Objective: To minimise the impact that solid wastes may have on the environment

Relevant documents

Environment Protection Act 1993

Environment Protection (Water Quality) Policy 2003

EPA Guidelines: Pressure water-blasting activities, 2003

EPA Guidelines: Bunding and spill management, 2004

Stormwater Pollution Prevention Code of Practice for the community, 1997

Stormwater Pollution Prevention Code of Practice for the building and construction industry, 1997

EPA Guidelines: Management of aquaculture stock mortalities, 2007

Solid wastes relevant to abalone farming include: office refuse, putrescible materials, waste from maintenance of equipment and building and construction waste.

Solid waste must be managed appropriately on both sea-based and land-based facilities so as not to cause environmental harm.

Any solid waste produced on sea-based farms must be brought ashore and disposed of lawfully.

Forms of solid wastes

Forms of solid waste that may be produced at abalone farms and service depots include:

- *Office refuse*

Office refuse includes drink containers, food scraps and food wrappers, papers and cigarette butts.

- *Putrescible materials*

Putrescible materials include items such as stock mortalities, empty shells, biofouling, fish processing waste and sludge from cleaning culture equipment.

Appropriate disposal of putrescible materials is essential. Apart from stormwater contamination, inappropriate disposal may result in the emission of offensive odours, pest attraction and human health issues.

It should be noted that an EPA licence may need to be obtained should fish processing levels exceed 100 tonnes per year when wastewater is disposed to a sewer or septic tank effluent disposal system or over 2 tonnes when wastewater is being disposed of by other methods. It is recommended that farmers contact the EPA to assess whether a licence is required if any fish processing is to be conducted on site.

- *Building, construction and maintenance materials*

On many aquaculture farms, building, construction and maintenance of abalone farming infrastructure and associated equipment is an ongoing activity. These activities may produce a number of waste products (eg nets, ropes, treated timber, concrete, pipes, tanks, plates, filters, soil, etc).

Management and disposal of solid wastes

The improper disposal of solid wastes may lead to a variety of pollution concerns, most notably contamination of stormwater, surface water, groundwater and land.

Farmers should develop a contingency plan which identifies the types of waste that may be produced on the farm and outlines methods of disposal for those wastes. This contingency plan should aim to adopt the waste management hierarchy specified in the Water Quality EPP shown in Figure 2.

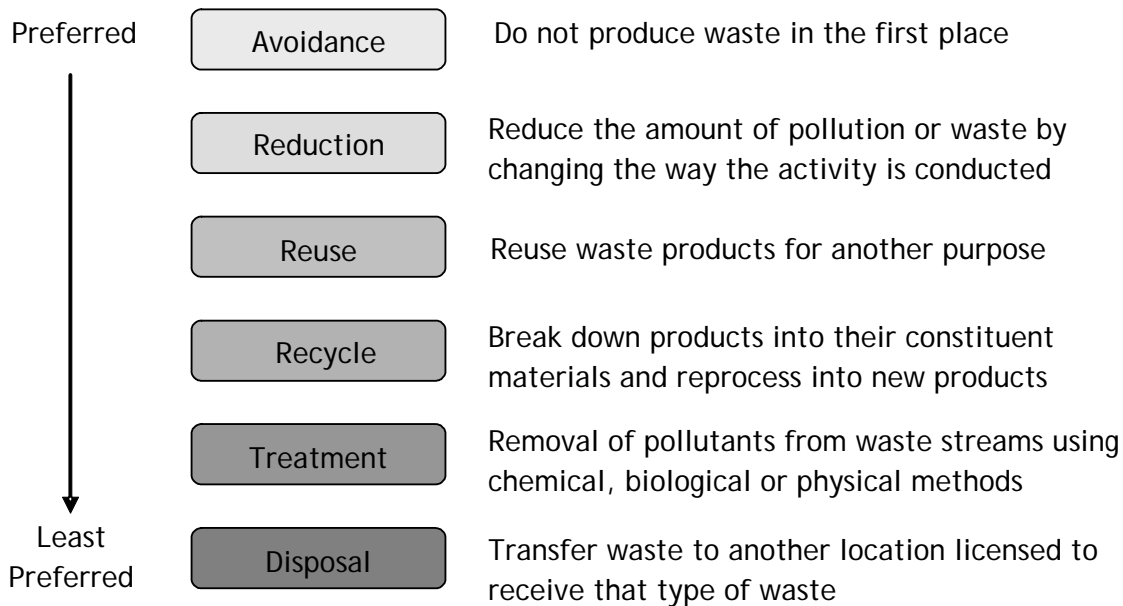


Figure 2 Waste management hierarchy

Methods of disposal may include composting (organic waste), recycling (plastics, metals and paper) and reusing (pipes, wood, tanks). If these methods can not be undertaken, the waste must be disposed of via a waste depot licensed to receive that type of waste.

In order to adequately prevent the contamination of stormwater and other waters, waste storage and collection areas should be contained, sealed and/or roofed to prevent stormwater access. If it is not possible to roof existing facilities, covered receptacles (eg rubbish skips, bins) should be used to prevent stormwater entry or dispersal by wind.

Suitable waste receptacles should also be placed on vessels that service marine sites and navigable vessels. Waste produced on marine sites and navigable vessels (eg ropes, netting, containers, abalone mortalities) must also be brought ashore and disposed off lawfully.

5.5 Storage, use and disposal of hazardous substances

Objective: To minimise the impact that hazardous substances may have on the environment during their use, storage and disposal

Relevant documents

Environment Protection Act 1993

Stormwater Pollution Prevention Code of Practice for the community, 1997

Stormwater Pollution Prevention Code of Practice for the building and construction industry, 1997

EPA Guidelines: Bunding and spill management, 2004

Dangerous Substances Act 1979

Controlled Substances Act 1984

Agricultural and Veterinary Products (Control of Use) Act 2002

Hazardous substances that may be used on land-based and sea-based facilities may include:

- fuel
- oil and grease
- cleaning chemicals (eg chlorine)
- veterinary chemicals
- chemicals used for harvesting (eg anaesthetics)
- antifoulants.

The main environmental concern in the storage, use and disposal of hazardous substances, is the potential for stormwater, groundwater, surface water and land contamination. Other legislation⁶ governs appropriate use and storage of hazardous and controlled substances to avoid adverse human health and general environmental impacts.

Vessel and vehicles must also be used and maintained in a manner that minimises the potential for fuel leakages and spillages or the contamination of any waters. Refuelling practices must be undertaken to prevent fuel and cleaning water from fuel dispensing being discharged directly into stormwater or other waters.

Farmers should consider the establishment of spillage kits on site to deal with any potential spills that may occur.

Antifoulants

Antifoulants are used to inhibit the growth of biofouling on marine vessels and structures. Conditions relating to the use of antifoulants are prescribed in the Water Quality EPP. These include:

- the cleaning of the hull of a vessel or the surface of any structure treated with an antifoulant or any equipment contaminated by an antifoulant may only be carried out in a dry dock, or above the high-water mark of any waters, or below the high-water mark of any waters while the tide is out so there is no tidal water coming into contact with the vessel, structure or equipment

⁶ The *Dangerous Substances Act 1979* and *Controlled Substances Act 1984* regulate the keeping, handling, conveyance and use of dangerous and controlled substances, and provide directives on storage and disposal of these substances

- antifoulant residues must not enter any waters or come in contact with any land that is below the high water mark of any waters
- antifoulants must be collected and disposed of at a waste depot that is authorised by the EPA to receive such waste.

5.6 Ecological effects

Objective: To protect South Australia's aquatic ecology through appropriate abalone farming techniques and procedures

Relevant documents

Environment Protection Act
1993
Aquaculture Act 2001

Other ecological issues associated with abalone farming include: disease and introduced aquatic pests, genetic pollution, marine animal interactions and impacts on sensitive habitats. These issues are dealt with under legislation other than the Environment Protection Act⁷ and farmers must comply with their requirements.

Diseases and aquatic pests

There are a number of diseases and aquatic pests present in South Australia which may affect abalone on farms. The most common in South Australia are *Perkinsus olseni*, *Vibrio sp.* and mudworm. There are also concerns regarding abalone viral ganglioneuritis that has been found on abalone farms and in wild stock in Victoria.

Diseases and aquatic pests can enter an abalone facility via a number of mechanisms including translocation of animals from another location (other farms or wild caught) or via the intake water supply. They can spread quickly when animals are held at high densities or are stressed and may cause poor growth and survival rates. It is important that farmers incorporate measures onto the farm to minimise the potential for disease outbreaks. These measures may include quarantine facilities, translocation policies, provisions to prevent stock escape and good farm management practices.

Environmental concerns associated with diseases and aquatic pests include potential spread to wild populations, issues associated with disposal of mortalities resulting from infestations and chemical use to control outbreaks.

Farmers must comply with PIRSA regulations and policies for disease management translocation of abalone, and broodstock collection.

Inbreeding and genetic pollution

The escape of farmed stock may have the potential to affect the genetic makeup of surrounding wild populations of abalone. Farmers should aim to use locally caught broodstock and incorporate measures into the farm to prevent farm stock escaping. Larvae spawned in abalone hatcheries should also be disposed of appropriately (eg destroyed prior to disposal and not deposited back into the marine environment) if not required. Farmers must also comply with PIRSA regulations and policies for translocation and broodstock collection.

⁷ For example the *Aquaculture Act 2001*, *Fisheries Management Act 2007* and *National Parks and Wildlife Act 1972*.

Marine animal interactions

There have been a number of concerns relating to the impacts of abalone farm infrastructure on marine animals both on land and at sea. Infrastructure may potentially impede the migratory pathway and movements of animals (eg migratory birds, dolphins, seals) or result in entanglements. Farmers must design and maintain facilities and take precautions to minimise marine animal interactions. Such measures for in-sea abalone farms may include providing adequate space between farming structures and within farming structures to allow the free movement of animals, keeping lines taut and tying off any trailing ropes, etc.

Marine animal interactions must be reported to PIRSA in accordance with provisions of the Aquaculture Regulations.

Impacts on sensitive habitats

The inappropriate positioning and management of abalone facilities may impact seagrass beds, marine reefs and coastal dunes.

A significant issue that may be associated with in-sea abalone aquaculture is the loss of seagrass from scouring or shading resulting from the positioning of infrastructure and culture equipment. Culture equipment should be positioned and managed to minimise the potential for scouring of the seafloor. The placement of intake and outlet pipes from pump-ashore facilities may also result in scouring or shading of the seafloor. Pipes should be positioned and secured in a manner that does not result in significant harm to the seafloor.

When constructing land-based facilities, the clearing of vegetation which may result in erosion of coastal sand dunes and disturbance to native flora and fauna species is regulated by a number of Acts. Operators should contact the DEH for further information.

Potential impacts can be minimised through the positioning of farms away from seagrass and other sensitive habitats. It should be noted that the EPA generally opposes aquaculture activities over seagrass communities.

Impacts may also be associated with the use of vehicles and vessels (eg propeller scour, impacts of vehicle wheels when launching vessels). Farmers should aim to use established boat launching facilities and be mindful of sensitive coastal areas when launching boats.

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- Environment Protection (Burning) Policy 1994
- Environment Protection (Water Quality) Policy and Explanatory Report 2003
- Environment Protection (Noise) Policy and Explanatory Report (2007)

Other relevant legislation

- Agricultural and Veterinary Products (Control of Use) Act 2002
- Aquaculture Act 2001
- Aquaculture Regulations 2005
- Coast Protection Act 1972
- Controlled Substances Act 1984
- Dangerous Substances Act 1979
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GLOSSARY

Biofouling	The unwanted settlement of aquatic organisms, such as molluscs and bryozoans, on structures that are immersed in water; it can occur in both marine and freshwater environments but is considered a major problem in various marine industries
Black water	Toilet water or human sewage
Bund	A wall, moat or other device which is graded or contains grated drains, or combines the two, which is designed to prevent the escape of spilt materials and to exclude stormwater runoff
Copper chrome arsenic (CCA)	Timber treatment or preservative
Controlled substance	Includes any substances defined within the Controlled Substances Act, and also includes any hazardous substances or wastes listed in the Environment Protection Act or relevant EPPs
Environmental management system (EMS)	A systematic approach to dealing with the environmental aspects of an organisation's operation. It is a 'tool' that enables an organisation of any size or type to control the impact of its activities, products or services on the natural environment
Environment	Means land, air, water organisms and ecosystems and includes:- (a) human-made or modified structures or area; and (b) the amenity values of an area.
Environmental authorisation	A works approval, licence or exemption
Environmental harm	'Any harm, or potential harm, to the environment (of whatever degree or duration), and includes an environmental nuisance' (the Act); each EPP defines relevant environmental harm differently—for example, in the Water Quality EPP it may be a reduction in numbers of any native species of aquatic animal or insect caused by pollution; in the Noise EPP it may be excessive noise emanating from construction works

Environment Protection Policy (EPP)	A legislative tool provided for by the Act to address environment protection matters. It can be made for any purpose directed towards securing objects of the Act
Environment Protection (Water Quality) Policy 2003 (Water Quality EPP)	Policy developed by the EPA in relation to impacts upon water quality which clarifies the obligation imposed by Section 25 of the Act (general environmental duty) on any person in South Australia undertaking an activity that pollutes or might pollute
General environmental duty	‘A person must not undertake an activity that pollutes, or might pollute, the environment unless the person takes all reasonable and practicable measures to prevent or minimise any resulting environmental harm’ (Section 25 of the Act)
Grey water	Wastewater that has been used for washing, laundering, bathing or showering
Licensed waste depot	Waste depot licensed under Part 6 of the Environment Protection Act
Listed pollutants	Pollutants outlined in Schedule 4 of the Environment Protection (Water Quality) Policy 2003
Listed waste	Defined by the Act, Schedule 1 Part B
Pollutant	(a) any solid, liquid or gas (or combination thereof) including waste, smoke, dust, fumes and odour; or (b) noise; or (c) heat; or (d) anything declared by regulation to be a pollutant; and includes waste. (As defined by the Act; Schedule 5 of the Water Quality EPP lists pollutants)
Putrescible	Component of the waste stream liable to become putrid
Sediment/settlement ponds	A pond used to reduce the sediment and nutrient load of wastewater prior to reuse, discharge or disposal
Stormwater	Rainwater runoff
Surface waters	Marine waters and all other waters of the state other than underground water
Underground water	Water occurring naturally, or stored, below ground level

Water quality criteria

The Water Quality EPP sets upper and lower limits to numerous potential wastewater pollutants in receiving waters; their levels must not exceed or further exceed the given values. For example, zinc levels in effluent must not exceed 0.5 mg/L if discharging into marine ecosystems and other waters.

Waters

Waters includes all state waters, stormwater and underground water

APPENDIX ENVIRONMENT PROTECTION LEGISLATION

The principal legislation addressing pollution in South Australia is the *Environment Protection Act 1993* (the Act). In particular, Section 25 imposes a general environmental duty on all persons undertaking an activity that may pollute to take all reasonable and practicable measures to prevent or minimise any resulting environmental harm.

The Act provides for legislative tools in the form of Environment Protection Policies (EPPs) to address environment protection matters. At present, there are a number of EPPs in place that address issues such as the production of noise, stormwater contamination and air pollution. Every person, business and industry, including aquaculture, is legally bound to comply with the Act and consequently with relevant EPPs.

Of particular relevance to both sea- and land-based aquaculture is the *Environment Protection (Water Quality) Policy 2003* (Water Quality EPP), which aims to achieve the sustainable management of South Australian waters by protecting or enhancing water quality while allowing economic and social development. The Water Quality EPP:

- sets water quality objectives by identifying protected environmental values and corresponding water quality criteria
- provides for the management and control of point and diffuse sources of pollution
- outlines obligations relating to particular activities
- specifies water quality criteria, discharge limits and listed pollutants
- promotes best practice environmental management.