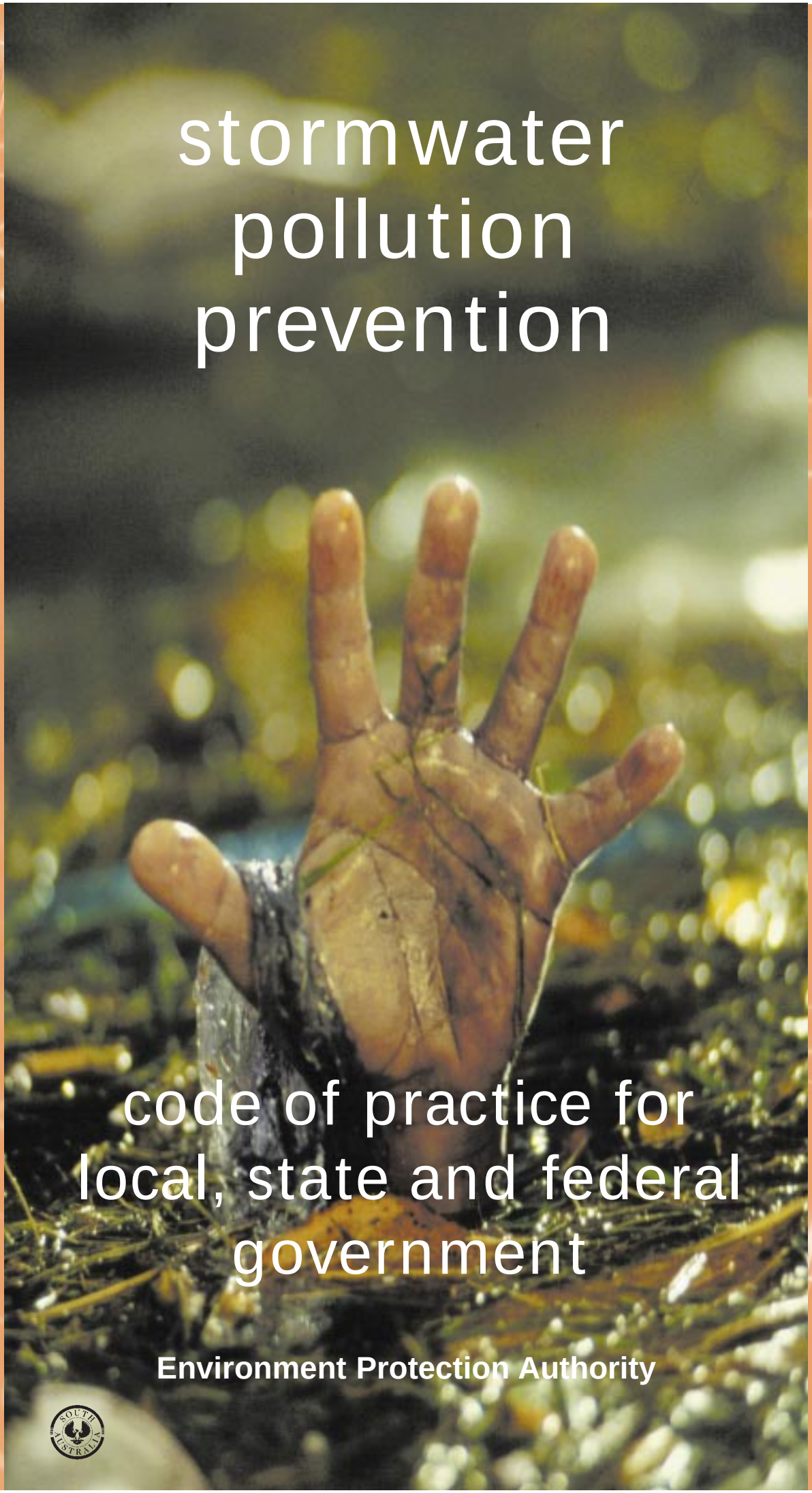

stormwater pollution prevention

code of practice for local, state and federal government

Environment Protection Authority

JULY 1998

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FOREWORD

Diffuse pollution and waste sources make a major contribution to pollution loads in stormwater. Past legislation has concentrated on point sources of pollution such as specific industry exhaust stacks and discharge pipes, and has led to significant improvements in the management of hazardous wastes, wastewaters and air emissions throughout Australia. Point source improvements are still needed but present and future programmes must also target the diffuse sources.

Stormwater carries to our waterways and oceans this pollution which, in urban areas, comes from a multitude of small and diffuse pollution sources. Litter is usually the most visible pollutant but sediments, oil and grease, excess nutrients (eg phosphorus and nitrogen), organic matter, residual pesticides and fertilisers all add up to an impact on the environment. These contaminants result in fish kills in lakes and estuaries, unsafe swimming conditions, the accumulation of toxins in aquatic animals in the food chain or unsightly waterways that degrade our parks and recreation areas.

A variety of strategies can now prevent and, as a last resort, manage pollution inputs into waterways. The approach to environment protection now tends to be integrated, rather than just 'command and control' regulation, and relies on a much broader suite of tools including flexible legislation, non-mandatory instruments and facilitative programmes.

The environmental regulators in many developed countries commonly encourage self-regulation through Codes of Practice and guidelines for environmental management.

This Local, State and Federal Government code is one in a series of codes for stormwater pollution management in South Australia. Other codes in the series are:

- general community
- building and construction industry
- general industry, retail and commercial premises.

Some aspects of these stormwater Codes of Practice are envisaged to become mandatory when they are linked to an Environment Protection Policy under the *Environment Protection Act 1993*.

The primary role of these codes is to help industry achieve the 'general environmental duty' under the *the Act*. The Environment Protection Authority aims to facilitate cooperation and collaboration with the general community, industry and public authorities to achieve its environmental goals through the development, acceptance and implementation of Codes of Practice.

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GLOSSARY

Batter Toe Drains	Open channels or swales constructed laterally at the base of a slope to direct runoff away from exposed areas.
Catch Drains	Open channels or swales constructed laterally above an exposed cutting to divert runoff into side diversion drains.
Catchment	Area of land that contributes stormwater runoff to a site including under extremely heavy rainfall.
Disturbed Area	That part of a development site that has been disturbed by cut and fill operations to produce an erodible surface.
Diversion Drains	Open channels or swales constructed to divert stormwater runoff around exposed areas.
Filter Fabric	Tightly woven geotextile fabric used to retain sediments yet allow water to pass through.
Filter Strip	Strip of permanent dense vegetation to retard sheet flow and cause deposition of silt.
Gabions	Wire cages filled with rocks.
Hydrolysis	Decomposition of a substance due to chemical action of water.
Interstitial Water	Water in between sediment particles.
Level Spreaders	Banks and mounds constructed laterally across a slope to convert a concentrated runoff flow into a slower moving shallow widespread flow.
Non-Point Source Pollution	Pollution from a variety of sources spread over a wide area that arrives at a waterbody or drainage system by less direct methods than for point sources.
Off Line	Structures not built along main drainage lines, but rather off to one side, thus avoiding the need to treat all of the flow.
On Line	Structures placed within main drainage lines, intercepting all of the flows.
Photolysis	Decomposition of a substance by the chemical action of light.
Point Source Pollution	Pollution entering a waterbody or drainage system directly from a single discharge point.
Sheet Flow	Runoff flowing in a thin layer across the surface

1 GENERAL

1.1 Introduction

This general Code of Practice for the control of stormwater pollution at its source for Local, State and Federal Government agencies provides agencies and their contractors with information on the strategies and techniques available to reduce the incidence of stormwater pollution at its source. For the purposes of this code, stormwater refers to both surface runoff and groundwater infiltration. Not all components of this code apply to all agencies because of the diverse activities conducted by Local, State and Federal agencies.

The Code of Practice was prepared jointly by the Environment Protection Authority (EPA) and representatives from various Local, State and Federal Government agencies.

This code covers a range of potential pollution sources from a variety of activities and practices. The code addresses issues related to construction activities subject to approval by Local Government or Government agencies, mainly construction and building works that follow the granting of development approval. This construction phase is extremely important for the control of site erosion.

The code does not contain design details or practices for large scale structural measures such as sedimentation basins or wetlands, which require careful design by qualified and experienced engineers and freshwater ecologists. The bibliography contains references to a number of manuals that can assist in these design processes.

This code will eventually be linked to an Environmental Protection (Water Quality) Policy (water quality EPP) under the *Environment Protection Act 1993* (the Act). During public consultation on this policy, appropriate enforcement arrangements and penalties will be determined.

The primary role of this code is to inform government agencies of their 'general environmental duty' with respect to stormwater under the Act. Use the code as a guide with techniques to enable the council or agency to adhere to the general environmental duty through 'standards of care'. If a council or agency has alternative techniques that meet the general environmental duty, then these will be deemed acceptable. If a council or agency adheres to the general environmental duty, whether by complying with recommendations within this code or with other appropriate methods to achieve the same objective, then this compliance could act as a defence from prosecution.

For example, if all reasonable and practicable measures had been taken to adhere to the code and an act of vandalism or an extremely unlikely event occurred and resulted in creating environmental harm (or potential environmental harm), then prosecution is not likely to occur. The council or agency will, however, be required to remediate any

environmental harm caused. Remediation for damages by a third party and remediation off site are also the responsibility of the council or agency.

It is envisaged that this code will be updated as new information and technologies become available, but any amendments will not be retrospective for enforcement.

All government agencies can influence the quality of stormwater. Increasing awareness through education and training programmes will be the primary method in changing behaviour and attitudes. This code provides government agencies with benchmarks of good practice. It is anticipated that government agencies will actively and responsibly take the necessary steps to minimise the pollution of stormwater and it is recommended that all government agencies formulate a process for self monitoring and audit.

Consider the code as one of the major objectives of an integrated Total Catchment Management Plan for each drainage basin. Catchment management authorities will be active in promoting good practice and monitoring improvements.

This is the second of four proposed codes of practice for the source control of stormwater pollution with the following primary objectives:

No.	Target Audience	Primary Objective
1	Community	Control of pollution from the general community.
2	Local, State and Federal Government agencies	Control of pollution from construction, maintenance and operations activities carried out by these agencies.
3	Building and Construction Industry	Control of pollution from building and construction projects.
4	General Industry, Retail and Commercial Premises	Control of pollution from activities carried out by all industrial, retail and commercial businesses.

Councils and agencies should require their contractors to adopt this code through contractual agreements. Consult the Building and Construction Industry, and Industrial, Retail and Commercial Premises Codes of Practice for further detail for some activities.

1.2 Guiding Principles

This Code of Practice is based on the following key principles.

Eliminate non-stormwater discharges

Stormwater drains must only carry stormwater runoff, and not wastewater or washdown water, rubbish, litter or any other contaminant that can be reasonably prevented from entering the system.

Most built up areas are well served with a sewerage system or a septic tank effluent drainage system (STEDS) and waste collection services. Since these provide a very adequate waste disposal system, there is no reason to dump wastes in the stormwater system.

Rain and other water runs from drains down the gutters of roadways into drains under the road, which connect to our natural waterways (ponds, swamps, creeks and rivers) or to large open drains and to the ocean without treatment. Only clean rainfall runoff should enter this system.

The sewer takes wastewater to treatment works, before being piped to the ocean or irrigated over land, such as golf courses. Strong wastes (eg solvents and oils) need treatment at specialised facilities.

Further information on the disposal of waste to sewer can be obtained from the SA Water Trade Wastes Unit by telephoning (08) 8216 1723.

Control stormwater pollution at its source

It is far preferable to reduce and, where possible, eliminate the causes or sources of stormwater pollution rather than treat the effects somewhere downstream. Source controls place responsibility directly on the polluter and this should lead to long term permanent solutions resulting from simple changes in practice.

Stormwater runoff is a resource

Stormwater runoff should be managed as a valuable water resource. Better quality runoff increases the value of the resource and also the potential number of uses from recreational waterbodies to alternative sources of water supply.

Maximum extent practicable

Reducing pollutants in stormwater is difficult and costly to quantify or prescribe, so this code aims to reduce pollution to the maximum practicable extent by promoting best management practices. This will require ongoing active support and awareness by government agencies.

1.3 Management Techniques

Effective implementation of these guiding principles will only be achieved if all government agencies adopt the strategies and objectives contained within this code in planning, design, construction and operation activities.

Standing Codes of Practice developed by agencies for minor or repetitive projects should encompass the requirements of this code. These requirements should be the same as those for larger projects, but set at the appropriate scale. An effective workforce education and awareness campaign is extremely important for the successful implementation of any modified standing Codes of Practice.

For all projects, a soil erosion and drainage management plan (SEDMP; see section 5.4) must be prepared and approved in accordance with the

requirements of this code. The project client should prepare the SEDMP as part of the design documentation and include it as a tender document. The SEDMP documentation must define the scope of pollution control works required in sufficient detail to prepare reliable tender costs. Make provision if possible to allow prospective tenderers to submit alternative strategies and measures where advantages may be demonstrated, provided that the principal aims and objectives of this Code of Practice are maintained.

1.4 Regional Issues

This code contains an emphasis on the control of stormwater pollution from sites within built up areas. Where relevant, activities within regions of South Australia are licensed under the Act to ensure the protection of the water resources. For example, stormwater discharge in the Mount Gambier region is now licensed to protect the valuable groundwater resource. An important condition of that licence is that an environment improvement programme is being developed and activated.

It is intended, where appropriate, that district councils and agencies consider the guidelines outlined in this code and tailor them to suit their particular circumstance.

This code does not address broadacre primary production activities undertaken by agencies such as Primary Industries SA (PISA) Forestry. It is acknowledged that PISA Forestry has developed guidelines relevant to their activities which will be used in place of this code of practice. The guidelines used by PISA Forestry are listed in appendix 1 and may be a useful reference for district councils and other agencies undertaking broadacre management. PISA Forestry have set an example by continually updating and self auditing their own management guidelines.

Some detailed recommendations in this code will not be relevant to remote communities without stormwater systems. However, these communities must still follow the guiding principles as outlined in section 1.2.

2 LEGISLATIVE CONTROLS

2.1 General

This Code of Practice is complemented by legislation aimed at protecting the environment. When using this code, refer, if necessary, to relevant legislation for specific requirements for certain activities. Brief summaries of the more relevant Acts are provided in appendix 2.

Note that once an Environment Protection Policy (EPP) is in force, activities related to other Acts must defer to the provisions contained in the EPP.

2.2 the Act

General Environmental Duty

Section 25, General Environmental Duty, is one of the underpinning components of the Act and states that:

> *A person must not undertake an activity that pollutes, or might pollute, the environment unless the person takes all reasonable and practicable measures to prevent or minimise any resulting environmental harm.*

Environmental harm is defined as any harm or potential harm to the environment (of whatever degree or duration) and includes an environmental nuisance. Several strategies available can be employed to achieve this, such as the development and adherence to guidelines of best practice provided by Codes of Practice and EPPs.

In determining the measures required to ensure that all reasonable and practicable measures have been taken to prevent or minimise environmental harm, section 25(2) of the Act specifies that regard must be given, amongst other things, to the:

- nature of the pollution or potential pollution and sensitivity of the receiving environment
- financial implications of various measures that might have to be taken, as those implications relate to the class of persons undertaking activities of the same or similar kind
- current state of technical knowledge and likelihood of successful application of the various measures to be taken.

Enforcement

Although the EPA has a variety of enforcement options under the Act, it is recognised that the general community, industry and other sectors such as Local Government and other State and Federal agencies need to work together to ensure that complementary outcomes are achieved by increasing environmental performance.

The the Act and the EPA foster a keen sense of environmental responsibility on the part of the general community, industry and public authorities such as government agencies, encouraging their active participation in finding solutions and developing innovative approaches to environmental issues. Participation in the development, trial and assessment process for this code and later during the EPP process is one such example. During consultation on the policy, appropriate enforcement arrangements will be determined.

Members of the community, government agencies, industry, and commercial and retail premises, that cause environmental harm or fail to comply with the general environmental duty, can be forced to comply by an Environment Protection Order issued by an officer authorised under section 93 of the Act. An Environment Protection Order may require that a person or agency, take specified action within a specified period.

A Clean-up Order may also be issued (section 99 of the Act) in place of or in conjunction with an Environment Protection Order.

Failure to comply with these orders can result in maximum fines of:

- $4000 for an Environment Protection Order
- $120,000 for a corporate body and $60,000 for a person for a Clean-up Order.

Civil Remedies

Section 104 of the Act outlines how to apply to the Environment, Resources and Development Court to issue an order on a third person or corporate body. Provisions in this section include the issue of an order restraining a person from engaging in conduct of a particular kind or requiring a person to take specified action, and recovery of expenses from perpetrators of environmental harm for clean-up costs, injury, loss or damages.

2.3 Australian Standards

Refer also to any relevant Australian Standards, for example:

- AS 1940–1993 Storage and Handling of Flammable and Combustible Liquids
- AS 2507–1984 Storage and Handling of Pesticides
- AS 2508 Safe Storage and Handling Information Cards for Hazardous Materials (various dates depending on the hazardous material)
- AS 3780–1994 Storage and Handling of Corrosive Substances
- AS 4326–1995 Storage and Handling of Oxidising Agents
- AS 4332–1995 Storage and Handling of Compressed Gasses
- AS/NZS 4452–1997 Storage and Handling of Toxic Substances
- (Draft) Storage and Handling of Class 4 Dangerous Goods
- (Draft) Safe Warehousing of Dangerous Goods

3 OPERATIONS AND SERVICES

3.1 Introduction

The principal objective of controls on council and government agency operations and services is to minimise the generation of pollutants that may eventually enter the stormwater drainage network.

This section of the Code of Practice covers the works and activities carried out directly by agencies or their nominated contractors. These include but may not necessarily be limited to:

- construction works
- maintenance works
- operational activities
- transportation activities
- marinas, ports and slipways.

Issues to be considered during the design of stormwater drainage works are also discussed.

3.2 Construction Works

Minimise the generation of sediment, litter and debris during the construction and reconstruction of agencies' infrastructure and remove any resultant debris from the site to an authorised landfill or waste depot.

General

Soil erosion and the generation of sediment during construction activities cannot be entirely prevented. Sound project planning can reduce the potential for erosion but control measures are necessary to reduce the impact of the erosion both on site and off site, and may combine construction strategies, structural and vegetative measures, and soil stabilisation techniques. For maximum effect, integrate all control measures into the site development plan. The complexity and extent of control measures required depends largely on the magnitude and duration of the construction activity.

For each construction project, prepare a SEDMP (see section 5.4) which incorporates the following key elements.

- Ensure that the smallest area of land is exposed to the risk of erosion for the shortest period of time.
- Effectively control surface runoff entering and leaving the site.
- Effectively control the generation of dust, litter and debris within the site.

- Install erosion control works and measures to minimise the extent of site erosion.
- Install sediment collection devices to prevent the export of sediment from the site.
- Maintain the erosion control and sediment collection devices.
- Where applicable, periodically inspect completed works to ensure erosion control strategies are working.
- Rehabilitate all disturbed areas as soon as possible.

For methodology, works and measures that can be used to implement these elements see section 4.2 Land Development and Construction Works.

General Criteria

In addition to the elements cited above, consider the following objectives for all types of construction projects:

- Limit site access to nominated and controlled areas.
- Locate all stockpiles away from concentrated flow paths.
- Ensure that erosion control and sediment collection structures are in place before site clearing works begin.
- Locate sediment traps and basins in locations that will not create adverse flood risks to adjoining properties.
- Clearly specify the conditions under which any of the erosion control or sediment collection structures can be decommissioned.

Road and Rail Construction

Consider the following objectives for road and rail construction projects. Not all of these objectives may be appropriate for all conditions:

- Confine access tracks to proposed permanent road locations.
- Grade access tracks to a crown to avoid water concentration.
- Construct access tracks to cross concentrated drainage paths at right angles.
- During the construction of culverts and bridges, divert baseflows around disturbed areas of site.
- Extend culvert outlets beyond the toe of fill embankments.
- Install energy dissipator structures at the outlets of all culverts installed before waterways downstream are stabilised.
- Form regular cross drains to intercept runoff from long cut or fill batter slopes.
- Rehabilitate road shoulders and adjacent swales, preferably with vegetation cover, as soon as practicable.
- Locate road construction stockpiles away from concentrated drainage paths.

- Protect the toe of all stockpiles retained for more than one day with an appropriate silt barrier.
- Secure contaminated soil on the shoulders or dispose of at a licensed landfill.

Services Installation

Consider the following objectives for service installation works. Not all objectives may be appropriate for all conditions:

- Attempt to install water and sewer services at the time of the road construction works, and before the road pavement is constructed, to decrease the number of times soil disturbance occurs.
- Encourage service authorities to install ducting during road construction if these services are to be installed later.
- Where practicable, avoid works in areas of likely concentrated runoff.
- Divert runoff away from all trench lines with temporary banks constructed from trenching spoil or sandbags.
- Properly compact soil used for trench backfill and rehabilitate the road surface as soon as practicable.
- Locate stockpiles of bedding and backfill material away from concentrated drainage paths, including road gutters.
- Protect the toe of all stockpiles retained for more than one day with an appropriate silt barrier.

Take special consideration when installing services by the direct ploughing method and the alignment is across the natural surface contours. Under this method, the trench is not compacted and may be subject to severe erosion from runoff entering the trench and washing the uncompacted material along the trench line. Use techniques that minimise this risk, such as direct grout injection at regular intervals along the trench line to create effective barriers and force any soakage water back to the surface and away from the trench.

Building Construction Works

Conduct all building construction works, such as the examples given below, in a manner that minimises entry of pollutants into the stormwater system.

Hard Waste

- Store all hard waste on site in a manner that prevents any materials from entering the stormwater system either by wind or water action.
- Keep smaller items in covered bins.

Concrete works

- Prevent all residues and wastes generated by concrete works from entering the stormwater system. Where this is not possible, such

as in concrete pavement cutting works, minimise the amount of waste entering the stormwater system.

- Mix concrete, either by hand or by mechanical means, in a designated area of the site capable of containing all excess water.
- On sites requiring the use of concrete pumps from public roadways, provide temporary bunds across all downslope gutters to trap any spilt material. Remove all spilt material from the roadway and gutter before removing the temporary bunds.
- Do not wash down concrete mix trucks, pumps and equipment in roadways, footpaths or reserves. Wash them down within a designated contained area on the site, or at a suitably designed and operated depot washdown facility.
- Allow waste concrete slurry to dry and either dispose of it on site or take it to an authorised waste depot.

Brick works and brick cutting

- Do not mix mortar in gutters or any other locations which drain to the stormwater system.
- Prevent all wastewater from brick cutting activities from entering the stormwater system.
- Do not carry out brick cutting activities that generate surplus wastewater on public roads, footpaths or reserves.
- Recycle, dispose to sewer (with SA Water Trade Wastes Unit approval) or discharge into a contained area for drying by soakage, if appropriate, all surplus wastewater from brick cutting activities.

Painting

- Do not discharge paint waste and washwater to the stormwater system.
- Divert water-based paint cleaning water into a contained area on site for soakage or to sewer (with SA Water Trade Wastes Unit approval).
- Filter oil-based clean-up material for reuse of the solvent or take it to an authorised waste depot licensed to accept these wastes.
- Keep unused paint in the tin or other sealed container, and place it in a bin or take it to the EPA Hazardous Household Waste Collection Facility. Contact the EPA on (08) 8204 2004 for further details.

Plastering

Allow all residues and wastes from plastering activities to dry within a designated contained area of the site. Dispose of solid waste either on site or take it to an authorised waste depot.

Cleaning

Do not allow paint stripping waste, roof cleaning waste and other general building cleaning wastes to enter the stormwater system.

With the exception of certain hazardous materials (eg lead/caustic paint scrapings), discharge these wastes either into a contained area on the site for soakage or to sewer (with SA Water Trade Wastes Unit approval).

Airconditioner Installation

Install evaporative airconditioners so that saline wastewater is either directed to sewer, or to a suitable garden area or rainwater tank (not for drinking). For the wastewater not directed to sewer, consider:

- the salinity of the bleed-off water (plants have salinity ranges for growth and survival)
- if overwatering will run off into a neighbour's property or create a muddy area in the garden.

Termite Protection

Use physical barriers for termite protection in areas where residuals from spray treatments may enter the stormwater or groundwater systems.

3.3 Maintenance Works

Minimise the source of potential wind and water borne material that may be generated during maintenance works. Prevent these materials from entering the stormwater system.

Street Sweeping

Ensure street sweeping activities are an integrated component of the agency where relevant or council maintenance programme. Take account of the estimated accumulation rates of dust, debris and organic litter along each road segment. Some generation rates will be based on natural events, while others can be related to such activities as grass cutting and vegetation pruning. Consider factors such as vegetation type, road terrain, rainfall characteristics and prevailing wind conditions in the preparation of the integrated maintenance programme. Test the performance objectives of the maintenance programme using quantifiable measures so the programme can be modified and fine tuned as required.

The Corporation of the City of Adelaide has established a street cleaning programme based on best management practice that will address operational, environmental and community issues. This programme may also be applicable to other major and local commercial areas.

In the absence of an integrated maintenance programme and in built up areas, adopt the following minimum street sweeping requirements for paved roads:

- Sweep all residential streets at an interval not exceeding six (6) weeks.

- Sweep all main and arterial roads where ribbon shopping is predominant at an interval not exceeding three (3) weeks.
- Sweep all other streets at an interval not exceeding eight (8) weeks.
- Ensure all street sweeping operations prevent materials (litter, sediment, wastes) being deposited in the stormwater drainage system.

Do not allow wastewater, sediment and debris collected during street sweeping operations to enter the stormwater system.

Parks, Gardens, Reserves and Roadside Verges

Sweep up before the end of the day (or immediately if rain is imminent) all organic material, including prunings, leaves and grass cuttings, left on roadways, footpaths, in gutters or in the stormwater drainage system following maintenance works and dispose of it well away from the stormwater system.

Encourage councils and residents to replace high maintenance grassed verges with low groundcovers and other suitable vegetation.

This strategy works well with a formal paved footpath area for pedestrian safety, and not only saves on maintenance costs, but also eliminates the problem of grass clipping disposal.

Reduce the impact of grass cutting by designing a mowing strategy that throws the cut from the initial passes away from the roadway or drainage lines.

In addition, consider establishing low dense vegetated buffer strips along drains and watercourses that traverse areas where grass cuttings are not collected as part of the routine maintenance. These strips help prevent cuttings from entering the stormwater system.

Select appropriate species of trees and shrubs for planting in and adjacent to major drainage paths by choosing species with relatively low leaf drop rates. The range of appropriate species depends on the location of the site and the expected land use. Contact the Vegetation Conservation Branch of the Department of Environment, Heritage and Aboriginal Affairs (phone (08) 8204 8888) or State Flora (phone (08) 8278 7777 or 088531 1420) for advice. Take care to ensure that any planting within drainage lines does not lead to an increased flood risk.

In extremely high leaf litter areas, the use of litter capture cages inside stormwater inlet pits is recommended. Design and maintain these cages to ensure that they cannot create a blockage within the pit that may create a flood risk for adjacent properties.

Use mulch covers on reserves to reduce water demand and erosion potential. However, do not locate permanent loose mulch areas within major drainage lines defined by the flow width for the estimated 1 in 5 year Average Recurrence Interval. Provide sufficient edge retention of the mulch to prevent it being washed into the stormwater system.

Apply fertilisers with care and in a manner that prevents their entry into the stormwater system, through washing off or by leaching and migration through the upper soil zone. Consider the use of slow release organic fertilisers.

Manage large landscaped areas that require regular watering and fertilising under an irrigation and drainage management plan which considers such issues as:

- soil types
- vegetation types
- matching fertiliser application rates to nutrient requirements
- the fate of excess nutrients that could be exported from the site
- selection of the most appropriate irrigation methods
- the potential for recycling of excess irrigation water
- the risk of exporting excess fertiliser with rainfall washoff.

Pesticides

Consider stormwater drains as part of the natural waterway systems. Pesticides can be introduced into the aquatic environment through spillage or accidental discharge or through waste disposal during production, packaging, storage and use. They can also enter surface and subsurface waters by direct use near aquatic environments or by runoff or leaching from land-based applications. Once pesticides are transported to waterways, some are broken down but some are persistent. Figure 3.1 illustrates the fate of pesticides within the water column.

Pesticides contain an active toxic component and a surfactant to help spread the active component. These surfactants also have detrimental impacts on organisms living in the water.

Factors considered important in determining the likely risks and adverse effects of the use of various pesticides are:

- the toxicity of the pesticide component of the spray mixes
- the mobility of the pesticide
- the half life of the pesticide under a range of conditions
- breakdown products
- the climatic, soil and water characteristics under which the pesticide is applied
- the characteristics (as for the pesticide component) of the surfactant.

Most pesticides are manufactured overseas and very few toxicological studies have been undertaken on Australian indigenous species. A recent study by Bidwell and Gorrie (1995) on glyphosate and Roundup™ is an exception.

Little is known about pesticide movement and its fate in the environment, so minimise the unnecessary release of pesticides into the environment. Use pesticides (which include herbicides, insecticides, rodenticides) in conjunction with a strategic integrated pest management plan. An integrated management plan may involve, for example, the physical removal of plants and physical trapping of animals at optimum times of the year. In the case of plants, take care not to disturb watercourse banks and to replace the pest species with preferred vegetation as soon as possible to both prevent erosion and reinfestation of pest plants.

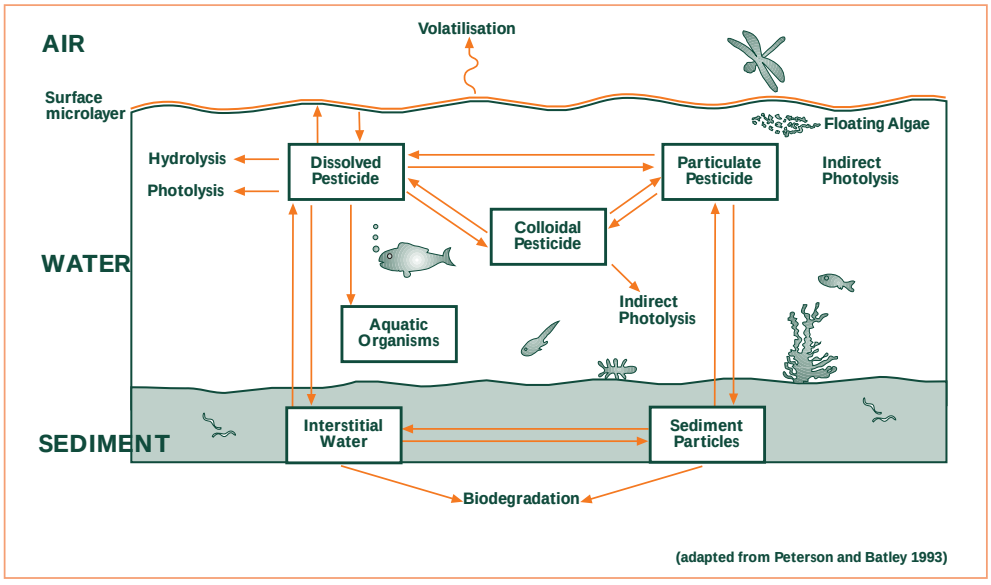

Figure 3.1 Pesticide transport and transformation processes.

Adopt the following guidelines for the management of pesticides:

- Apply herbicides during the early growth phase of the target plants before flowering (preventing cross pollination with other stands of pest vegetation in the area and eliminating seed set).
- After using the herbicide, physically remove weeds and replace them, preferably with indigenous vegetation suitable to that location or other suitable plants. Non-pest grass species may help stabilise banks until the preferred vegetation establishes. To stop the reinstatement of pest plants, cover the ground as soon as possible with the replacement vegetation and/or matting. Plant during the growth period (autumn or spring for most plants). This corresponds well with spraying at the beginning of the growth period.
- Time the application so continual use of the herbicide is not needed. Do not use during periods of rain. Plants generally require 24 hours to absorb the herbicide through the leaves. Rain in the meantime may wash off the herbicide which can enter the

stormwater system and not effectively kill the target vegetation. This may be a particular problem for pre-emergent sprays such as atrazine if applied to soils.

- Wand and paint the herbicide on to leaves or, for woody weeds, cut and paint or inject in preference to spraying, to minimise spray drift. Inject the herbicide immediately after leaf drop in deciduous trees, to prevent the possibility of herbicide entering waterways through the leaf litter.
- Avoid applying herbicides in areas surrounding watercourses. If you cannot avoid it, consult the EPA. Note that very few pesticides are registered for spraying in watercourses.
- Do not spray under windy conditions. The wind may transport spray to non-target species and stormwater systems.
- Use pre-emergence insecticides such as Bti ahead of adult treatment. Pre-emergence insecticides gradually decrease the source by preventing development of breeding stock.
- Place rodenticide baits so they are not available to indigenous mammals and cannot enter waterways.
- Store pesticides and develop accidental spill contingency plans as for all hazardous chemicals (see Storage, Loading and Unloading Areas; Spills, Clean-up Procedures in section 3.4).
- Colour all herbicides with a suitable non-toxic dye to indicate where they have been used.
- Dispose of unwanted chemicals at an approved waste depot, and do not tip them into the stormwater system. Dispose of empty pesticide containers at an approved waste depot.
- Follow manufacturer's handling and safety instructions for all applications.

Watercourses

Maintain watercourses (within council or agency owned land) such as swales, ditches, creeks and rivers in a way that minimises scour and erosion from the base and banks. Establish or retain watercourse vegetation to promote bank stability and the natural biological filtering processes. Give preference wherever possible to retaining or re-establishing endemic species.

Avoid planting deciduous trees (such as willow, ash, plane and poplar trees) which drop excessive leaf litter during autumn. The annual once-off mass load of quickly decaying deciduous leaves unnaturally increases the organic loading of waterways which in turn unbalances the ecosystem. Eucalyptus trees drop leaves throughout the year and the excess may need to be swept up as they are slow to decay, and may block drains and lead to increased flood risks.

Select the appropriate bed and bank stability measures in conjunction with the relevant catchment management authority to ensure that bank batters will be both stable and at a maintainable slope.

Infrastructure Maintenance

Maintain any council or agency infrastructure elements in a manner that minimises the pollution of stormwater. The degree of protection will depend on the scope and duration of the maintenance works.

If workers will always be on-site during the entire maintenance period, then clean the site using dry sweeping techniques.

Incorporate the maintenance of drainage systems into an integrated maintenance programme to take account of the likely build up of sediment, leaf litter and debris. In the absence of such a programme, clean stormwater inlet pits at least three times per year, with one clean before winter rainfall begins.

If the maintenance work needs to be conducted over several days, employ temporary strategies to prevent the pollution of stormwater, including:

- planning a maintenance programme that minimises the risk of erosion and silt generation
- conducting stormwater drain maintenance after major leaf fall events and before winter
- locating stockpiles on site away from drainage lines, and protecting them from being washed or blown to the stormwater system with hay bale barriers or silt fences (see section 5.3) at the toe of stockpile batters if necessary, to prevent any loss
- protecting side entry pits with an appropriate temporary sediment trap during the maintenance period if excavated material could be washed into the drainage system (see section 5.3)
- constructing temporary sediment traps within watercourses where the prevention of the entry of silt and sediment is not practicable (see section 5.3)
- servicing and cleaning up on-site equipment in areas where contaminants or wastewater cannot enter the stormwater system
- discharging brick and concrete cutting wastewater through an appropriate filter device to remove all contaminants or storing and disposing to sewer with the approval of the SA Water Trade Wastes Unit, not to the stormwater system
- resurfacing or stabilising disturbed areas as soon as practicable (see section 5.2).

Graffiti Removal

Manage washdown water and materials generated during the removal of graffiti so as to minimise their entry into the stormwater system. Refer to the code of practice for High Pressure Water Blasting Activities.

Roadside Erosion Control

Manage runoff from roadways and service tracks to minimise erosion and sedimentation. Remove the accumulation of loose material on unsealed roads and shoulders.

Where there is no formal kerbing, use swale drains, stabilised with vegetation, as an alternative. They offer the advantage of removing sediment from the runoff but may require a larger flow area to maintain the required flood capacity.

The grading of road shoulders and swale drains can destabilise the roadside and lead to increased erosion and sedimentation. Compact shoulders by rolling after grading works. Consider small permanent silt traps in areas where unsealed roads are regularly graded. Locate these traps immediately before the entry point to the defined drainage system. Vegetated swale drains can also be effectively used as filtering devices to remove sediment and associated contaminants washed from unsealed roadways.

Where practicable, use a slasher as an alternative measure of controlling vegetative growth, while maintaining the stability of road shoulders. However, take care to ensure permanent vegetation growth immediately adjacent to road shoulders does not adversely affect the structural integrity of the roads.

Emergency Repairs under Wet Conditions

Conduct all emergency repair works in a manner that prevents the deposition of debris, spoil, excavated material or polluted water into the stormwater system. Pay particular attention to the repairs of water and sewerage infrastructure elements. For minor repair works, use local stormwater inlet silt traps (see section 5.3). For larger scale repair works, use silt fences (section 5.3) to filter sediment from any discharge from the repair activities.

Remove any material accidentally deposited in the stormwater system as quickly and to the maximum extent practicable. Depending on the nature of material deposited, the EPA may require that the material be removed from the stormwater system and taken to an authorised waste depot. Develop contingency plans which address stormwater pollution control for burst water mains and sewer (or common effluent drain) overflow incidents, to be adopted by SA Water and councils where relevant.

Emergency Response Plan

Councils should have a current drainage network plan of their area available which shows:

- all entry points to the stormwater system and catchment boundaries
- the alignment of all drains and watercourses
- the location of all permanent waterbodies
- the location of all stormwater entry points from industrial and commercial premises
- the location of all sensitive ecological areas and possible upstream spill containment sites.

Use the plan as the basis for providing information and/or assistance in response to an emergency that poses a risk of polluting downstream areas. Endeavour to ensure access to the plans and an emergency callout crew is available on a 24-hour basis through the council's emergency callout facilities.

3.4 Operational Activities

Minimise the generation of water and wind borne material by any council or agency operational activity.

General

Do not allow non-stormwater discharges to the stormwater system from council or agency premises. Undertake a thorough site audit of all premises to ensure this requirement is satisfied. The EPA may approve, as a voluntary environmental audit, a specified programme of action to evaluate performance with respect to compliance with the Act. Information produced and approved for this purpose is subject to privilege against proceedings under the Act.

The EPA may also enter into an environment performance agreement with any other person or persons (including a Minister or public authority). This agreement may contain terms providing for any matter that the EPA considers appropriate for securing the objects of the Act, including terms binding a party (other than the EPA) to undertake programmes of any kind directed towards the protection, restoration or enhancement of any part of the environment.

The Act enables the EPA to issue an Environment Protection Order, or Clean-up Order, to secure compliance with an EPP or the duty to prevent or minimise environmental harm. An Environment Protection Order may require a person, or council or agency, to take specified action within a specified period.

Dispose of all spills and wastes to a licensed waste depot or to sewer, if approved by the SA Water Trade Wastes Unit. Spills and wastes can only be disposed to local council STEDS with the formal approval of the relevant council.

Animal Husbandry, Zoos and Wildlife Parks

Clean yards regularly and dispose of solid waste away from watercourses. Zoo and park managers may wish to sell solid waste to fertiliser or mulch companies.

Direct stormwater runoff from the maintained yards and stockpiles to the sewer with approval from SA Water Trade Wastes Unit.

If sewer facilities are not available, direct stormwater runoff to an artificial wetland or other treatment device to remove organic material and nutrients such as phosphates and nitrates.

The runoff water may also be stored and used for irrigation (refer to the Australian and New Zealand Environment and Conservation Council

(ANZECC) *Australian Water Quality Guidelines for Fresh and Marine Waters 1992*).

Whatever the method used, divert yard runoff away from waterways.

Use the following specific guidelines or policies for the appropriate activities:

- *Environment Protection (Milking Shed Effluent) Policy*
- *Guidelines for the Establishment and Operation of Intensive Piggeries in South Australia* (Primary Industries SA, EPA, Murraylands Development Board)
- *Guidelines for the Establishment and Operation of Cattle Feedlots in SA* (Primary Industries SA, EPA)
- *Code of Practice for the Growing of Freshwater Crayfish in South Australia* (Australian Freshwater Crayfish Association, SA Branch, Primary Industries SA, EPA)

To obtain copies, telephone the EPA on (08) 8204 2004.

Refuelling Facilities

Cover fuel dispensing areas and isolate them from surface runoff generated elsewhere on site by utilising surface grades, bunds and/or diversion drains.

Do not discharge cleaning or wash waters generated from fuel dispensing areas directly or indirectly to stormwater. Discharge all runoff generated from fuel dispensing areas into a well-maintained separate system, with the necessary pretreatment facilities for discharge to sewer or a temporary storage facility. Contact the SA Water Trade Wastes Unit if you propose to install facilities for such discharges to sewer.

Train employees to reduce pollution risks by eliminating refuelling spillage.

For temporary refuelling activities, remove any contaminated soil from site once work is completed.

Workshops

Isolate the floor drainage of covered work areas from the stormwater system by using surface grades, bunds and/or diversion drains. When floor areas are cleaned, use dry absorbents and dry sweeping to minimise the generation of wastewater.

Pretreat wastewater or washwater in an approved manner (consult with SA Water Trade Wastes Unit) prior to disposal to the sewer. Regularly maintain any required collection and pretreatment system.

Uncovered Work Areas

Work activities that involve potentially polluting materials such as fuel, oil, grease, coolant, chemicals, solvents and/or cleaning agents that could drain, leak or spill should be relocated to undercover areas which contain pretreatment devices connected to sewer. Where this is not

possible, regularly cleaned and maintained drip pads or containers must be used. Spilt material that could pollute stormwater must not be left unattended, but should be cleaned using dry absorbents and dry sweeping wherever possible.

Storage, Loading and Unloading Areas

Store and handle all materials in a manner that avoids contamination of stormwater. Direct stormwater drainage around or away from all stockpiles that could potentially cause pollution of stormwater. Cover hard stockpile areas or locate them so as to prevent erosion of the stored material and subsequent pollution of stormwater.

Store and handle carefully all liquid materials that are potentially hazardous to the environment to avoid leaks and spills. Locate large quantities within a bunded compound that is:

- impervious to infiltration
- able to safely contain at least 120% of the volume of the largest container located within the bund
- roofed to minimise the collection of rainwater inside the bunded compound.

Cover and bund liquid handling facilities to prevent possible stormwater contamination as well as to help control any spills.

Vehicle, Plant and Equipment Cleaning Areas

Clean vehicles, plant and/or equipment in a covered area that discharges all wastewater and washdown water to sewer in an approved manner. Do not discharge to the stormwater system.

Parking Areas

Regularly dry sweep parking areas and paved open areas discharging to the stormwater system. Fit these areas with devices capable of preventing litter and sediment from entering the stormwater system. Where necessary, install grease and oil separators within the internal drainage system to remove the pollutants regularly washed off parking areas.

Use any opportunities to direct runoff from parking areas on to vegetated filter strips before it discharges into the stormwater system.

Hard Waste Disposal, Landfill and Borrow Pit Sites

Operate all solid waste disposal sites, landfills and borrow pits in a manner that prevents the pollution of surface water, including stormwater.

Isolate areas that could give rise to contaminated runoff from uncontaminated areas. Exclude or divert stormwater from surrounding areas around the site of any potential contamination. Protect a watercourse traversing an area of potential contamination, from contamination by appropriate measures including lining, enclosure, cutoff banks and/or vegetated buffer zones.

Collect any surface water discharged from a contaminated area and store it for assessment and/or treatment before it is released from the site. Encourage the internal reuse of treated runoff from these areas.

Landfill licensees are required to follow the EPA's S*pecification for Surface Water Sampling at South Australian Landfills* which outlines the requirements for metropolitan landfill licensees when undertaking a surface water runoff monitoring programme at designated landfill sites. Any agency operating a landfill site should refer to this specification, and the *Interim Criteria for Major Landfill Depots.*

Composting

Refer to the *Draft Environmental Guidelines for Composting and/or Organic Waste Recycling Facilities.*

Spills, Clean-up Procedures

Any property that contains hazardous and/or potentially polluting material should have an emergency spill response plan.

Keep a copy of the Material Safety Data Sheets readily available for all materials on site.

Prepare spill response procedures, train employees and provide appropriate clean-up materials at all sites that deal with potentially polluting material. As a minimum, a basic spill response procedure must make employees aware of the need to contain spills and not to wash spills into the stormwater system.

In the event of a spill, stop the spill source quickly and safely, and isolate and contain the spilt material from the stormwater system and waterways. The spill must be cleaned up in accordance with the Material Safety Data Sheets.

Emergency Response to Spill or Leakage of Hazardous Material

Seek help and advice from the appropriate emergency authorities for large or hazardous spill incidents. Ensure a copy of the State Government's *Emergency Response to a Leakage or Spillage of a Hazardous Material during Transport, Storage or Handling: The Role and Responsibilities of the Emergency Services and other Government Agencies* (the Blue Book) is readily available on site. In the first instance, notify the South Australian Police of a hazardous material incident.

Under the Act, the EPA must be notified as soon as practicable of all events or conditions causing or threatening serious or material environmental harm (pager 08 8415 7930 24 hour Emergency Response Only).

Under the Blue Book emergency response procedure, the EPA is a support agency and may be called upon by the emergency services to provide specialist advice and assistance on the environmental impact of dangerous substances involved in emergency incidents.

The EPA is also called upon to advise and assist in situations where the National Plan to combat oil spills at sea is initiated.

In addition, the EPA also has responsibilities under the Act to protect

the environment, minimise environmental impact and ensure that appropriate clean-up and disposal measures are undertaken.

Although the EPA's role is advisory for clean-ups where potential or actual environmental impacts are apparent, if the responsible council or agency refuses to take action upon EPA advice, the EPA can, if it deems that environmental harm will eventuate, undertake clean-up and subsequently bill the responsible council or agency.

3.5 Transport — Road, Rail, Sea, Air

Minimise the quantity of pollutant source that may be created during the transportation of materials. This applies to both construction and maintenance activities.

Transport all goods and materials (by an agency, council and/or nominated contractors) in a manner that prevents accidental spills and leakage. Totally and securely cover loads that may be blown by the wind.

Clean up any accidental spills immediately to prevent the material from entering the stormwater system.

3.6 Marinas, Ports and Slipways

Land-based discharges from marine vessels are subject to the *Environment Protection (Marine) Policy 1994*.

Discharge sewage and sullage to sewer. If a sewer is not available, a sullage tanker service can remove the wastes for disposal at an appropriately licensed waste installation. The requirements of MARPOL (the convention on marine pollution) must be met. Contact the local marine safety authority for marine-based discharges and the relevant local council for river-based discharges.

Discharge bilge, ballast water or sludge in ballast tanks or sea chests to sewer if available, with approval from SA Water Trade Wastes Unit.

Clean equipment on wharves (including imported equipment) in washdown bays connected to appropriate pretreatment systems which are connected to sewer with approval from SA Water Trade Wastes Unit.

Dispose of all soil particulate and other materials washed or cleaned from equipment, wharves and stormwater drains, to an authorised landfill site.

On slipways, conduct maintenance undercover and drain or pump waste to a local collection pit or to sewer for disposal with approval from SA Water Trade Wastes Unit. If this is not possible, carry out all maintenance above mean high-water mark in an area draining liquid wastes and solids to a collection pit to be collected by a licensed liquid waste transporter.

Carry out allowable maintenance with screens or tarpaulins placed

around and under the vessel to catch and retain all particulates. Take the waste to a secure storage at the completion of each job and finally dispose of it to an approved landfill.

Provide all workshop areas with an effective enclosure to eliminate the risk of waste blowing, washing or falling into the water. A bund may also be required around the workshop area to ensure the area is not affected by maximum high water levels, and wastes cannot escape through the wall and floor junctions.

ANZECC is developing a Code of Practice for the application, use, removal and disposal of anti-fouling substances. This code will apply to the measures discussed in the preceding two paragraphs and, when finalised, must be adhered to where appropriate. It is anticipated that the consultation draft will be available in late 1997.

ANZECC has also produced guidelines for waste reception facilities. In addition to the measures in the guidelines, provide clearly labelled litter bins placed in prominent positions on all marina walkways, workshop and retail business areas to the satisfaction of the local council. Provide bins with self closing lids that are sealed to prevent leakage and dispersal of litter by wind, water or animals.

3.7 Drainage Design

Include best management practices in agency or council stormwater drainage design policies that consider water quality objectives.

The design of stormwater drainage systems is a significant factor in determining the removal efficiency of stormwater pollutants. Water quality is one of several objectives to consider during the design of stormwater systems.

Design stormwater drainage systems in accordance with an integrated and total catchment management policy, and incorporate best management practices.

Works and measures for the control of stormwater pollution vary between catchments. Consider measures such as the following:

- Retain natural creek and waterway systems wherever possible to promote the natural filtering and pollutant removal processes and help prevent scouring and erosion.
- Rehabilitate degraded creek and waterway systems to achieve the same objective.
- Implement scour and erosion protection strategies and devices along the waterway system. Pay particular attention to the protection works necessary at the outlet of all high velocity drainage systems.
- Incorporate water quality improvement works, such as sedimentation basins, inlet pit baskets, trash racks, pollution removal devices and wetland systems as an integrated part of the complete drainage system.

- Protect ecologically sensitive areas from the erosion and pollution potential of stormwater runoff as follows:
  - Protect remnant bushland and open space areas from the impact of stormwater runoff.
  - Place velocity dissipators at the exit of all concentrated stormwater discharges to create non-erodible conditions in the downstream watercourse.
  - Stabilise watercourses, if necessary, immediately downstream of stormwater outlets to allow for the transition of high velocity flows to non-erodible velocities.
  - Use level spreaders to convert concentrated stormwater flows into shallow sheet flows that discharge across stable vegetated areas.
  - Minimise the discharge of all forms of pollutants from the stormwater before discharge into the sensitive areas, including the removal of excess nutrients, silt, organic matter containing pest species and litter.

3.8 Community Involvement Campaigns

Many community involvement campaigns focus on the source control of stormwater pollution in South Australia, for example:

- local environment action groups
- Landcare groups
- Waterwatch.

Encourage and assist, wherever possible, any community-based education, public awareness and land rehabilitation campaigns that could have a direct or indirect impact on stormwater quality. Local community involvement in stormwater and land development projects allows for more effective control of stormwater pollution, particularly from non-point sources.

Under the *Soil Conservation and Landcare Act 1989* (see appendix 2) there are 27 soil conservation boards established around the State, made up of community representatives appointed by the Minister for Primary Industries, Natural Resources and Regional Development. These boards have powers to oversee good land management. The boards in rural areas could potentially be the focus for initiating community education and involvement in issues of stormwater pollution control.

4 APPROVAL CONTROLS

4.1 General

This section of the code covers all works and activities over which councils or government agencies have some indirect control through the relevant approval processes, including land development and construction works.

Land development and most building works require the approval of either council or the Development Assessment Commission. Some development work may also require approval by the Department of Transport under the Stormwater Drainage Subsidy Scheme.

Development projects undertaken by Federal Government agencies should adopt the principles of this code as part of the agreed resolutions under the Intergovernmental Agreement on the Environment.

Development works undertaken by councils or agencies, not requiring formal approval by an external authority, should still adopt the principles outlined in the following sections in order to satisfy their general environmental duty.

4.2 Land Development and Construction Works

Minimise the potential for site erosion and subsequent sedimentation during land development and construction works.

General

Land development is the most critical stage for the generation of sediment pollution. Sediment eroded from development and construction sites can cause damage to adjacent properties, block stormwater systems, and be deposited in creeks, rivers, dams, lakes and eventually the marine environment. This section of the code defines the requirements to adopt as part of a soil erosion control strategy during land development and construction works.

Minimise the potential for soil erosion downstream of any development site, both during the construction period and following its completion. Erosion can result from concentration of flow paths, increased peak flow rates and duration of runoff due to the addition of impervious areas and extended periods of low trickle flows resulting in continuous wetting of the soil.

The key elements to a soil erosion control strategy are:

- construction planning to minimise the risk of erosion
- installation of erosion control structures and strategies
- installation of sediment collection structures
- stabilisation and rehabilitation of all disturbed areas.

For many land development projects, these elements can be implemented through relatively simple, low cost measures.

The measures discussed in this section of the code represent the minimum requirements for erosion and sediment control works. Compliance with these requirements does not remove the obligation of the developer or designer to exercise the necessary general environmental duty of care. Since these are minimum guidelines only, special site and environmental conditions may require greater levels of protection than those contained in this code.

The following major development and construction activities require appropriate soil erosion control strategies to ensure that the minimum amount of silt, litter or debris leaves the site or pollutes any receiving waters or stormwater drains:

- subdivision projects
- large site developments
- road and transport projects
- underground utilities
- building projects
- channels and floodways.

Construction Planning and Practice

Minimise development costs associated with erosion and sediment control by planning to cater for the physical limitations and constraints of the site, including:

- avoiding development of areas with high to extreme erosion hazard potential
- scheduling earthworks so as to retain as much protective groundcover as possible at all times
- programming slope stabilisation and revegetation works to follow as soon as possible after the completion of earthworks formation
- minimising the amount of site disturbance beyond the limit of approved development works
- undertaking earthworks that conserve the original soil horizons.

As construction work progresses, minimise site erosion by adopting the following practices:

- diverting drainage from outside the site around all disturbed areas
- intercepting and redirecting runoff on the site to protect all exposed areas
- using simple, temporary measures where appropriate to treat runoff from small areas that may be exposed for only a short period of time
- installing erosion and sediment control structures before all site disturbance and construction works begin

- retaining topsoil for later use in revegetation works. Stockpile the topsoil on site outside all drainage path lines and stabilise spoil heaps kept on site for more than 14 days with vegetation by seeding with a sterile, non seed-setting vegetation cover if natural regeneration does not occur. Cover stockpiles that cannot be stabilised by vegetation cover with an appropriate wind- and waterproof membrane. Surround all spoil heaps by a silt fence at the toe of the stockpile (see section 5.3).

During the construction period, make provision on site for the orderly collection and temporary storage of all site debris and waste. Locate this storage facility away from all drainage paths to prevent litter and debris from entering the stormwater system. Keep the storage facility covered at all times if it contains material that can be blown away.

Erosion Control Structures and Strategies

Install erosion control structures and implement erosion control strategies to significantly reduce the need, size and hence cost of the sediment collection structures.

These structures and strategies can include:

- locating catch drains, which direct the runoff to diversion drains, at the top of proposed cuttings, where adjacent land drains towards the cutting
- constructing diversion drains to protect slopes by directing intercepted surface water to a stable outlet
- constructing batter toe or catch drains to collect runoff from batter slopes and direct it to drainage systems or natural watercourses
- constructing level spreaders to convert a concentrated flow of runoff into sheet flow at a non-erosive velocity on to an undisturbed area stabilised with vegetation
- rehabilitating all disturbed areas that are not built on or otherwise developed within 14 days of final land formation for each area
- keeping all exposed ground surfaces damp to minimise dust emission and if not practicable, installing a 40% porous (eg 60% shade cloth) wind break fence (effective over a distance of about 15 times its height) on the windward side of the site
- establishing a temporary cover of a dense ground crop utilising sterile, non seed-setting species (such as 'barley wheat') on all disturbed areas that will otherwise remain exposed for more than 14 days before permanent stabilisation works are undertaken.

These works are discussed in further detail in section 5.

Sediment Collection Structures

Install devices to remove sediment from the runoff before it leaves the site. These devices may be temporary, for use only during the construction period, or permanent. Design the sediment collection structures so that they will not be overtopped by events more frequent than the estimated 1 in 5 year Average Recurrence Interval storm.

Install the devices before the site is disturbed. Regularly inspect and maintain the structures, especially after each significant runoff event, for damage or clogging by silt and debris.

The devices discussed in section 5.3 of this Code of Practice are included as a representative sample of the available structures. Typical guideline values for their scope of application are given for average conditions and may be used in the absence of more detailed information. Select the most appropriate measures for the hydrological and geophysical conditions of each site.

Sediment collection structures have the potential to create stagnant pools of water that could attract such pests as mosquitoes and rodents. Ensure that any permanent wet areas are accessible to within at least 1.0 metre in case emergency baiting is required for pest control purposes.

The following sediment collection structures are suitable in the circumstances given. Other suitable structures may be available:

- Place interception filter devices such as hay bale barriers and silt fences across minor drainage lines to filter sediment from runoff from small areas. The devices are typically suitable for development sites where the disturbed area is less than 0.5 ha.
- Install temporary construction exit pads at all exits from the site to prevent the transportation of sediment on to public roads from vehicle tyres, chassis and sides.
- Use sedimentation traps, constructed from hay bales or gabions to allow settling of sediments from small construction sites where the disturbed area is less than 1.0 ha. For larger construction sites, use stone weirs comprising a core of hay bales or stone contained by a timber framework on either side.
- Use filter strips of vegetation, comprising tall dense grasses, as a simple, effective and economical sediment trap. The flatter (ground slope) and wider the filter strips are, the greater their ability to trap sediment.
- Sedimentation basins may be temporary, semi-permanent or permanent, depending on the size and nature of the development. Construct the basins off-line and use them to collect sediment laden runoff generated from the construction site.
    - Use temporary sedimentation basins for a disturbed construction area that exceeds 0.5 ha but is less than 2.0 ha and the entire site will be completely developed at the end of the proposed construction works.
    - Use semi-permanent sedimentation basins for a disturbed construction area that exceeds 0.5 ha but is less than 2.0 ha and the entire site will not be completely developed at the end of the proposed construction works, such as a staged development proposal or land subdivision application.

- Use permanent sedimentation basins, incorporating a gross pollutant trap, for:

  • a disturbed construction area exceeding 2.0 ha without permanent source control measures provided as part of the development

  • an application including parking areas for more than 10 vehicles without a grassed or vegetated filter strip provided to treat runoff from the parking area.

- Size all sedimentation basins in accordance with a specified maintenance interval.

Stabilisation and Rehabilitation of all Disturbed Areas

Vegetation is the most effective erosion and sediment control measure for all surfaces that are to remain unsealed. Therefore, re-establishing the vegetation cover on all disturbed areas, as soon as practicable, is a critical element of any soil erosion and sediment control strategy.

Progressively establish permanent vegetation on all disturbed areas as each stage is completed to the point of no further construction. Maintain and protect these rehabilitation areas from any damage from activities on adjoining parts of the site. Revegetation is discussed further in section 5.2

Stormwater Requirements for Building Works

Include the following strategies as requirements for the development approval for building works to help reduce pollution from each site.

- Do not allow non-stormwater discharges to the stormwater system from the site.
- Discharge, where practicable, runoff from potentially polluted surfaces on to a suitable vegetation filter strip before the stormwater leaves the site. Otherwise, fit a stormwater treatment device capable of removing litter, sediment and oil products from the runoff.
- Drain runoff from uncontaminated surfaces, such as roof areas, directly to council's stormwater system and not on to polluted surfaces within the site.
- Provide all industrial land-use sites with an inspection pit on all boundary connections to the stormwater drainage system. Cover the outlet from each pit by a stainless steel or hot dipped galvanised screen with a maximum grid opening of 10 mm, to help trace any illegal or accidental discharges into the drainage system.
- Regularly dry sweep parking areas and open hard stand areas and keep them clean of waste. Clean spills using dry absorbents followed by dry sweeping. Do not wash them off into the drainage system.
- Apart from erosion and sedimentation, the most significant problem associated with building sites relates to the tidiness of the

builder. Keep all refuse containers covered and located on the site to prevent contamination of stormwater runoff.

- Store all hard waste on site in a manner that prevents any materials from entering the stormwater system either by wind or water action.
- Provide permanent water quality improvement structures (such as sedimentation basins or artificial wetlands) as a part of any development works which would have detrimental impacts downstream of the site. These structures may need to be able to remove pollutants from stormwater discharges, as well as reduce peak flow rates and velocities to within non-erodible limits.

4.3 Protection and Maintenance of Watercourses

Under section 634 of the *Local Government Act 1934*, councils are responsible for the protection of all watercourses within their areas. However, the *Water Resources Act 1997* broadly defers watercourse management responsibility to catchment water management boards where they exist.

Unless authorisation is given by the relevant council:

- nothing can be deposited in a watercourse
- watercourses may not be obstructed
- the course of watercourses may not be altered
- nothing can be removed from the bed and banks of a watercourse.

Developments associated with a natural waterway should retain the watercourse as a natural waterway, or if the opportunity arises, improve it through weed control, revegetation and/or bank stabilisation.

The advantages of retaining the natural watercourse are:

- decreased velocity of flow
- prevention of erosion
- improved water quality
- provision of native wildlife habitat
- increased adjacent property values.

Publications are available from the Catchment Resource Centre, Mount Barker on watercourse stabilisation and rehabilitation in South Australia (see Bibliography).

Councils should consider the following guidelines whenever activities prescribed under section 635 of the Local Government Act are proposed or ongoing.

Deposition in a Watercourse

Where approval is sought to deposit anything in a watercourse, including the stormwater system, councils should be satisfied that the

activity will not cause any pollution of the stormwater. Examples of cases where approvals are necessary include the discharge of wastewater from extractive industry activities and site dewatering.

It is envisaged that most of these activities will ultimately be covered by their own Codes of Practice.

Alteration to a Watercourse

When approval is sought to alter a watercourse, seek the following objectives from the proponent to maintain and improve the quality of stormwater.

- Preserve natural systems.
- Minimise impacts of approved alterations on adjacent sections of the watercourse.
- Provide for the rehabilitation of natural watercourses within private lands.
- Make all alterations in a manner that prevents the export of material from the site.
- Leave all alterations in a stable state. Use erosion control matting on all surfaces that will require time for the establishment of a vegetative cover.

5 SOIL EROSION AND SEDIMENT CONTROL STRUCTURES

5.1 General

This section contains a brief description of the soil erosion and sediment control structures referred to in the code. Further details on the design and implementation of these measures and devices can be obtained from the reference texts and manuals listed in the Bibliography.

Select the appropriate controls, measures and design details of structures with reference to the geological, soil, landform and hydrological characteristics of the site. Not all measures and devices will be applicable for all sites. Select treatment devices that achieve the principal objectives contained within this code.

Figure 5.1 provides an example of the use of site development measures.

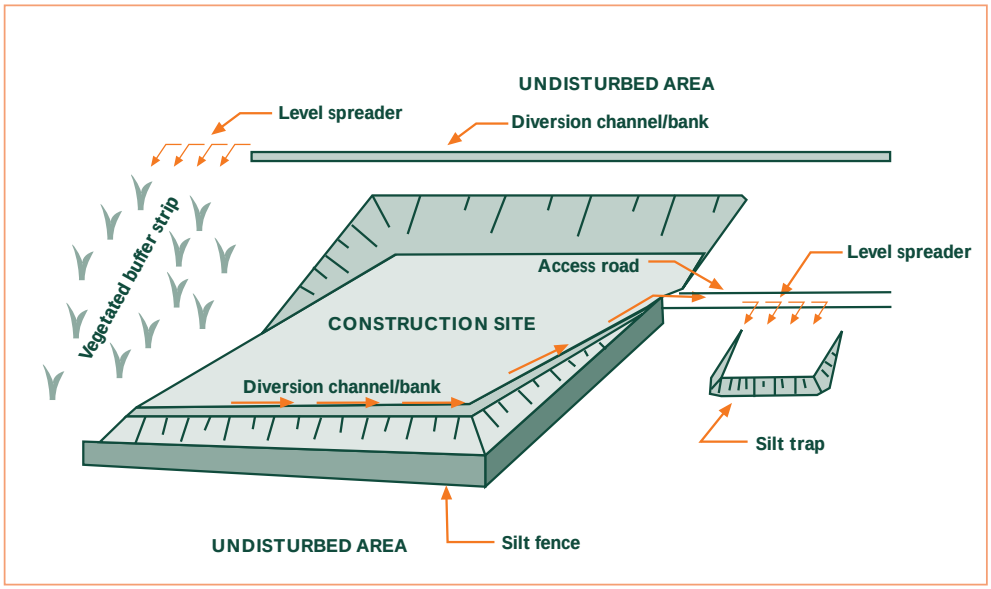

Figure 5.1 Examples of site development measures.

5.2 Erosion Control Measures

General

Measures described in this section are source controls that limit the amount of site erosion. The measures rely on the principles of limiting

runoff velocities and stabilising disturbed surfaces to limit erosion. Select the appropriate controls, or combination of controls, to suit the relevant site conditions.

Catch or Diversion Drains

Catch or diversion drains, as shown in figure 5.2, are constructed across a slope to intercept sheet runoff and divert it at a non-scouring velocity to a stabilised outlet or area. The channel may be combined with an embankment on the downslope side to increase its capacity.

Use diversion drains to direct flow from upslope catchments around disturbed areas and to reduce long cut or fill slopes to shorter non-erodible sections. The channels require construction on a relatively flat grade to minimise velocities and prevent scour. Use channel stabilisation measures if the grade is not relatively flat.

Diversions of runoff around disturbed areas minimise the quantity of runoff requiring treatment for the removal of sediment. Drains across disturbed slopes intercept overland sheet flow and reduce its sediment load. The drains are relatively easy and cheap to construct if earthmoving equipment is available on site.

Revegetation

Revegetation, by providing a dense groundcover, is effective in reducing soil erosion from disturbed sites. A range of methods can establish a vegetation cover for the control of scour by protecting the soil surface from rain impact, increasing infiltration, reducing runoff velocity, binding the soil and filtering runoff. Do not expect revegetation to provide complete erosion protection for a soil that is not stable because of its inherent structure, texture or excessive slope. Use erosion control matting on all revegetation areas on excessive slopes to provide interim protection until the vegetation cover can be fully established.

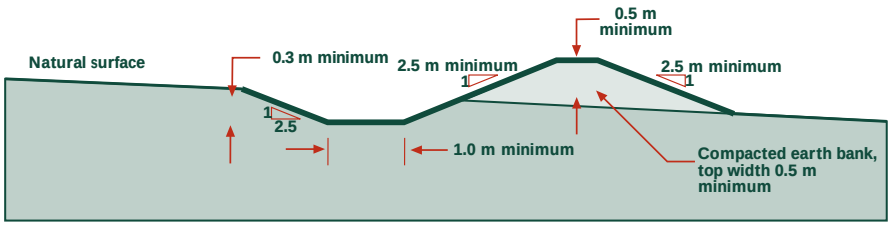

Figure 5.2 Catch or diversion drain installation method.

Revegetate all disturbed areas as soon as practicable following the completion of earthworks. Apply the measures on a broad scale to control erosion from a large area, or apply them to a more localised extent to protect newly constructed formations against scouring effects. Adequately fence all revegetation areas to prevent damage from adjacent activities.

Level Spreaders

A level spreader is a structure built across the slope at the outlet of a channel or drain, which has a wide level outlet sill discharging on to an undisturbed area stabilised by vegetation cover. The level spreader converts a concentrated, potentially erosive outflow from a drain or channel into non-erosive sheet flow.

Level spreaders are generally used at the outlet of diversion channels but can be more widely used at any concentrated discharge outlet.

Carefully construct the spreaders to ensure that the outlet sill is level over its entire length, is parallel to the slope and discharges on to a stabilised vegetated area. Allow discharge from the sill only as a shallow, slow moving sheet flow and ensure that the discharge does not become concentrated into rivulets across unstable areas. Do not use level spreaders in potential flow path areas.

Refer to figure 5.3 for the installation method of level spreaders.

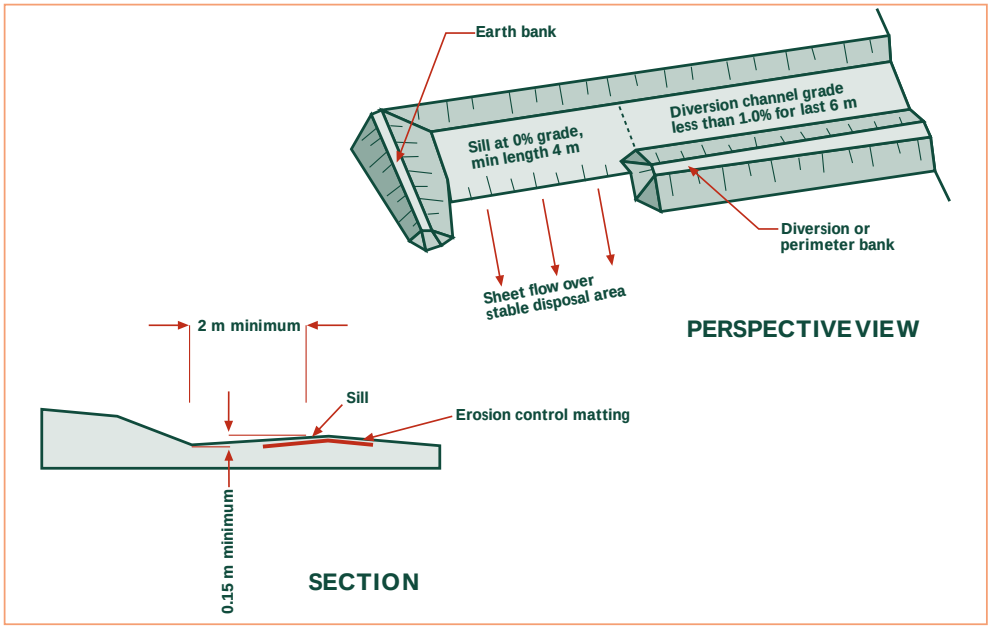

Figure 5.3 Level spreader installation method.

Stabilised Waterways

Stabilised waterways are open earth channels that have a trapezoidal or shallow rounded cross section. They are protected by a dense grass

cover and, in the case of larger watercourses that collect urban stormwater, generally incorporate some form of invert protection or a low flow pipe. The waterways are usually landscaped and do not need to follow a linear alignment.

The primary function of such channels is to reduce the scour along drainage lines of concentrated flow. Use stabilised waterways for both minor drains or swales and larger major drainage lines. The methods adopted for stabilising the channel bed and banks depend on its size and frequency of use.

Stabilisation of open earth channels can reduce the requirements for maintenance; less work is required to replace or repair scoured sections and remove sediments. Select appropriate species for the vegetation cover to help minimise vegetation maintenance.

Waterways stabilised with landscaped vegetation cover correspondingly increase in aesthetic appeal which in turn could be reflected in an increase in adjacent property values. Stabilised waterways require more land than conventional drainage systems but landscaping can create active and passive recreation areas along the watercourse.

5.3 Sediment Collection Structures

General

Measures described in this section are small scale devices for use on construction sites to remove sediment from site runoff. Most of them would normally be temporary, being required only until the disturbed surfaces in the catchment that they serve have become permanently stabilised.

Select the appropriate controls, or combination of controls, based on the expected rate of sediment export and the duration of the construction works. All sediment control structures require regular inspection and periodic maintenance and/or replacement. Take care to ensure that sediment removed from the structures during maintenance operations is not allowed to be remobilised and exported from the site.

Hay Bale Barriers

Hay bale barriers, as shown in figure 5.4, are a temporary sediment control device constructed from bales of hay positioned to intercept sediment laden runoff, and retain the sediment and reduce runoff velocities.

Place hay bale barriers across minor drainage lines to filter runoff from small catchment areas of up to about 0.5 ha. Use hay bales as a temporary perimeter bank around disturbed areas preventing runoff from leaving the disturbed area without being treated. They can also be placed around stormwater inlet pits, particularly during the construction phase of a development, to prevent sediment entering the underground drainage system.

Hay bale barriers are relatively inexpensive and easy to install but only have an average three-month life span (depending on the rainfall events) and therefore require regular inspection and repair or replacement. Ensure that the hay bales do not contain any potential pest plants.

Hay bales used on development sites can be used as mulch after their useful life span.

Inspect hay bale barriers after each rain event for displacement, undercutting and overtopping, and repair them immediately. Most hay bale barrier failures are related to the following installation problems:

- bales not staked firmly into the ground
- bales not embedded into the ground
- bales not butted tightly end-to-end
- insufficient space provided for sediment entrapment
- access for cleaning not provided
- bales displaced by site operations or equipment and not restored to their original position at the end of the working day
- barrier not located in the centre of, and perpendicular to, the flowpath
- bales providing habitats for vermin.

Take care on sites prone to vandalism as hay bales may be subject to arson attacks.

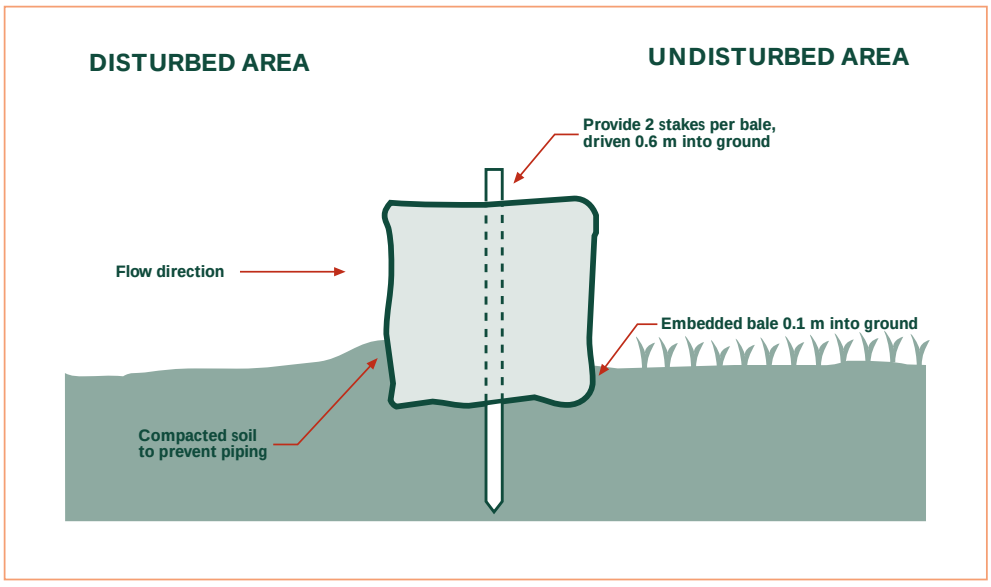

Figure 5.4 Hay bale installation method.

Silt Fences

Silt fences, as shown in figure 5.5, are a temporary sediment control measure constructed from woven wire fencing mesh and filter fabric to intercept sediment laden runoff, and retain sediment and reduce runoff velocities.

Place silt fences to intercept sheet flow from disturbed areas or around the toe of stockpiles to prevent the unwanted migration of material from the stockpile. In some instances, silt fences can also be placed across minor drainage lines to act as a sediment trap. Under these conditions, the total catchment area draining to the fence should be less than about 0.5 ha.

The fences are relatively quick and easy to install, and may be moved from location to location as required. The design life of the silt fence is governed by the ultra-violet stability of the fabric, which is generally about 6 months. Commercially available silt fences offer complete prefabricated systems and greater ultra-violet stability.

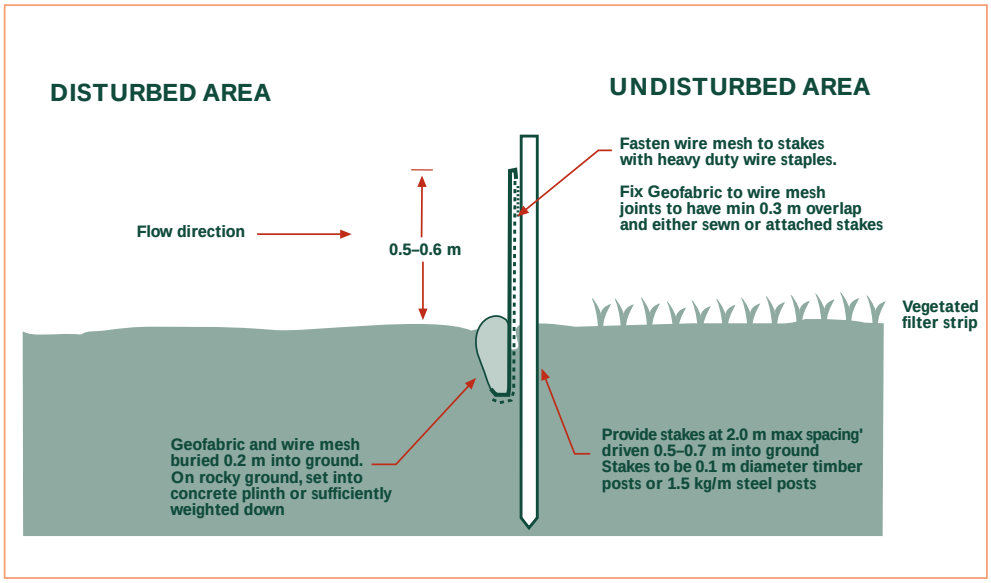

Figure 5.5 Silt fence installation method.

Stormwater Inlet Pit Traps

Stormwater inlet pit traps, as shown in figures 5.6 and 5.7, are temporary devices used to prevent silt from entering stormwater drainage pipes during construction or maintenance works. Take care when installing these devices to ensure that total blockage of the approach to the inlet pit does not create a risk of flooding adjacent properties.

Two types of inlet pit traps can be used, one for drop inlets and the other for side entry inlets. Both are constructed from heavy gauge wire

netting or mesh supporting a geotextile filter fabric, protected and held in place by a layer of 50–75 mm gravel, preferably prewashed.

A semi-portable version can be manufactured for use in both cases. A long 'sausage' manufactured from the wire netting, filter fabric and gravel can be laid around the approach to both types of inlets, or used as a series of interceptors laid diagonally across road gutters. Ordinary house bricks can be used as spacers to set the filter sausage back from the face of the inlet so the filter device can be overtopped during flood events.

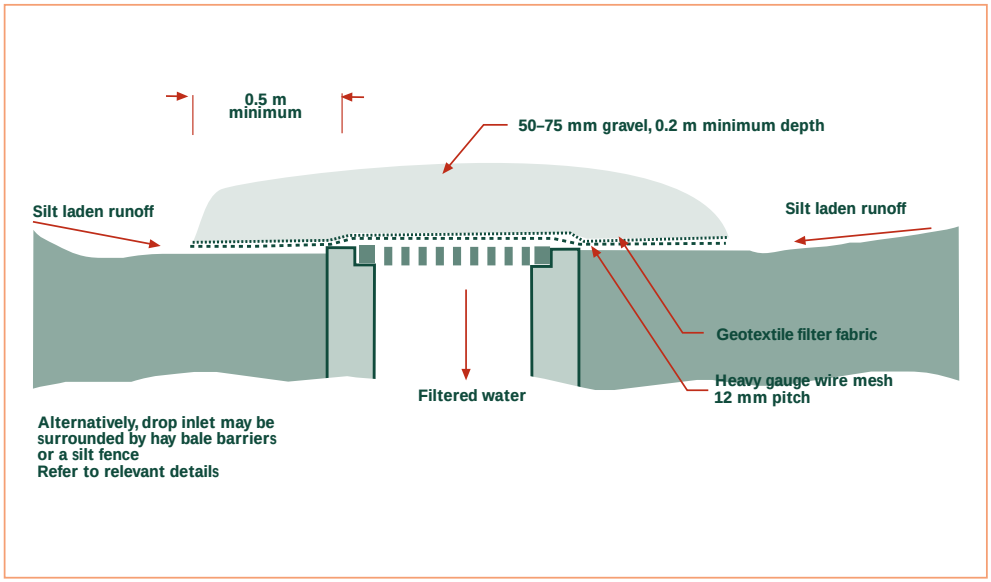

Figure 5.6 Drop inlet pit trap.

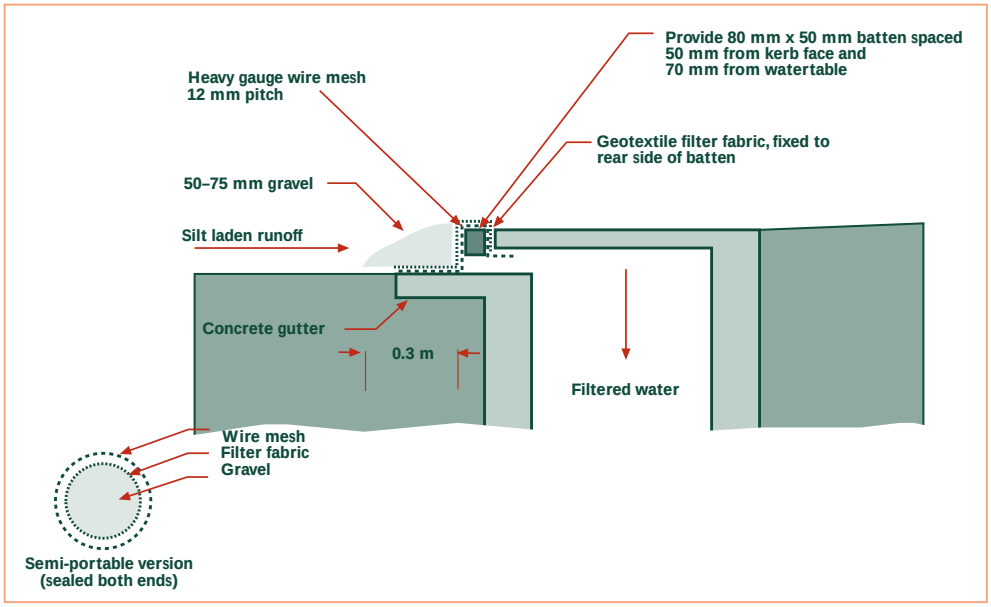

Figure 5.7 Side inlet pit trap.

These small scale devices need frequent cleaning to remain effective over a long period. They are ideal for use during short term maintenance projects.

Sediment Traps

Sediment traps are temporary structures used to intercept runoff and capture silt. The traps take a number of forms, but usually involve the excavation of a small basin and the creation of an embankment along its downhill side. The sediment trap captures a concentrated sediment laden flow and stores it under quiescent (still) conditions to allow the silt to deposit in the bottom of the trap.

Locate sediment traps on drainage lines downstream of small catchment areas expected to generate a high sediment load. (For low sediment loads, hay bale barriers or silt fences may be more suitable.) Install the traps before any land clearing operations begin and site them to capture runoff from disturbed areas. To minimise the size of the sediment trap required, divert runoff from areas outside the site or from stable areas around the trap.

Depending on the arrangement adopted, sediment traps can be used for catchment areas of up to about 5.0 ha. Do not locate the traps within main drainage lines, otherwise they may be frequently overtopped and the trapped sediment resuspended.

Traps can be constructed economically in areas with ready access to earthmoving equipment. They require regular maintenance and clearing of silt to maintain their efficiency and capacity. Improve the effectiveness of the traps to remove fine particles by placing filter fabric along the uphill face of the embankment.

Vegetated Buffers

Vegetated buffers take the form of a strip of undisturbed or established vegetation, left to intercept sediment laden sheet flow and remove silt by the filtering action of the vegetation and reduced runoff velocities.

They are usually located around disturbed areas to intercept the sheet flow which then discharges into adjacent waterways or stormwater inlets. Buffers must be continuous and are most effective for shallow flow spread over a large area.

The buffer strip length data given in table 5.1 are a guide for use in the absence of more detailed information. These lengths are based on the assumption that the average flow depth through the filter was approximately 30 mm.

Use buffer strips within waterways or swales to intercept and filter runoff. Improve the effectiveness of vegetation in swales by ensuring that the flow through the vegetation is shallow and does not flatten the vegetation.

Vegetated buffers are relatively cheap to incorporate, particularly if the existing vegetation cover can be used. In addition, buffer areas are aesthetically pleasing and can form a final part of the site's landscaping, becoming a permanent sediment removal feature.

Table 5.1 Minimum vegetated buffer strip lengths for slope of buffer strip.

Vegetation Type	Minimum strip lengths (m)						
	2% slope	4% slope	6% slope	8% slope	10% slope	12% slope	14% slope
Trees with dense groundcover	10	10	10	10	15	15	15
Dense grassed cover	15	20	30	40	50	60	70
Light grassed cover	30	60	90	120	150	180	220

The effectiveness of vegetated buffers is dependent on the ground slope, catchment size and density of vegetation. Dense strips of vegetation in waterways increase roughness and the size of waterways needs to be increased to compensate for the loss of hydraulic capacity.

Temporary Construction Exit

Install temporary construction exits, as shown in figure 5.8, at any point traffic leaves a construction site. The construction exit minimises the transportation of sediment, on the wheels, chassis and sides of vehicles, from construction sites on to public roads or adjacent properties. Temporary construction exits consist of an elevated pad of coarse gravel overlaying a geotextile fabric. A timber or metal shaker ramp is often located on top of the gravel pad. Provide facilities for vehicles to be washed down on the pad before leaving the site; in muddy conditions the shaking action of the pad may not be sufficient to dislodge material attached to the outside of the vehicles.

Direct all drainage from the exit pad to a sediment trap or sedimentation basin. A mountable berm, immediately adjacent to the site boundary, may be necessary to prevent drainage from the pad discharging on to the exit road.

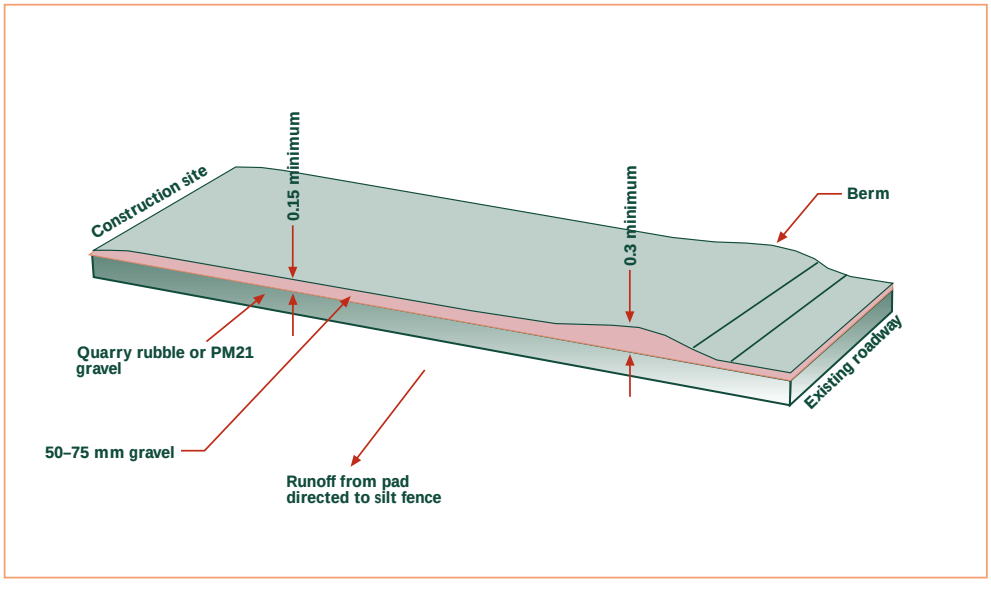

Figure 5.8 Temporary construction exit.

Ensure the exit pad has a minimum width of 3.0 metres but is not less than the maximum available width at the site exit. The minimum length of the exit pad should be 15 metres, except for single residential allotments where a 6 metre minimum length applies.

Construct the gravel pad from 75 mm aggregate, to a minimum thickness of 150–200 mm. It may require periodic topping up.

For building sites with only small areas of disturbed soil that are not accessible to construction traffic, temporary construction exits may not be required.

For all construction sites, remove any sediment deposited on public roads or adjacent properties using dry sweeping methods at least once daily following the conclusion of the daily construction activities. Increase the frequency of cleaning if rainfall is likely.

Sedimentation Basins and Wetlands

Use sedimentation basins and wetlands as a last resort to improve the quality of stormwater discharge from a site and do not use them as the sole means of controlling the export of sediment from a site. Incorporate permanent sedimentation basins and wetlands into an integrated total catchment management plan under the direction of the relevant catchment management board, drainage authority or council. Wetlands have the advantage of being a potential source of water for reuse, such as for irrigation.

Sedimentation basins may be temporary or permanent structures used to intercept runoff and capture silt. The basins capture concentrated sediment laden runoff and store it under quiescent conditions to allow the silt to settle. Construct a compacted earthen embankment across a drainage line to make the basin.

Provide a perforated and filtered riser pipe as an outlet to ensure an appropriate detention period. In principle, the longer the detention period, the smaller the particle that settles.

Place sedimentation basins on drainage lines immediately downstream of disturbed areas or locate the basins off line and treat sediment laden runoff from catch and diversion drains. Install the basin before any land clearing work begins. The basins may be able to treat runoff from larger catchment areas of up to 40 ha. Basins for large catchments require careful siting and design to ensure safety and the correct operation. Take extreme care in the design of sedimentation basins whose embankment failure could pose a threat to properties and communities. Provide emergency spillways on all sedimentation basins to allow flood flows to pass over.

Sedimentation basins usually do not effectively remove fine silt and clay sized particles because of the length of time they take to settle. Sedimentation efficiency can be improved if emergent aquatic vegetation is established within the basin which, if kept permanently wet, will provide some of the advantages associated with wetlands.

Wetlands have the added benefits of:

- additional pollutant removal mechanisms, particularly soluble impurities, and plants acting as physical barriers to sediment movement
- enhanced aesthetic value
- creation of more diverse habitats for wildlife
- being a significant education resource for schools and communities on the importance of stormwater pollution control.

Design and manage artificial wetlands in accordance with the requirements and objectives of the relevant catchment management board, drainage authority or council. Consider such factors as:

- mosquito control, preferably by natural methods based on providing a diverse habitat for mosquito predators and the creation of wave action
- maintenance requirements, particularly with regard to the desilting of the wetlands
- the fate of any sediments removed from the wetlands, particularly with possible metal contamination
- the need for a harvesting schedule of wetland vegetation to prevent the release of captured nutrients during the plant die-off period.

Natural wetlands must not be used for the treatment of stormwater pollution.

5.4 Soil Erosion and Drainage Management Plan

General

For any site development, integrate the planning and implementation of a soil erosion and drainage management strategy into the initial development plan.

Prepare a SEDMP if either of the following applies:

- There is a risk of significant sediment pollution to adjoining lands or receiving waters.
- The total area to be disturbed, or left disturbed, at any one time exceeds 0.5 ha.

The plan should demonstrate the following major objectives of the site's erosion and sediment control strategy:

- Ensure the least land is exposed to the risk of erosion for the shortest period of time.
- Effectively control surface runoff entering and leaving the site.
- Install erosion control works and measures to minimise the extent of site erosion.
- Install sediment collection devices to prevent the export of sediment from the site.

- Rehabilitate all disturbed areas as soon as possible.
- Maintain erosion control and sediment collection devices.

Prepare an effective SEDMP by following this sequence of steps:

1. Investigate the site characteristics.
2. Integrate all clearing and grading works with the site layout design.
3. Determine the existing and proposed drainage patterns.
4. Select the appropriate erosion control practices.
5. Select the appropriate sediment collection devices.
6. Outline the site rehabilitation programme.

The preparation and lodgement of a SEDMP should be a necessary condition of consent for land development and construction works. Lodge the SEDMP before engineering designs are submitted to councils. It may be necessary to have the SEDMP approved and certified by suitably qualified and experienced organisations to avoid additional processing work by council or agency staff. For works requiring external approval, such as by the relevant council, Development Assessment Commission or EPA, the SEDMP must be endorsed by the relevant approval authority.

For construction and maintenance works carried out by a council, agency, or its nominated contractor, prepare a SEDMP as part of the usual planning and design processes. In this instance, the council or agency would need to perform a self regulatory role.

The SEDMP should be approved by someone nominated within or by the council or agency to specifically undertake this task for these works.

The SEDMP should comprise:

- Plans
  - Major drainage plan
  - Site plan
- Supporting documentation
  - Report
  - Calculations
  - Preliminary design sketches.

Plans

Major Drainage Plan

Include on one or more maps at a maximum scale of 1:2500:

- the development site boundaries and the total contributing catchment area boundary (including all external areas) to the most downstream point(s) of the site
- all existing major drainage systems and creeks within the total catchment area, and contours within the total catchment area at a

sufficient interval to adequately define general drainage paths

- the location of any sensitive ecological areas in the vicinity of the development site
- the location of the proposed stormwater discharge point(s) from the site, both during and following completion of the final land development.

Site Plan

Include on one or more site plans at a scale of either 1:200 or 1:500:

- existing contours at a maximum interval of 2 metres
- interim (if applicable) and final design contours at a maximum interval of 2 metres
- site boundaries and existing adjoining land use
- location of identified critical areas within or near the proposed development with potential for serious erosion problems
- limits of site disturbance including areas of cut and fill volumes at each disturbance location and proposed stockpile areas
- areas of existing vegetation to remain undisturbed and type of site protection measures to be used
- the location and size of all temporary, semi-permanent and permanent erosion and sediment control structures, devices and measures
- details of the proposed permanent stormwater management system, including all inlets, drains and outlets
- site rehabilitation proposals, including all permanent vegetated areas.

Documentation

Provide documentation to support the proposed SEDMP such as:

- SEDMP report containing:
  - brief description of the nature and purpose of the development
  - description of the existing site topography, soil erodibility, vegetation and drainage pattern(s)
  - description of neighbouring areas, such as creeks, lakes, reserves and existing development that may be affected by the land disturbance
  - statement regarding the impact of the proposal on the existing drainage pattern within and adjacent to the development site
  - description of the methods adopted to control erosion and sediment during construction
  - brief description of how the site will be stabilised after construction is completed

- construction schedule including the -
  - phasing of land disturbance works
  - staging of the rehabilitation of the disturbed areas
  - implementation of the temporary or permanent erosion and sediment control structures and strategies
- maintenance schedule of regular inspections, cleaning and repairs of all erosion and sediment control structures.

- Calculations supporting the selection of the size of any temporary or permanent erosion and sediment control structures. These calculations should be in sufficient detail to enable the preliminary sizing of all structures, such as the silt storage capacity of a sediment trap.
- Preliminary drawings of all major temporary or permanent structures such as sedimentation basins that are not standard structures or devices.

Detail

The amount of detail required for a SEDMP will vary between projects. Use suitable risk management techniques to determine not only the appropriate recurrence interval standard for the works to comply with this code, but also the amount of detail required for a SEDMP. In essence, assess the exposure risk created by the council's or agency's activity to the likely environmental harm or damage. Consider factors such as:

- the size and nature of the external contributing catchment
- the scale of the project
- the estimated duration of the works involved with the project
- erosion susceptibility of exposed surfaces
- ecological sensitivity of the surrounding environment
- consequences of the failure of any of the SEDMP works
- ability to instigate effective emergency clean up procedures in the event of a failure
- season
- likelihood of short term rainfall
- climate
- natural vegetation growth.

Standard Symbols

Adopt the standard symbols shown in Figure 5.9 when preparing the SEDMP.

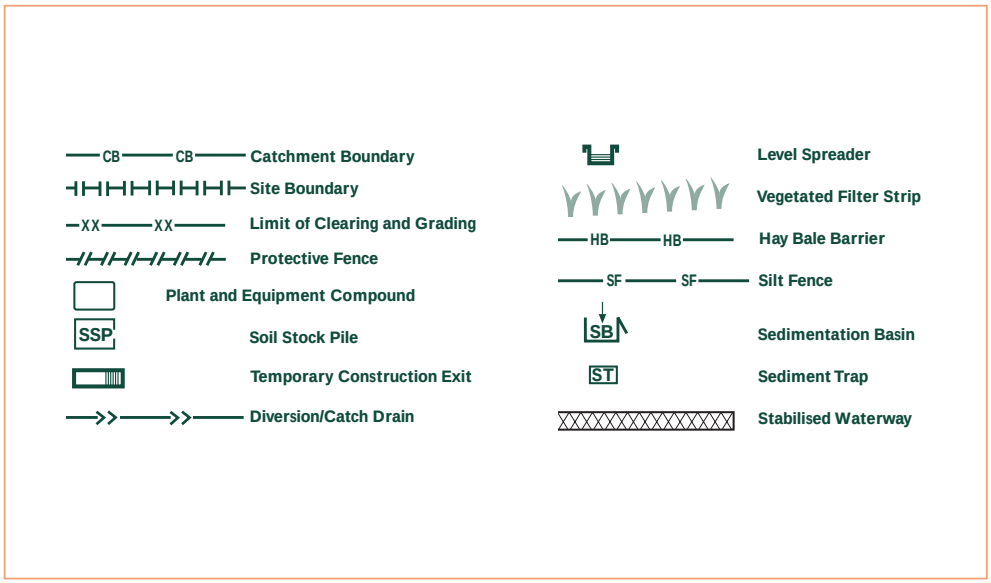

Figure 5.9 SEDMP standard symbols.

Examples

The two examples of site plans illustrated are for single residential allotment development (figure 5.10) and for residential subdivision roadworks formation (figure 5.11).

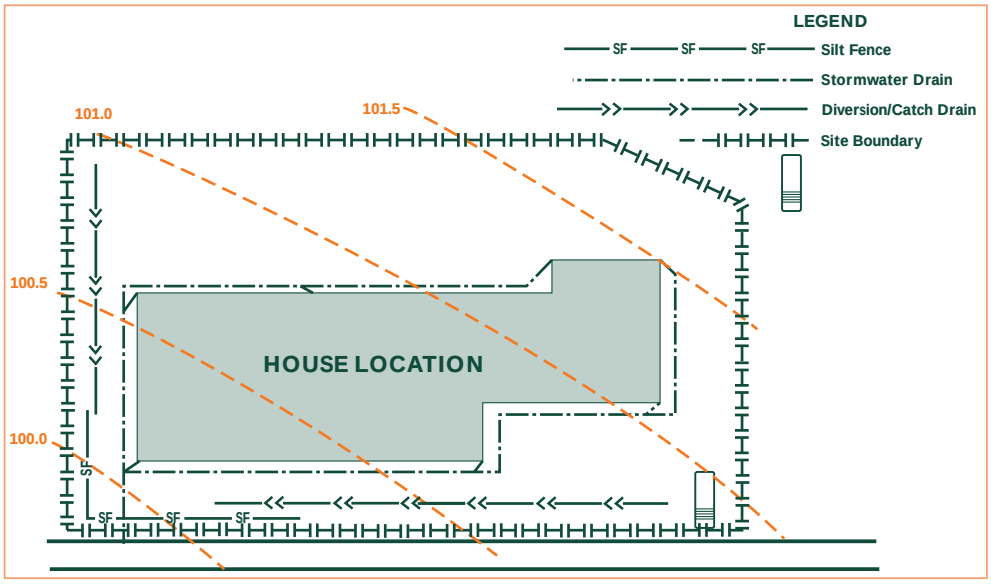

Figure 5.10 Single residential development example.

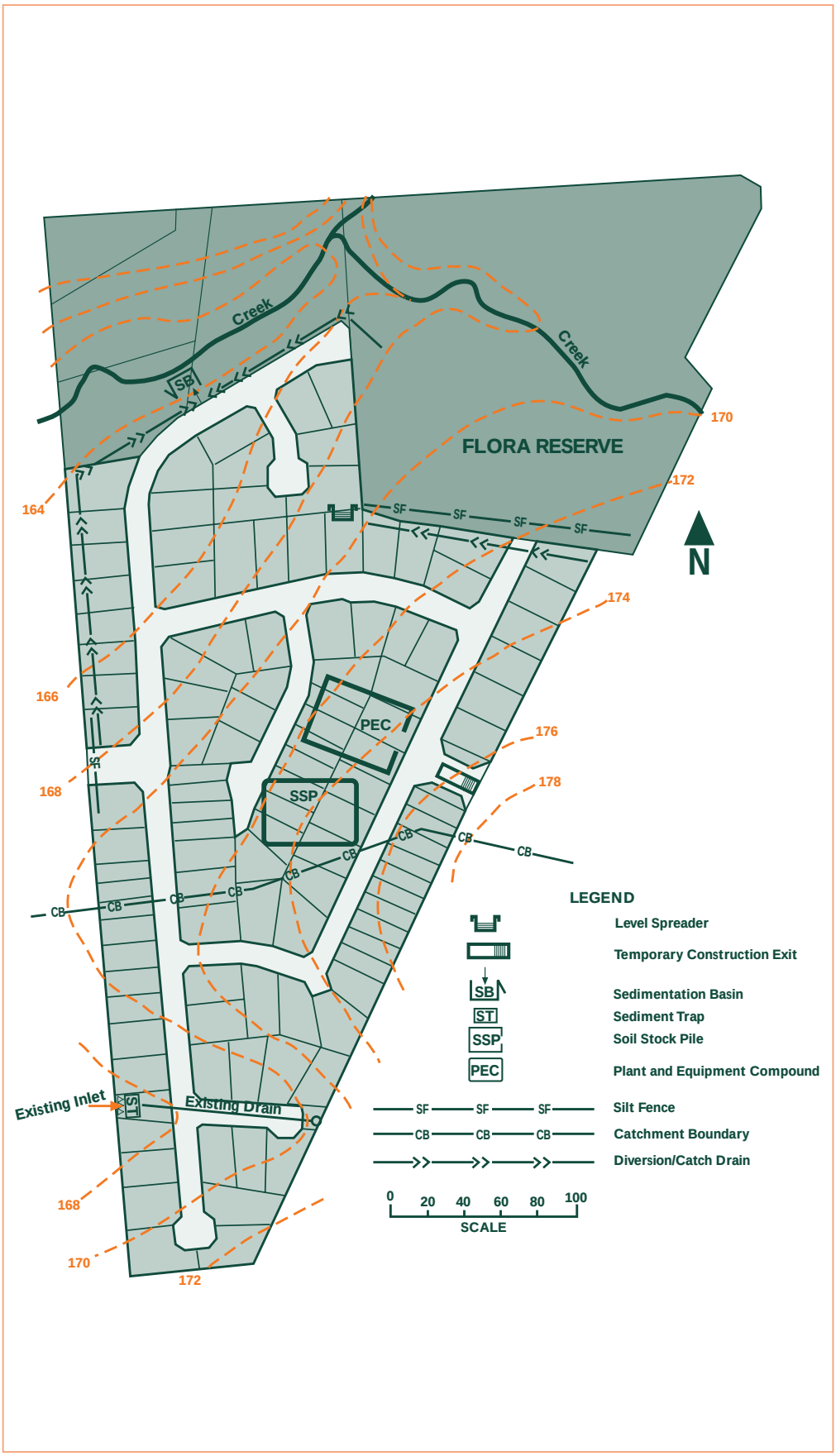

Figure 5.11 Residential subdivision roadworks formation example.

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Catchment Resource Centre Waterwise Information Pamphlets:

- Revegetation of watercourses
- Watercourse management
- Exotic trees along watercourses

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Mr Richard Crabb	City of Burnside
Mr David Elliot	City of Salisbury
Mr Dean Mathews	City of Noarlunga
Mr Harry Pitrans	City of Tea Tree Gully

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Mr Laurie Bruggeman	Defence Centre, Adelaide
Mr Greg Cock	Primary Industries SA
Mr Gavin Dougherty	SA Metropolitan Fire Service
Mr Peter Francis	Federal Airports Corporation
Mr Van Kennewell	SA Water
Mr David Kernich	Department of Transport
Mr Hoang Nguyen	ETSA Corporation
Mr Bernard Wesselingh	Services SA
Mr Les Williams	Telstra

The City of Tea Tree Gully

for permission to include material from their Stormwater Management Bulletin.

BC Tonkin & Associates, Adelaide

for permission to include material from the Mount Lofty Ranges Watershed Urban Stormwater Guideline Manual.

APPENDIX 1
PISA FORESTRY ENVIRONMENTAL MANAGEMENT GUIDELINES

PISA Forestry have developed and are continually updating and self auditing their own codes of practice and management guidelines including the following:

- Environment Management Guidelines for Plantation Forestry in South Australia
- Code of Practice for Safe Handling and Use of Agricultural Chemicals (Pesticides)
- PISA, Forestry Manual Vol 2
- Harvesting and Transportation of Roundwood Products Specification comprising Tender and Contract Conditions
- Raising of Roading Material Specification comprising Tender and Contract Conditions
- Plantations Establishment Proposal Documents
- Forest Roading Syllabus for Training
- Guidelines for Firebreak and Fire Access Tracks
- Control Burning Guidelines
- Native Forest Management Plans
- PISA Forestry is involved in the development of National Plantation Guidelines and is currently involved in a CSIRO audit of their management techniques
- Soil Conservation Board District Plans
- Regional *(Development Act 1993)* Strategy Plans (eg Mt Lofty Ranges)
- Groundwater monitoring for weedicide residues in conjunction with MESA and Department for Environment, Heritage and Aboriginal Affairs.

APPENDIX 2
RELEVANT LEGISLATION

This appendix contains additional information about legislative controls that may apply when considering the objectives of this Code of Practice.

Environment Protection Act 1993

Codes of Practice and Environment Protection Policies

Codes of Practice are the vehicles currently being used by the EPA to achieve improved stormwater quality. The purpose of the codes is to provide guidelines on how to prevent pollution from leaving sites where the pollution originates, by the use of long term planning, modification of practices and treatment at source where appropriate.

It is intended that a period of approximately 12 months will be allowed for the particular community sectors (in this case government agencies) to alter behaviours if necessary and to practise and trial the suitability of techniques and activities outlined in the code. After this period of time, these codes will be linked to the water quality EPP under the Act, aspects of which may be mandatory where appropriate, or non-mandatory.

Following the formation of the EPP, agencies will have a period of time to implement actions to adhere to the mandatory provisions of the EPP, on condition that the agencies demonstrate that they are making appropriate changes towards meeting the provisions of the EPP.

Authorised Officers

The Act allows for the following persons to be appointed as authorised officers:

- appointed by the EPA (with the approval of the Minister)
- all members of the police force
- a council employee or officer as appointed by the relevant council after consultation with the EPA (powers of council appointed authorised officers may be limited by regulation).

Fully authorised officers are empowered to:

- require compliance with the mandatory provisions of an EPP
- enter and inspect places or vehicles including, on the obtaining of a warrant from a justice, breaking into a place or vehicle
- require documents or information to be produced and to take copies of such documents or information
- take samples for analysis, examine or test plant, equipment or vehicles
- take photographs, films, audio, video and other recordings
- seize material evidence
- require a person to provide their name and address and to answer questions.

Water Resources Act 1997

The Water Resources Act 1997 allows for the proclamation by the Governor of a catchment area to be administered by a catchment water management board. The board is charged with preparing a catchment water management plan for its catchment area, which includes water quality objectives of:

- removing pollutants from watercourses
- providing support for activities which will improve the quality of catchment water
- educating the public in relation to the management of the catchment.

This stormwater pollution control Code of Practice has been designed to prevent the entry of pollutants to the watercourses by proposing strategies and works to control the generation of the pollutants at their source.

State and Federal Government agencies should consult with the relevant catchment water management board before undertaking any major development or stormwater construction works.

Local Government Act 1934

The Local Government Act 1934 provides councils with certain obligations and powers for the protection of watercourses. Although principally targeting the issue of flood control, the relevant sections of the Local Government Act could be interpreted to include issues related to the source control of stormwater pollutants. Under these wider interpretations, the Code of Practice is intended to be in agreement with the Local Government Act.

Government agencies that wish to alter a watercourse should consult directly with the relevant council.

Specific sections of the Local Government Act relate to the source control of stormwater pollutants:

Section 634 specifies that councils are responsible for the protection of all watercourses within their areas (except where the watercourses are proclaimed under the *Water Resources Act 1997*).

Section 635 requires council authorisation for persons to deposit anything in a watercourse, obstruct, alter the course or interfere with the bed and banks of a watercourse.

Section 636 allows councils to require the removal of obstructions, the making good of damage, or maintenance of a watercourse which passes through privately owned land.

Section 637 gives councils the power to carry out works to remove obstructions, make good damage and otherwise maintain a watercourse in good condition.

Section 748a gives councils the power to fine any person depositing litter, refuse or waste matter in a street, road or public place.

Various penalties and appeal procedures are included in some of these provisions.

Public and Environmental Health Act 1987

Under part III of the *Public and Environmental Health Act 1987*, councils are responsible for the protection of public health.

Section 15 of the Public and Environmental Health Act relates to the control of unsanitary premises, defined as those with offensive material or odours emitting from the premises.

Section 18 relates to the control of discharge of waste from premises into a public place or other property.

Section 21 relates to the protection of water supplies.

Substantial penalties are available under the Public and Environmental Health Act for breaches of these sections.

Sewerage Act 1929

The *Sewerage Act 1929*, and its associated Regulations specify allowable discharges to sewer. Telephone the SA Water Trade Wastes Unit on (08) 8216 1723 to obtain further information about the current Trade Waste licensing conditions.

Soil Conservation and Landcare Act 1989

The central requirement of the *Soil Conservation and Landcare Act 1989* is:

It is the duty of an owner of land to take all reasonable steps to prevent degradation of the land

where '*land*' is described in the Act as 'its soil, vegetation and water', and '*degradation*' of land means a decline in the quality of soil, vegetation, water and other natural resources of the land, resulting from overgrazing, excessive tillage, mineral extraction, development of towns, diposal of wastes, road construction, failure to control plant and animal pest or any other human activity on the land.

The State has at present 27 soil districts of varying size, each with its own district plan. These districts cover all of the State with the exception of all Aboriginal lands and parts of metropolitan Adelaide. Each district plan is administered by its own soil conservation board, appointed by the Minister of Primary Industries. In the absence of a defined district or board, the designated soil conservator is the administrator.

Soil conservation boards and the soil conservator are empowered by the Act to exercise its powers, mainly through the issuing of Soil Conservation Orders.

As a rule, few of these orders are issued because the Board's primary role is education and negotiation to address problems and effect community change.

State and Federal Government agencies should consult with the relevant soil conservation board before undertaking major works.

Development Act 1993

Development plans, as defined in division 2 of the *Development Act 1993*, may be amended to include the provisions of an EPP under section 29(1)(b) and Regulation 14(b). Regardless of the incorporation of EPPs or aspects of EPPs into development plans, any development which requires authorisation under the Development Act will also require compliance with all EPPs in force at the time.

It is also important to note that the procedures in any EPP apply also in circumstances in which any prior non-complying use of land is expanded.

Development plans currently contain both regional and local objectives and principles of development control (some of which will have stormwater implications) that authorities must have regard to when assessing development applications. The stormwater related issues can be addressed by the design of development proposals approved under the Development Act and by conditions of consent on application.

Other Legislation

The following legislation requirements may also be relevant in certain situations and should be referred to as required.

- *Pollution of Waters by Oil and Noxious Substances Act 1987* (section 26) prohibits the discharge of oil or any oily mixture from a vehicle or apparatus (eg pipeline, structure on land, oil storage receptacle) into State waters.
- *Petroleum Products Regulation Act 1995* (section 25 and 26) requires a general environmental duty and a duty to prevent the risk of significant environmental harm and to ensure the plant is in a safe condition and that it does not give rise to the risk of significant environmental harm whether in use or not in use.
- *Dangerous Substances Act 1979* regulates the keeping, handling, conveyance and use of dangerous substances and provides directives on how the substances must be kept (eg bunding for flammable, toxic and corrosive substances), calling up Australian Standard AS 1940–1993 The Storage and Handling of Flammable and Combustible Liquids, as the compliance document. In setting out requirements, AS 1940 also addresses the matter of preventing a spill or leak from entering the sewerage and water systems and contaminating soil.
- *Environment Protection (Impact of Proposals) Act 1974* binds Commonwealth bodies to fully examine and take into account matters that affect the environment.
- *Australian Heritage Commission Act 1975* applies to those places in the natural and cultural environment that have special significance.
- *Endangered Species Protection Act 1992*.
- *National Parks and Wildlife Conservation Act 1975*.
- *Aboriginal and Torres Strait Islander Heritage Protection Act 1984*.

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