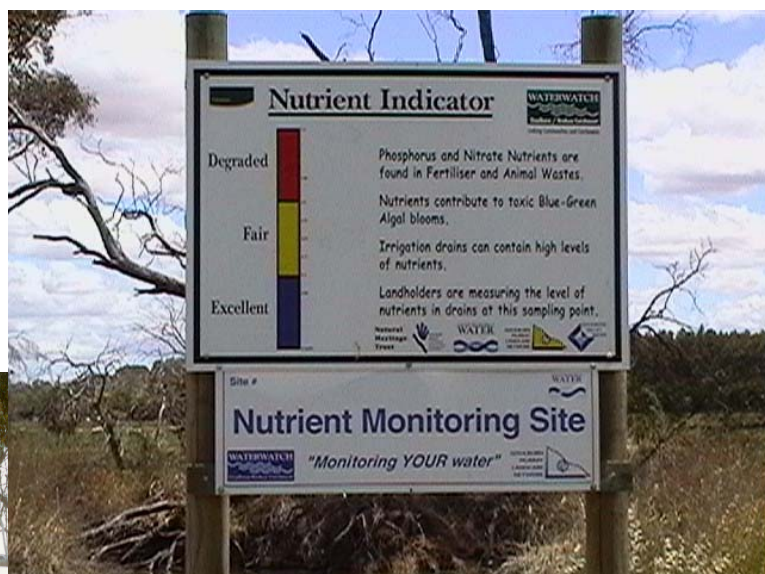




Water Quality Current Recommended Practices (CRPs) for the Goulburn Broken Catchment

CRP Manual
February 2004



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The Water Quality CRP Manual for the Goulburn Broken Catchment has been prepared by the Goulburn Broken CMA. The project was overseen and reviewed by a steering committee comprising:

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Part A

General



1. Introduction

Sinclair Knight Merz were contracted by the Goulburn Broken Catchment Management Authority (GBCMA) to collect, investigate and review water quality related Current Recommended Practices (CRPs) applicable to the Goulburn Broken Catchment.

The aim of the project was to collate these into an easy to use document - the CRP manual. The CRP manual makes recommended water quality management practices readily available to all stakeholders in the catchment in the one source reference.

1.1 Background

The Goulburn Broken Catchment was identified as one of the three highest priority catchments targeted by the Murray Darling Basin Ministerial Council's Algal Management Strategy (MDBC, 1994) to develop and implement catchment management strategies addressing algal and nutrient problems. Both the Murray Darling Basin Commission Management Strategy (MDBC, 1994) and Victorian Nutrient Management Strategy (DSE, 1995) called for the development of catchment based nutrient management strategies (GBCMA, 2002).

A Draft Goulburn Broken Water Quality Strategy (GBCMA, 2002) was developed in 1996 and formally endorsed by the Catchment and Land Protection Board and the region in 1997. A formal review of the document was undertaken in 2002.

The Strategy identified elevated nutrient loads (nitrogen and phosphorus) as the second highest priority issue for water quality in the catchment. As a result, it sets targets and objectives that aim to achieve improvements in water quality parameters throughout the catchment in line with the objectives of the State Environment Protection Policy (SEPP) Waters of Victoria (Government of Victoria, 2003). The water quality goal for the Goulburn Broken Catchment as set by the Catchment community is to:

Improve and maintain water quality at optimum levels within and downstream of the catchment for native ecosystems, recreation, human and animal consumption, agriculture and industry

The Water Quality Strategy target with respect to nutrient management is to:

Reduce potential catchment phosphorus loads by 65% (from 1993/4 levels) by 2016

In order to achieve these nutrient reductions, the River Health and Water Quality Coordinating Committee (RHWQCC) has adopted a Current Recommended Practice (CRP) approach. The approach uses the adoption rate of CRPs as a target for achieving desired nutrient reduction and/or management in the Catchment (GBCMA, 2002).

CRPs are practical guidelines for sustainable land management that aim to achieve sustainable natural resource management, while maintaining or improving productivity. Land managers will use CRPs to contribute to on farm, local, regional, State and National goals for natural resource management.



CRPs are implemented via a range of coordinated programs in the Catchment (GBCMA, 2002):

- Irrigation drainage;
- Dryland diffuse sources;
- Wastewater management facilities;
- Urban stormwater;
- Intensive animal industries;
- Local water quality issues;
- Other water quality issues; and
- Program coordination (incorporating research and investigation, monitoring, evaluation and reporting, community involvement, community education and planning issues).

The widespread adoption of CRPs can only be achieved through making the practices readily available, in a readily understood form, to all stakeholders in the catchment. In addition, the highest nutrient reductions can only be achieved by implementing the most current and successful practices.

1.2 The nutrient problem

Nutrients are naturally occurring chemical elements, which are essential for plant growth and the maintenance of healthy aquatic ecosystems. In soils, they exist in solution (readily available to plants) or are tightly bound to soil particles or organic matter. Natural nutrient concentrations within waterways vary, and are dependent on the type of rocks that comprise the earth's crust, rates of weathering of the catchment and the biotic communities it supports (Croke, 2002). While nutrients are vital ingredients to our ecosystems, catchment development and changes in human and land use activities have radically altered the amount being delivered to our waterways.

Elevated nutrient loads in our waterways can adversely affect ecosystem balances. In particular, the elements phosphorus (P) and nitrogen (N) in high concentrations can subsequently lead to a process called eutrophication that stimulates the excessive production of toxic and unsightly algal blooms such as blue-green algae (cyanobacteria). Some algae can release toxins which pose a risk to human and stock health and recreational opportunities.

As nutrients, and phosphorus in particular, are known to be the limiting factor in the growth of blue-green algal blooms, the Goulburn Broken Water Quality Strategy concentrates on reducing the supply of nutrients (especially phosphorus) to waterways and aims to minimise the health risks associated with blue-green algal blooms (GBCMA, 2002).

Nutrients are generated from a variety of sources within the catchment, some natural, but many from human impacts. The relative significance of each source varies from place to place, depending upon factors such as land use, geology, population density, rainfall intensity and erosion (Croke, 2002). Phosphorus, in particular can be dissolved in water and delivered as a point source or bound to soil sediment and delivered as a diffuse source. Phosphorus generated from point sources directly enters the waterway, from sewage treatment

plants, intensive animal industries and irrigation and stormwater drains (Croke, 2002). Sewage disposal is thought to be the major point source of nutrients to Victorian streams, however research in Australia has shown that the biggest contributor of phosphorus in Australian catchments comes from diffuse sources such as soil erosion (Croke, 2002). Phosphorus generated from diffuse sources attaches itself to soil or organic matter particles and is transported when the soil particles are detached by run-off. These nutrients can, however, become available when deposited into waterways. Minimising soil loss from land can serve to significantly reduce the amount of nutrients in waterways.

The major sources of nutrients in the Goulburn Broken Catchment have been identified as coming from (GBCMA, 2002):

- Irrigation drains in times of both high and low flow;
- Dryland areas in time of high flow;
- Sewage effluent flows.

Since the development of the GBWQS in 1996 significant improvements in wastewater treatment facilities, riparian land management and other farming and irrigation practices have lead to a reduction of nutrients generated within the catchment by the above sources. This has been achieved through the implementation of key projects by the respective management agencies in the region. The reductions in phosphorus discharged from wastewater treatment facilities now means that sewage effluent flows are no longer considered a major source of nutrients.

Nutrients generated in the Goulburn Broken Catchment have the potential of reaching the Murray River system and influencing algal growth and bloom development in the Murray River. However, because nutrients in the Catchment are diverted with water trapped in reservoirs, not all nutrients in the Goulburn Broken Catchment reach the Murray River (GBCMA, 2002). It is estimated that in a typical year, 80% of the total phosphorus load generated in the Goulburn Broken Catchment reaches the Murray River (GBCMA, 2002).



1.3 Environmental planning, legislation and policy in Victoria

Environmental planning, legislation and policy in Victoria governs the way the environment is protected and managed. There are a number of key agencies that contribute to the development and enforcement of these regulations and others that must abide by them in the catchment.

1.3.1 Management agencies

Environment Protection Authority

The Environment Protection Authority (EPA) is a statutory body established under the *Environment Protection Act 1970* in response to Government and community concern about pollution in our environment. The EPA helps to protect Victoria's surface water environments through State legislation and policy, regulatory control and by working in partnership with Victorian communities, including businesses, Government, groups and individuals to achieve mutual goals. A key goal of the EPA is to set standards for environmental protection through the development of policies, specifically the State Environment Protection Policy (SEPP) Waters of Victoria (Government of Victoria, 2003). The SEPP describes the beneficial uses associated with Victorian surface waters and the environmental objectives that need to be attained to protect these uses. Partnerships, works approvals and licences, input into statutory planning and enforcement action are the key tools available to EPA to achieve these objectives.

Department of Primary Industries

The Department of Primary Industries (DPI) is responsible for the areas of agriculture and food, fishing and aquaculture, minerals and petroleum, and science and research. DPI provide effective partnerships with industries and communities, innovative policy and science and technology partnerships. DPI also works with the Ellinbank Research Institute and its website is home to the Target 10 Dairy Extension, which provides reference material, software tools and decision support systems to the dairy industry.

Department of Sustainability and Environment

The Department of Sustainability and Environment (DSE) is responsible for the areas of planning and environmental sustainability. Environmental sustainability is achieved through catchment management, conservation, water sector development services, forests and fire management and policy and programs. A key role and statutory requirement of DSE is to ensure that the costs and benefits of Regulatory Impact Statements and Codes of Practice are examined and public comments are sought.

DSE also manages the regulatory framework for land-use planning, environment assessment and land subdivision. It provides advice on planning policy and urban design, strategic planning, and information on land development and forecasting.

Goulburn Broken Catchment Management Authority

The Goulburn Broken Catchment Management Authority (GBCMA) was established by the State Government in 1997 to coordinate the management of land and water resources in the Goulburn Broken catchment. The aim of the GBCMA is to ensure the protection and restoration of land and water resources and sustainable development of natural resource based industries.



The GBCMA addresses a number of catchment issues and conducts on ground works in relation to the protection of native flora and fauna, management of irrigation and dryland salinity, waterway management and sustainable land management practices.

Under the *Water Act 1989*, the GBCMA also has responsibility for the coordination and management of water quality and nutrient management, stormwater run-off and pollution, rural drainage and water quality and nutrient management.

The GBCMA also works with DSE, Goulburn-Murray Water and Goulburn Valley Water to deliver on-ground solutions and develop strategies to address land and water degradation.

Local government

Local government is government at a community level. Local government is responsible for delivering a wide range of economic and human services and providing engineering services and infrastructure. It is also responsible for developing, implementing and administering various environmental policies and legislation within its area of jurisdiction, including the *Planning and Environment Act 1970*, State Environment Protection Policies, Codes of Practice and relevant guidelines. There are eight local governments within the Goulburn Broken Catchment – City of Greater Shepparton, Moira Shire, Benalla Rural City, Mansfield Shire, Mitchell Shire, Murrindindi Shire, Strathbogie Shire and Campaspe Shire.

Goulburn-Murray Water

Goulburn-Murray Water (G-MW) is a rural water authority who derives its powers from the *Water Act 1989*. G-MW are responsible for the delivery of rural water services to customers located within the six management areas of Shepparton, Central Goulburn, Rochester-Campaspe, Pyramid-Boort, Murray Valley and Torrumbarry. The services include gravity irrigation, pumped irrigation, surface and sub surface drainage, surface and groundwater diversion, domestic and stock water supply and flood protection. G-MW maintains approximately 7000 km of channels for irrigation, domestic and stock purposes and, on average, 2.1 million megalitres is delivered each year.

Goulburn Valley Water

Goulburn Valley Water (GVW) is Victoria's largest manager of urban water supply and wastewater treatment. The functions currently carried out by GVW include water harvesting and storage, water treatment and supply, and wastewater collection, treatment and re-use. GVW must ensure that wastewater management facilities (re-claimed water) and sewerage treatment plants operate under EPA Victoria licenses.

1.3.2 Planning legislation

The key legislation relating to land development in Victoria is the *Planning and Environment Act 1987*. The objectives of the planning framework established under this Act include:

- To enable land use and development planning and policy to be easily integrated with environmental conservation and resource management policies; and



- To ensure that the effects on the environment are considered when decisions are made about the use and development of land.

The Act requires each local council to prepare a planning scheme for its municipal district, which is the key tool the council uses to control land use and development. Each planning scheme contains the State Planning Policy Framework and the Local Planning Policy Framework. The Act also establishes a range of tools to ensure that the objectives set out in the planning schemes are realised. These include municipal planning statements, local planning policies and planning permit processes.

It is through these policies and objectives that CRPs for water quality are implemented. General CRPs in Victoria are implemented through the State Planning Policy Framework and locally specific CRPs for Councils are implemented through the municipal planning statements.

1.3.3 Environmental legislation and policy

The *Environment Protection Act 1970* provides a legislative framework for the control of water, air and land pollution in Victoria. It specifies that individuals and organisations cannot pollute water environments, so that water is safe for humans, animals and plants and suitable for other important uses and values such as swimming, drinking and water for various industries. The EPA administers the Act.

The Act provides for the formulation and adoption of subordinate legislation such as State Environmental Protection Policies (SEPPs) (Waters of Victoria) (Government of Victoria, 2003). SEPPs are the central policy for managing surface water quality in Victoria and establish:

- The ways Victorians want their waterways used;
- The water quality objectives that need to be achieved to enable those beneficial uses to safely occur; and
- The attainment measures that need to be put in place to ensure that these water quality objectives are achieved.

The SEPP (Waters of Victoria) recognises that land use practices within a catchment area play a major role in determining the water quality of streams in the catchment. Consequently, the policy contains measures to reduce pollution from a range of sources, such as:

- Urban stormwater;
- Agricultural activities;
- Irrigation channels and drains;
- Intensive agricultural industries;
- Vegetation protection and rehabilitation;
- Recreational activities;
- Forestry activities;
- Construction activities; and
- Extraction industries.



While controls on point sources have been progressively improved, those on diffuse sources have been more difficult to achieve. This is largely because of the diverse responsibilities for many of the diffuse sources of water pollution, and the need to gain greater understanding about best-management practices to minimise waste reduction from land holders and a commitment to implementing them.

A summary of the State Environment Protection Policy (Waters of Victoria) can be found on the EPA Victoria website:

[http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/515bc2fde7bf93f44a2565b6001ee896/0eb2322c034c0685ca256c0d001e07c9/\\$FILE/796.pdf](http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/515bc2fde7bf93f44a2565b6001ee896/0eb2322c034c0685ca256c0d001e07c9/$FILE/796.pdf)

1.4 The Solution – CRP Manual

Most guidelines for the protection of water quality outline what has to be done to reduce nutrient contributions. However few provide the information and resources which detail ‘how to’ achieve these objectives and outcomes.

The solution to this problem is the CRP manual. The CRP manual provides a collation of CRPs for water quality in the Catchment in one easy to use document.

2. The CRP Manual

2.1 Who should use the CRP Manual?

Government, the private sector and individuals should use the CRP manual to select the most appropriate CRP for reducing water quality in their industry.

The GBCMA will update the manual as new practices are developed and monitor the implementation rate of CRPs to broadly assess progress of implementation of the Water Quality Strategy and water quality objectives (GBCMA, 2002).

2.2 The CRP Manual structure

CRPs within the manual are separated into three sections, Codes of Practice, Guidelines and Other Current Recommended Practices. Codes of Practice and Guidelines are actual documents that have been produced by a regulatory authority and are available in their entirety. They have been developed under statutory provisions of legislation, such as the State Environment Protection Policies at a particular point in time, and therefore may not align with the current EPA objectives. Other Current Recommended Practices are 'on-ground' management techniques that have often been suggested for use within a Code of Practice or Guideline.

2.2.1 Codes of Practice

A Code of Practice is a document that describes how a particular set of activities should be carried out. It usually reflects 'best practice' and sets a standard agreed to by those with a specific interest in the activities to which it applies. Codes of Practice are developed under statutory provisions of legislation and their application is usually mandatory. An example of a Code of Practice is *Fire Management on Public Land*.

2.2.2 Guidelines

Guidelines have been produced by the EPA and GBCMA to promote Best Practice Environmental Management (BPEM) for a particular industry. The BPEM approach seeks to focus on desired objectives and outcomes rather than regulatory controls so that performance measures can be adapted to local conditions. Current recommended practice techniques that are recommended within the Guidelines can also be found in the Other Current Recommended Practices section of the manual. An example of a Guideline is *Environmental Guidelines for the Dairy Processing Industry*.

2.2.3 Other Current Recommended Practices

Other Current Recommended Practices are practical techniques that explain 'how to' achieve good natural resource management in order to reduce nutrient inputs to waterways while maintaining or improving productivity. An example of a Current Recommended Practice is *Lasergrading*.

CRPs are continually evolving through improved land management, scientific research and advancements in technology, for example, wastewater treatment processes.



2.3 How to use the CRP Manual

Each CRP within the manual is presented in tabular form and contains information under the headings shown in Table 1.

■ Table 1 CRP format

CRP heading	What the CRP heading contains
Purpose	What the CRP specifically hopes to achieve.
Details	Information on how to implement the CRP.
Responsible agency	Agencies responsible for regulatory compliance and their roles.
Source document/s	Reference and location to the main information source used to create the details of the CRP. An external link is provided for documents that can be found on the World Wide Web.
Supporting documentation	Reference to other information sources that are relevant to the CRP.
Other relevant CRPs	A list of other relevant CRPs contained in the CRP manual. An internal link is provided for these.

CRP's can be located in the manual by using the links and bookmarks provided throughout the document. Links are underlined and highlighted blue.

Within each CRP template there is a list of other relevant CRPs contained within the manual. By clicking on any of these you will be taken directly to them.

Within Table 2 below, all CRPs in the manual are listed against the various programs undertaken by the GBCMA in the catchment. If the CRP is relevant to that program or topic, a tick has been put in the box beside it. To go directly to a particular CRP, click on the name of the CRP.

- **Table 2 CRPs contained within the manual and linked to the various programs undertaken by the GBCMA.**

CRPs	Irrigation drainage	Dryland diffuse sources	Wastewater management facilities	Urban stormwater	Intensive animal industries	Other
Codes of Practice						
Code of Practice for fire management on public land		✓				
Code of forest practices for timber production		✓				
Code of Practice for small wastewater treatment plants			✓			
Septic tanks Code of Practice			✓			
Code of Practice - piggeries					✓	
Guidelines						
Upper Goulburn recreational waterway strategy			✓			✓
Reuse options for household wastewater			✓			
Land capability assessment for on-site domestic wastewater management			✓			
Guidelines for wastewater irrigation			✓			
Guidelines for environmental management – use of reclaimed water			✓			
Disinfection of treated wastewater – guidelines for environmental management			✓			
Point source discharges to streams: protocol for in-stream monitoring and assessment			✓			
Managing sewage discharges to inland waters			✓			
Freshwater fish farms					✓	
Dairy cattle feedpad guidelines for the Goulburn Broken Catchment					✓	
Environmental guidelines for the dairy processing industry			✓		✓	
Environmental guidelines for major construction sites		✓				
Construction techniques for sediment pollution control		✓				
Other Current Recommended Practices						
Reducing dairy effluent			✓		✓	
Farm drainage reuse	✓					
Drainage diversion	✓					
Nutrient pollution of drainage water	✓					
Dryland drainage schemes	✓	✓				
Urban drain design – water sensitive urban design				✓		
Urban source controls				✓		
Primary stormwater treatment				✓		



CRPs	Irrigation drainage	Dryland diffuse sources	Wastewater management facilities	Urban stormwater	Intensive animal industries	Other
Secondary stormwater treatment				✓		
Dam desilting						✓
Filter strips		✓		✓		
Constructed wetlands			✓	✓		
Whole farm plans	✓	✓	✓	✓	✓	
Lasergrading	✓	✓				
Riparian land management	✓	✓			✓	✓
Stock management		✓			✓	
Stabilising soil erosion	✓	✓				
Unsealed roads		✓				
Cropping management		✓				
Perennial vegetation management		✓				
Improving environmental management: a guide to better soil, water and nutrient management practices for the Victorian strawberry industry	✓					✓
Storage and handling of farm chemicals					✓	✓



3. References

- Croke, J., 2002. *Managing phosphorus in catchments. Fact Sheet 11*. Land and Water Australia, Canberra.
- DSE, 1995. *Nutrient management strategy for Victorian inland waters*. Department of Sustainability and Environment, Melbourne.
- GBCMA, 2002. *Goulburn Broken Water Quality Strategy 1996-2016*. Goulburn Broken Catchment Management Authority, Shepparton.
- Government of Victoria, 2003. *State Environment Protection Policy No. S107 (Waters of Victoria)*.
- MDBC, 1994. *The algal management strategy for the Murray-Darling Basin: a component of the natural resources management strategy*. Murray-Darling Basin Ministerial Council, Canberra.



Part B

CRP Manual



4. Codes of Practice

Code of Practice for fire management on public land

Purpose

To ensure that the response to wildfire and the use of prescribed burning are in accordance with sound environmental guidelines.

Details

The Code lays down minimum state-wide standards for fire management on public land in Victoria. Fire management involves managing the threat and occurrence of wildfires and the use of prescribed burning to achieve specific fire and other management objectives. This is reflected in the organisation of the Code, with the contents being presented in three sections. The first section defines broad principles for fire management including the underlying principles of environmental care, the second addresses protection from wildfire, and the third provides a framework for the planned use of fire to achieve land management objectives.

Specific principles of environmental care that relate to water quality are the protection of:

- Water quality and quantity by measures which minimise the impact of fire management activities on streams, springs, soaks, swampy ground and bodies of standing water, and their physical, chemical, and biological quality; and
- Soil by measures which prevent inappropriate destruction of its physical and chemical properties or which promote stabilisation of bare or disturbed earth following disturbance.

These environmental care principles should be applied in accordance with the following fire management activities:

- Fire protection (Fire Protection Plans addressing environmental care principles);
- Fire prevention (eg. fuel management, slashing);
- Fire suppression (eg. Construction of fire control lines);
- Recovery after wildfire (eg. Rehabilitation Plan considering erosion and water quality); and
- Prescribed burning (eg. Fire Management Plan including soil lines).

Responsible agency

DPI must ensure that they key objectives of the Code and supporting Government Acts and regulations are met.

Source documents

DPI, 2001, *Code of Practice for fire management on public land*, Department of Primary Industries, Victoria.

The Code is available in summary form - within the DPI search engine, type 'Fire Management'

[http://www.dpi.vic.gov.au/web/root/domino/cm_da/dpincor.nsf/frameset/DPI+Corporate?OpenDocument&\[http://www.dpi.vic.gov.au/search.html\]](http://www.dpi.vic.gov.au/web/root/domino/cm_da/dpincor.nsf/frameset/DPI+Corporate?OpenDocument&[http://www.dpi.vic.gov.au/search.html])

A full copy of the Code can be purchased from the DSE Information Centre at:

8 Nicholson St

PO BOX 500 Melbourne 3002

Ph: 9637 8325

or e-mail: publications.sales@nre.vic.gov.au, cost \$5.50 plus postage.

Supporting documentation

The Code is complementary to those sections of the Code of forest practices for timber production, which also address fire-related topics. The Code of forest practices for timber production deals with fire management as it affects timber



production and therefore addresses some topics in more detail than the Code of Practice for fire management on public land.

Other relevant CRPs

- [Code of forest practices for timber production](#)
- [Construction techniques for sediment pollution control](#)
- [Environmental guidelines for major construction sites](#)
- [Filter strips](#)
- [Stabilising soil erosion](#)

Code of forest practices for timber production

Purpose

To ensure that water yield is not adversely affected by forest management activities and Statewide prescriptions for environmental protection are met.

Details

The Code of forest practices for timber production (the Code) provides Statewide goals and guidelines that apply to timber harvesting, timber extraction roading, regeneration and reforestation in native forests, as well as the establishment and management of softwood and hardwood plantations.

Of particular interest, is 'timber harvesting and roading for timber production', which describes measures to be employed to protect and rehabilitate soils and to ensure the maintenance of water quality and aquatic habitat.

The minimum Statewide guidelines include:

- The retention of a buffer of riparian vegetation within at least 20 m of permanent streams (streamside reserve). This buffer may be increased to either 30 m or 40 m, according to the slope, soil permeability, potential for erosion and overland flow;
- The retention of at least 20 m of riparian and other vegetation from permanent springs, swampy ground and bodies of standing water. This buffer may be increased to either 30 m or 40 m, according to soil permeability, potential for erosion and overland flow; and
- The retention of a filter strip at least 10 m wide on either side of temporary streams and drainage lines.

Other requirements of the Code include:

- Timber harvesting and carting to be suspended during periods of wet weather;
- The application of a general maximum slope limit of 30° for harvesting operations; and
- Addressing road and track design and maintenance standards and the siting and management of log landings and log dumps.



Key aspects of the Code are interpreted for application to the unique environments within the region. This is through detailed prescriptions, Forest Management Plans (FMPs) and Forest Coupe Plans for public land or the planning scheme (or stipulations in permits issued under the scheme) and a Timber Harvesting Plan for private land. FMPs are prepared for each Forest Management Area (FMA) in Victoria. FMAs that are applicable to the Goulburn Broken Catchment are Mid-Murray, Benalla-Mansfield, Central and North-East.

The actual protection measures to be applied within each FMA will depend on the erodibility of soils, rainfall erosivity, topography, intensity and magnitude of harvesting operations, riparian value etc. and will take account of other requirements set out in Special Area (Water Supply Catchment) Plans made under the *Catchment and Land Protection Act 1994*.

Water quality and aquatic habitat must be protected by classifying stream types within and near the coupe and maintaining the buffer and filter strips (to both sides of the stream) of at least the minimum widths specified in the Code. Streams can be classified as permanent, temporary, drainage or wetlands.

The planning, design, location, construction, maintenance and use of timber extraction roads, stream crossings, quarries and borrow pits must identify environmental values and consider possible risks to meet water quality requirements. For example, roads must be cross sloped or crowned and table drains provided to minimise the concentrations and velocity run-off and to ensure that water drains from the road surface.

The Mid-Murray FMA includes key aspects of the code interpreted for application to the unique environments of the floodplain forests which will establish a sound basis for the application of the Code for the protection of water quality and riparian vegetation. Also, guidelines are provided for the adaptive management of water on the floodplains according to seasonal conditions and for the coordination of water management and forest management programs to maintain or improve the health and regeneration of the forests.

Responsible agency

There are a range of divisions within DSE that manage forestry operations and policy, including the implementation of the Code. The roles of the various divisions are discussed within the DSE webpage,

http://www.dse.vic.gov.au/web/root/domino/cm_da/nrenfor.nsf/frameset/NRE+Forestry?OpenDocument

Source documents

NRE, 1996, *Victorian Code of forest practices for timber production*. Revision No.2. Department of Natural Resources and Environment, Melbourne.

The Code is available from the DSE webpage under Publications/Code of Practice,

http://www.dse.vic.gov.au/web/root/domino/cm_da/nrenfor.nsf/frameset/NRE+Forestry?OpenDocument

The Code is reviewed every 10 years. Regional prescriptions, which link the Code to specific forest types on public land, will be reviewed periodically to take account of new scientific information and operational experience.

Supporting documentation

Government of Victoria, 2003, State Environment Protection Policy No. S107 (Waters of Victoria)

<http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/0f1632a4b454c840ca256d41000cc1f3?OpenDocument>

Forest Management Plans are available from the DSE webpage under Publications/Forest Management Plans,

http://www.dse.vic.gov.au/web/root/domino/cm_da/nrenfor.nsf/frameset/NRE+Forestry?OpenDocument

Other relevant CRPs

- [Code of Practice for fire management on public land](#)
- [Construction techniques for sediment pollution control](#)
- [Environmental guidelines for major construction sites](#)
- [Filter strips](#)
- [Stabilising soil erosion](#)

Code of Practice for small wastewater treatment plants

Purpose

To ensure that small wastewater treatment plants are designed, constructed and managed, so that:

- Any discharges to surface waters meet all statutory requirements;
- Measures are employed to deal with emergencies without damage to any surface waters or to the soil/land;
- All wastewater is treated and retained on land wherever practicable and environmentally friendly; and
- Measures are employed to conserve water resources or provide for the re-use or recycling of treated wastewater.

Details

The principles and objectives of the Code of Practice for small wastewater treatment plants (the Code) have been adopted to facilitate the design of small wastewater treatment systems that serve less than 500 people.

The Code details design elements under the following headings:

- Site analysis;
- Waste management;
- Design and construction;
- Operation and maintenance; and
- Performance monitoring and reporting.

Each of the above elements has performance objectives and standards or suggested measures to illustrate possible ways of meeting both the performance objectives and standards. This approach permits and encourages alternative or innovative technology and effective solutions for best practice environmental management.

Some suggested measures in the Code include:

- The capacity of wastewater treatment plants should be based on the loading rates provided in the Code;
- Treatment plants should be ready for operation before any part of a subdivision, building or group of buildings to be served by the plant are occupied;
- Facilities for the application of wastewater by irrigation are to be designed in accordance with *the Guidelines for wastewater irrigation* (EPA Publication 168);
- Reuse of wastewater is to be undertaken in accordance with *Guidelines for environmental management – use of reclaimed water* (EPA Publication 464.1);
- Buffer distances should be established where surrounding terrain or prevailing wind will affect the dispersion or spread of odours (Figure 5 in the Code shows accepted buffer distances for different types of treatment processes);
- Stabilisation ponds should be located at least 100 m from a source of water supply, 30 m from property boundaries and of residential premises and 15 m from camping sites;
- No wastewater treatment plant should be located within 15 m of a source of water supply, or at such a greater distance as required by a responsible authority;
- Materials placed in the pond embankment must be sufficiently impervious to reduce seepage to a minimum;

- No stabilisation pond should have an area less than 50m²;
- The construction features of a typical sand filter are illustrated in Figure 11 of the Code;
- Where a sand filter exceeds 50m² in area, an automatic dosing device – such as a dosing siphon, tipping trough or pump – must be installed;
- Pump wells should be constructed in accordance with Section 3 and Figure 12 of the Code;
- The preference for satisfactory disinfection and reduction in the number of harmful organisms is passing a 10/15 standard effluent through a UV radiation or micro-filtration unit.

Generally, plants designed to treat domestic wastewater in accordance with the requirements of this Code will produce an effluent quality not exceeding a maximum of 80th% of 20 mg BOD/L and 30 mgSS/L, called a 20/30 standard. However more stringent controls or technology may be necessary where local environmental conditions require a higher level of protection.

Responsible agency

The EPA will ensure that the key objectives of the Code and supporting Government Acts and Regulations are met.

Source document

EPA, 1997, *Code of Practice for small wastewater treatment plants*, EPA Publication 500, Environment Protection Authority Victoria.

The Code is not available on-line. A copy of the Code is available from the EPA, <http://www.epa.vic.gov.au/contact.asp>, cost \$11 plus postage.

Supporting documentation

EPA, 2002, *Guidelines for environmental management – use of reclaimed water*, EPA Publication 464.1, Environment Protection Authority, Victoria.

[http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/64c2a15969d75e184a2569a00025de63/\\$FILE/464.1.pdf](http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/64c2a15969d75e184a2569a00025de63/$FILE/464.1.pdf)

EPA, 1991, *Guidelines for wastewater irrigation*, EPA Publication 168, Environment Protection Authority, Victoria.

The *Guidelines for wastewater irrigation* is not available on-line. A copy is available from the EPA, <http://www.epa.vic.gov.au/contact.asp>, cost \$16 plus postage.

Other relevant CRPs

- [Guidelines for environmental management – use of reclaimed water](#)
- [Guidelines for wastewater irrigation](#)

Septic tanks Code of Practice

Purpose

To ensure that on-site wastewater treatment systems, used to treat domestic wastewater in areas not served by a centralised sewerage system, protect public health and the environment now and into the future.

Details

The septic tanks Code of Practice (the Code) applies to all on-site wastewater treatment systems, treating less than 5,000 litres of wastewater per day.

It describes measures to ensure on-site treatment systems sustainably manage wastewater, while minimising health and environmental risks.

In order to achieve this, the Code sets out requirements for:

- Integrating on-site wastewater management with the land development process;
- Designing on-site wastewater treatment systems;
- Installing on-site wastewater treatment systems;
- Operating and maintaining on-site wastewater systems; and
- Land application of treated effluent.

The requirements within the Code include:

- The selection of the site for wastewater treatment should be based on a site assessment;
- Wastewater system types and their disposal options and monitoring requirements;
- On-site effluent disposal should be based on a risk minimisation approach;
- Detailed design wastewater loads; and
- Default minimum buffer distances between the wastewater disposal field and other sensitive features.

Responsible agency

There is an approval process for septic tank systems. The EPA approves the type of system via Certificate of Approval and Councils assess applications for permits to install individual systems.

Permits may be issued with conditions. The Council may also refuse to issue a permit if the proposed tank system is contrary to any State Environment Protection Policy.

For systems greater than 5,000 litres of wastewater per day, contact your regional EPA office.

Source document

EPA, 2003, *Septic tanks Code of Practice*, EPA Publication 891.1, Environment Protection Authority, Victoria.
[http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/23a34c182c9de88fca256ce800068eab/\\$FILE/891.pdf](http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/23a34c182c9de88fca256ce800068eab/$FILE/891.pdf)

Supporting documentation

The following references may assist in achieving best practice management of on-site wastewater treatment systems.

EPA, 2003, *Land capability assessment for on-site domestic wastewater management – domestic wastewater management*



series, EPA Publication 746.1, Environment Protection Authority, Victoria.

[http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/09fede9a26e853c8ca256ce800072d88/\\$FILE/746.1.pdf](http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/09fede9a26e853c8ca256ce800072d88/$FILE/746.1.pdf)

EPA, 2002, *Use of reclaimed water – guidelines for environmental management*, EPA Publication 464.1, Environment Protection Authority, Victoria.

[http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/64c2a15969d75e184a2569a00025de63/\\$FILE/464.1.pdf](http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/64c2a15969d75e184a2569a00025de63/$FILE/464.1.pdf)

EPA, 2001, *Domestic wastewater management Series: approving household on-site wastewater systems*, EPA Publication 747, Environment Protection Authority, Victoria.

[http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/1e3b3f3ffa2e1ce94a2569ec0020fa5b/\\$FILE/747.pdf](http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/1e3b3f3ffa2e1ce94a2569ec0020fa5b/$FILE/747.pdf)

EPA, 2001, *Domestic wastewater management series: EPA's certificate of approval system*, EPA Publication 748, Environment Protection Authority, Victoria.

[http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/85c04681d12cc9e94a2569ec00211880/\\$FILE/748.pdf](http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/85c04681d12cc9e94a2569ec00211880/$FILE/748.pdf)

EPA, 2001, *Domestic wastewater management series – reuse options for household wastewater*, EPA Publication 812, Environment Protection Authority, Victoria.

[http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/7a4f9f7400a82b43ca256af600140478/\\$FILE/812.pdf](http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/7a4f9f7400a82b43ca256af600140478/$FILE/812.pdf)

EPA, 1998, *Domestic wastewater management series: development approvals in sewerred and unsewerred areas*, EPA Publication 629, Environment Protection Authority, Victoria.

[http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/f2196a11c16b0c104a2566b900117464/\\$FILE/629.pdf](http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/f2196a11c16b0c104a2566b900117464/$FILE/629.pdf)

EPA, 1997, *Code of Practice for small wastewater treatment plants*, EPA Publication 500, Environment Protection Authority, Victoria.

This publication is not available on-line. Copies available from the EPA, <http://www.epa.vic.gov.au/contact.asp>. cost \$11 plus postage.

EPA, 1991, *Construction techniques for sediment pollution control*, EPA Publication 275, Environment Protection Authority, Victoria.

[http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/f10374f564ef42e54a2565fc0008e2da/\\$FILE/275.pdf](http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/f10374f564ef42e54a2565fc0008e2da/$FILE/275.pdf)

EPA, 1983, *Guidelines for wastewater irrigation*, EPA Publication 168. Environment Protection Authority, Victoria.

This publication is not available on-line. Copies are available from the EPA, <http://www.epa.vic.gov.au/contact.asp>, cost \$16 plus postage.

Other relevant CRPs

- [Code of Practice for small wastewater treatment plants](#)
- [Construction techniques for sediment pollution control](#)
- [Guidelines for environmental management – use of reclaimed water](#)
- [Guidelines for wastewater irrigation](#)
- [Land capability assessment for on-site domestic wastewater management](#)
- [Reuse options for household wastewater](#)

Code of Practice – piggeries

Purpose

To ensure that piggeries are managed effectively, with minimal environmental impact and disturbance to the local area.

Details

The Code of Practice – piggeries (the Code) provides minimal standards that apply to new piggeries or where there are substantial modifications to existing piggeries.

The standards are provided under the following headings:

- **Topography, soils, liable to flooding;**

The piggery site should be on undulating or flat terrain to minimise soil erosion. No piggery should be established on land that is liable to flooding, as defined by the flood frequency of 1 in 50 years. Although not a specific item of the Code, soils should be a medium loam-clay to provide reasonably good drainage and retention of nutrients.

- **Piggery classification;**

A piggery shall be classified according to the space actually occupied, or designated for occupation by pigs. Piggeries can be classified as – intensive, semi-intensive, semi-extensive or extensive. These classifications help determine the buffer distances for a piggery.

- **Buffer zone dimensions (distances) for a piggery;**

Buffer zones shall be established around a piggery and consist of two parts, fixed and variable. Fixed buffer zones are independent of the size of the piggery and shall be the horizontal distance between the piggery building or area designated for occupation by pigs and landscape features. Landscape features include public roads, watercourses, neighbouring piggery, residence on the property and major water supply storage within its catchment area. A variable buffer zone shall have an assigned horizontal distance that is determined according to the size of the piggery and the nature of the surrounding conditions which includes, isolated rural residence, farmhouse, proclaimed township boundary and rural residential zone/residential area.

- **Buffer distances surrounding effluent treatment systems or land disposal areas;**

Buffer zones shall be established between all treatment units or land disposal areas and residential or other nominated features. They are in addition to buffer zones for the piggery and are determined separately. Buffer zone distances are determined by classifying effluent handling systems into five categories.

- **Treatment lagoons; and**

Treatment lagoons should be constructed with a low permeability liner of adequate thickness and operated within a minimum freeboard of 500 mm and maintained to ensure wastes do not contaminate surface or ground waters.

- **Disposal of effluent.**

Effluent disposal to land (with or without pre-treatment) shall be in accordance with the following:

- There shall be no run-off of wastes or of stormwater contaminated by wastes from the property;
- Precautions shall be taken during periods of bad weather to prevent any irrigated effluent being carried downslope towards watercourses; and
- Soil shall not be waterlogged.



Responsible agency

Compliance with the Code is required for existing piggeries to undertake further modifications which provide for an increase of more than 10% in pig numbers.

Source document

DPI , 1992, *Code of Practice - piggeries*, Department of Primary Industries, Victoria.

[http://www.dpi.vic.gov.au/web/root/domino/cm_da/dpincor.nsf/frameset/DPI+Corporate?OpenDocument&\[http://www.dpi.vic.gov.au/search.html\]](http://www.dpi.vic.gov.au/web/root/domino/cm_da/dpincor.nsf/frameset/DPI+Corporate?OpenDocument&[http://www.dpi.vic.gov.au/search.html])

A review of this document is being undertaken and should be available in mid 2004.

For details in relation to the new Code contact DPI .

Supporting documentation

This Code does not cover detailed aspects of animal husbandry and design and operational requirements of piggeries. Responsible authorities and potential pig producers should refer to the companion volume entitled *Guidelines for the siting and operation of piggeries*.

Other relevant CRPs

- [Constructed wetlands](#)
- [Guidelines for environmental management – use of reclaimed water](#)
- [Guidelines for wastewater irrigation](#)
- [Whole farm plans](#)



5. Guidelines

Upper Goulburn recreational waterway strategy

Purpose

To ensure the natural values of the Upper Goulburn River catchment are adequately protected, long-term recreational use is sustainable and stream health is maintained or improved.

Details

The upper reaches of the Goulburn River catchment are home to some of Victoria's most scenic waterways, popular for recreational pursuits such as fishing, canoeing, bush walking, camping and horse riding.

These activities usually take place on or adjacent to a river and can disturb the streamside zone, leading to a decrease in the quality of run off into the stream. There are many examples of this including, camper's rubbish, camper's toilet waste, nutrient rich run-off from horse yards and car parks located so drainage enters the waterway.

Recreational demand needs to be managed in order to protect and enhance the environmental value of the waterway and riparian zone. This can be achieved through on-site and off-site measures, which need to be supported by strategies that deliver appropriate marketing and information to users.

The Upper Goulburn recreational waterway strategy is an important way to promote an agreed vision for recreation that will lead to partnerships in work programs that are supported by the local and wider communities.

The strategy provides:

- Local government, DSE, Parks Victoria and GBCMA with guidelines for developing and assessing the impact of recreational developments on waterways;
- An agreed framework for assessing new proposals for development/activity;
- A methodology and guidelines for designing facilities/activities to support recreational activities;
- A guide to responsibilities and cost sharing arrangements for providing recreational waterway activity/facilities;
- An indication of available funding opportunities; and
- A set of Actions for six priority stream reaches.

The strategy outlines a number of ways in which recreational demand can be managed. These include:

- Designing and siting all new and upgraded facilities in line with guidelines to minimise any impact on the waterway;
- Limiting the number of users in peak times (ie. Christmas, Easter) to a number which the area and the facilities in the area are capable of handling;
- Encouraging private land managers to allow campers during peak periods;
- Encouraging activity in non-sensitive areas and prohibiting or severely restricting camping in sensitive areas;
- Locating amenities including toilets, showers and car parking in zones where the future impact of recreational use on waterway health will be minimal; and
- Encouraging the sale of commercial firewood at camping areas as an alternative to removing fireplaces.

The following principles should also be applied to ensure sustainable recreation activities and minimise off site impacts:

- Horse yards should be located at least 50 m from the stream bank to provide a suitable riparian zone and/or grass

zone. Avoid sites that slope toward the stream;

- Toilets to be constructed in accordance with the *Septic tanks Code of Practice* (EPA Publication 891.1). No toilet waste material should be mobilised during flood or be allowed to seep into the stream;
- Redirect all run off away from waterways to ensure adequate settling/filtration prior to run off water entering the waterway (ie. car parks);
- Maintain and enhance riparian buffer zones wherever possible to assist in the filtration of run off;
- Keep stream crossings for vehicles and horses to a minimum and only at constructed fords or crossings;
- Users to take away rubbish and waste products;
- The riparian (streamside) zone should be of suitable width to control sediment run off. Camping should often only be in designated areas, and roads and parks a suitable distance away from the waterway;
- Where a recreation user is some distance from established toilet block, or portable toilet, they should be encouraged to bury any waste. The recreation user should bury waste at least 100 m from the stream, or above the floodplain, where it cannot be mobilised. The user must not however trespass in the process;
- In steep areas where run off into the waterway appears unavoidable, grassed swales should be provided to prevent any sediment run off entering waterways;
- Refuelling should only take place at a suitable distance from the waterway to minimise the risk of spillage into the waterway; and
- Promote 4 WD 'tread lightly' policy.

Responsible agency

The Strategy is an initiative of the Upper Goulburn Implementation Committee, which operates under an agreed Charter of the GBCMA.

A number of other agencies interlink with the GBCMA's direct responsibilities. Other agencies with direct responsibility include DSE, Parks Victoria and Local Government as well as individual landholders.

Source document

GBCMA, 2001, Upper Goulburn catchment recreational waterway strategy. Part One: strategy. Goulburn Broken Catchment Management Authority, Victoria.

Other relevant CRPs

- [Septic tanks Code of Practice](#)

Reuse options for household wastewater

Purpose

To ensure the reuse of household wastewater is managed in a sustainable manner that protects human health and environmental values in urban communities.

Details

Although water consumption in the household can be reduced, modern households still produce significant volumes of wastewater.

In urban areas, sewerage systems are provided to deal with wastewater. However household wastewater can be reused before it goes to the sewer. Best practice reuse options fall into two main categories:

- 1) The diversion of untreated 'greywater' for immediate reuse; and
- 2) The installation of systems to collect and treat household wastewater and reuse the resulting effluent.

In both instances, household wastewater must be contained within allotment boundaries and not discharged to drains or waterways.

The seasonal diversion of untreated greywater has many associated environmental potential impacts due to the many pollutants it contains (eg. chemicals derived from detergents and other cleaning agents). For example, saturating the soil may cause wastewater to run-off where it may find its way into stormwater drains and waterways.

The following procedures should be implemented to reduce the environmental risks associated with greywater reuse:

- The use low phosphorus detergents;
- Not allowing the soil to become saturated by carefully monitoring the impact of greywater on the irrigation area; and
- Directing greywater to sewer during periods of wet weather.

Household reuse schemes in sewerage areas typically include a wastewater treatment unit and a treated effluent irrigation area. Reuse schemes are only acceptable when managed sustainably. This occurs when treated effluent is applied to meet plant needs over summer and is stored during winter, and there is negligible discharge of effluent to the environment. To ensure sustainability the following procedures should be implemented:

- Effluent reuse reduced in very wet years;
- Monitoring of the system;
- Storages designed to minimise the risk of failure; and
- Design of schemes considering wastewater volume and surface water protection (stopping effluent running off and entering surface water).

More information in regards to specific legislation and policies can be found in Section 3 of this Information Bulletin.

Responsible agency

The wastewater treatment unit to be installed must be approved by the EPA. Approved types of treatment units are the manufacturer's responsibility and should not concern individual householders.



The entire scheme (that is, including the wastewater collection, treatment and reuse components) must be approved by the local council and issued with a 'septic tank permit' before it is installed.

Source document

EPA, 2001, *Domestic wastewater management series – reuse options for household wastewater*, EPA Publication 812, Environment Protection Authority, Victoria.

[http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/7a4f9f7400a82b43ca256af600140478/\\$FILE/812.pdf](http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/7a4f9f7400a82b43ca256af600140478/$FILE/812.pdf)

EPA Victoria is responsible for reviewing this Information Bulletin. Reviews will occur from time to time reflecting up to date developments in the treatment of wastewater.

Supporting documentation

Information regarding sustainable reuse issues can be found in:

EPA, 1991, *Guidelines for wastewater irrigation*, EPA Publication 168, Environment Protection Authority, Victoria.

This publication is not available on-line. Copies are available from the EPA, <http://www.epa.vic.gov.au/contact.asp>, cost \$16 plus postage.

Other relevant CRPs

- [Code of Practice for small wastewater treatment plants](#)
- [Guidelines for environmental management – use of reclaimed water](#)
- [Guidelines for wastewater irrigation](#)
- [Land capability assessment for on-site domestic wastewater management](#)
- [Whole farm plans](#)

Land capability assessment for on-site domestic wastewater management

Purpose

To provide a framework for assessing the capability of a site to sustainably manage wastewater and identify measures which minimise the health and environmental impacts of on-site wastewater treatment.

Details

To ensure that unsewered residential development only proceeds on land that has an acceptable capability for sustainable on-site wastewater management, a Land Capability Assessment (LCA) should be undertaken prior to development proceeding.

The LCA procedure can follow a four stage process:

1) Development of appropriate LCA criteria.

Land capability ratings are developed based on features at the site that are relevant to the particular development (eg. slope, soil profile, site drainage etc.). The ratings, between 1 and 5, indicate from lowest to highest, the potential risk and management inputs needed to ensure that environmental degradation is minimised.

2) Collation of land inventory information.

The assessor should prepare an inventory of the information needed to allocate ratings for each of the features at the site. This involves a desk top review, site visit, material collation and information appraisal. Information collected may include council requirements (planning), soil features (profile depth, structure) and climate data (rainfall, evaporation).

3) Assessment of land capability.

The assessor should assign a rating to each land feature. The features with the highest rating are those that are the most constraining. As the land capability rating increases so does the associated risk, and with it, the degree of difficulty for satisfying environmental protection.

4) Development management program.

Although the LCA indicates the inherent capability of a site for on-site wastewater management, it should be complemented by a management program showing how the land constraints (and the associated risks) identified in the LCA can be addressed.

The LCA and the management program should be considered together when determining whether a proposed development is sustainable.

Responsible agency

Councils assess applications for development based on the LCA and corresponding management program.

Source document

EPA, 2003, *Domestic wastewater management series: land capability assessment for on-site domestic wastewater management*, EPA Publication 746.1, Environment Protection Authority, Victoria.

[http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/2f1c2625731746aa4a256ce90001cbb5/09fede9a26e853c8ca256ce800072d88/\\$FILE/746.1.pdf](http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/2f1c2625731746aa4a256ce90001cbb5/09fede9a26e853c8ca256ce800072d88/$FILE/746.1.pdf)

Supporting documentation

The following references may assist in achieving best practice management of on-site wastewater systems:

EPA, 2003, *Septic tanks Code of Practice*, EPA Publication 891, Environment Protection Authority, Victoria.

[http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/23a34c182c9de88fca256ce800068eab/\\$FILE/891.pdf](http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/23a34c182c9de88fca256ce800068eab/$FILE/891.pdf)

EPA, 2002, *Guidelines for environmental management – use of reclaimed water*, EPA Publication 464.1, Environment Protection Authority, Victoria.

[http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/64c2a15969d75e184a2569a00025de63/\\$FILE/464.1.pdf](http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/64c2a15969d75e184a2569a00025de63/$FILE/464.1.pdf)

EPA, 1999, *Guidelines for wastewater irrigation*, EPA Publication 168, Environment Protection Authority, Victoria.

This publication is not available on-line. Copies available are from the EPA, <http://www.epa.vic.gov.au/contact.asp>, cost \$16.

EPA, 1998, *Development approvals in sewerred and unsewerred areas*, EPA Publication 629, Environment Protection Authority, Victoria.

[http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/2f1c2625731746aa4a256ce90001cbb5/f2196a11c16b0c104a2566b900117464/\\$FILE/629.pdf](http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/2f1c2625731746aa4a256ce90001cbb5/f2196a11c16b0c104a2566b900117464/$FILE/629.pdf)

EPA, 1997, *Code of Practice for small wastewater treatment plants*, EPA Publication 500. Environment Protection Authority, Victoria.

The Code is not available on-line. A copy of the Code is available from the EPA, <http://www.epa.vic.gov.au/contact.asp>, cost \$11 plus postage.

Other relevant CRPs

- [Code of Practice for small wastewater treatment plants](#)
- [Guidelines for environmental management – use of reclaimed water](#)
- [Guidelines for wastewater irrigation](#)
- [Septic tanks Code of Practice](#)
- [Whole farm plans](#)

Guidelines for wastewater irrigation

Purpose

To ensure wastewater irrigation schemes are designed and operated in accordance with environmental legislation to ensure that waterway quality is protected.

Details

The State Environment Protection Policy (Waters of Victoria) (SEPP) directs that wastewater should be discharged to land in preference to water wherever practicable and environmentally beneficial. This practice not only ensures that waterbodies are protected, but components of wastewater can be beneficially used to produce protein and fibre. However if poor attention is paid to site characteristics and management, pollution of waterways can result.

The Guidelines for wastewater irrigation (the Guidelines) details the steps which should be taken when considering irrigating with wastewater and procedures which then should used to develop an application for a works approval, if required, under the *Environment Protection Act 1970*. The overall objective is to match soil characteristics, irrigation methods and land use to irrigation water quality to protect waterways and maximise plant growth.

The steps which should be undertaken are listed under the following headings:

- Determination of feasibility of irrigation;
- Determination of sites suitable for irrigation;
- Wastewater quality in relation to soils, plant growth and human health;
- Determination of irrigation methods;
- Identification of vegetation types that can be grown with wastewater;
- Livestock management; and
- Monitoring requirements (effluent quantity and quality).

Some suggested measures in relation to these are:

- Prior to proceeding it needs to be established that wastewater quality is suitable for irrigation, the irrigation proposal is in accordance with the SEPP and irrigation would be a permitted use of the land;
- A site selection assessment should involve the consideration of a number of factors (climate, soil characteristics, buffer distances etc.);
- Facilities for wastewater storage and irrigation should be designed and constructed to contain all waste in at least the 90th percentile wet year.
- Water budgets should be compiled for irrigation seasons;
- Irrigation should be restricted to the warmer months of the year;
- The ideal pasture composition for wastewater irrigation is a mix of perennial, deep-rooted species so as to maximise water and nutrient uptake while providing the nutrient requirements of livestock;
- Cattle grazing on pastures irrigated with treated sewage must comply with requirements of the *Health Act 1958*;
- Livestock must be excluded from wastewater treatment facilities such as lagoons, channels and drains; and



- Monitoring of flow (influent and effluent), waste quality and soil should be undertaken to ensure that, if needed, remedial action can be undertaken early.

Additional information is included in the Guidelines on:

- Irrigation options suitable for wastewater;
- Plant species that can be grown with wastewater irrigation; and
- Recommended soil and water testing parameters.

Responsible agency

The EPA will ensure that the key objectives of the Guidelines and supporting Governments Acts and Regulations are met.

Source documents

EPA, 1991, *Guidelines for wastewater irrigation*, EPA Publication 168. Environment Protection Authority, Victoria.

This publication is not available on-line. Copies available are from the EPA, <http://www.epa.vic.gov.au/contact.asp>, cost \$16.

A revised draft EPA Publication 168a *Best practice environmental guidelines for wastewater irrigation* has been prepared for the EPA, but is not yet available.

Supporting documentation

Proposed wastewater irrigation schemes must comply with the SEPP.

Government of Victoria, 2003, State Environment Protection Policy No. S107 (Waters of Victoria).

<http://www.epa.vic.gov.au/Publications/Legislation/sepps.asp> – water

Other relevant CRPs

- [Guidelines for environmental management – use of reclaimed water.](#)
- [Whole farm plans](#)



Guidelines for environmental management – use of reclaimed water

Purpose

To appropriately treat wastewater (reclaimed water), so as to reduce the amount of wastewater discharge to surface waters.

Details

The Guidelines for environmental management – use of reclaimed water (the Guidelines) apply to the use of reclaimed water from sewage treatment plants, which includes both municipal sewerage facilities and trade waste agreements.

The overall objective of the Guidelines is to maximise the reuse of reclaimed water through minimising and managing any risks associated with its use.

To meet this objective the Guidelines:

- Encourage the sustainable and safe use of reclaimed water;
- Set clear performance objectives for the use of reclaimed water;
- Establish obligations of the suppliers and uses of reclaimed water; and
- Suggest best practice environmental measures for wastewater treatment, quality, site selection, application site management, monitoring and reporting in order to meet the performance objectives.

Best practice measures for water quality include:

- The level of treatment of the reclaimed water must satisfy the treatment and water quality objectives listed in Table 1 of the Guidelines;
- Reclaimed water used for the irrigation of pasture or fodder grazed by stock should be either retained for at least 30 days in detention lagoons or filtered by an approved method;
- Transporting reclaimed water in a watertight and enclosed tanker and ensuring that the full quantity of water supplied to the transporter is delivered to the reuse site;
- An emergency blue-green algal management plan must be prepared for schemes at risk from algal bloom impacts;
- Above ground distribution systems should not be laid closer than 100 millimetres from potable water pipes and below ground distribution systems are not laid closer than 300 millimetres from potable water pipes;
- Fodder and crops irrigated with reclaimed water should be ensiled or dried before use or packaging;
- Reclaimed water should not be used as washdown water for food packaging or processing machinery or dairy milking machinery;
- Wastewater schemes should be designed to contain all waste in at least a 90th percentile wet year; and
- Emergency discharges from winter storages should only be undertaken in accordance with Environmental Improvement Plans and EPA Victoria approval.

Responsible agency

All schemes require formal endorsement from the EPA. Schemes that do not comply with Guideline requirements will need to either obtain a works approval and a discharge licence, or receive a specific exception from the EPA.

Source document



EPA, 2002, *Guidelines for environmental management: use of reclaimed water*, EPA Publication 464.1 Environment Protection Authority, Victoria.

[http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/64c2a15969d75e184a2569a00025de63/\\$FILE/464.1.pdf](http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/64c2a15969d75e184a2569a00025de63/$FILE/464.1.pdf)

EPA Victoria is responsible for auditing and reviewing the effectiveness of these Guidelines. Reviews will occur from time to time reflecting up to date developments in the use and management of reclaimed water in Australia and overseas.

Supporting documents

The Victorian Agnotes series provide additional information in regards to the use of reclaimed water in livestock and cattle production.

DPI , 2003, *Reclaimed water – use in livestock production*, AG1090, Department of Primary Industries, Victoria.

[http://www.dpi.vic.gov.au/web/root/domino/cm_da/dpincor.nsf/frameset/DPI+Corporate?OpenDocument&\[http://www.dpi.vic.gov.au/search.html\]](http://www.dpi.vic.gov.au/web/root/domino/cm_da/dpincor.nsf/frameset/DPI+Corporate?OpenDocument&[http://www.dpi.vic.gov.au/search.html])

DPI , 2003, *Reclaimed water – use in cattle production*, AG1089, Department of Primary Industries, Victoria.

[http://www.dpi.vic.gov.au/web/root/domino/cm_da/dpincor.nsf/frameset/DPI+Corporate?OpenDocument&\[http://www.dpi.vic.gov.au/search.html\]](http://www.dpi.vic.gov.au/web/root/domino/cm_da/dpincor.nsf/frameset/DPI+Corporate?OpenDocument&[http://www.dpi.vic.gov.au/search.html])

EPA, 1991, *Guidelines for wastewater irrigation*, EPA Publication 168. Environment Protection Authority, Victoria.

This publication is not available on-line. Copies available are from the EPA, <http://www.epa.vic.gov.au/contact.asp>, cost \$16.

A revised draft EPA Publication 168a *Best practice environmental guidelines for wastewater irrigation* has been prepared for the EPA, but is not yet available.

Other relevant CRPs

- [Guidelines for wastewater irrigation](#)
- [Whole farm plans](#)

Disinfection of treated wastewater – guidelines for environmental management

Purpose

To provide water businesses and private owners with a framework of best management practices for the disinfection of treated wastewater from sewage plants, destined either for reuse or disposal to surface waters.

Details

Untreated, and in some instances treated effluent, contains a range of organisms and nutrients which pose a potential risk to the environment, livestock or human health.

In order to manage these risks, the Disinfection of treated wastewater – guidelines for environmental management (the Guidelines) provides a framework of best practices for the disinfection of treated wastewater from sewage plants (nominally greater than 5,000 litres per day).

The objective of the Guidelines is to ensure that treated wastewater should:

- Reduce microbial pathogens to below the minimum criteria in the *Guidelines for environmental management: use of reclaimed water (EPA Publication 464.1)* and levels consistent with meeting the receiving water objectives in the State Environment Protection Policy (SEPP) (Waters of Victoria);
- Not result in an increase in the discharge toxicity of the wastewater;
- Be reliable and cost effective; and
- Not result in any incremental risks to human health or the environment due to the transport, storage or handling of disinfection chemicals or by-products.

Disinfection of wastewater in Victoria is achieved through either tertiary or secondary treatment. These treatments involve a variety of disinfection methods which include:

- Chemical (for example, chlorination, ozonation);
- Physical (for example, ultraviolet radiation, microfiltration); and
- Biological (for example, detention lagoons).

Selection of the most appropriate disinfection method largely reflects on site-specific issues such as effluent quality, effluent volumes and the management approach (reuse versus discharge to surface waters).

The following performance criteria should be used to determine the most appropriate disinfection method for reused or discharged wastewater:

- Biocidal efficiency (reduction of pathogen groups);
- Practicality;
- Reliability;
- Cost effectiveness;
- Environmental impact; and

- Occupational health and safety risks.

For **wastewater reuse**, best practice disinfection is determined by the nature of the reuse application and potential for human or stock exposure to this water. When reuse involves high-level risks of exposure for humans or livestock, the waste water will require disinfection processes to achieve the treatment levels set in the *Guidelines for environmental management: use of reclaimed water* (EPA Publication 464.1). Suggested best practice disinfection measures for such high quality applications include microfiltration, UV or chlorination. Chlorination, in conjunction with UV, ozonation or microfiltration, is considered best practice where bacterial re-growth is a significant risk due to both the piping of treated wastewater over large distances and its storage for long periods. Uses that involve a low risk of direct exposure will generally not require effluent to undergo a specific disinfection process.

For **wastewater discharged to surface waters**, disinfection is required to achieve the water quality objectives set in the State Environment Protection Policy (SEPP) (Waters of Victoria). This should be achieved by secondary treatment level, however suggested best practice is tertiary treatment level where higher disinfection efficiency is required. Microfiltration is considered the most effective disinfection method, however the costs of implementation can be prohibitive. Therefore, UV disinfection is the suggested best practice when discharging treated wastewater to surface waters.

Responsible agency

The EPA's Guidelines for environmental management are not driven by regulatory compliance, but by the recognition that this approach is synonymous with best practice business management and reduced environmental impact. A combination of the various disinfection methods may be employed, but the overall objective of compliance to SEPP objectives must be met.

Source documents

EPA, 2002, *Disinfection of treated wastewater – guidelines for environmental management*, EPA Publication 730, Environment Protection Authority, Victoria.
[http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/7bd15d7cd88dbc3c4a2566aa00158da0/\\$FILE/730.pdf](http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/7bd15d7cd88dbc3c4a2566aa00158da0/$FILE/730.pdf)

Supporting documentation

Wastewater discharged to surface waters must comply with the SEPP.

Government of Victoria, 2003, State Environment Protection Policy No. S 107 (Waters of Victoria).
<http://www.epa.vic.gov.au/Publications/Legislation/sepps.asp - water>

Wastewater intended for reuse will require disinfection processes to achieve treatment levels set in the EPA, 2002, *Guidelines for environmental management: use of reclaimed water*, EPA Publication 464.1, Environment Protection Authority, Victoria.
[http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/64c2a15969d75e184a2569a00025de63/\\$FILE/464.1.pdf](http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/64c2a15969d75e184a2569a00025de63/$FILE/464.1.pdf)

Other relevant CRPs

- [Guidelines for environmental management – use of reclaimed water](#)

Point source discharges to streams: protocol for in-stream monitoring and assessment

Purpose

To assist industry in assessing attainment of EPA licence conditions or State Environment Protection Policy (SEPP) objectives in the design and implementation of in-stream assessment programs for point source discharges to streams.

Details

Point source discharges to streams: protocol for in-stream monitoring and assessment (the Protocol) provides an approach and method for undertaking monitoring and assessment of the impact of point source discharges on stream ecosystems.

The primary aim of an in-stream monitoring program is to monitor and assess impacts of a discharge on the ecosystem of the receiving stream, which includes the physical, chemical and biological environment.

The protocol considers the major goals that must be met to achieve the primary objective. They are:

- Determining an acceptable number and location of monitoring sites;
- Selection of appropriate monitoring indicators, methods and times;
- Data analysis and interpretation; and
- Report results and conclusions.

Responsible agency

The EPA judges whether the data indicates a detrimental change in environmental quality between the control (upstream not affected by the discharge) and impact sites (downstream of the discharge).

Source documents

EPA, 1988, *Information bulletin: point source discharges to streams: protocol for in-stream monitoring and assessment*, EPA Publication 596, Environment Protection Authority, Victoria.

[http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/419eab44ac27d6e44a2566080007b3e6/\\$FILE/596.pdf](http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/419eab44ac27d6e44a2566080007b3e6/$FILE/596.pdf)

Supporting documentation

Wastewater discharged to surface waters must comply with the SEPP.

Government of Victoria, 2003, State Environment Protection Policy No. S 107 (Waters of Victoria).

<http://www.epa.vic.gov.au/Publications/Legislation/sepps.asp - water>

Rapid monitoring techniques are available from the following EPA protocol,

EPA, 1988, *Rapid bioassessment of victorian streams: the approach and methods of the Environmental Protection Authority*, EPA Publication 604, Environment Protection Authority, Victoria.

[http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/39135f9be5b061fa4a256616007887dc/\\$FILE/604.pdf](http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/39135f9be5b061fa4a256616007887dc/$FILE/604.pdf)

Other relevant CRPs

- [Managing sewage discharges in inland waters](#)

Managing sewage discharges to inland waters

Purpose

To assist water authorities achieve best practice in their management of wastewater and consider issues that need to be addressed when developing wastewater management plans.

Details

The State Environment Protection Policy (SEPP) directs that sewage effluent should be discharged to land in preference to water wherever practicable and environmentally beneficial.

The Managing sewage discharges to inland waters guideline (the Guideline) has been prepared to assist business achieve best practice in managing sewage throughout Victoria, where discharge to land is not practical.

The Guideline contains principles of ecologically sustainable sewage management which fall under the following headings:

- Provision of sewerage systems;
- Effective reticulation systems;
- Trade and domestic inputs;
- Connection to sewer;
- Sewage treatment and disposal;
- Wastewater disinfection and sludge management;
- Operator training; and
- Wastewater management plans.

These principles ensure that sewage treatment protects public health, minimises environmental impacts, maximises reuse opportunities and uses modern, economically viable technology.

The principles are:

- Sewerage needs to be provided to existing developments which are incapable of retaining their wastes on-site;
- New developments must not proceed without the provision of sewerage if on-site containment is not viable;
- Sewerage systems need to be designed and operated to ensure overflows are kept to a minimum (nominally to a less than one in five year rainfall event);
- The minimum level of treatment required in Victoria is secondary level treatment to achieve the traditional standard of:
 - 20 mg/L BOD (biochemical oxygen demand);
 - 30 mg/LSS (suspended solids); and
 - 1000 org/100mL E. coli (bacteria).
- Approval for the discharge of waste to a watercourse shall not normally be given in situations where less than 5:1 dilution is available;
- New treatment plants proposing to discharge to inland waters should, having verified reuse is not practical, incorporate tertiary treatment;

- Existing plants planning on continuing to discharge to waterways should upgrade to tertiary treatment within five years. Such plants should achieve the minimum standards for effluent quality detailed in the Guideline;
- The reuse of effluent must be carefully managed to avoid;
 - Excessive accumulation of toxicants and salt in the soil;
 - Contamination of groundwater or crops;
 - Degradation of soils; and
 - Raising of groundwater tables.
- New sewage treatment should not use chlorine for disinfection unless special circumstances exist and the EPA gives approval. Existing plants should implement dechlorination to reduce the toxicity of chlorine residuals and consider upgrading to an alternative disinfectant.

Responsible agency

The EPA regulates licences and conditions for discharging to inland waters.

Source document

EPA, 1995, *Managing sewage discharges to inland waters*, EPA Publication 473, Environment Protection Authority, Victoria.
[http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/f8cdc5444551e42a4a2565fc0008e287/\\$FILE/473.pdf](http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/f8cdc5444551e42a4a2565fc0008e287/$FILE/473.pdf)

Supporting documents

Facilities for the disposal of wastewater by irrigation should be designed in accordance with,

EPA, 1991, *Guidelines for wastewater irrigation*, EPA Publication 168, Environment Protection Authority, Victoria.

This publication is not available on-line. Copies are available from the EPA, <http://www.epa.vic.gov.au/contact.asp>, cost \$16 including postage.

Wastewater discharged to waterways must be disinfected in accordance with,

EPA, 2002, *Disinfection of treated wastewater – guidelines for environmental management*, EPA Publication 730, Environment Protection Authority, Victoria.

[http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/7bd15d7cd88dbc3c4a2566aa00158da0/\\$FILE/730.pdf](http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/7bd15d7cd88dbc3c4a2566aa00158da0/$FILE/730.pdf)

To assist industry in assessing the attainment of EPA licence conditions the following approach and method for undertaking monitoring and assessments should be undertaken in accordance with:

EPA, 1988, *Information bulletin: point source discharges to streams: protocol for in-stream monitoring and assessment*, EPA Publication 596, Environment Protection Authority, Victoria.

[http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/419eab44ac27d6e44a2566080007b3e6/\\$FILE/596.pdf](http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/419eab44ac27d6e44a2566080007b3e6/$FILE/596.pdf)

The source document should also be read in conjunction with the following water quality guidelines:

- EPA, 1995, *Preliminary nutrient guidelines for Victorian inland streams*, EPA Publication 478, Environment Protection Authority, Victoria.

[http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/01162bfb668027db4a2565fc0008e34e/\\$FILE/478.pdf](http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/01162bfb668027db4a2565fc0008e34e/$FILE/478.pdf)

- Government of Victoria, 2003, State Environment Protection Policy No. S 107 (Waters of Victoria).

<http://www.epa.vic.gov.au/Publications/Legislation/sepps.asp - water>

Other relevant CRPs

- [Disinfection of treated wastewater – guidelines for environmental management](#)
- [Guidelines for wastewater irrigation](#)



- [Point source discharge to streams: protocol for in-stream monitoring and assessment](#)

Freshwater fish farms

Purpose

To ensure that aquaculture activities are managed in a way that minimises their risk to the environment and associated beneficial uses. Nutrients, reduced dissolved oxygen, suspended solids and pH are water quality variables typically impacted on by fish farming activities.

Details

Effluent produced from freshwater fish farms has been identified as a significant source of nutrients. The reduction of nutrient levels in waste waters is a major challenge facing the freshwater fish-farming industry.

Best practice management is to adopt the following waste management hierarchy:

Avoid, Reduce → Resuse, Recycle, Reclamation → Treatment → Dispose

The waste management hierarchy applies to fish farming enterprises and should be the basis of environmental management systems.

By focussing on waste avoidance and through the use of better production processes and practices, pollution control and waste disposal costs can be lowered, profitability increased and environmental impacts reduced.

Major environmental considerations which should be examined in developing and operating a fish farm include:

- Site selection;
- Farm design and management;
- Water abstraction;
- Wastewater discharge;
- Feed management;
- Wastewater treatment and management options; and
- Other impacting processes, including sludge and solid waste management, chemical usage, stock escape, diseases and aesthetic considerations.

General measures that represent best practice include:

- Maintaining sufficient flow in the adjacent water to ensure associated ecosystem values are not adversely impacted;
- Metering the flow from off take and discharge points to ensure water usage complies with license requirements;
- Minimising inlet to outlet distance where practicable
- Limiting encroachment of farm activity close to bankside areas;
- Periodic simultaneous inflow and outflow composite water sampling;
- Auditing feed used and feed quality together with nutrient mass balance to monitor wastewater generated;
- Managing feed, oxygen supply and fish biomass (on site) to maximise production and, minimise water quality impacts;
- Fine tuning feed requirements so as to reduce water generation
- Converting to high energy and extruded feeds which give improved food conversion efficiencies;

- Improving the feed composition to contain low levels of nitrogen and phosphorus;
- Assessing all options for reducing wastes before investigating waste treatment options;
- Identifying and implementing a suitable integrated wastewater treatment system;
- Installing microscreen filtration where practicable so as to reduce remove suspended solids from the waste flow;
- Examining the potential for the treatment of dissolved nutrients (eg. constructed wetlands, irrigation plants);
- Assessing the final outflow water quality and ensuring effluent quality is maintained within acceptable standards;
- Reducing the volume of sludge produced by dewatering and reusing before disposal;
- Investigating options for solid waste re-use, eg. composting and rendering options for carcasses and offal.
- Following the manufacturer's directions and guidelines for storage, use and disposal of chemicals and/or drugs.

The EPA regulates discharges of wastes to the environment, which for fish farms this is achieved through licensing. License conditions control the quality of wastewater discharges, waste management (solid and liquid), monitoring and continuous improvement. More recent licenses contain conditions, which require license holders to develop and submit environment improve plans or environmental management plans. These plans require the licensee to detail a range of actions they will undertake to improve the environmental performance of their farms.

These requirements typically include:

- A site plan;
- Flow recording;
- Feed management;
- Fish processing and waste management;
- Waste minimisation;
- Contingency plans;
- Monitoring program;
- Implementation of best practice;
- Greenhouse gas emissions; and
- Groundwater.

Responsible agency

The *Industrial waste management policy (Waste minimisation) Act 1990*, administered by the EPA requires all new developments, subject to works under the Act, to develop plans for waste minimisation.

Scheduled premises discharging to water are required to hold an EPA discharge licence. Only those farms discharging or depositing waste solely to land are currently exempt from licensing.

The *Fisheries Act 1995* requires an Aquaculture Licence to operate a fish farm in Victoria. Fisheries Victoria, an agency within the Department of Primary Industries, administers the Act.

Source documents

EPA, 2003, DRAFT standard licence for fish farms, Environmental Protection Authority, Victoria.

EPA, 1999, Environmental guidelines for the freshwater salmonid farming industry: best practice management series, 6th DRAFT, Environment Protection Authority, Victoria. (currently under development by the Victorian Department of Primary Industries – research division).



Supporting documentation

Wastewater discharged to surface waters must comply with the SEPP:

Government of Victoria, 2003, State Environment Protection Policy No. S 107 (Waters of Victoria).

<http://www.epa.vic.gov.au/Publications/Legislation/sepps.asp - water>

EPA, 1988, *Information bulletin: point source discharges to streams: protocol for in-stream monitoring and assessment*, EPA Publication 596, Environment Protection Authority, Victoria.

[http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/419eab44ac27d6e44a2566080007b3e6/\\$FILE/596.pdf](http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/419eab44ac27d6e44a2566080007b3e6/$FILE/596.pdf)

Other relevant CRPs

- [Constructed wetlands](#)
- [Guidelines for environmental management: use of reclaimed water](#)
- [Guidelines for wastewater irrigation](#)
- [Point source discharges to streams: protocol for in-stream monitoring and assessment](#)

Dairy cattle feedpad guidelines for the Goulburn Broken Catchment

Purpose

To ensure that feedpads are planned, designed, sized, constructed, maintained and managed to prevent potential adverse impacts on the environmental and especially waterways.

Details

'A feedpad is part of a dairy farm that is utilised for the supplementary feeding of livestock on an area of land that is formed, surfaced or stocked at a rate that precludes vegetation'.

The Dairy cattle feedpad guidelines for the Goulburn Broken Catchment (the Guidelines) provide best practice guidelines for all aspects relating to incorporating a feedpad into a farming operation. This includes regulatory requirements, farm planning, feedpad design, construction, maintenance and management.

Guideline feedpad principles for best management practice in relation to water quality include:

- No excessive amount of nutrients, salts, chemicals, microbial pathogens or oxygen demanding organic matter should leave the farm, contaminate the soil, or air or adversely influence the farm environment;
- No contaminated surface run-off or effluent should leave the farm; and
- No discharge should give rise to material detrimental to any person.

Feedpad considerations explained in the Guidelines, includes:

- Planning/statutory requirements and regulations;
- Buffer distances (based on 'Dairy Cattle Units' or DCU);
- Detailed feedpad plan;
- Siting (topography, soils, groundwater, flooding, waste management); and
- Recommended designs (type of feedpad, sizing and layout, drainage, waste management).

Regulations for the management of effluent that apply to dairy sheds also apply to feedpads. It should be noted that an existing dairy shed effluent storage is unlikely to be able to incorporate the waste generated from a feedpad.

Following minimisation of waste, effluent management in order of best practice, includes:

- 1) Treating wastewater to a suitable standard for reuse or recycling in accordance with *Guidelines for environmental management – use of reclaimed water* (EPA Publication 464.1) for intended use;
- 2) Discharging to local authority sewers under a trade waste agreement (with pre-treatment necessary); and
- 3) Appropriately treating and discharging to land wherever practicable and environmentally beneficial. Wastewater treatment systems should be designed and constructed and wastewater irrigated in accordance with *Guidelines for wastewater irrigation* (EPA Publication 168);

Responsible agency

The EPA only needs to be contacted in cases where a feedpad of greater than 5,000 head is proposed or if another agency refers the application to the EPA.



DPI dairy extension staff should be consulted to help decide on the type of feedpad system to be adopted, where to site the facility, how to size the facility and how to manage the facility and the associated stock.

The Municipal Planning Officer of your local council must be consulted for advice about whether a planning permit is required.

Source document

Dairy cattle feedpad guidelines for the Goulburn Broken Catchment are available on the Goulburn Broken Catchment Management Authority website,

<http://www.gbema.vic.gov.au/publicationsframe.html>

It is envisaged that a Code of Practice will be developed based on these Guidelines at a later date and in the interim the Guidelines will be reviewed regularly.

Supporting documentation

Regulations for the best management practice of feedpad effluent can be found in the following documents:

EPA, 2002, *Guidelines for environmental management: use of reclaimed water*, EPA Publication 464, Environment Protection Authority, Victoria.

[http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/64c2a15969d75e184a2569a00025de63/\\$FILE/464.1.pdf](http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/64c2a15969d75e184a2569a00025de63/$FILE/464.1.pdf)

EPA, 1991, *Guidelines for wastewater irrigation*, EPA Publication 168, Environment Protection Authority, Victoria

This publication is not available on-line. Copies available from the EPA, <http://www.epa.vic.gov.au/contact.asp>, cost \$16 including postage.

Other relevant CRPs

- [Guidelines for environmental management: use of reclaimed water](#)
- [Guidelines for wastewater irrigation](#)
- [Managing sewage discharges in inland waters](#)

Environmental guidelines for the dairy processing industry

Purpose

To help the dairy industry address its environmental obligations more effectively by providing environmental objectives and methods to assess and minimise the actual or likely impacts of the dairy industry and an outline of practices to achieve the desired results.

Details

Best management practice options for dairy effluent are shown below in order of preference:

Avoid, Reduce → Resuse, Recycle → Treatment → Dispose

Under the *Industrial waste management policy (Waste minimisation) 1990*, premises which are subject to works approval require waste management plans incorporating waste minimisation. Each dairy plant should therefore assess opportunities for reducing waste arising from its operations.

Waste reduction measures can be undertaken at the plant, process and personnel stage, and may include:

- Appropriate location of the plant to minimise impact;
- Reducing the use of water (less than 0.5 litres of water per litre of milk represents best practice);
- Reducing the use of chemicals or substitution of chemical salts;
- Recycling water and chemicals;
- Recovery and reuse of product from first resuse;
- Reuse/reprocessing of off-spec material;
- A waste management program;
- Recovering and reusing spilled raw materials and products.

The Guidelines suggest specific best management practice waste minimisation techniques for processing liquid/packaged milk, butter, cheese and associated dried products and evaporation and powder production.

Suggested best practice measures in relation to site selection include:

- Soil assessment (land capability assessment);
- Consideration of current and future proximity of other developments;
- Ensuring there is sufficient land for future waste management facilities;
- Site in accordance with buffer distance recommendations; and
- Site at least 100 m from watercourses.

A waste management plan must be prepared in accordance with the procedures outlined in *Waste minimisation assessment and opportunities for Industry – a practical guide to cleaner production* (EPA Publication 351).

Following minimisation of waste, best practice effluent management includes:

- Treating wastewater to a suitable standard for reuse or recycling in accordance *with Guidelines for environmental*

management: use of reclaimed water (EPA Publication 464.1.);

- Discharge to local authority sewers under a trade waste agreement (with pre-treatment necessary); and
- Appropriate treatment and land discharge wherever practicable and environmentally beneficial.

Design and construct wastewater treatment system and irrigate wastewater in accordance with *Guidelines for wastewater irrigation* (EPA Publication 168) such that loading rates and waste concentrations on irrigated pasture are less than:

- 250 kg N/ha/year for total nitrogen, depending on the vegetation/crop grown;
- Crop uptake rate for phosphorus;
- 1,000 Mg/L for total dissolved solids; and
- 60 mg BOD/L for odour control.

Best practice wastewater treatment measures include:

segregation→screening→equalisation→pH control→fat removal→BOD removal→land irrigation

Responsible agency

The EPA has produced the Guidelines and encourages the industry to adopt cleaner production and waste minimisation principles. The EPA also monitors the application of the various Acts and policies through licensing.

Source document

EPA, 1997, *Environmental guidelines for the dairy processing industry*, EPA Publication 570, Environment Protection Authority, Victoria.

<http://www.epa.vic.gov.au/water/programs/wastewater.asp> - On-site

The EPA Guidelines are reviewed regularly and updated as necessary, on the basis of operating experience and the development of national standards.

Supporting documentation

The Victorian Agnotes series provide additional information in regards to dairy effluent management. The series can be found on the DPI website by following the link,

[http://www.dpi.vic.gov.au/web/root/domino/cm_da/nreninf.nsf/frameset/NRE+Information+Series?OpenDocument&\[/web/root/domino/cm_da/nreninf.nsf/vp/BBB90E3F477D0B74CA256BC700811C92?OpenDocument&Count=1000\]](http://www.dpi.vic.gov.au/web/root/domino/cm_da/nreninf.nsf/frameset/NRE+Information+Series?OpenDocument&[/web/root/domino/cm_da/nreninf.nsf/vp/BBB90E3F477D0B74CA256BC700811C92?OpenDocument&Count=1000])

- DPI, 1999, *Dairy effluent: Minimising dairy shed effluent* AG0433, Department of Primary Industries, Victoria.
- DPI, 1999, *Dairy effluent: Management of dairy shed effluent in Victoria* AG0435, Department of Primary Industries, Victoria.
- DPI, 1999, *Dairy effluent: Sources of information on dairy shed effluent* AG0430, Department of Primary Industries, Victoria.
- DPI, 1999, *Dairy effluent: Choosing an effluent management system* AG0840, Department of Primary Industries, Victoria.

Legislation and other Guidelines that are relevant include:

- Government of Victoria, 2003, State Environment Protection Policy No. S 107 (Waters of Victoria).
<http://www.epa.vic.gov.au/Publications/Legislation/sepps.asp> - water
- EPA, 1991, *Guidelines for wastewater irrigation*, EPA Publication 168. Environment Protection Authority, Victoria.



This publication is not available on-line. Copies available are from the EPA, <http://www.epa.vic.gov.au/contact.asp>, cost \$16.

- EPA, 2002, *Guidelines for environmental management: use of reclaimed water*, EPA Publication 464.1, Environment Protection Authority, Victoria.
[http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/64c2a15969d75e184a2569a00025de63/\\$FILE/464.1.pdf](http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/64c2a15969d75e184a2569a00025de63/$FILE/464.1.pdf)
- EPA, 1993, *Waste minimisation assessment and opportunities for Industry – a practical guide to cleaner production*, EPA Publication 351, Environment Protection Authority, Victoria.
[http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/2f1c2625731746aa4a256ce90001cbb5/20dedd336df9fe47ca256c130022c470/\\$FILE/351.pdf](http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/2f1c2625731746aa4a256ce90001cbb5/20dedd336df9fe47ca256c130022c470/$FILE/351.pdf)

Other relevant CRPs

- [Guidelines for environmental management: use of reclaimed water](#)
- [Guidelines for wastewater irrigation](#)
- [Managing sewage discharges in inland waters](#)
- [Reducing dairy effluent](#)

Environmental guidelines for major construction sites

Purpose

To manage risks to the environment during construction projects, such as roads and freeways.

Details

Environmental guidelines for major construction sites (the Guidelines) is designed to provide developers and contractors with sound practices that can be implemented to minimise environmental impacts and eliminate health risks and nuisance to residents near a construction site.

The Guidelines contain:

- Information on how to avoid and minimise environmental impacts;
- Information on the likely impact of construction activities;
- Steps for undertaking a risk assessment;
- A clear statement of environmental performance objectives; and
- Suggested best practice environmental measures to meet the performance objectives based on available experience, which can be tailored to particular site conditions.

Best practice measures to protect water quality from soil erosion and leaching of contaminants are listed under the following headings:

- Land disturbance;
- Waste minimisation; and
- Contaminated material and wastes.

Some best practice measures in relation to these are to:

- Keep vehicles to well-defined haul roads;
- Keep areas of land cleared to a minimum, and the period of time areas remain cleared to a minimum;
- Minimise the quantity of uncontaminated stormwater entering cleared areas;
- Establish cut-off or intercept drains to redirect stormwater away from cleared areas and slopes and direct it to stable (vegetated) areas or effective treatment installations;
- Install erosion and sediment control measures, if possible, before construction begins;
- Ensure that contingency plans are in place for unusual storm events;
- Establish an adequate inspection, maintenance and cleaning program for sediment run-off control structures;
- Monitor every hour, the turbidity of water pumped directly to a natural waterway or a drainage system discharging to a natural waterway;
- Treat contaminated water pumped into the stormwater system or a natural waterway to remove sediment if the turbidity exceeds 30 NTU;
- De-water by pumping water, wherever practical, on to a vegetated area of sufficient width to remove suspended soil, or to sediment control devices;

- Ensure that the level of suspended solids in waters pumped to natural waterways never exceeds the regulatory water quality standard;
- Locate stockpiles away from drainage lines, at least 10 m away from natural waterways and where they will be least susceptible to wind erosion;
- Stabilise stockpiles and batters that will remain bare for more than 28 days by covering with mulch or anchored fabrics or seeding with sterile grass;
- Ensure that stockpiles and batters are designed with slopes no greater than 2:1 (horizontal:vertical);
- Design crossings so that drainage off the crossing does not contribute to the sediment load in the stream;
- Stabilise banks and in-stream structures so they do not contribute to the sediment load of the stream; and
- Plan in-stream works so that the contact time is minimised and time of stream disturbance is minimised.

Tables are also provided in the Guidelines to assist with determining the correct timing of inspections, monitoring and audits.

Responsible agency

The Guidelines do not refer to State legislation, regulations or environmental policy. Developers, contractors and subcontractors when they are used, must make themselves aware of their legal obligations because they are responsible for compliance with the Guideline.

The SEPP (Waters of Victoria) requires that land disturbance activities be carefully controlled and soil conservation measures undertaken to minimise soil erosion and subsequent run-off of suspended, dissolved, floatable and settleable matter.

Source document

EPA, 1996, *Environmental guidelines for major construction sites*, EPA Publication 480, Environment Protection Authority Victoria.

<http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/11a96b5fc29366764a2565fc0008e284?OpenDocument&Highlight=2,construction>

Supporting documentation

Further information on available erosion and sediment run-off devices can be found from the following publication, EPA, 1991, *Construction techniques for sediment pollution control*, EPA Publication 275, Environment Protection Authority, Victoria.

[http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/2f1c2625731746aa4a256ce90001cbb5/f10374f564ef42e54a2565fc0008e2da/\\$FILE/275.pdf](http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/2f1c2625731746aa4a256ce90001cbb5/f10374f564ef42e54a2565fc0008e2da/$FILE/275.pdf)

Surface water quality must comply with,

Government of Victoria, 2003, State Environment Protection Policy No. S 107 (Waters of Victoria).

<http://www.epa.vic.gov.au/Publications/Legislation/sepps.asp - water>

Other relevant CRPs

- [Construction techniques for sediment pollution control](#)
- [Constructed wetlands](#)
- [Filter strips](#)

Construction techniques for sediment pollution control

Purpose

To ensure that construction works on or adjacent to surface waters are managed to minimise environmental risk posed to the aquatic ecosystem and to protect other beneficial uses.

Details

The quantity of sediment discharged from a construction site can often be minimised by the application of typical best management practices or techniques. These techniques generally aim to reduce flow rate velocities, protect exposed soil from erosion and trap sediment.

Sediment control techniques provided in the Construction techniques for sediment pollution control guideline (the Guideline) include:

- Retaining and creating a buffer of dense vegetation;
- Application of a thick layer of mulch to conserve soil moisture and assist plant growth;
- Stabilising earthworks;
- Management of stockpiles;
- Protection of drains and streams and creation of diversions;
- Construction of water chutes and drop structures;
- Consideration of dams and basins for trapping sediment;
- Installation of sediment and litter traps;
- Stabilisation of roads, tracks, access points and stream crossings; and
- Maintenance and waste disposal.

The Guideline also details practical design and construction principles for each technique. For example, managing stockpiles involves consideration of the location and temporary uses. In addition, topsoils should be stockpiled separately from subsoils, stockpiles should be removed if not stabilised and where possible contain all stockpiles of loose erodible material in storage bins or cover them with tarpaulins or dense vegetation.

Responsible agency

The SEPP (Waters of Victoria) requires that land disturbance activities be carefully controlled and soil conservation measures undertaken to minimise soil erosion and subsequent run-off of suspended, dissolved, floatable and settleable matter.

Source document

EPA, 1991, *Construction techniques for sediment pollution control*, EPA Publication 275, Environment Protection Authority, Victoria.

[http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/2f1c2625731746aa4a256ce90001cbb5/f10374f564ef42e54a2565fc0008e2da/\\$FILE/275.pdf](http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/2f1c2625731746aa4a256ce90001cbb5/f10374f564ef42e54a2565fc0008e2da/$FILE/275.pdf)

Supporting documentation

Further information on available erosion and sediment run-off devices can be found from the following publication, EPA, 1996, *Environmental guidelines for major construction sites*, EPA Publication 480, Environment Protection Authority,



Victoria.

<http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/11a96b5fc29366764a2565fc0008e284?OpenDocument&Highlight=2,construction>

Surface water quality must comply with,

Government of Victoria, 2003, State Environment Protection Policy No. S 107 (Waters of Victoria).

<http://www.epa.vic.gov.au/Publications/Legislation/sepps.asp> – water

Other relevant CRPs

- [Constructed wetlands](#)
- [Environmental guidelines for major construction sites](#)
- [Filter strips](#)
- [Primary stormwater treatment](#)



6. Other Current Recommended Practices

Reducing dairy effluent

Purpose

To minimise dairy effluent produced in the dairy shed, so as to reduce the volume needing treatment and therefore the volume discharged to the environment.

Details

The volume and nature of waste generated by the dairy industry can have a potentially adverse impact on the environment if not managed appropriately.



Best practice management is to avoid and reduce the amount of wastewater generated.

By reducing the amount of effluent requiring storage and treatment, significant savings can be made in terms of storage facilities and pumping and handling costs.

The following practices and design considerations will help to reduce the amount of dairy effluent produced:

- Diverting stormwater run-off into a tank for use in the dairy as stock water or into a stormwater drain;
- Building a footpath at the yard entrance;
- Using a minimal amount of yard water (which will increase the retention time for effluent pond treatment);
- Designing the farm dairy so that cattle flow is maximised;
- Designing race and wintering pads to prevent rainwater from washing down the race and flowing into waterways;
- Diverting water from plate coolers to reuse as washdown water;
- Pre-wetting the yard before milking to speed up the cleaning process and minimise water use;
- Creating a calm environment for the herd (eg. even tempered, reduce excessive or unusual noise) to reduce the amount of effluent generated by the herd;
- Using high flow volume water at low pressure to clean the farm dairy (to reduce washing time and therefore amount);
- Using manual scrapers and squeegees and shovel off manure pats to minimise the amount of washdown water used; and
- Mechanically separate the coarse solids out of the effluent to reduce the volume of liquid effluent that needs to be stored.

Following minimisation of waste, best practice effluent management includes:

- Treating wastewater to a suitable standard for reuse or recycling in accordance *with Guidelines for environmental management: use of reclaimed water* (EPA Publication 464.1.);
- Discharge to local authority sewers under a trade waste agreement (with pre-treatment necessary); and

- Appropriate treatment and land discharge wherever practicable and environmentally beneficial.
Design and construct wastewater treatment system and irrigate wastewater in accordance with *Guidelines for wastewater irrigation* (EPA Publication 168) such that loading rates and waste concentrations on irrigated pasture are less than:
 - 250 kg N/ha/year for total nitrogen, depending on the vegetation/crop grown;
 - Crop uptake rate for phosphorus;
 - 1,000 Mg/L for total dissolved solids; and
 - 60 mg BOD/L for odour control.
 Best practice wastewater treatment measures include:
segregation→screening→equalisation→pH control→fat removal→BOD removal→land irrigation

Responsible agency

Under the *Industrial waste management policy* (waste minimisation) *Act 1990*, EPA ensures that premises which are subject to works approval develop plans for waste minimisation.

Source documents

The Victorian Agnotes series provide information in regards to dairy effluent management. The series can be found on the DPI website by following the link,

[http://www.dpi.vic.gov.au/web/root/domino/cm_da/nreninf.nsf/frameset/NRE+Information+Series?OpenDocument&\[/web/root/domino/cm_da/nreninf.nsf/vp/BBB90E3F477D0B74CA256BC700811C92?OpenDocument&Count=1000\]](http://www.dpi.vic.gov.au/web/root/domino/cm_da/nreninf.nsf/frameset/NRE+Information+Series?OpenDocument&[/web/root/domino/cm_da/nreninf.nsf/vp/BBB90E3F477D0B74CA256BC700811C92?OpenDocument&Count=1000])

- DPI, 2002, *Boosting winter growth with dairy effluent* AG1041, Department of Primary Industries, Victoria,
- DPI, 2002, *Flood irrigation of dairy shed effluent* AG0426, Department of Primary Industries, Victoria.
- DPI, 2002, *Is the farm's effluent system working efficiently?* AG0406, Department of Primary Industries, Victoria.
- DPI, 2002, *Pond construction* AG0425, Department of Primary Industries, Victoria.
- DPI, 2002, *Pond maintenance and desludging* AG0423, Department of Primary Industries, Victoria.
- DPI, 2002, *Struvite management in dairy effluent systems* AG1038, Department of Primary Industries, Victoria.
- DPI, 2000, *Applying dairy effluent to land* AG0432, Department of Primary Industries, Victoria.
- DPI, 2000, *Emergency disposal of milk on farms* AG0428, Department of Primary Industries, Victoria.
- DPI, 2000, *Equipment suppliers and contractors* AG0431, Department of Primary Industries, Victoria.
- DPI, 2000, *Pumps* AG0436, Department of Primary Industries, Victoria.
- DPI, 2000, *Yard floor washing systems* AG0429, Department of Primary Industries, Victoria.
- DPI, 1999, *Application to pastures* AG0419, Department of Primary Industries, Victoria.
- DPI, 1999, *Dairy effluent: Choosing an effluent management system* AG0840, Department of Primary Industries, Victoria.
- DPI, 1999, *Dairy effluent: Management of dairy shed effluent in Victoria* AG0435, Department of Primary Industries, Victoria.
- DPI, 1999, *Dairy effluent: Minimising dairy shed effluent* AG0433, Department of Primary Industries, Victoria.
- DPI, 1999, *Dairy effluent: Sources of information on dairy shed effluent management* AG0430, Department of Primary Industries, Victoria.

- DPI, 1999, *Protecting groundwater* AG0841, Department of Primary Industries, Victoria,
- DPI, 1999, *Pond site selection* AG0424, Department of Primary Industries, Victoria.
- DPI, 1997, *Building and operating a safe system* AG0444, Department of Primary Industries, Victoria.
- DPI, 1995, *Choosing an effluent pondage system* AG0422, Department of Primary Industries, Victoria.
- DPI, 1995, *Pumped sumps* AG0442, Department of Primary Industries, Victoria,
- DPI, 1995, *Storage pond sizing* AG0441, Department of Primary Industries, Victoria.
- DPI, 1995, *Trafficable solids trap* AG0443, Department of Primary Industries, Victoria.

EPA has produced a series of booklets titled 'A Farmer's Viewpoint':

- Series 1: Desludging of effluent ponds;
- Series 2: Management of effluent ponds;
- Series 3: Flood wash systems;
- Series 4: Applying dairy effluent with manure irrigators; and
- Series 5: A successful effluent management system.

These booklets are available from the EPA, <http://www.epa.vic.gov.au/contact.asp>.

Dairying and the Environment Committee, 1995, *Dairying and the Environment Manual*. Chapter 1 Managing Dairy Farm Effluent. New Zealand Dairy Research Institute, New Zealand.

<http://www.drc.co.nz/market/pdf/mfde0.pdf>

Legislation and other Guidelines that are relevant include:

- Government of Victoria, 2003, State Environment Protection Policy No. S 107 (Waters of Victoria).
<http://www.epa.vic.gov.au/Publications/Legislation/sepps.asp - water>
- EPA, 1991, *Guidelines for wastewater irrigation*, EPA Publication 168. Environment Protection Authority, Victoria.
This publication is not available on-line. Copies available are from the EPA, <http://www.epa.vic.gov.au/contact.asp>, cost \$16.
- EPA, 2002, *Guidelines for environmental management: use of reclaimed water*, EPA Publication 464.1, Environment Protection Authority, Victoria.
[http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/64c2a15969d75e184a2569a00025de63/\\$FILE/464.1.pdf](http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/64c2a15969d75e184a2569a00025de63/$FILE/464.1.pdf)
- EPA, 1993, Waste minimisation assessment and opportunities for Industry – a practical guide to cleaner production, EPA Publication 351, Environment Protection Authority, Victoria.
[http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/2f1c2625731746aa4a256ce90001cbb5/20dedd336df9fe47ca256c130022c470/\\$FILE/351.pdf](http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/2f1c2625731746aa4a256ce90001cbb5/20dedd336df9fe47ca256c130022c470/$FILE/351.pdf)

Other relevant CRPs

- [Environmental guidelines for the dairy processing industry](#)
- [Whole farm plans](#)



Farm drainage reuse

Purpose

To maximise water use efficiency and minimise the impact of flow, sediments, nutrients, salt and other pollutants on surface waters.

Details

A well-managed wastewater reuse scheme is the best way to reduce nutrient loss from the farm.

Reuse schemes are relatively small farm storages (typically 3 – 6 ML) which collect surface run-off to augment the farm irrigation allocation. These storages enable irrigation run-off and small summer rainfall events to be collected and reused for irrigation instead of running off the farm and entering local waterways.

Drainage reuse schemes are best designed during the development of a whole farm plan and require compliance with local government planning schemes.

Generally, the size of the reuse is determined by the amount of earth required for channel works etc. which allows construction to be completed at a lower cost. However, a design standard of at least 7.5 mm of run-off/ha of perennial pasture (50% of a 50 mm irrigation) should be adopted as a minimum to ensure the sump size is adequate.

Best management practice is to have the water level as low as possible before the next drainage flow occurs (to maximise collection and reduce loss to regional drainage). This means ensuring the water level in the reuse system is as low as possible at the end of each irrigation event. This emptying minimises the build up of nutrients and reduces the risk of algal blooms.

Efficient operation can also be achieved by:

- Leaving an area unirrigated which is then watered using the run-off in the sump ie. the last part of the irrigation cycle uses collected drainage water;
- Using fresher water (shandy and less than 1000 EC) next watering on any area watered when emptying a sump containing water of more than 1000 EC salinity;
- Maximising the area which can be irrigated with reuse water;
- Having an efficient pumping system which is not labour intensive;
- Ensuring that there is sufficient design capacity to allow free drainage from bays and collection of water from the whole farm to the design standard (ie 7.5 mm/ha);
- Having a location to collect all run-off from areas that receive dairy and other animal effluent, or areas where fertiliser is applied; and
- Considering tree shading to enhance the area, reducing evaporation and possibly the potential for algal blooms.

Responsible agency

Drainage reuse schemes require compliance with local government planning schemes.

Source document

GBCMA, unknown, *Managing nutrients on irrigated dairy farms*, Best Management Practices Booklet series, Goulburn Broken Catchment Management Authority, Victoria.



The booklet is available from the Goulburn Broken Catchment Management Authority and DSE/DPI offices. It contains other Best Management Practices for managing nutrients on irrigated dairy farms.

Other relevant CRPs

- [Guidelines for environmental management – use of reclaimed water](#)
- [Guidelines for wastewater irrigation](#)
- [Lasergrading](#)
- [Whole farm plans](#)

Drainage diversion

Purpose

To remove nutrients in drain flow during rainfall induced high flows and low flows when on farm efficient water use practices are being adopted.

Details

Drainage water used from irrigation drains can provide a ready source of extra irrigation water, as well as reducing nutrient loads to waterways.



Drainage diversion licences (worked out on the basis of area irrigated) are provided through the relevant water supply authority (eg. Goulburn-Murray Water) and are allocated according to anticipated drain flows.

Where diversion occurs, Goulburn-Murray Water provides an agreed pump site and the licensed diverter provides the pumping unit and delivery system. An annual fee is usually levied according to licensed volume (usually this fee is a fixed % of the gravity flow charge).

Use of drainage water is opportunistic with little formal security as there is no guarantee of volume or quality.

Management procedures to assist in the effective use of drainage water have been developed by Goulburn-Murray Water.

Always be aware of salinity levels of drainage water to avoid salt build up on the property and damage to pastures. Water applied to pastures should be less than 1000 EC if possible (depending on the soil types).

Responsible agency

A drainage diversion licence is required to implement an irrigation supply. Licences are available from Goulburn-Murray Water.

Source document

GBCMA, unknown, *Managing nutrients on irrigated dairy farms*, Best Management Practices Booklet series, Goulburn Broken Catchment Management Authority, Victoria.

The booklet is available from the Goulburn Broken Catchment Management Authority and DSE/DPI offices. It contains other Best Management Practices for managing nutrients on irrigated dairy farms.

Other relevant CRPs

- [Whole farm plans](#)

Nutrient pollution of drainage water

Purpose

To manage fertiliser applications effectively to reduce the amount of run-off containing nutrients.

Details

Fertiliser is added to pasture or cropland to supplement what is already available in the soil. It allows crops and pastures to reach their potential growth through good use of water in an average rainfall year.

Efficient fertiliser use reduces the amount and cost of fertiliser applied. Most importantly it minimises the risk of nutrient pollution of drainage water, which can enter surface waterbodies.

Efficient fertiliser use can be achieved in the following ways:

- **Match supply to demand.**

With increased fertiliser application rates, the risk of nutrient losses in run-off also increases. Improving the efficiency of fertiliser uptake by plants requires consideration of the plant's needs (eg. the form of fertiliser plants most readily use and time when plants most need it). To determine what elements and rates are needed, soil and plant testing (leaf for orchards and forestry), observation of plant vigour and understanding the stage of fruit growth are required. Custom blended fertilisers mixed in the proportions recommended by the soil test analysis should be ordered in preference to using only standard blended products.

- **Leave a buffer zone when fertilising.**

A buffer zone will trap nutrients and prevent them being lost to run-off. Experiments conducted by the Institute for Sustainable Irrigated Agriculture, Tatura, suggest that regardless of bay length, a buffer of 20 m will halve the concentration of phosphorus in the surface run-off after fertilising. During furrow irrigation, leaching occurs in the saturated zone directly beneath the furrow. If no fertiliser is placed in this zone then the risk of leaching nutrients can be reduced.

- **Delay irrigation after fertilising.**

Where fertigation is not available, fertilisers should be applied between irrigations. Leaving a lag time for irrigating after fertilising, allows the phosphorus to fix to soil particles, which means there is less available to be dissolved in irrigation water.

- **Prevent run-off for two irrigations after fertilising.**

It has been found that the first two irrigations after fertiliser application account for half to three quarters of annual phosphorus losses.

- **Re-use run-off.**

Every attempt should be made to retain water and nutrients on the farm. Properly designed and managed re-use systems ensure that water and nutrients do not leave the farm.

- **Optimise the whole system's performance.**

Maximum returns from fertiliser will only be achieved if aspects such as water, grazing and pasture are managed correctly. Whole farm planning is important for ensuring that the physical aspects of the farm are designed to achieve maximum potential.

- Avoid applying fertiliser prior to predicted high rainfall events.
 - Avoid direct contamination of waterways, especially with aerial application.
 - Apply fertiliser close to plants.
- Banding or dropping and incorporating fertiliser close to the plants using an accurately calibrated fertilising or planting implement are the best practices for pre-plant fertiliser application on most soils except light sands.

It is also particularly important that nitrogen is managed to avoid excess vegetative growth at the expense of fruit production or fruit quality.

Source documents

The following Victorian Agnotes series can be found on the DPI webiste,

- DPI, 2003, *The use of fertiliser in farm forestry*, AG0788. Department of Primary Industries, Victoria.
[http://www.dpi.vic.gov.au/web/root/domino/cm_da/dpincor.nsf/frameset/DPI+Corporate?OpenDocument&\[http://www.dpi.vic.gov.au/search.html\]](http://www.dpi.vic.gov.au/web/root/domino/cm_da/dpincor.nsf/frameset/DPI+Corporate?OpenDocument&[http://www.dpi.vic.gov.au/search.html])
- DPI, 1995, *Efficient fertiliser application in orchards*, AG0240. Department of Primary Industries, Victoria.
http://www.nre.vic.gov.au/web/root/domino/cm_da/nreninf.nsf/frameset/NRE+Information+Series?OpenDocument

NRE, unknown, *Optimising fertiliser and water use on irrigated pastures*. Natural Resources and Environment and Pivot Agriculture, Victoria.

This booklet is available from the GBCMA and DSE/DPI offices.

NRE, 1999, *Fertiliser management for pears in the Goulburn-Murray valleys – promoting pear fertiliser best management practices*, Natural Resources and Environment, Victoria.

This booklet will assist in the management of fertiliser for pears and includes procedures for collecting representative leaf samples and an example of a leaf analysis report. It is available from the GBCMA and DSE/DPI offices.

DRNE, 2002, *Improving environmental management – a guide to better soil, water and nutrient management practices for the Victorian strawberry industry*, Department of Natural Resources and Environment, Victoria.

This booklet is available from the GBCMA and DPI /DSE offices

For further information contact the Nutrient Extension Officer, Kyabram (03) 5852 0500 or fertiliser retailers/suppliers.

Other relevant CRPs

- [Farm drainage reuse](#)
- [Guidelines for environmental management: use of reclaimed water](#)
- [Improving environmental management – a guide to better soil, water and nutrient management practices for the Victorian strawberry industry.](#)
- [Lasergrading](#)
- [Storage and handling of farm chemicals](#)
- [Whole farm plans](#)



Dryland drainage schemes

Purpose

To minimise the amount of sediment, salt and nutrient discharges from dryland areas to receiving areas during dryland drainage works.

Details

Drainage works are undertaken to reduce sub-surface waterlogging, prevent or reduce surface water flow onto an area, and increase the speed and efficiency of surface water removal from an area.

Drainage works can have a number of impacts on the environment. The most significant impacts are changes to water tables, flows and soil disturbance.

In order to reduce these impacts in dryland areas, it is best practice to explore options to treat drainage at the source before undertaking any drain construction. Options include on-farm management practices such as controlled grazing on hills, contour ploughing and buffer strips.

Despite undertaking on farm management best practices, it is recognised that drainage may be required in special circumstances to remedy existing drainage and saline problem areas. In these circumstances, the fundamental drainage principles regarded as best practice are as follows:

- Drainage is to remain in natural catchments and sub-catchments to prevent cross catchment transfer of surface drainage;
- Point of drainage outfall over a property boundary is to remain unchanged ;
- Change in the flow rate and volume over a property boundary should not be unreasonable;
- Discharge of saline groundwater should not be unreasonable; and
- Storage areas are to be preserved.

Water quality impacts need to be carefully assessed to minimise mobilisation of sediment, nutrient and saline discharge.

The following are best practice water quality management drainage principles for dryland drainage works:

- Design to accommodate drainage reuse (both on farm and from the drain) and nutrient stripping (eg. constructed wetlands and grassed swaled depressions) to reduce their impact on the water quality;
- All large drains outfalling to streams and waterways should incorporate on-line or offline wetlands or storage, which act to trap nutrients and weed stock and to deposit sediment; and
- Apart from designing outfalls to reduce capacity, drainage outfalls should be designed to reduce velocities of flow entering the riparian zone of receiving waters and minimise the risk of erosion.

Technical water quality standards for dryland drainage controls that should form part of rural drainage design include:

- Provide revegetated minimum wide buffer strips (1.5 times the top width of the constructed drain channel or at least 5 metres from the constructed drain bank);
- Revegetate within the proposed drain itself;
- Incorporate constructed wetlands where possible into proposed drainage schemes to reduce the export of nutrients and sediment to downstream wetlands and receiving waterways; and



- Maintain the natural wetting/drying cycle of existing wetlands effected by the proposed rural drainage works.

Responsible agency

Those wishing to undertake dryland drainage works must lodge a planning application with local council for a permit to undertake the works. Other authorities, such as DSE and GBCMA will respond to council with approval of application (with conditions if necessary). A permit is not required if the works are part of a whole farm plan.

Source document

SMEC, 2002, *Best practice principles and standards for drainage in dryland catchments*, Report for the Goulburn Broken Catchment Management Authority, Victoria.
<http://www.gbcma.vic.gov.au/publicationsframe.html>

Supporting documentation

SKM, 1999, *Community surface drainage schemes – guidelines for design*, Sinclair Knight Merz, Tatura.
 Chapter 7 of this document outlines comprehensive assessment and protection procedures for undertaking dryland drainage works. This is to be adopted as best practice for regional dryland drainage schemes.

SKM, 2001, *Goulburn-Murray Water – design guidelines for surface water management schemes*, Sinclair Knight Merz, Tatura.

SKM, 2003, *Goulburn-Murray Water – draft design guidelines for primary surface water management schemes*, Sinclair Knight Merz, Tatura.

These manuals cover all major aspects of drain design including, outfall to watercourses, consideration of environmental features and environmental design specifications and are available from the GBCMA.

Other relevant CRPs

- [Construction techniques for sediment pollution control](#)
- [Constructed wetlands](#)
- [Filter strips](#)
- [Stabilising soil erosion](#)
- [Whole farm plans](#)

Urban drain design – water sensitive urban design

Purpose

To protect urban waterway quality and increase the value of the urban landscape by adopting a range of water sensitive urban design (WSUD) techniques.

Details

The Victorian stormwater guidelines, Chapter 5, provide techniques available to local government and other agencies in order to decrease the proportion of sealed areas (eg. concrete) and integrate natural flow paths into the landscape.

A high proportion of sealed areas greatly reduces the amount of water infiltrating the soil, leading to increased flood volumes, which can cause a significant increase in the amount of pollutants carried into our urban waterways.

By adopting a range of these WSUD techniques, a more natural stormwater system can be maintained.

Some suggested WSUD techniques are provided under the following activities:

- *Site planning.*

There are three key areas where developers can incorporate planning principles: site analysis, land capability assessment, and land-use plans.

- *Residential design tools (local public open space networks, housing layout, road layout, streetscape layout).*

Some suggested techniques include integrating filtration/retention basins in public open space, incorporating buffer zones besides creeks and retaining existing remnant vegetation during housing layout as well as reducing impervious surfaces by decreasing the width and length of low flow traffic roads.

- *Commercial and industrial design tools (parking area storage, on-site detention for large sites).*

Some suggested techniques include constructing infrequently used parking areas with porous pavement and constructing wetland systems or landscaped depressions to reduce peak discharges and impacts on the downstream receiving environment from large industrial sites which tend to have extensive impervious surfaces.

- *Site construction management practices.*

Reducing erosion during construction can be achieved by using a combination of improved construction practices, structural and vegetation measures and soil stabilisation techniques. Further information can be found within the Urban source controls CRP.

Responsible agency

Local government will use these WSUD techniques to plan for new development and assess development applications, which have the potential to affect stormwater quality or quantity.

Source document

Victorian Stormwater Committee, 1999, *Urban stormwater: best practice environmental management guidelines*. CSIRO Publishing, Australia.

Supporting documentation

EPA, 1991, *Construction techniques for sediment pollution control*, EPA Publication 275, Environment Protection Authority, Victoria.



[http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/2f1c2625731746aa4a256ce90001cbb5/f10374f564ef42e54a2565fc0008e2da/\\$FILE/275.pdf](http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/2f1c2625731746aa4a256ce90001cbb5/f10374f564ef42e54a2565fc0008e2da/$FILE/275.pdf)

EPA, 1996, *Environmental guidelines for major construction sites*, EPA Publication 480, Environment Protection Authority, Victoria.

<http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/11a96b5fc29366764a2565fc0008e284?OpenDocument&Highlight=2,construction>

Other relevant CRPs

- [Construction techniques for sediment pollution control](#)
- [Constructed wetlands](#)
- [Filter strips](#)
- [Primary stormwater treatment](#)
- [Secondary stormwater treatment](#)
- [Stabilising soil erosion](#)
- [Urban source controls](#)



Urban source controls

Purpose

To protect waterway quality by preventing sediment and wastewater pollutants reaching the stormwater system.

Details

Dealing with pollution at the source is the most effective means of protecting stormwater quality.

The Victorian stormwater guidelines (the Guidelines), Chapter 6, suggest best practice measures available to local government and other agencies to help prevent stormwater pollution at the source, resulting from municipal operations, household, business and construction activities in urban areas. The suggested measures fall under the following two activities:

Maintenance

- Building;
- Drain;
- Unsealed roads;
- Pavement repair;
- Material storage;
- Plant and equipment;
- Unloading and loading areas; and
- Graffiti removal.

Construction (land development stage, building stage)

- Site management plans;
- Erosion control;
- Sediment collection;
- Site water control;
- Equipment storage and maintenance;
- Materials storage;
- Wash down practices; and
- Building activity.

Some suggested best practice measures include:

- Avoidance of grading when road surfaces are extremely dry so as to reduce erosion and siltation;
- Material such as packing sand, gravel, crushed rock and excavated material should be stockpiled away from any drainage flow path and covered to prevent erosion;
- Road materials that easily bind together and minimise contamination of run-off with fine particles should be used;
- Wash-down water and other materials resulting from graffiti removal should not enter the stormwater system; and
- Wash-down areas for plant and equipment with appropriate run-off treatment.

The Guidelines also describe methods for developing effective education and awareness programs for stormwater pollution, including a number of education tools and examples of successful programs.

Responsible agency

Local government will use these techniques to prevent effects on stormwater quality or quantity.

Source documents

Victorian stormwater committee, 1999, *Urban stormwater: best practice environmental management guidelines*, CSIRO Publishing, Australia.

Supporting documentation



The following EPA Guidelines are relevant for sediment control:

- EPA, 1995, Environmental guidelines for major construction sites, EPA Publication 480, Environment Protection Authority, Victoria.
[http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/11a96b5fc29366764a2565fc0008e284/\\$FILE/480.pdf](http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/11a96b5fc29366764a2565fc0008e284/$FILE/480.pdf)
- EPA, 1991, Construction techniques for sediment pollution control, EPA Publication 275, Environment Protection Authority, Victoria.
[http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/f10374f564ef42e54a2565fc0008e2da/\\$FILE/275.pdf](http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/f10374f564ef42e54a2565fc0008e2da/$FILE/275.pdf)

Stormwater Management Plans have been produced for the City of Greater Shepparton, Moira Shire, Benalla Rural City, Mansfield Shire, Mitchell Shire and Campaspe Shire. No Plan has been produced for the Strathbogie Shire and a plan is currently being prepared for the Murrindindi Shire.

Stormwater management plans can be obtained from the Catchment Stormwater Officer – Brad Montgomery (03) 5832 0720 or directly through each of the above Councils.

A stormwater Self-Management System has been introduced to all councils across the catchment, and has been implemented by the City of Greater Shepparton. It targets both construction and maintenance activities with an auditing process, which identifies activities not adhering to a Best Management Practice.

Other relevant CRPs

- [Construction techniques for sediment pollution control](#)
- [Drain design – water sensitive urban drain design](#)
- [Environmental guidelines for major construction sites](#)
- [Filter strips](#)
- [Primary stormwater treatment](#)
- [Secondary stormwater treatment](#)

Primary stormwater treatment

Purpose

To trap and separate gross pollutants from incoming stormwater that is delivered to waterways via screening and sedimentation processes.

Details

The following are primary stormwater treatments that trap pollution after the source.

Gross pollutant traps

Gross pollutant traps (GPTs) are a sediment trap with a trash rack, usually constructed of vertical steel bars, located at the downstream end of the trap. GPTs are primarily designed to remove litter, debris and coarse sediments. They have high construction costs and are difficult and expensive to clean.

Return flow litter baskets

Return flow litter baskets operate by using the force of 'return flow' water leaving the collection basket to create a 'hydraulically driven barrier' that diverts incoming water into the collection basket. The device is intended to be installed in existing pipe systems, with minimal disturbance to the flow capacity or established flow patterns. A limitation with this device is that it is a potentially large structure requiring substantial area for installation.

Hydraulically operated trash racks

Hydraulically operated trash racks use a hydraulically driven sluice gate to filter stormwater through a series of vertical screens before flowing under a fixed brick baffle wall, then over a weir. Intensive maintenance of this measure is required to ensure the filter screens are clean.

Sediment settling basins and ponds

Sediment settling basins are usually pond (earth) or tank (concrete) structures designed to trap coarse sediment. They are different from wetlands, in that they primarily rely on physical settling rather than biological means of pollutant removal. The advantage of settling basins and ponds is that the design is simple, which makes construction easy. Accumulated sediments need to be removed regularly to prevent scouring during storms and maintain storage volume.

Circular settling tanks

Circular settling tanks are primarily designed for sediment and oil retention, although floatables and other gross pollutants may be retained during low to moderate flows. The advantages of settling tanks is that they retain a high proportion of sediments, also collect oil and grease and can be retrofitted into existing drainage systems. The limitations are that there are high initial costs and gross pollutants may block inlet downpipes.

Hydrodynamic separators

Hydrodynamic separation units induce a vortex in the stormwater flow as it enters a large separation chamber. The system relies on the secondary flows, caused by the vortex action to concentrate sediments at the bottom of the chamber. The advantage of hydrodynamic separators is that they have high sediment removal rates and can incorporate return flows to sewers to minimise cleaning. The limitations are that they are expensive, complex to install and removal rates fall with increasing stormwater flow.

Circular screens

Circular screens separate incoming stormwater from gross pollutants, which are contained in a separation chamber. The advantages of circular screens are that they have high gross pollutants removal rates and minimal maintenance and visual



impact. The limitations are that they are expensive to install and require substantial area and depth for installation.

For each of these devices, the following criteria need to be considered to determine their effectiveness:

- Catchment flow characteristics;
- Expected pollutant loads;
- Maintenance access; and
- Location of device.

Responsible agency

Local government will use these Guidelines to plan and design new drainage infrastructure and help identify opportunities to upgrade existing infrastructure to improve environmental performance.

Source document

Victorian Stormwater Committee, 1999, *Urban stormwater: best practice environmental management guidelines*, CSIRO Publishing, Australia.

Other relevant CRPs

- [Secondary stormwater treatment](#)
- [Urban source controls](#)

Secondary stormwater treatment

Purpose

To trap and separate pollutants from incoming stormwater that is delivered to waterways via sedimentation and filtration processes.

Details

The following are secondary stormwater treatments that trap pollution after the source.

Filter strips

Filter strips are grassed or vegetated areas that treat shallow overland flow before it enters the drainage network. They initially immobilise pollutants, by binding them to organic matter and soil particles. Often located adjacent to waterways, they remove sediment and nutrients. The advantages of filter strips are that they retain these pollutants close to the source and are relatively inexpensive to construct. The limitations are that there is limited removal of fine sediment and dissolved pollutants.

Grass swales

Swales are grass-lined channels often used in low density residential housing developments as an alternative to kerbs or gutters, or as a pre-treatment to other measures. Pollutant removal is achieved in much the same way as filter strips, although grass swales convey greater flow and may therefore achieve lower removal rates. The advantages of grass swales is that they are relatively inexpensive to construct and retain particles close to the source. The limitations are that swales require a larger area than kerbs and gutters and are only suitable for gentle slopes.

Triple interceptor pits

Triple interceptors generally comprise three underground retention chambers designed to remove coarse sediments and retain oils. The advantages of interceptor pits is that they can effectively treat stormwater from areas where petroleum products are stored or handled, can be retrofitted into existing drainage systems and also trap litter. The limitations are that they can pose a potential safety hazard for maintenance personnel and they require cleaning to achieve design objectives.

Porous pavements

Porous pavements are suitable for areas with light traffic loads such as car parks. They allow some run-off to infiltrate through the pavement's surface to the underlying soil, rather than complete run-off as occurs with non-porous areas. Removal of particulate and some dissolved pollutants is achieved by filtration and adsorption on to soil particles. The advantages of porous pavements is that they retain pollutants close to the source and can be more aesthetically pleasant than conventional drainage channels. The limitations are that that can only support light traffic loads and there is a possible risk of groundwater contamination.

Infiltration trenches

An infiltration trench is a shallow, excavated trench filled with gravel or rock, into which run-off drains. Stormwater exfiltrates from the trench into the surrounding soil, while particulates and some dissolved pollutants are retained in the trench. The trench is lined with a layer of geotextile fabric, to prevent soil migration into the rock or gravel fill. The top surface of the fill is also covered with a layer of fine fibre fabric, then finished with a layer of topsoil. The advantages of infiltration trenches are that they reduce peak run-off rates and volumes and recharge groundwater. The limitations are that infiltration trenches cannot be located on steep slopes, loose or unstable areas and pollutants and sediment may clog



the gravel and infiltration surface.

Infiltration basins

Infiltration basins are open excavated basins designed to retain storm flow and remove sediment and some dissolved soluble pollutants. They rely on suitable soil conditions for effective operation and are intended to overflow during large storms. If properly designed and maintained, infiltration basins reduce downstream run-off volumes and velocities. The limitations are that they cannot be located on steep slopes, loose or unstable areas and large land areas may be required for installation.

Extended duration basins

Extended duration basins store run-off for periods of one to two days, then drain between storm events, thereby reducing pollutants through sedimentation. There are many different basin designs; all incorporate a water retention barrier or embankment and a water outlet structure. The advantages of extended duration basins is that they are appropriate in areas where conditions are not suitable for constructed wetlands. Limitations include that outlet structures are prone to flooding and that efficiency can be reduced for events smaller than the design event.

Sand filters

Sand filters comprise a bed of sand or other media through which run-off is passed. The filtered run-off is then collected by an underdrain system. The filters are provided with an upstream pre-treatment system to remove coarse sediment and ensure even inflow and distribution across the filter. The advantages of sand filters is that they can be retrofitted into existing systems. The limitations of sand filters is that they are not suitable for disturbed catchments or catchments with high sediment yields.

Responsible agency

Local government will use these Guidelines to plan and design new drainage infrastructure and help identify opportunities to upgrade existing infrastructure to improve environmental performance.

Source document

Victorian Stormwater Committee, 1999, *Urban Stormwater: best practice environmental management guidelines*. CSIRO Publishing, Australia.

Other relevant CRPs

- [Constructed wetlands](#)
- [Filter strips](#)
- [Primary stormwater treatment](#)
- [Urban source controls](#)

Dam desilting

Purpose

To ensure desilting activities are managed to minimise the re-suspension and transport of sediments or other pollutants that pose a risk to the aquatic environment and beneficial users.

Details

Sediment enters storages predominantly from natural processes within the catchment area and if not removed has the potential to reduce the operational volume of storages and create significant wear on dam infrastructure.

Most dam operators have operational requirements to remove accumulated sediment from their storages. These desilting activities can impact on water quality through the release of contaminants and increase in suspended solids concentrations and turbidity that may impact on light-requiring species and their habitat.

Desilting activities need to be managed to minimise the re-suspension of sediments and transport of other sediments. Best management practices that have been implemented to reduce impacts include:

- Desilting during high flow events to dilute the suspended solids and turbidity concentrations in downstream waterways;
- Monitoring the impacts of desilting activities on the flora and fauna of downstream water systems;
- Real time monitoring of turbidity as a measure of suspended solids and possibly nutrient concentration on site;
- Check dams to be retained and cleared of silt prior to each desilting activity;
- Establishing target limits from desilting activities on downstream water quality in conjunction with the EPA;
- Reducing flow from the dams, by closing scour valves, when high turbidity is detected; and
- Desilting annually, rather than every 2 to 3 years, thus decreasing the volume of silt released during each desilting event.

Responsible agency

The SEPP (Waters of Victoria) requires that dredging and desilting activities need to use effective management practices. The EPA will ensure that the State Environment Protection Policy water quality targets are met downstream of desilting dams.

Supporting documentation

EPA, 2001, Best practice environmental management: guidelines for dredging, EPA Publication 691, Environment Protection Authority, Victoria.

[http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/2f1c2625731746aa4a256ce90001cbb5/a1344bea8e671bb5ca256af40076b884/\\$FILE/691.pdf](http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/2f1c2625731746aa4a256ce90001cbb5/a1344bea8e671bb5ca256af40076b884/$FILE/691.pdf)

Government of Victoria, 2003, State Environment Protection Policy No. S107 (Waters of Victoria)

<http://epanote2.epa.vic.gov.au/EPA/Publications.nsf/d85500a0d7f5f07b4a2565d1002268f3/0f1632a4b454c840ca256d41000cc1f3?OpenDocument>

Filter strips

Purpose

To trap and therefore reduce the amount of sediment and nutrients delivered to waterways and drains via run-off.

Details

Filter, or buffer strips, are land areas of either planted or remnant vegetation, situated between a potential, pollutant-source area and a surface-water body or drain that receives run-off.

The purpose of a filter strip is to trap sediment, nutrients, organic matter and chemicals in run-off from agricultural land or urban areas as it passes through the vegetated area.

Filter strips remove sediment and nutrients from run-off before it reaches the stream in two ways:

- Infiltration: water with dissolved nutrients and sediment infiltrates the soil in the filter strip; and
- Deposition: sediment with attached nutrients is deposited in the filter strip.

Plant nutrients and pesticides that become trapped in a filter strip may be degraded or transformed by biological and chemical processes, into other compounds that may be used by the vegetation growing in the filter strip.

The effectiveness of a filter strip depends on a number of factors which need to be considered:

- Source of sediment and nutrients (identify all areas of diffuse overland flow);
- Location of vegetation (consideration of terrain, soil, vegetation type, land use and stream order);
- Width of filter strip (should reflect intensity of source, topography etc.);
- Vegetation species (eg. dense grass will provide a more effective buffer on steeper riparian land); and
- Stock management (to avoid damage to the soil and degradation of vegetation).

Experiments conducted by the Institute of Sustainable Irrigated Agriculture, Tatura suggest that, regardless of bay length, a buffer of 10 m will halve the concentration of phosphorus in the surface run-off after fertilising.

Source documents

Prosser, I and Karssies, L 2001, *Riparian land management technical guideline updates. No. 1 – Designing filter strips to trap sediment and attached nutrient*.

Lovett, S and Price, P (eds), 1999, *Riparian land management and technical guidelines, Volume one: principles of sound management*, LWRRDC, Canberra. (Chapter 5).

Price, P and Lovett, S (eds), 1999, *Riparian land management and technical guidelines, Volume two: on-ground management tools and techniques*, LWRRDC, Canberra. (Section D).

Victorian Stormwater Committee, 1999, *Urban stormwater : best practice environmental management guidelines*. CSIRO Publishing, Australia.

Supporting documentation

A number of fact sheets that cover river and riparian management issues and guidelines can be found on the Land and Water Resources Research and Development Corporation (LWRRDC) website, <http://www.rivers.gov.au/publicat/factsheets.htm>,



and includes:

- Legislation most relevant to riparian vegetation management,
http://www.rivers.gov.au/acrobat/techguidelines/tech_guide_vol1b_chap03.pdf
- Prosser, I and Karssies, L, 2001, Riparian Land Management Technical Guideline Updates. No. 1 – Designing filter strips to trap sediment and attached nutrient.
<http://www.rivers.gov.au/acrobat/techupdate1.pdf>

Fact sheets and guidelines produced by the LWRRDC are reviewed periodically and are dependent upon projects worked and funded upon.

Other relevant CRPs

- [Improving environmental management – a better guide to soil, water and nutrient management practices for the Victorian strawberry industry](#)
- [Secondary stormwater treatment](#)
- [Stabilising soil erosion](#)
- [Stock management](#)

Constructed wetlands

Purpose

To contribute to water quality improvement by utilising the processes and functions found in natural wetlands.

Details

Broadly, wetlands are marshes, swamps, mangroves, billabongs, or wet heathlands that form a shallow waterbody (up to 2m depth) when inundated for various lengths of time. The duration of inundation determines the type and productivity of the water, soil, plant and animal communities.

Constructed wetlands are *"purpose built structures, utilising the predominantly natural materials of soil, water and biota, which perform the desired physical, chemical and biological processes and functions of natural wetlands to achieve desired objectives"*.

They have been utilised to treat agricultural wastes, urban stormwater, industrial processes as well as providing habitat, recreational and visual amenity.

Constructed wetlands provide several functional components which contribute to water quality improvement, such as:

- Microbial breakdown (microbes extract soluble carbon and nutrients, potentially reducing BOD and coliform levels);
- Plant uptake (plants take up dissolved nutrients and other pollutants from water for growth);
- Retention (of nutrients via plant uptake); and
- Settling and adsorption (adsorbed nutrients and other pollutants settle to the bottom).

When constructing a wetland the following need to be considered:

- Determination of wetland purpose and function;
- Planning of layout;
- Sizing of components;
- Design;
- Legislative framework (planning);
- Planning and supervision of construction; and
- Planning and supervision of the wetland operation and maintenance.



The design, construction and maintenance of constructed wetlands requires a wide range of expertise. Wetland designers need to be familiar with the physical, chemical and biological processes and ecological interactions. They need to have knowledge of engineering techniques, an understanding of the hydrology, an understanding of soils in relation to wetland processes and knowledge of wetland planting procedures etc.

Responsible agency

Various planning prescriptions and environmental Acts will require referral upon wetland construction. These are dependent upon the wetland type, its function and impact upon the surrounding environment.



Source documents

The Constructed wetlands manual provides comprehensive technical information about the planning, design, construction and operation of constructed wetlands for a range of applications.

DLWC, 1998, *The constructed wetlands manual* Volume 1. Department of Land and Water Conservation. New South Wales.

DLWC, 1998, *The constructed wetlands manual* Volume 2. Department of Land and Water Conservation. New South Wales.

The constructed wetlands manual is NSW based and therefore has information, such as planning prescriptions, which are irrelevant to Victorian legislation.

Supporting documentation

The Department of Infrastructure, Planning and Natural Resources web site (previously DLWC) contains information on the importance, processes and management of wetlands. However, some of this information is specific to NSW,

<http://www.dsnr.nsw.gov.au/index1.html>

The Wetlands Policy of the Commonwealth Government of Australia, January 1997 can be found at the following link,

http://www.ramsar.org/wurc_policy_australia.htm

Other relevant CRPs

- [Secondary stormwater treatment](#)

Whole farm plans

Purpose

To ensure farm development recognises, protects and fits in with environmental assets.

Details

A Whole Farm Plan (WFP) should be viewed as a blue print for future farm development which gives the basis to integrate practices that provide the most effective economic and environmental means of production for a property whilst recognising and protecting essential environmental assets located on land.

Whole farm planning involves four steps:

- 1) Setting goals;
- 2) Making an inventory and assessment of farm resources;
- 3) Developing and implementing an action plan; and
- 4) Monitoring on-farm progress towards goals.

The first step in developing a WFP typically begins with developing goals and a long term vision for the future of your farm and how your farm enterprise will provide the income and living environment you need.

The second step in developing a WFP involves making an inventory of and assessing your resources, including natural resources, human resources, financial and capital assets, and crops and livestock systems. Depending on the farming practice this will include obtaining an aerial photo or topographic survey and marking on it such features as buildings, property boundaries, existing fences, ridges and crests, rivers and creeks, drainage lines, saline areas and remnant and non-remnant vegetation.

The third step in the process is to identify and evaluate management alternatives, and to develop and implement an action plan. The number and type of alternatives identified and evaluated is up to you. However, the broader the range of alternatives you consider, the more likely you are to find options that meet your overall vision and address the human, financial, and environmental resource goals you laid out in Step 1.

The final step after developing an action plan that is compatible with the goals set by you and your family is to monitor progress toward these goals. As the Whole Farm Plan is implemented, try to evaluate how the plan is working, and make minor corrections and refinements as time goes by. Keep records and check your progress toward the goals you set, so you can see how your plan is working. If the work you're doing isn't helping reach your goals, or if something just isn't working out the way you expected, it's time to revisit the plan.

The owner/operator in conjunction with WFP consultants generally complete WFPs. It is important that the plan is the thoughts and ambitions of the owner and not the consulting person as it will be up to the landholder to implement.

The cost of a WFP is related to the size of the property and the amount of specialist design work involved.

Responsible agency

'Earthwork Planning Controls' in the City of Greater Shepparton, Campaspe and Moira Shires require landowners to apply for a Planning Permit before undertaking prescribed works. This is unless the works are consistent with a WFP, which has



been certified by the municipality.

DSE run a WFP Incentive Scheme where a percentage of the cost of the WFP can be covered by salinity plans up to a maximum level (this varies between regions).

Properties within the Shepparton Irrigation Region (SIR) are eligible for reimbursement of up to 50% of plan costs (with upper limits for each part). The GBCMA Whole Farm Plan Co-Ordinator must be contacted prior to starting the plan development.

Source documents

Garrett, B (ed), 1993, *Whole farm planning: principles and options*. Department of Agriculture Agmedia and Department of Conservation and Natural Resources, Victoria.

GBCMA, unknown, *Managing nutrients in permanent plantings of irrigated fruit crops and vineyards*. Best Management Practices Booklet. Goulburn Broken Catchment Management Authority, Victoria.

This booklet is available from the Goulburn Broken Catchment Management Authority and DSE/DPI offices.

Supporting documentation

Harris, R and Ridley, A, 2000, How to minimise nitrogen and phosphorus losses from temperate dryland grazing and cropping farms – nutrient management guidelines, Department of Natural Resources and Environment, 2000.

This booklet provides an indicative cost for the development of a WFP.

Assistance can be obtained from DSE, Goulburn-Murray Water advisory officers, Irrigation Survey and Design Group members (ISDG), farm consultants and those farmers that have completed a WFP.

Other relevant CRPs

- [Drainage diversion](#)
- [Farm drainage reuse](#)
- [Guidelines for environmental management: use of reclaimed water](#)
- [Lasergrading](#)

Lasergrading

Purpose

To maximise efficient water use through improved irrigation and drainage which subsequently reduces nutrient loss from the farm.

Details

Lasergrading is used to obtain more uniform slopes (and recommended steeper slopes when combined with landforming) to irrigation bays. This provides the basis for more efficient water use during the irrigation season, whilst providing for improved surface drainage all year.

The ability to reduce nutrient loss from the farm via more efficient control of irrigation and drainage is an important benefit from lasergrading, which must be captured by installing a reuse system.

Lasergrading should be implemented as part of a whole farm approach and is a specialised activity best managed through a qualified earthmoving contractor. Quotes for the works should be obtained from the contractor prior to the work.

Responsible agency

Lasergrading can increase and/or alter run-off patterns therefore many local municipalities require plans to be submitted for permit under their planning schemes.

Source document

GBCMA, unknown, *Managing nutrients on irrigated dairy farms*, Best Management Practices Booklet, Goulburn Broken Catchment Management Authority.

This booklet is available from the Goulburn Broken Catchment Management Authority and DSE/DPI offices.

Additional information

Additional information can be sought from irrigation designers, DPI /DSE and Goulburn-Murray Water advisory offices.

Farm consultants and earthworks contractors will also be able to provide costings.

The Rural Finance Corporation offers reduced interest for development projects including lasergrading via the Rural Adjustment Scheme and 'Water Management' loans to eligible irrigators.

Other relevant CRPs

- [Farm drainage reuse](#)
- [Guidelines for environmental management: use of reclaimed water](#)
- [Guidelines for wastewater irrigation](#)
- [Whole farm plans](#)

Riparian land management

Purpose

To ensure riparian lands are protected from threatening processes.

Details

Intensive or inappropriate landuse of riparian lands can have impacts at both the farm and catchment level. These impacts can reduce productivity on adjacent lands and degrade water quality and aquatic ecosystems.

Improved management of the riparian zone will assist in protecting these values and enhancing their condition.

Benefits of well managed riparian land include:

- Helping to stabilise waterways;
- Maintaining water quality;
- Provision of shade and shelter;
- Reduction of insect pests;
- Increased land values; and
- Productive ecosystems.



There are a number of activities that can be undertaken to protect and enhance the condition of the riparian zone. These include:

- Managing stock;

Fencing provides the ability to control stock in the riparian zone and reduce the impact of grazing on stream functions and values. There are a number of factors to consider when constructing a fence. These include the type of fence and installation to suit the flood regime and land use. On-going checks should be conducted with regular maintenance of the stock crossing and fence areas.

Minimum standards each type of fence (conventional – plain wire, hingejoint/ringlock, electric and drop or lay-down) are set by the GBCMA.

- Revegetation;

Vegetation helps to reduce the rate of streambank erosion, by reinforcing the soil and providing some resistance to bank scouring. There are a number of factors to consider when revegetating. These include:

- Planting methods (natural regeneration, direct seedling, tree planting);
- Species selection; and
- Site preparation (eg. planning for weed control).

The species chosen should be indigenous to the area being planted and preferably grown from locally collected seed. The surrounding remnant vegetation is often a good guide, however, many understorey species are often missing. The Revegetation Guide for the Goulburn Broken Catchment is a good source of information.



■ Stock watering;

Restricting stock access to the riparian zone reduces the impact of grazing, increase in soil erosion and direct input of wastes. Alternative water for stock can be achieved by pumping/gravitating from waterway/bore/dam to – troughs or properly constructed/controlled access points to the waterway.

When stock obtain water from troughs, the position of the trough is an important consideration. The trough position:

- Should not be in the corners as fewer and deeper tracks are formed causing increased runoff and erosion;
- Should be at least 50 m from a waterway;
- Can be through a fence to service separate paddocks;
- Should avoid depressions and slopes; and
- Should be in shade.

When the use of the stream is the only option for watering it is important to restrict stock to a controlled access point. A controlled access point usually consists of a fenced area protruding into a stream. Electric fencing has to be used and might only consist of one or two wires or tape so that the impact of flooding is reduced. When choosing an access point, the following should be kept in mind:

- The site should be flat;
- The site should be located on the inside of bend, where water movement is slower;
- The access point should be angled in a downstream direction, so that stock enter the stream in the direction of water flow;
- The surface of the access point should be hardened with gravel; and
- The site should not be well shaded, to minimise problems associated with stock loafing around the watering point.

Responsible agency

The Waterway Grant Scheme encourages community support and seeks to provide a financial stimulus and opportunity for landholders to change land practices, through direct work on the ground.

Grants available include fencing, revegetation and off-stream watering points where stock have been watering from the stream.

For further information regarding grants for the protection of riparian zones, contact the GBCMA or Department of Sustainability office.

The GBCMA also provide landholders with support to undertake revegetation programs, which assist in protecting riparian zones. Generally, the riparian activities are organised according to what is agreed on between the landholder and an inspecting officer of the authority.

Support is available to develop an alternative water supply where access to previous water points is denied as a result of riparian management (fencing) project.

Source documents

Lovett, S and Price, P (eds) 1999, *Riparian land management and technical guidelines, Volume One: Principles of sound management*, LWRRDC, Canberra.

Price, P and Lovett, S (eds) 1999, *Riparian land management and technical guidelines, Volume Two: On-ground management tools and techniques*, LWRRDC, Canberra.

A number of fact sheets that cover river and riparian management issues and guidelines can be found on the LWRRDC



website, <http://www.rivers.gov.au/publicat/factsheets.htm>.

Fact sheets and guidelines produced by the LWRRDC are reviewed periodically and are dependent upon projects worked and funded upon.

A publication assisting revegetation in the Catchment is available from the GBCMA,

Earl, G; Stelling, F; Titcumb, M; Berwick, S (eds), unknown, *Revegetation Guide for the Goulburn Broken Catchment*.

Department of Natural Resources and Environment, Victoria.

Supporting documentation

The LWRRDC has also produced:

- Technical guidelines and manuals about the science underpinning recommended best practice

<http://www.rivers.gov.au/publicat/guidelines.htm>

- Legislation most relevant to riparian vegetation management

http://www.rivers.gov.au/acrobat/techguidelines/tech_guide_vol1b_chap03.pdf

Other relevant CRPs

- [Filter strips](#)
- [Stabilising soil erosion](#)
- [Stock management](#)
- [Whole farm plans](#)
- [Stock management](#)

Stock management

Purpose

To manage stock in such a way as to avoid degradation of riparian land and minimise nutrient run-off.

Details

Stock congregate along waterways and drainage lines as these areas provide water, shade and protection from wind.

The animals' most obvious impact on riparian land and waterways is the:

- Input of wastes which can directly foul the water; and
- Increase in soil erosion by overgrazing and trampling hooves.



These impacts can be managed by totally excluding stock from waterways and drainage lines, and controlling the timing of the area grazed by stock.

Good farm planning is essential with regard to stock management and needs to consider the following:

- Stock yard placement.

Stock yards and other areas where stock are likely to congregate (eg. water points) are best placed well away from waterways and drainage lines.

- Stock crossings.

When planning stock movement around the farm, the best points for waterway crossings and the need for fencing to force stock to use those crossings needs consideration. Whether a bridge is required or only stabilisation of the streambed, will depend on the size and condition of the stream.

- Stock watering.

Alternate forms of watering for stock such as nose pumps and solar powered pumps should be considered. When use of the stream is the only option for watering it is important to restrict stock to designated watering points to minimise disturbance. When choosing an access point, the following in mind should be kept in mind:

- The site should be flat;
- The site should be located on the inside of a bend, where water movement is slower;
- The access point should be angled in a downstream direction, so that stock enter the stream in the direction of water flow;
- The surface of the access point should be hardened with gravel; and
- The site should not be well shaded, to minimise problems associated with stock loafing around the watering point.

- Timing, frequency and intensity of grazing.

If riparian land is to be grazed, it should be grazed only when the bulk of the vegetation is dormant and when the soil moisture levels are low. Grazing of riparian land in the growing and flowering season, which generally means spring and summer, and when germination is occurring should be avoided. If it is necessary to graze riparian land both the stocking rates and the frequency of use should be adjusted to suit the sensitive nature of the land.

The simplest way of regulating animal access and grazing pressure along waterways is to erect a fence between the riparian zone and the rest of the property. There are a number of factors to consider when constructing a fence. These include the type of fence and installation to suit the flood regime and land use. On-going checks should be conducted with regular maintenance of the stock crossing and fence areas.

Where the siting of stock access points is less than optimal, some remedial work such as a wetland or silt trap below the access point should be considered.

Responsible agency

The GBCMA will be able to help with the finance of fencing to exclude stock from waterways.

Source documents

Lovett, S and Price, P (eds) 1999, *Riparian land management and technical guidelines, Volume One: Principles of sound management*, LWRRDC, Canberra.

Price, P and Lovett, S (eds) 1999, *Riparian land management and technical guidelines, Volume Two: On-ground management tools and techniques*, LWRRDC, Canberra.

A number of fact sheets that cover river and riparian management issues and guidelines can be found on the LWRRDC website, <http://www.rivers.gov.au/publicat/factsheets.htm>.

In particular there is a fact sheet for the management of stock, <http://www.rivers.gov.au/manage/is6stock.htm>

Fact sheets and guidelines produced by the LWRRDC are reviewed periodically and are dependent upon projects worked and funded upon.

Supporting documentation

The LWRRDC has also produced:

- Technical guidelines and manuals about the science underpinning recommended best practice

<http://www.rivers.gov.au/publicat/guidelines.htm>

- Legislation most relevant to riparian vegetation management

http://www.rivers.gov.au/acrobat/techguidelines/tech_guide_vol1b_chap03.pdf

Other relevant CRPs

- [Constructed wetlands](#)
- [Filter strips](#)
- [Stabilising soil erosion](#)
- [Whole farm plans](#)

Stabilising soil erosion

Purpose

To help reduce the risk of bank collapse and sediment entering waterways.

Details

Soil erosion is the result of some form of soil disturbance or poor soil structure that allows top soil to be either washed or blown away.



Erosion occurs in many forms (eg. gully, tunnel and sheet) and is usually a result of the removal of native vegetation, planting of shallow rooted annuals and/or grazing stock.

Control of erosion must take into account the underlying causes, which in the Goulburn Catchment, is generally the direct action of water on the soil and the speed with which water moves.

In order to stabilise soil erosion each farm will need to assess its own land capability and possible solutions.

The following are techniques for what to consider. They generally aim to slow down the flow of water across the surface and trap as much of the sediment that does get dislodged before it reaches the streams and rivers.

- **Revegetation.**

Vegetation helps to protect streambanks by reinforcing the soil and improving drainage. There are a number of factors to consider when revegetating to prevent erosion. These include planting methods, species selection and position of plants. If resources are limited, it is best to target areas where vegetation has most chance of becoming successfully established.

- Keeping intensive stock activity (eg. around water troughs, yards) away from erodable soils.
- Removing stock if a paddock reaches over 30% bare ground.
- Designing and maintaining rural roads and farm tracks so that flow is not channelled into an eroding stream.
- Land class fencing.

Where soils have different properties, which are hard to manage as a single unit, building fences to make sure the different classes of land can be managed in their own way.

- Keep a vegetated filter strip between cropped areas and watercourses.

Responsible agency

Advice in regards to revegetation in the area can be sought from the GBCMA.

Source documents

Lovett, S and Price, P (eds) 1999, *Riparian land management and technical guidelines, Volume One: Principles of sound management*, LWRRDC, Canberra.



Price, P and Lovett, S (eds) 1999, *Riparian land management and technical guidelines, Volume Two: On-ground management tools and techniques*, LWRRDC, Canberra.

A number of fact sheets that cover river and riparian management issues and guidelines can be found on the LWRRDC website, <http://www.rivers.gov.au/publicat/factsheets.htm>

In particular there is a fact sheet for streambank stability, <http://www.rivers.gov.au/manage/is2stable.htm>

Fact sheets and guidelines produced by the LWRRDC are reviewed periodically and are dependent upon projects worked and funded upon.

A publication assisting revegetation in the Catchment is available from the GBCMA,

Earl, G; Stelling, F; Titcumb, M; Berwick, S (eds), unknown, *Revegetation Guide for the Goulburn Broken Catchment*.
Department of Natural Resources and Environment, Victoria.

Supporting documentation

The LWRRDC has also produced,

- Technical guidelines and manuals about the science underpinning recommended best practice
<http://www.rivers.gov.au/publicat/guidelines.htm>
- Legislation most relevant to riparian vegetation management
http://www.rivers.gov.au/acrobat/techguidelines/tech_guide_vollb_chap03.pdf

Keywords

- [Constructed wetlands](#)
- [Filter strips](#)
- [Stock management](#)
- [Whole farm plans](#)



Unsealed roads

Purpose

To design, construct and maintain unsealed roads to minimise erosion and ensure water is not directly channelled into waterways.

Details

The compacted and exposed nature of unsealed roads makes them vulnerable to erosion.

The following practices and design considerations will help to minimise erosion and ensure water is not directly channelled into waterways:

- Unsealed roads should be built on the most stable and hardest ground avoiding areas that will require cut and fill, drainage lines and wet and boggy ground. Ideally they should be located on ridge tops or on areas with little slope and be wide enough to accommodate both vehicles and table drains;
- Unsealed roads should be gently crowned or sloped to shed water and minimise the time and distance water travels down them. They should also be supported by trackside or table drains to carry road run-off;
- On roads that run down or diagonally across a slope, run-offs or low earthen diversion banks can be constructed which direct run-off from the road. On steep grades, place earthen banks 20 to 30 cm apart and build them on an angle across to the road to avoid water ponding, or concentrating and eroding trackside drains;
- Discharge diversion banks or run-offs into non-erodable table drains or vegetated areas, away from dams and watercourses;
- Where possible, establish grass on low use tracks. Hard wearing grasses suitable for tracks include turf type ryegrasses and fescues. On high use roads, crushed rock or surface gravel should be used, even if only in difficult sections;
- Restrict major traffic to designated hardwearing roads, particularly in wet weather;
- Wheel ruts concentrate water flow and start erosion. Wheel tracks should be changed to prevent ruts forming. If ruts do form, prevent erosion by using a shovel to build mini blocks within the rut;
- If planting trees next to roads, be mindful of shade. Winter shading of laneways reduces the drying action of sun and wind;
- Like cut off drains, table drains should be wide with a flat floor and batter slopes no steeper than 3 (horizontal): 1 (vertical);
- Table drains should be made stable with the use of grass species such as fescue that can tolerate periods of waterlogging;
- Table drains should discharge into stable grassed areas or sediment traps before entering waterways;
- Culverts must be large enough to handle peak flows. They should be spaced at an interval that will prevent water building up to levels that will generate erosion;
- Culverts should discharge into dense vegetated areas or sediment traps, well away from waterways, to reduce the velocity of run-off, encourage filtration and trap sediment;
- Road construction and maintenance should be conducted when soils are moist – not too wet (boggy) or dry (when soils



are not compact). Traffic should be introduced only after a sufficient time for compacting and settling; and

- Road maintenance should focus on keeping the crown or slope drains effective, avoiding v-shaped or u-shaped clearing of table drains and damage to discharge areas. Indicators for maintenance include eroding batters or track surface, wheel ruts, boggy patches, and blocked culverts.

Responsible agency

Road managers, including municipal councils and VicRoads, need to maintain, and where relevant, manage roads and infrastructure.

Advice in regards to revegetating table drains in the area can be sought from the GBCMA.

Resource Documents

DNRE, 2002, *Improving environmental management: a guide to better soil, water and nutrient management practices for the Victorian strawberry industry*, Department of Natural Resources and Environment, Victoria.

ARRB, Transport Research Ltd, 2000, *Unsealed roads manual: guidelines to good practice*.

Supporting documentation

A publication assisting revegetation in the Catchment is available from the GBCMA,

Earl, G; Stelling, F; Titcumb, M; Berwick, S (eds), unknown, *Revegetation Guide for the Goulburn Broken Catchment*.

Department of Natural Resources and Environment, Victoria.

Other relevant CRPs

- [Filter strips](#)
- [Stabilising soil erosion](#)

Cropping management

Purpose

To prevent soil loss and minimise surface run-off in cropping systems.

Details

Keeping soils on cropping paddocks, capturing nutrients within the root zone and minimising surface run-off are the major factors that determine nutrient losses in any cropping system.

Current recommended practices for cropping management include:

- Retaining stubble to improve the soil structure and therefore protect surface soils from wind and water erosion. Farmers who are reluctant to adopt stubble retention on a whole farm basis, should retain stubbles on light sandy soils and sandhills prone to erosion as a priority;
- Spreading stubble evenly across the paddocks to protect all the soil where rain falls and aid in organic matter breakdown;
- Buffering pathways of water run-off from the paddock through the use of filter strips;
- Carrying out soil testing prior to cropping to objectively determine the fertility status of any paddock and tailor a fertiliser program to correct deficiencies;
- Cultivating followed by sowing as an alternative strategy, although it does not encourage the same degree of organic matter accumulation as under stubble retention systems; and
- Planting deep rooted plants such as lucerne in the rotation.

These practices are recommended for implementation within the context of a whole farm plan.

Source document

NRE, 2000, Harris, R and Ridley, A. (eds) *How to minimise nitrogen and phosphorus losses from Temperate Dryland Grazing and Cropping Farms – Nutrient management guidelines*. A report prepared by Agriculture Victoria for the Murray-Darling Basin Commission.

This booklet is available from the GBCMA and DPI/DSE offices.

Other relevant CRPs

- [Whole farm plans](#)
- [Filter strips](#)

Perennial vegetation management

Purpose

To prevent soil loss and minimise surface run-off when farming perennial species.

Details

Perennial species such as trees, shrubs and pasture species increase water use and subsequently nutrient uptake. The amount of perennial vegetation required to minimise nutrient loss is dependent on rainfall, soil, enterprise type and slope. As a rule the deeper the root system of perennials, the greater the water and nutrient using capacity. Species are grouped from deepest to shallowest rooting depth as follows:

Trees > lucerne > phalaris > cocksfoot/perennial ryegrass > annual species

Current recommended practices for perennial vegetation management include:

- Planting perennials on the lower areas of a farm where water and nutrient accumulate;
- Combating subsurface flow that may re-emerge on duplex soils by using trees as a soak to intercept water and nutrients;
- Reducing deep drainage losses in areas of moderate rainfall (450 – 500 mm/year) by establishing deep rooted perennial pastures;
- Using lucerne in traditional cropping areas and phalaris where rainfall exceeds 450 mm/year;
- Growing deep-rooted perennials such as lucerne for a minimum of three years before commencing a cropping phase;
- Following perennials with short pulses of cropping (three to four years) to reduce water and nutrient loss; and
- Aim to have at least 30% of the farm under perennial species – preferably with a mix of trees and perennial pasture where rainfall exceeds 600 mm/year. In high rainfall areas over 600 mm/year, perennial pastures alone are unlikely to completely stop drainage and nitrate leaching.

These practices are recommended for implementation within the context of a whole farm plan.

Source documents

NRE, 2000, (eds) Harris, R and Ridley, A. *How to minimise nitrogen and phosphorus losses from Temperate Dryland Grazing and Cropping Farms – Nutrient management guidelines*. A report prepared by Agriculture Victoria for the Murray-Darling Basin Commission.

This booklet is available from the GBCMA and DPI /DSE offices.

Other relevant CRPs

- [Whole farm plans](#)



Improving environmental management: a guide to better soil, water and nutrient management practices for the Victorian strawberry industry

Purpose

To prevent soil and nutrient loss from strawberry farms.

Details

This booklet focuses on the fundamental principles of preventing soil and nutrient loss on strawberry farms by:

- Maximising the uptake of nutrients by the crops they are applied to;
- Maximising infiltration of water where it falls;
- Maximising soil cover;
- Reducing the amount of 'external' run-off through an area under production; and
- Safely removing surface water in the event of run-off.

These principles can be achieved through:

- Whole farm planning.
Whole farm plan options that minimise soil and nutrient loss and water run-off from strawberry farms include shorter row lengths, cut-off drains and grass buffers.
- Understanding soil structure and its protection.
Good soil structure is vital for maximising soil water intake, plant growth and minimising soil erosion. If the soil is covered with vegetation or mulch, water droplets hitting the soil do not become dispersed.
- Appropriate cultivation practices.
Frequent cultivation practices,, faster ground speed of tractors and implements and concentration of tractor and implement weight all contribute to soil structure damage by breaking up aggregates and breaking down soil stabilising organic matter. Working on soil that is too wet or too dry accentuates the problem.
Cultivations should be:
 - Reduced to the minimum essential number;
 - Delayed until just prior to the preparation of the beds;
 - Undertaken when moisture content makes the soil feel friable – not wet and slippery when the soil sticks or dry and hard so that it powders; and
 - Worked to move the soil up hill, to avoid build-up at the bottom of the slopes.
- Growing green crops (eg. oats and ryecorn) between strawberry crops.
Green crops produce organic matter that produce gums and resins which assist in binding soil particles together to form aggregates and pore spaces. This increases the water and nutrient holding capacity of the soil. Green crops should be slashed to minimise seeding, encourage density and avoid weed problems.



- Fertiliser and irrigation management;
Base fertiliser decisions on soil test, leaf analysis and plant sap test results that take account of soil type and varietal differences. Leaf analysis and plant sap testing should be conducted throughout the critical flowering to fruiting period. Drip irrigation is the preferred irrigation method as it applies water close to the root zone and if managed well, results in zero run-off and seepage.
- Drainage management;
Buffer strips situated above and below strawberry paddocks reduce the speed and filter sediment from run-off water flowing down rows;
- Design, maintenance and construction of unsealed roads; and
- Managing dams and stream frontages.
Vegetation consisting of dense perennial grasses or native shrubs and trees stabilises soil and slows down run-off thereby reducing erosion.

Source document

DRNE, 2002, Improving environmental management – a guide to better soil, water and nutrient management practices for the Victorian strawberry industry, Department of Natural Resources and Environment, Victoria.

This booklet is available from the GBCMA and DPI /DSE offices.

Other relevant CRPs

- [Filter strips](#)
- [Nutrient pollution of drainage water](#)
- [Stabilising soil erosion](#)
- [Whole farm plans](#)

Storage and handling of farm chemicals

Purpose

To avoid farm chemicals polluting and contaminating land and waterways.

Details

Improper use of chemicals may result in the accidental pollution of land and waterways.

Responsible storage and handling of chemicals will help prevent such concerns to the environment and can be achieved by:

- Mixing chemicals as the label recommends, in a well ventilated, well lit and hazard-free environment;
- Taking care when transporting chemical products to avoid spills and other accidents - it is preferable to have products delivered;
- Only buying the amount of chemical needed;
- Storing the chemical/s in a secure, well ventilated and dry area out of direct sunlight. The area should have bunding to contain chemical spills; and
- Properly disposing of empty farm containers.

It is a requirement under the *Agricultural and Veterinary Chemicals (Control of Use) Act 1992* that users of some specific agricultural chemicals have an Agricultural Chemical Users Permit or work under direct supervision of someone who has a permit. Completion of an approved training course is a prerequisite to obtaining a permit.

Responsible agency

Users of specific chemicals under the *Agricultural and Veterinary Chemicals (Control of Use) Act 1992* should apply to DPI for a permit.

Source documents

The following Victorian Agnotes series can be found on the DPI website,

- DPI, 2002, *Responsible use and handling of farm chemicals*, AG0520, Department of Primary Industries, Victoria, [http://www.nre.vic.gov.au/web/root/domino/cm_da/nrecinf.nsf/c119e3f042f5596aca256bca001f8bd5/6018a0b2ea1f5831ca256bcf000bbee2/\\$FILE/Ag0520.pdf](http://www.nre.vic.gov.au/web/root/domino/cm_da/nrecinf.nsf/c119e3f042f5596aca256bca001f8bd5/6018a0b2ea1f5831ca256bcf000bbee2/$FILE/Ag0520.pdf)
- Legislative controls over fertiliser, agricultural, chemical and veterinary use in Victoria. http://www.nre.vic.gov.au/web/root/domino/cm_da/nreninf.nsf/frameset/NRE+Information+Series?OpenDocument
This document is currently being reviewed.

Additional information

Further information on this topic can be obtained from the Chemical Information Service (03) 9210 9379

Other relevant CRPs

- [Nutrient pollution of drainage water](#)