# SECTION R

# ENVIRONMENTAL PROTECTION

## INDEX TO CLAUSES

# SECTION R

# ENVIRONMENTAL PROTECTION

## R.1 THE ENVIRONMENTAL MANAGEMENT SYSTEM

The Contractor shall include in its Quality System a system element covering environmental management in accordance with Australian Standard AS/NZS ISO 14001: 1996 - Environmental Management System and this Specification. The Contractor shall incorporate into its Quality Plan for this Contract an element to manage the environmental effects of the work. This element shall consist of a project specific environmental management plan that considers, but is not necessarily confined to air pollution, water pollution, noise, waste, soil contamination, sediment control and the preservation of habitat and identified historic and archaeological sites.

The system shall cover all work under the Contract.

The plan shall be developed with reference to the Environment Protection Authority's Publications No. 480, "*Environmental Guidelines for Major Construction Sites"* and No. 275 *"Construction Techniques for Sediment Pollution Control"*. The plan must demonstrate, as a minimum, compliance with the requirements of the "Catchment and Land Protection Act 1994", the "Environmental Protection Act 1970", the "Environmental Protection and Biodiversity Conservation Act 1999", other Acts of Parliament, Regulations and State Environmental Protection Policies. In addition the Contractor will abide by all Ordinances, Local Laws and any specific requirements of the responsible authorities for the administration of these Acts, Regulations, Ordinances and Local laws.

The costs of compliance with these requirements shall be deemed to be included in the contract sum.

## R.2 NOISE CONTROL

The Contractor shall conform with AS 2436-1981 *"Guide to Noise Control on Construction, Maintenance and Demolition Sites"*. The Contractor shall avoid practices, which lead to excessive noise and disturbance to site occupants and adjoining landowners and occupiers. Noise emanating from spoil dumping into trucks and from other machinery shall be minimised.

Silencing of Machinery – General

Machinery including jackhammers shall be silenced. Compressors shall be fitted with acoustic canopies to minimise noise levels.

All machinery shall be kept properly greased and maintained to the manufacturer's specifications.

Noise labels are required (by Law) to be affixed to new mobile air compressors and pavement breakers. The unit with the lowest noise rating, which meets the requirements of the job, shall be used where the work is conducted in a residential area or other noise sensitive location.

## R.2 NOISE CONTROL (cont'd)

All mechanical plant must be silenced by the best practical means using current technology. Noise suppression devices shall be maintained to the manufacturer's specifications. Internal combustion engines shall be fitted with a muffler in good repair.

Where possible, no truck associated with the works shall be left standing with its engine operating in a street adjacent to a residential area.

Site buildings, access roads and plant shall be positioned such that the minimum disturbance occurs to the locality.

Noise from the site must comply with the requirements of the schedule below.

Machinery Used Outside of Working Hours

All machinery used outside normal working hours, such as pumps, motors and the like shall be electrically driven or otherwise fully silenced.

All vehicular movements to and from the site must only be made during the scheduled normal working hours unless approved by the Superintendent.

Where it is not possible for continuous type work such as casting concrete to be completed within the hours specified in the schedule, and the noise of this activity will impact on the residential area, then affected premises shall be given 24 hours notice in writing of the intended work, its duration and times of occurrence.

Schedule

(a) No work shall be carried out on any Sunday, public holiday, between Good Friday and Easter Monday inclusive, or during the Christmas to New Year periods;

(b) No work shall be carried out on the site outside the period between 7:00 am or sunrise, whichever is the later, and 6:00 p.m. or sunset, whichever is the earlier;

(c) Saturday - unless otherwise specified or approved by the Superintendent, no work shall commence before 9:00am - refer Environment Protection Authority Residential Noise Regulations 48a(5).

Noise level at any residential premises shall not exceed background noise by:

(i) 10dB(A) or more for up to 18 months after project commencement.

(ii) 5dB(A) or more after 18 months.

## R.2 NOISE CONTROL (cont'd)

During the hours of:

| | |
|---|---|
| 6:00pm to 10:00pm | Monday to Friday |
| 1:00pm to 10:00pm | Saturdays |
| 7:00am to 10:00pm | Sundays and Public Holidays |

Noise must be inaudible within a habitable room of any residential premises:

| | |
|---|---|
| 10:00pm to 7:00am | Monday to Sunday. |

## R.3 MINIMISING MUD AND DUST

The Contractor shall adopt practices that ensure that the dust and mud associated with the Works are minimised. Appropriate methods are set out in Environment Protection Authority Publication No. 480 "*Environmental Guidelines for Major Construction Sites*".

Complaints

The Contractor shall immediately rectify any complaint from adjoining landowners and occupiers concerning disturbance over dust and mud. The cost of resolving complaints and cleaning up (where required) shall be borne by the Contractor.

Mud and Dust on Construction Equipment

Mud, dust or road making materials from wheels and tracks of construction equipment shall not be carried onto roads, paved streets, footpaths and the like. When accidentally deposited on paved surfaces, such materials shall be removed immediately by the Contractor. Where water is used in its removal the water must first pass through a sediment-filtering device prior to it entering the drainage system.

Suppression of Airborne Dust

Wholesale removal of existing ground cover shall not be allowed. The contractor shall plan and coordinate the works so that there are no delays in construction activities resulting in disturbed land remaining unstabilised and must revegetate and mulch progressively as each section of the works is completed.

The Contractor shall take measures necessary to keep airborne dust to a minimum. Unless otherwise specified, no separate payment will be made for the suppression of dust.

## R.3 MINIMISING MUD AND DUST (cont'd)

Should the Contractor fail to achieve adequate dust control, particularly where the safety and convenience of the public are affected; the Superintendent may take any action necessary and deduct the cost of such action from moneys due or becoming due to the Contractor.

The Superintendent may direct the suspension of work at any time where that work creates a dust hazard or nuisance to the public, personnel working on the site or property such as crops, stock and houses in the vicinity of the work. Where the Superintendent has directed a suspension of work and considers that the Contractor could not have been expected to have adequately controlled the dust, the Superintendent may consider an extension of time pursuant to the General Conditions of Contract. No claim for increased costs due to such suspension will be considered

## R.4 DISPOSAL OF CONTAMINANTS

The Contractor shall properly dispose of all liquid, gaseous and solid contaminants in accordance with all statutory and contractual requirements.

(a) Gaseous contaminants shall be discharged in a manner that complies with the State Environment Protection Policy for the Air Environment.

Liquid contaminants to be disposed to stormwater must comply with the requirements of the State Environment Protection Policy for the Waters of Victoria. Liquid contaminants to be disposed to sewer must first be approved by South East Water Limited, and shall be contained in approved vessels for disposal at approved sites. In this instance, "approved" means as approved by the South East Water Limited Environmental & Technical Services Manager. Evidence of such approval shall be recorded within the Contractors quality system.

The Contractor shall dispose of solid contaminants by removal from site to an appropriate landfill that is licensed to accept the contaminant.

## R.5 STORMWATER QUALITY PROTECTION

The Contractor shall avoid pollution of any watercourse, drain or dam by taking measures necessary to minimise erosion by way of surface protection of exposed areas, control of runoff water and trapping sediments.

These measures shall be detailed in the Environmental Management Plan under the heading of Stormwater Management Plan ('*SMP'*). The SMP shall be based on a risk assessment. For information about completing a risk assessment and preparing a SMP refer to Appendix A.

## R.5 STORMWATER QUALITY PROTECTION (cont'd)

In developing the SMP the Contractor must:

5.1 Comply with this specification and all relevant EPA Guidelines, including:

5.1.1 Construction Techniques For Sediment Control - Publication No 275

5.1.2 Sediment Pollution Control on Construction Sites -TG208/90

5.1.3 Environmental Guidelines for Major Construction Sites - Publication No. 480

(Copies of these documents are available from the EPA Customer Service and Information Centre - GPO BOX 4395QQ, Melbourne, 3001)

5.2 Ensure that the concentration of suspended solids and turbidity in waters discharging into drainage systems do not exceed the emission limits for waste discharges to water as specified in Schedule E of the *State Environment Protection Policy (Waters of Victoria).* To achieve this it may be necessary to:

5.2.1 Adequately plan, install and maintain the sediment control of the construction site and ensure that construction activities such as excavating and de-watering do not result in turbid water entering drainage networks.

5.2.2 Monitor at a frequency, which complies with Section 9. 2 - EPA Publication 480, the turbidity of water directed to a natural waterway or a drainage system that is discharging to a natural waterway.

5.2.3 Supervise all pumping operations and implement precautions to ensure that the turbidity of pumped water is minimised.

5.3 Adopt practices to ensure that turbid water shall not enter the drainage systems. Suggested practices could include, but are not limited to:

5.3.1 Construction of detention basins and settling ponds particularly on larger sites.

5.3.2 Discharge of silt laden waters onto vegetated areas of suitable size and slope to filter out suspended silts.

5.3.3 Where land is not available or suitable for settling ponds and/or vegetated filter strips, then silt laden water may need to be subject to a specifically designed physical filtration and/or chemical flocculation system to remove suspended silts.

## R.5 STORMWATER QUALITY PROTECTION (cont'd)

5.4 Nominate for each element of the works the sediment filter-barriers to be installed prior to construction commencing. For suggested options / methods that the Contractor may use to achieve the measures refer to Appendix A to Section R of the Specification:

***(Note: These options / methods only present a few of what is available and the Contractor may use other suitable methods that exist).***

5.5 Stockpiles of spoil and materials are to be kept to a minimum as well as being located clear of footpaths and street channels. Other steps that may be necessary to prevent sediment from stockpiles entering the drainage system may be the use of such options as:

5.5.1 Tarpaulins or plastic sheeting over the stockpiles.

5.5.2 Storage bins or placing spoil material directly into trucks for removal to more suitable stockpile/disposal sites.

5.5.3 Use of timber toe boards and/or silt fences around the base of stockpiles.

5.5.4 DO NOT use hay bales as the only sediment control in residential streets.

If all known on-site treatment methods are unsuitable or impracticable, then turbid and silt-laden water must be removed by tankers for treatment and disposal at an appropriate waste water treatment facility.

The Contractor shall make reference to and conform to the requirements of the SMP during all stages of the project.

**The Contractor shall submit, before commencing any part of the work, details of the proposed SMP to be implemented during the Contract for review by the Superintendent.**

Should circumstances arise which are not adequately covered by the SMP, the Contractor shall submit an alternative SMP to the Superintendent for review prior to the works proceeding.

**HP Works shall not commence or continue at any location until all stormwater quality protection measures specified in the SMP have been implemented and inspected by the Superintendent.**

## R.5 STORMWATER QUALITY PROTECTION (cont'd)

Site Inspections/Meetings

The Contractor shall provide a minimum of 24 hours notice prior to required inspections by the Superintendent following installation of all stormwater protection measures in accordance with the SMP.

Contractors Representatives

On commencement of work, the Contractor shall advise the Superintendent in writing of the names, addresses and telephone numbers of employees who can be contacted in any emergency under the Contract or undertake the replacement or maintenance of stormwater protection and treatment measures. Any proposed changes of representatives, addresses or telephone numbers shall be notified promptly to the Superintendent and confirmed in writing to the Superintendent.

Maintenance of Treatment Measures

To ensure that construction activities minimise environmental damage, the Contractor shall maintain the treatment measures throughout the duration of the works and the maintenance period in accordance with its SMP and EPA Publication No. 480.

Inspections After Runoff Events

The Contractor shall ensure that during the works and maintenance period, following a runoff event that all treatment measures are inspected, and any maintenance necessary to meet the requirements of the SMP and EPA Publication No. 480 is carried out.

Material for Stormwater Quality Protection Measures

Unless otherwise specified, the Contractor shall supply all materials required as part of the SMP.

Monitoring of Stormwater Management

The Contractor shall comply with any requests from the Superintendent to alter or improve existing stormwater management measures within 24 hours (or within 2 hours if rain is threatening) of being notified.

Should the Contractor at any time during the Contract, fail to undertake the above specified works within the prescribe time, the Superintendent may without further notice, have the works undertaken by others and deduct the cost of such work from the amount the Principal owes to the Contractor.

## R.5 STORMWATER QUALITY PROTECTION (cont'd)

Retaining Treatment Measures After Completion of the Works

Upkeep of retained treatment measures shall be the responsibility of the Contractor during the maintenance period of the works. The upkeep period for the purpose of maintaining treatment measures shall be the period necessary to re-establish disturbed ground surfaces. After this period the Contractor shall notify the Superintendent of its intention to remove and then remove all treatment measures unless the Superintendent directs otherwise.

Provision for Sediment/Pollution Disposal

The Contractor is responsible for the collection and disposal of any pollutants that results from the works undertaken in accordance with all statutory requirements.

Waste Disposal

The Contractor is responsible for the collection and disposal of any waste that results from the works undertaken in accordance with all statutory requirements.

Spills Contingency Plan

The Contractor shall have a spills contingency plan prepared to prevent any chemicals entering the stormwater drainage system. This plan shall include methods and access to materials to contain the spill, to clean up the spill and to dispose of or reuse the recovered residues (Refer to Appendix A to Section R of the Specification).

Any materials necessary to contain chemical spills should be available on sites where storage of such chemicals occurs.

The plan shall contain key contacts at appropriate agencies to contact in case of chemical spillage.

## R.6 PREVENTING DAMAGE TO VEGETATION

The Contractor must take all care to avoid damaging any shrubs, bushes, trees or other significant vegetation, during the works. This includes actions such as:

(a) Realigning the works (property connections etc.) to avoid the vegetation.

(b) Fencing off the vegetation to keep machinery away.

(c) Tying back stems and branches to keep them out of the path of construction plant.

## R.6 PREVENTING DAMAGE TO VEGETATION (cont'd)

(d) Avoiding piling materials directly over or against the vegetation for prolonged periods.

(e) Avoid piling soil, rocks or gravel against trees or under tree canopies.

(f) Immediately trimming back damaged roots or branches with a sharp saw to achieve a clean cut, and applying tar mastic to reduce chances of infection.

(g) Recording the location of, then transplanting and maintaining, small significant trees/shrubs etc, and replacing and re-establishing them as near as possible to their original location after the works are completed.

(h) Providing landowners with advanced potted trees/shrubs to compensate for trees that had to be removed and could not successfully be re-established.

(i) In areas where cinnamon fungus occurs - carefully cleaning machinery between jobs to minimise contamination between work sites.

Amelioration of Damage to Vegetation

Should there be a possibility of permanent damage to significant trees, and the area cannot be avoided, the Contractor must first contact the Superintendent, who may wish to be present before works proceed. In general terms, a significant tree has a diameter of more than 10 cm or is a protected native tree or is otherwise conspicuous or protected under a local planning scheme.

Any absolutely necessary damage to trees shall be done in a way that minimises possible health risks to trees. Roots or branches that are damaged and/or trimmed shall be cut back cleanly and daubed over the cut end with tar mastic to prevent infection. Where possible, roots with a minimum diameter of 50 mm shall be dug around and not damaged.

Trees accidentally damaged by construction plant shall be repaired immediately. Splinters or hanging sections shall be cut back cleanly and the whole damaged area daubed with tar mastic.

Where tree branches impair tall construction plant and there is no alternative but to use such plant, it is preferable to tie the offending branches back out of the way. If this cannot be done, and there is no other way the plant can work, then the branches may be cut back with the tree owner's approval. Only the minimum amount necessary for the plant to undertake the works shall be cut back. The branches shall be cut cleanly and immediately daubed with tar mastic.

**APPENDIX A:**

# MATERIAL AND DESIGN REQUIREMENTS FOR STORMWATER PROTECTION MEASURES AND; HOW TO PREPARE A STORMWATER MANAGEMENT PLAN ('SMP')

## 1. NOTES FOR USERS

This document contains descriptions and diagrams of stormwater quality protection measures for Erosion Control/Prevention Measures and Sediment Control Techniques. These measures should be considered not as individual tools, but as part of an integrated approach to stormwater management.

It is envisaged that this document will be used by Council's Contractors in the process of establishing a Stormwater Management Plan for individual Council projects, as part of the Environmental/Site Management Plan.

Not every possible stormwater quality protection measure has been included. Omissions such as gross pollutant traps and rock filter dams have been made on the basis that typical Council managed contracts would not call for such measures.
The measures that have been included have been selected for their ease of implementation and removal, availability and cost of necessary materials, and the stormwater protection needs of typical works undertaken by Council and Council's Contractors.

For each of the measures this document includes:

- Applications and limitations;
- Material requirements (where applicable);
- Design requirements; and
- Maintenance requirements.

For ease of representation on technical drawings, for each of the measures a standard symbol is depicted on the corresponding diagram. Although no formal standard exists for symbols associated with stormwater quality protection, the symbols devised by IEAUST (Qld) have been adopted.

Adoption of uniform symbols by both Councils and Contractors is an important part of the success of the implementation of Council Specifications for Stormwater Quality Protection into Council managed contracts.

General Site Management has also been included in this section of the documentation. This section provides guidance on waste disposal, plant maintenance and refuelling, and spills contingency plans.

## 2. EROSION CONTROL/PREVENTION MEASURES

Erosion control/prevention measures are most suitable for the protection of exposed surfaces and stockpiles from the erosive effects of raindrop impact and stormwater runoff.

### 2.1 Erosion Control Mats

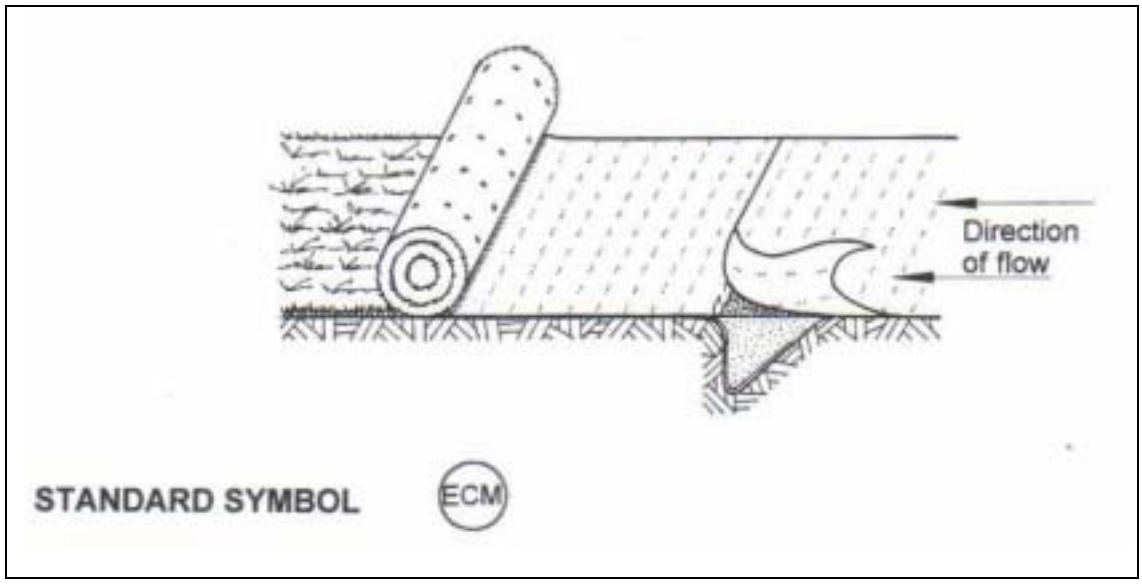


***Figure 2.1 Erosion Control Mats***

#### 2.1.1 Applications and Limitations

Suitable for:

- Exposed surfaces;
- Stockpiles;
- Slopes greater than 4(H): 1(V) to be revegetated.

Limitations of using erosion control mats are:

- Biodegradable products can generally not withstand erosive effects of concentrated flow;
- Some fabrics have a limited working life and may need replacement following runoff events;
- Can be difficult to maintain if maintenance requirements are not given adequate consideration during the design phase.

### 2.1.2 Material requirements

Because of the variety of erosion control geotextiles available, it is recommended that manufacturer's advice is sought prior to the selection of the material.

### 2.1.3 Design requirements

For specific design information refer to the various product data sheets supplied by the manufacturers. The method of installation varies with the type of material used and the purpose being performed by the erosion control mat.

The diagram above (Figure 2.1) depicts the typical method of laying erosion control mats. In addition, good contact must be achieved with the surface being protected. Erosion control mats should be installed so that seepage is minimised. Surface irregularities should be removed where possible, prior to installation of erosion control mats. Mats should be anchored well enough to withstand both wind and water.

### 2.1.4 Maintenance Requirements

Should be inspected on a regular basis and after each storm event that produces runoff.

## 2.2 Mulching

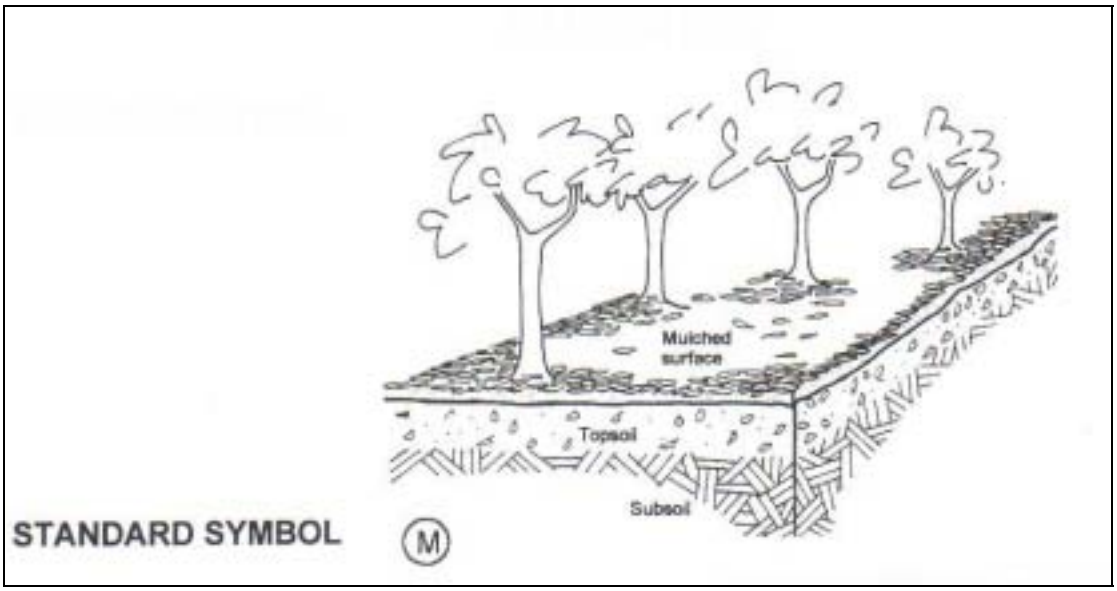


***Figure 2.2 Mulching exposed surfaces***

### 2.2.1 Applications and Limitations

Suitable for:

- Clay-soil surfaces;
- Dispersive soils;
- Seeded areas;
- Exposed sub-soils;
- Mild slopes 1(V): 5(H); and
- Aiding or inhibiting seed germination.

Limitations of using mulch are:

- Some mulches are not suitable in environmentally sensitive areas due to possible introduction of unwanted seeds;
- Not suitable for areas subjected to concentrated flow, unless gravel mulch is used;
- Mulch should cover 70-75% (minimum) of the soil surface to give adequate protection against erosion.

### 2.2.2 Material Requirements

Mulch materials can include pine bark, wood chip (not from plywood products), a mixture of sawdust and wood shavings, shredded newspaper, straw, paper pulp. Mulch should be free of weeds, deleterious material, toxins and pathogens, and shall be well composted.

Fibreglass mulch should not be used.

### 2.2.3 Design Requirements

Mulch should be spread evenly with a maximum depth of 50mm. Thicker layers (75 to 100mm) inhibit germination and can be used to control weed growth. Mulch should cover a minimum of 70-75% of the soil surface.

#### 2.2.3.1 Straw Mulch

Effective on dispersive soils.
Should be dry with low leaf content.
May be applied to small areas such as earthy embankments and soil stockpiles.
Application rate: 2.5 bales per 100m2.

#### 2.2.3.2 Brush Mulch

Preferred on areas where regeneration with native plants is desired.
Should be applied parallel to contours.
Mulch should be free of non-native seed.

#### 2.2.3.3. Wood Chip Mulches

Useful for weed control and mulching small areas that are not closely mowed.
Application rate: 110 to 140 kg per 100m2.

#### 2.2.3.4 Bark Chips and Shredded Bark

Pine bark lowers the pH of soils, so should not be used on low pH soils.
Application rate: 0.025m3/100m2.

### 2.2.4 Maintenance Requirements

Should be inspected on a regular basis and after each storm event that produces runoff.

Area may need reapplication if the vegetation does not establish in the required time or if weed control if necessary.

## 3. SEDIMENT TRANSPORT CONTROL MEASURES

Sediment transport control measures are most suitable for the prevention of sediment and pollutant transport by stormwater. These control measures can also be used to prevent erosion through sheet or concentrated stormwater runoff.

### 3.1 Straw Bales

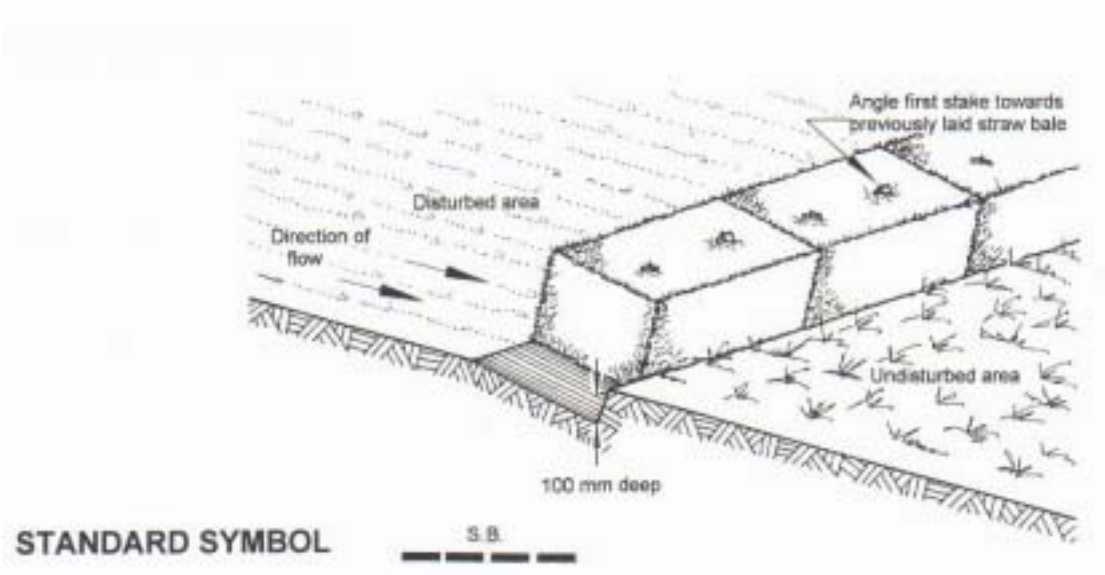


***Figure 3.1 Installation of straw bales***

#### 3.1.1 Applications and limitations

Suitable for:

- Filtering coarse sediment;
- Reducing velocity of sheet flow;
- Limit rutting due to sheet flow;
- Source of mulch; and
- Redirecting flow (when covered in geotextile).

Limitations of straw bales:

- Limited control over fine silts and clay runoff;
- Not effective for flow with >40L/s velocity;
- Effective on catchments <4000m2;

- Not recommended for concentrated flow;
- Not useful in paved areas;
- Maximum slope gradient of 1(H): 2(V); and
- Limited service life (3 to 4 months).

### 3.1.2 Material Requirements

Some bales are not suitable in environmentally sensitive area due to possible introduction of unwanted seeds. Straw bales should be dry with low leaf content. The use of hay bales is not recommended.

### 3.1.3 Design Requirements

Straw bales should be constructed as close as possible to parallel to the contours of the site or at the toe of a slope.

Bales should be anchored into at least a 75mm trench, as per Figure 3.1. Stakes should be angled towards previously placed bales. Stakes should be driven 600mm into the ground and should be flush with the top of the bales.

When used as diversion structures or perimeter banks, the upstream face should be lined with a geotextile.

### 3.1.4 Maintenance Requirements

Bales should be inspected on a regular basis and after each storm event that produces runoff. Bales should be replaced at intervals of 3 to 4 months, or more frequently during wet season.

Following completion of works, bales may be left to degrade, unless Council specify that these should be removed.

## 3.2 Grassed Filter/Buffer Strips

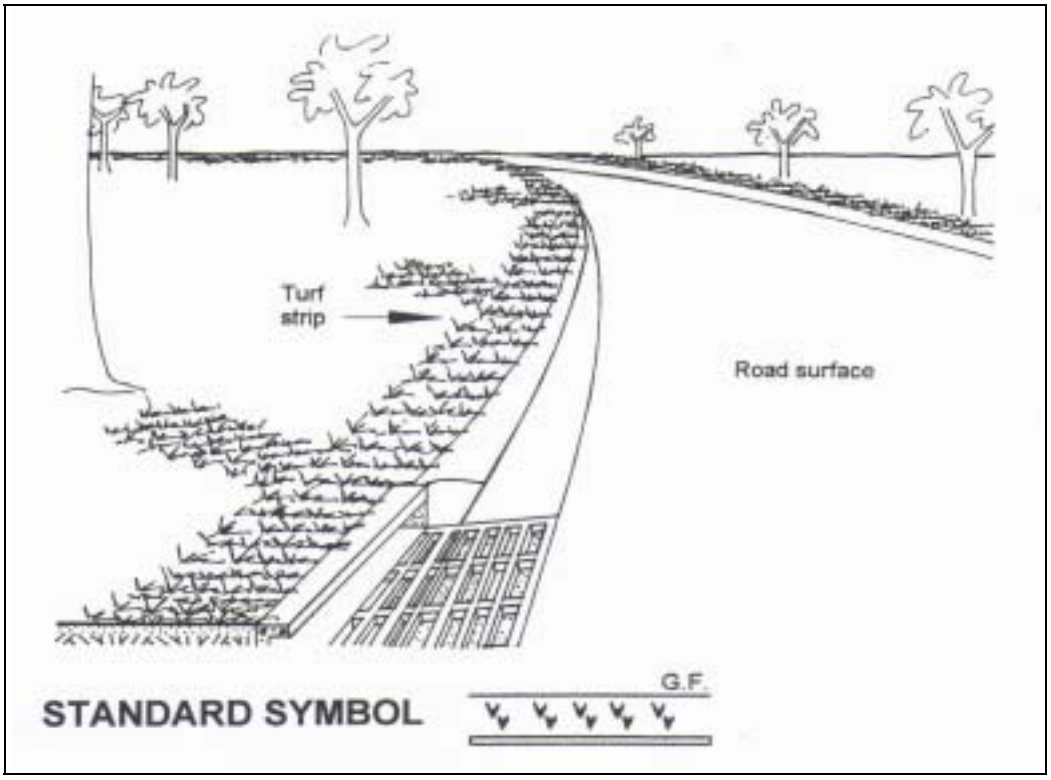


***Figure 3.2 Grassed Filter Strip***

### 3.2.1 Applications and Limitations

Suitable for:

- Filtering coarse sediment;
- Reducing velocity of sheet flow;
- Green field sites with existing vegetation; and
- Use as a buffer strip for works near watercourses.

Limitations of grassed filter strips:

- Clays and silt particles will pass through the filter zone;
- Effectiveness depends on width and slope of filter strip;
- Not suitable for slopes steeper than 5%;
- Ineffective during periods of heavy rain; and
- Can be easily disturbed by construction vehicles.

### 3.2.2 Material Requirements

Existing vegetation can be used. In high velocity areas, where turf needs to be laid, turfing should be stapled to a topsoil layer and/or laid over geosynthetic reinforcement.

### 3.2.3 Design Requirements

On sub-divisions and urban road developments, turf strips should be at least 300mm (preferably 600mm) wide.

The figure below shows the minimum recommended width of any well-grassed buffer strip.

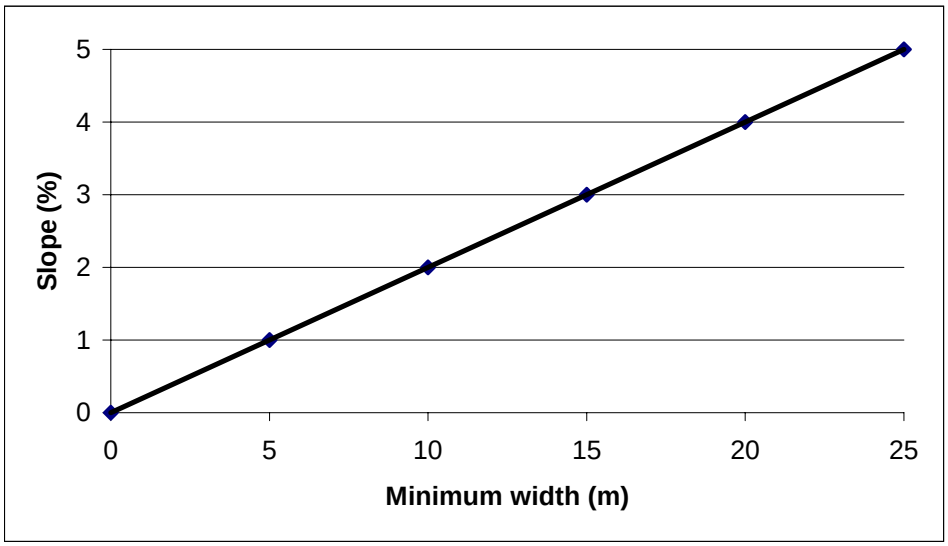


***Figure 3.3 Minimum Width of a Well-Grassed Buffer Strip***

### 3.2.4 Maintenance Requirements

Significant build of up sediment on filter strips indicates inefficient on-site erosion control. The source of excessive sediment deposits should be investigated and rectified.

Filter strips (especially one where turf has been laid) should be inspected on a regular basis and after each storm event that produces runoff.

### 3.3 Sediment Barriers

A number of sediment barrier designs exist. The type of inlet that is being protected dictates the most favourable barrier design.

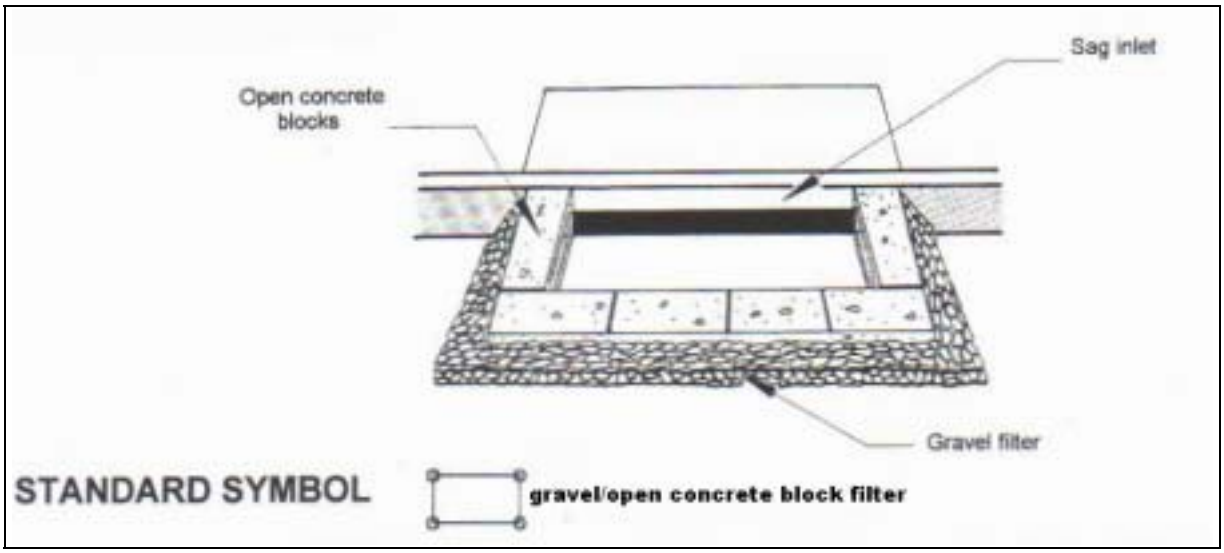


***Figure 3.4 Gravel/Concrete Block Sediment Filter***

#### 3.3.1 Applications and Limitations

Suitable for:

- Filtering coarse sediments;
- Sites where little site disturbance is a requirement;
- Sites with limited area to install other stormwater quality protection measures; and
- Protecting drop inlets, pipe inlets and kerb inlets.

Depending on the design of the sediment barrier, limitations include:

- High upslope erosion rates can block the barriers, causing flow bypassing and entering stormwater drains further downstream;
- Catchment area should be limited to 4000m2;
- Typically, sediment barriers are not effective at removing fine sediment from stormwater;
- Sediment barriers should not be the primary sediment control devices, unless the site prevents any other stormwater quality protection measures;
- Not suitable for areas where damage from construction traffic is likely.

#### 3.3.2 Material Requirements

Materials to be used for sediment barriers will vary depending on the design.

### 3.3.3 Design Requirements

There are numerous designs of sediment barriers. Essential components of these barriers are:

- An effective filter medium is required. This may be a geotextile, sandbags, or gravel;
- A solid frame to support the filter medium, such as concrete blocks or posts and wire mesh;
- Perimeter banks should be incorporated into the design to control pond level;
- Kerb inlet sediment barriers should not block the kerb inlet but should be set back to allow the drain to function during periods of heavy rain;
- A stable bypass outlet should exist in case of blockage. This outlet should not promote downstream erosion;
- Ponding must be allowed to occur upslope of the trap in order to achieve particle settlement.

### 3.3.4 Maintenance Requirements

Should be inspected on a regular basis and after each storm event that produces runoff. Bulk sediment should be regularly removed to ensure efficacy of barrier and to prevent bypassing flow.

Refer to below diagrams for design alternatives.

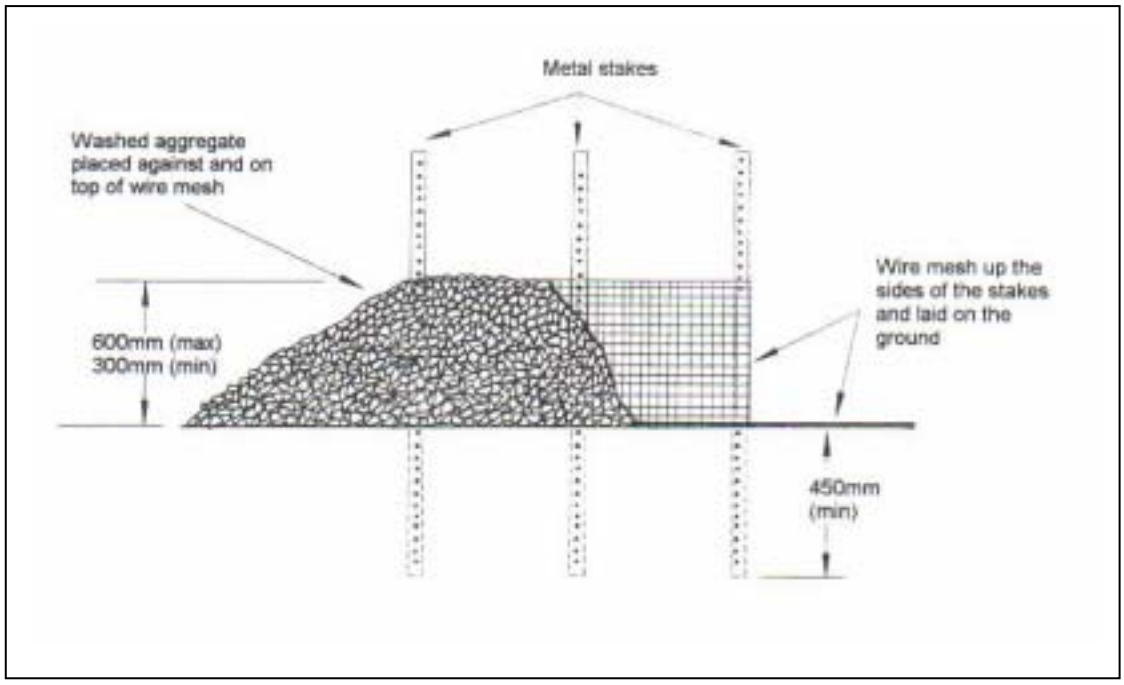


***Figure 3.5 Mesh and Aggregate Drop Inlet Protection***

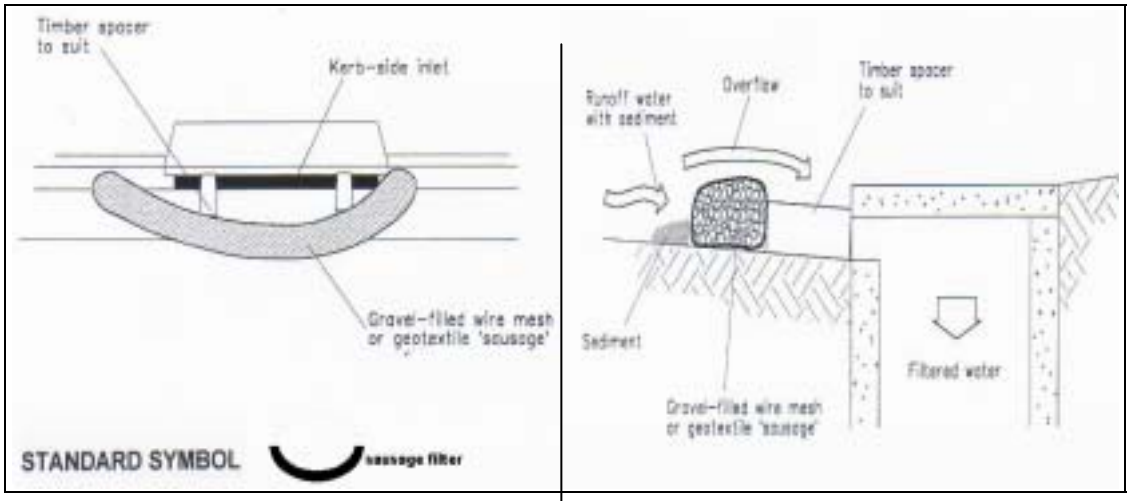


***Figure 3.6 Geotextile 'Sausage' Inlet Filter***

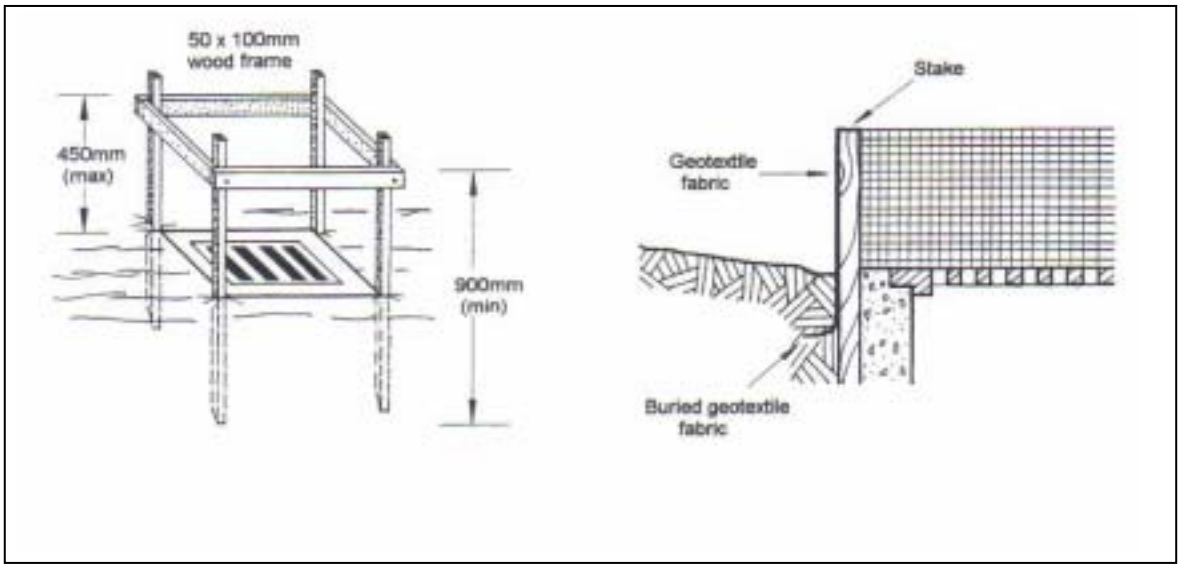


***Figure 3.7 Fabric Drop Inlet Protection***

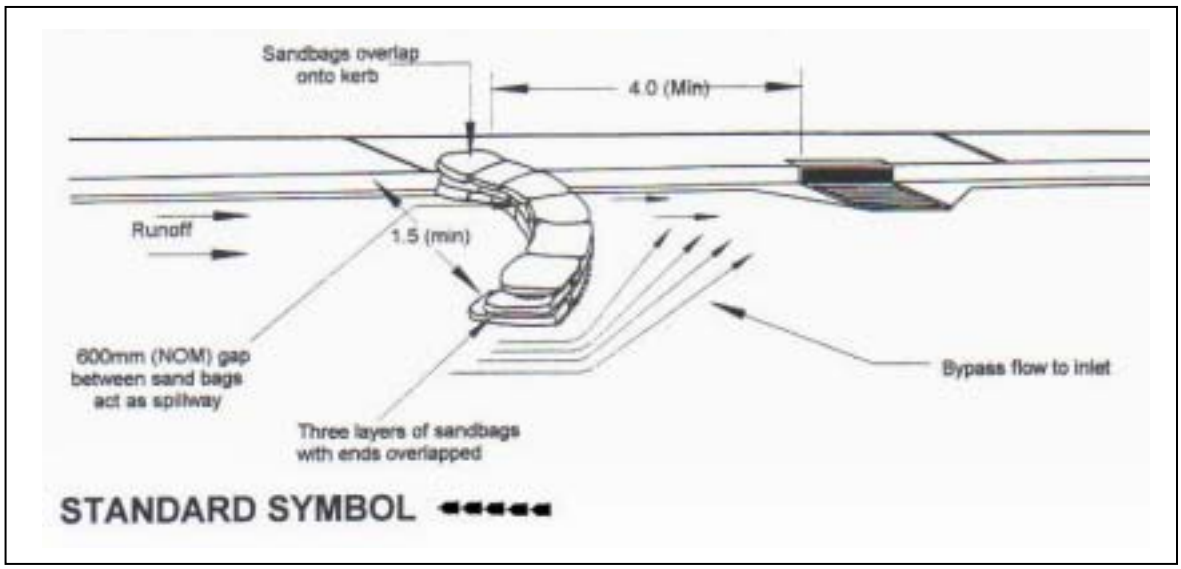


***Figure 3.8 Sandbag Sediment Barriers***

## 3.4 Sediment Fences

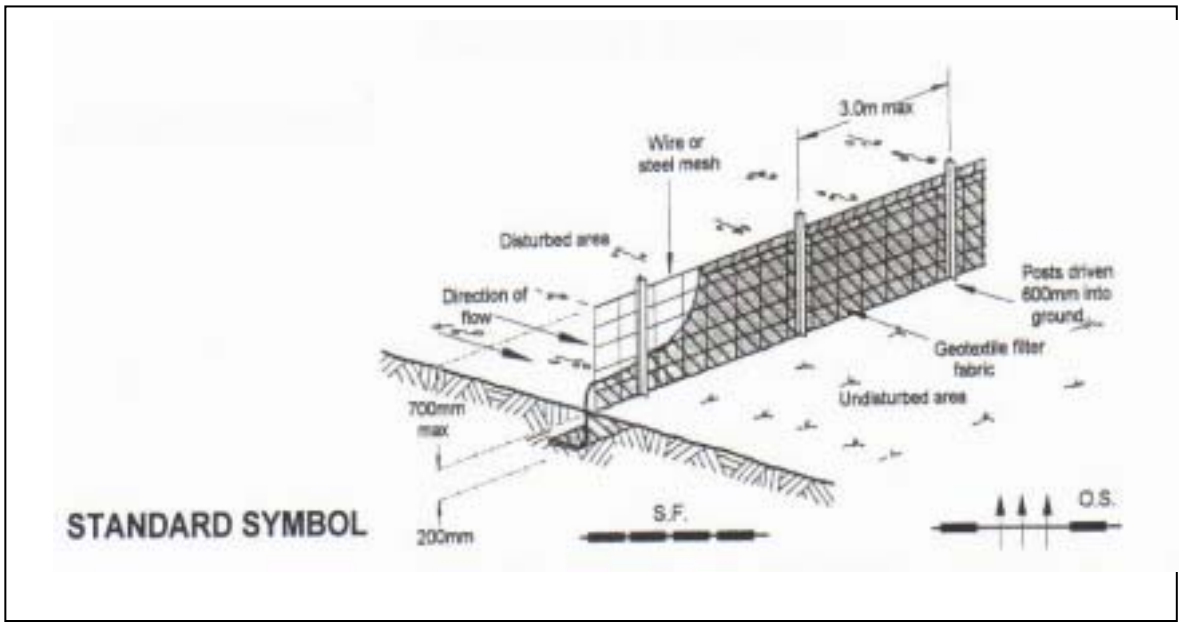


***Figure 3.9 Sediment Fence Installation***

### 3.4.1 Applications and Limitations

Suitable for:

- Reducing the velocity of contaminated sheet flow to induce settlement of the entrained sediment,
- Control of coarse sediment runoff from exposed land, unsealed roads and stockpiles;
- Limiting rutting caused by concentrated flow;
- Controlling sediment runoff close to the source; and
- Redirecting flow when combined with straw bales.

Limitations of sediment fences include:

- Sediment fences can not retain fine silts (<0.02mm);
- Concentrated flow should not exceed 40L/s;
- Drainage area should be limited to 6000m2 per 100m of fence;
- Easily damaged by construction equipment and movement of stockpiles;
- Can cause concentration of sheet flow if inadequately located, installed or maintained;
- Sediment fences should not be located across streams, ditches, channels or gullies.

### 3.4.2 Material Requirements

Non-woven, needle punched geotextiles are preferable for relatively small areas of disturbance such as building sites, but have a service life of approximately 1 month.

Because of the variety of erosion control geotextiles available, it is recommended that manufacturer's advice is sought prior to the selection of the material.

### 3.4.3 Design Requirements

Sediment fences should be aligned with the contour wherever possible. The ends of the fence should be turned upslope.

Sediment fences around stockpiles should be located 2m from the base of the pile to avoid being damaged by falling rocks or shifting soil.

Filter fabric should be anchored into a 150 to 200mm deep trench. Where this is not possible, a continuous layer of gravel may be placed over a minimum 200mm length of the fabric laid upslope of the fence.

There should be a minimum 300mm sewn overlap at joints. The maximum post spacing should be 3m with wire mesh (200mm opening) backing, 2m without wire mesh backing, and 0.5m when installed in a U-shape across minor drains.

### 3.4.4 Maintenance Requirements

Should be inspected on a regular basis and after each storm event that produces runoff. Bulk sediment should be regularly removed to ensure efficacy of barrier and to prevent bypassing flow.

## 3.5 Sediment Fence Sediment Traps

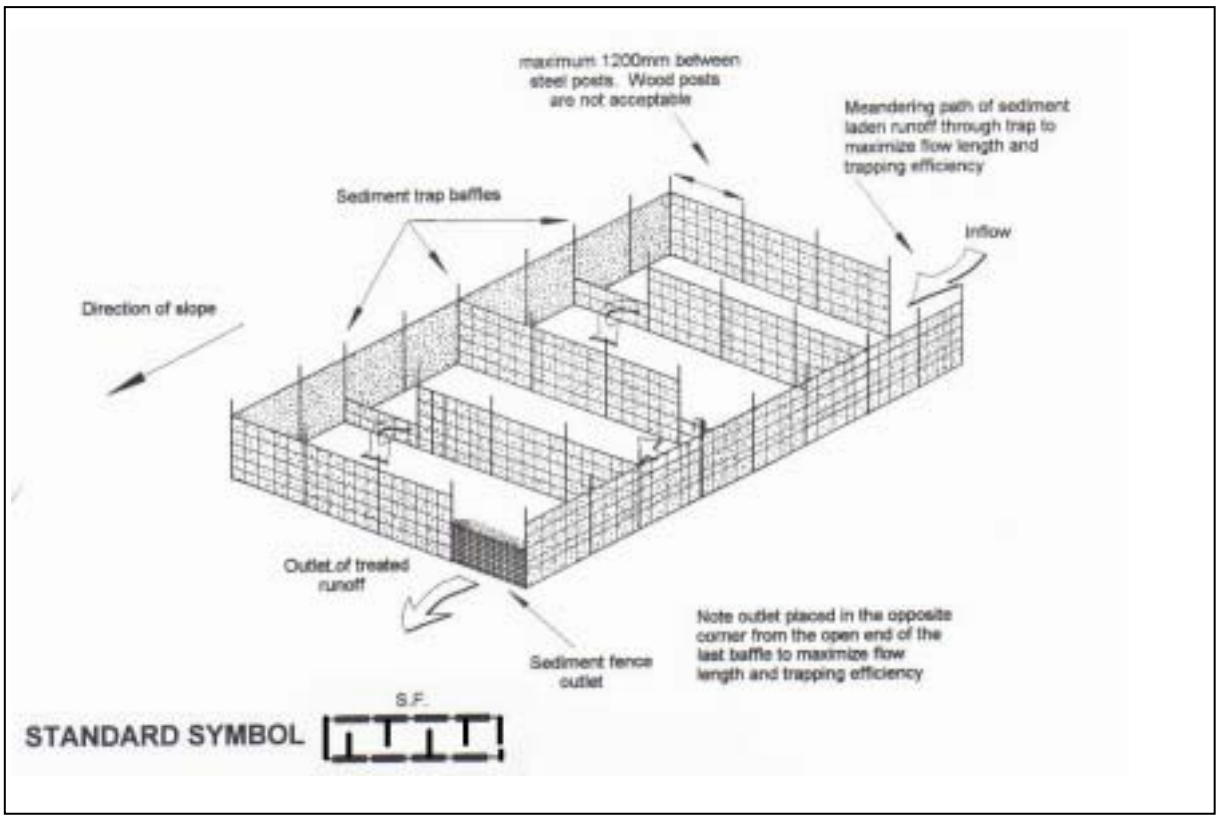


***Figure 3.10 Sediment Fence Sediment Trap***

### 3.5.1 Applications and Limitations

Suitable for:

- Trapping coarse sediments;
- Reducing velocity of concentrated flow; and
- Long-term sediment control, such as for areas being revegetated.

Sediments traps are limited by the following:

- A maximum catchment area of 4000m2 where no more than 50% of the catchment is disturbed;
- Slope of the trap must be less than 3%;
- Average slope of the disturbed are must not exceed 10%.

### 3.5.2 Material Requirements

As per sediment fences.

### 3.5.3 Design Requirements

A maximum distance of 1200mm should be maintained between steel supporting posts. Wood posts should not be used.

### 3.5.4 Maintenance Requirements

Should be inspected on a regular basis and after each storm event that produces runoff. Bulk sediment should be regularly removed to ensure efficacy of barrier and to prevent bypassing flow.

## 3.6 Site Access Stabilisation Measures

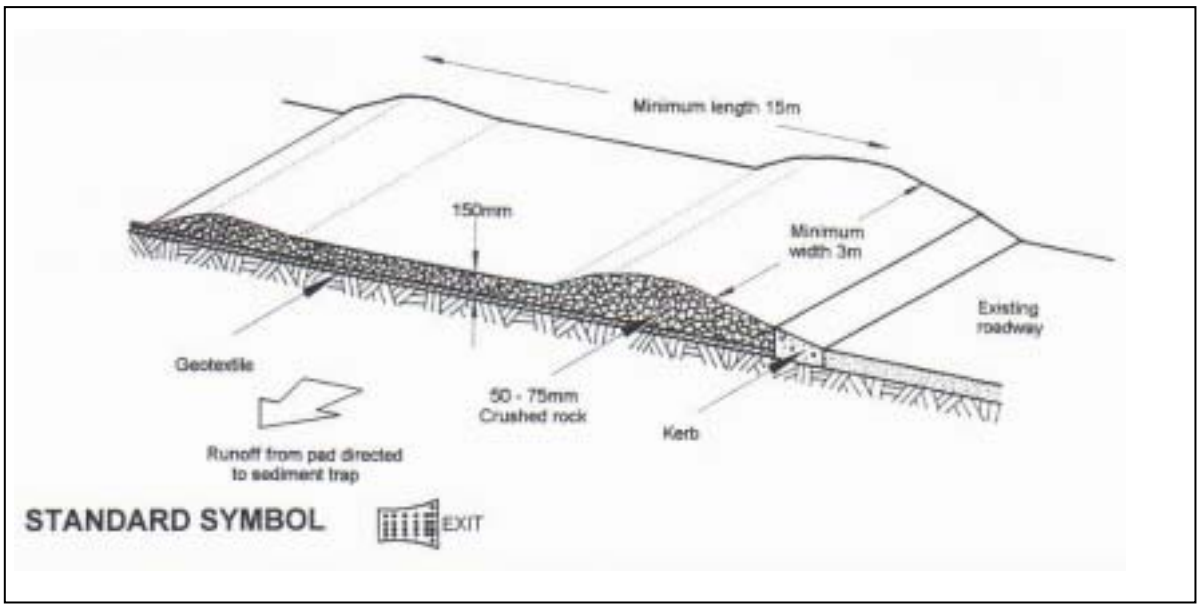


***Figure 3.11 Site Access Rock Pad***

### 3.6.1 Applications and Limitations

Site access stabilisation is suitable for sites where vehicles will exit the site over exposed soils, where there is a risk of tracking soil materials onto public roads. Site access stabilisation is also important to ensure all-weather site access, if required.

There is a variety of preventative measures that can be employed to stop pollutants leaving the site via exiting vehicles' wheels. These include dry systems (rock pads, vibration grids) or wet systems (wash-down areas).

Site access stabilisation has limited effectiveness, as not all of the sediment can be removed from vehicles unless a wash bay, or suitably designed drive-through wash rack is used.

### 3.6.2 Material Requirements

Material requirements will depend on the design of the site access stabilisation.

### 3.6.3 Design Requirements

To minimise the risk of stormwater pollution, site access points should be limited to one per site, where possible.

"Cattle" grids made of either metal or timber sleepers require a 100mm height with 200mm spacing, constructed at least 3.5m long.

Crushed rock pads (as per Figure 3.11) require a 75mm rock pad at least 15m long and 150mm thick. The width should be a minimum of 3m.

The pad should be underlaid with a geotextile filter designed to prevent intermixing of sub-grade and base material. The geotextile may be a woven or needle punched product with a minimum burst strength of 2500N (AS3706.4-90).

A hump should be constructed immediately within the property boundary to divert water to a sediment fence or other sediment trap.

Surface water flowing to the access point should be piped under the trap, or a perimeter bank should be constructed to direct surface flow away from the trap. The trap should not be located within an overland flow path. Site exits on steep grades should also be avoided.

### 3.6.4 Maintenance Requirements

Should be inspected on a regular basis and after each storm event that produces runoff.

Site access stabilisation points need to be maintained in an effective condition by regular removal of sediment and/or adding extra aggregate.

If excessive sediment is still being transported off the site, the length of the gravel pad should be extended or wash racks should be introduced.

## 4. SEDIMENT RETENTION MEASURES

Sediment retention is typically done through the use of basins or impoundments designed to intercept sediment lade runoff and retain a significant proportion of sediment. The retention of sediment is generally achieved by the settling of the suspended sediment from the stormwater flow, combined with the interception of 'bedload' material.

Sediment basins should be designed by appropriately qualified engineers. It is recommended that a conceptual design be completed initially prior to undertaking a detailed design for such sediment retention measures.

### 4.1 Sediment Basins

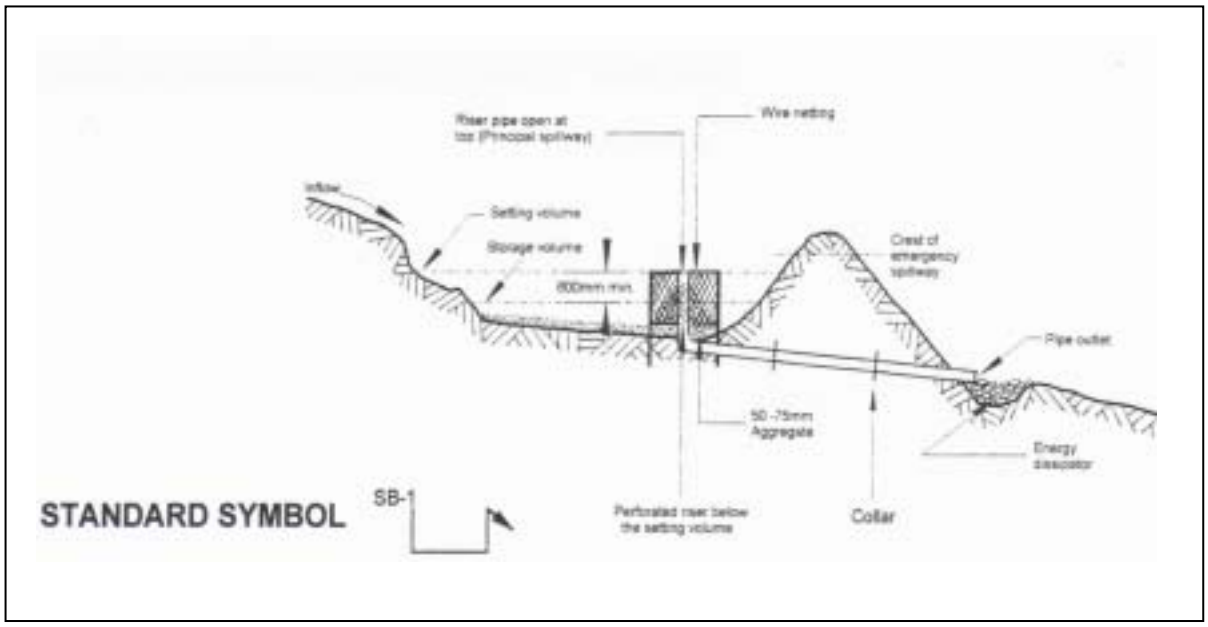


***Figure 4.1 Example of a Sediment Basin***

### 4.1.1 Applications and Limitations

Sediment basins may be permanent or temporary structures that allow ponding and settlement of sediment-laden runoff. Sediment basins are typically used on catchments greater than 1 ha. Basin operation may involve chemical dosing to improve capture of fine sediment particles. Basins are located upstream of water bodies, environmentally sensitive areas and major stormwater systems.

Sediment basins may be converted into permanent wetlands for stormwater treatment after the construction phase.

Sediment basins should not replace other on-site sediment control measures. Basins typically offer limited control over fine silts and clays if chemical dosing is not used. The dosing process is difficult to automate; therefore on-going maintenance issues need to be considered.

The use of a sediment basin on a works site should be carefully planned, as relocation of basins is costly and difficult.

### 4.1.2 Material Requirements

The materials required to construct a sediment basin will depend on the design and location of the basin, and should be considered in detail if the need for a basin is identified.

### 4.1.3 Design Requirements

Sediment basins consist of an excavated pit, stabilised flow entry points, low-flow filtered outlet and a high-flow emergency spillway. A formal design based on catchment hydrology, sediment transport rates and trapping efficiency is required for all sediment basins and should be incorporated in to the development layout in the early stages of the project.

Basins should be free-draining wherever possible, and should not be constructed in dispersive soils.

Basins should be fenced if settled sediment depths exceed 300mm at any point in the basin and public safety may be at risk.

The primary factor in the effective design and operation of sediment basins is the soil type likely to be eroded and washed into the basin.

### 4.1.4 Maintenance Requirements

Sediments basins and outlet structures should be inspected regularly. Scouring and damage to the inlet or outlets should be repaired and embankment vegetation maintained in a vigorous and healthy condition.

Any damage to the emergency spillway should be repaired within 24 hours.

A maintenance schedule should be established for the removal of sediment from the basin.

### 4.1.5 Guidelines for Basin Size Requirements

This section provides an indication of the volume requirements for sediments basins based on the soil type and disturbed area (Taken from Managing Urban Stormwater for Construction Activities, NSW EPA). It should be used for indicative purposes only, with conceptual and detailed designs being completed by qualified professionals.

### 4.1.5.1 Sediment Basins for Dispersive Soils and Fine Sediments

**Volume required = S x A x 1.2**

S = storage volume per hectare of disturbed land (m3/ha) – refer to Figure 4.2 below.

A = Disturbed area of site

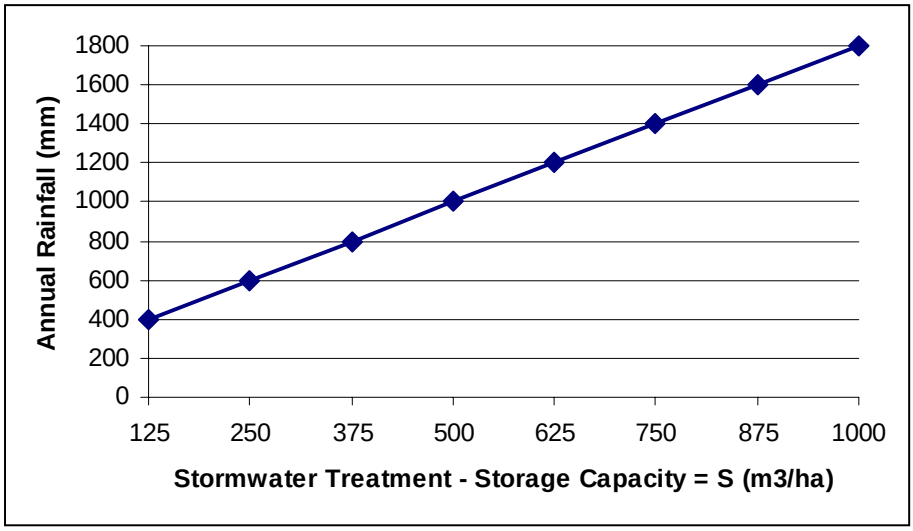


***Figure 4.2 Storage Capacity for Sediment Basins***

The minimum volume required is 125m3/ha.

**Example:** For dispersive soils or fine sediments at a site with 1.0ha of disturbed area with 600mm annual rainfall, the volume required for a sediment basin will be (250 x 1 x 1.2) 300m3. This includes 20% for storing sediment at the bottom of the basin.

### 4.1.5.2 Sediment Basins for Coarse Sediments

The maximum capacity of the sediment basin for coarse sediment basins can be estimated from the greater of:

- Volume of water that will enter in six minutes in a five year ARI, one hour storm event. Allow an additional 50% volume for sediment retention between clearing.
- Volume of subsoil material likely to enter over one year when vegetative cover and topsoil are removed, based on the Universal Soil Loss Equation.

A storage depth of at least one metre should be provided over two-thirds of the area. The basin should be cleared when one third of its capacity is taken up by sediment.

### 4.1.6 Costs Associated with Sediment Basins

The major cost component of constructing a sediment basin is the necessary earthworks. It is difficult to provide an indication of cost per volume due to the variability between sites. For example, the amount of cut and fill for a basin of exactly the same size may vary significantly, depending on the topography of the site.

## 5. GENERAL SITE MANAGEMENT

This section provides guidance on waste disposal, plant maintenance and refuelling, and spills contingency plans. It is intended that these aspects are considered as part of the risk assessment, and appropriate actions are selected and included in the Stormwater Management Plan.

### 5.1 Waste Disposal

All work practices should aim to safely dispose of waste materials like paint, concrete slurry, acid, toilet effluent, sediment and garbage. All waste should be removed from the site in a manner that is approved by the local consent authority and complies with the Environment Protection (Enforcement and Penalties) Act 2000.

The disposal of waste should be addressed as part of the risk assessment. The risk assessment should also address necessary provisions on site to collect the various types of waste that may be produced. For example, as part of works that may require rinsing of concrete or mortar slurries from trucks or equipment, appropriate receptacles should be installed to prevent any polluted water entering the drainage system or nearby waterways.

As part of the Site/Environmental Management Plan, the Contractor should make provisions for the regular clearing of any waste receptacles to ensure their efficacy, incorporating an approved method of transport (refer to Environment Protection (Transport) Regulations 1987).

The Contractor needs to be aware that current legislation requires that the quality of runoff water leaving any work site must be of an acceptable standard and that this legislation does not make allowance for:

- Any particular difficulty with the site;
- Specific or general problem in carrying out the Management Plan; or
- Whether the site manager is familiar with site work management.

### 5.2 Plant Maintenance and Refuelling

Plant maintenance, where there is a risk to the quality of stormwater runoff, should be identified as part of the risk assessment for the works. Appropriate measures and actions should be taken in the event that these risks include the possibility of oil, chemical or fuel spills on site.

Actions to minimise the risk of stormwater pollution include conducting maintenance only once protective measures have been put in place and conducting maintenance only in a location where any spills can be easily contained.

Any spills resulting from maintenance of equipment should be considered and managed as part of the Spills Contingency Plan (refer to Section 5.3 below.)

There are several approaches that can be taken to reduce the risk of fuel spills. Steps could include designing storage units to prevent vehicles or fork-lifts puncturing tanks, fitting automatic cut-offs to fuel dispensers, and making units vandal-resistant.

If refuelling is necessary on site, this should be considered as part of the risk assessment, and appropriate actions should be taken by the Contractor to minimise the risk of stormwater pollution.

Fuel spills should be considered and managed as part of the Spills Contingency Plan (refer to Section 5.3 below.)

### 5.3 Spills Contingency Plans

For projects where the storage of chemicals is necessary on site, and where any of these are classified as dangerous goods, the relevant requirements of the Dangerous Goods (Storage and Handling) Regulations 1989 – Statutory Rule No. 323/1989, and Australian Standard 1040 – The Storage and Handling of Flammable and Combustible Liquids must be used.

Should a spill occur, it is necessary to have a contingency plan in place to prevent the spread and transport of the pollutant (if safe to do so) and a plan to manage the clean-up operation. Material Safety Data Sheets should be available on site for each chemical, and should be used when collating information for the Spills Contingency Plan.

The plan should also include disposal or re-use of recovered residues, and contacting key company and government agency personnel to advise of the emergency.

A spills contingency plan should also ensure that correct process is followed in the event of a spill. Documentation of the events that lead up to the spill, the actions taken and by whom, and assessment of any preventative measures that would be applied to prevent a similar incident.

Steps must be taken to reduce the potential for pollution by spillage of any chemical stored on site. In high risk environments, priority should be given to preventing the chemicals entering waterways or drains. Location of chemical storage should also consider where the consequence of a spill would be minimal.

Appropriate treatment materials should be available on site to contain chemical or fuel spills. Neutralisation or absorption spill kits should be located on site, with appropriate personnel being appropriately trained in their use.

Site management options to reduce the risk of spills include reducing the quantities of chemicals and fuel stored on site to minimum practicable levels. Infrequently used chemicals should be ordered just before they are needed.

## APPENDIX TO SECTION R

For large amount of chemicals, EPA Publication 347 – Bunding Guidelines details the bund construction details for various storage methods.

## 6. HOW TO PREPARE A SMP

### 6.1 What is a SMP?

A SMP is a report typically prepared by the Contractor for Council. Depending on the unique environmental aspects to be considered, some contracts may contain Hold Points that relate directly to the SMP. A SMP has two major components:

- A risk assessment of the environmental aspects that may affect stormwater runoff quality from the works site; and
- A report stating how the identified risks will be managed during the life of the project.

### 6.2 How do I Prepare a SMP?

The first step involves completing a risk assessment. For each environmental aspect of the project, the severity and likelihood of stormwater quality pollution will need to be assessed. On this basis, the risk will be determined. For each risk, appropriate action will need to be specified. A table similar to the example below will need to be completed:

| **CONSTRUCTION PHASE** | | | **RISK** | | | **ACTION REQUIRED** | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Aspect** | **Impacts** | **Objective (s)** | **Likelihood** | **Severity** | **Assessed Risk** | **Specification Clause** | **Training** | **Further Action** | **Responsibility Target Date & Verification** |
| Clear vegetation to prepare site. | Erosion of exposed surfaces leading to sediment runoff into waterway. | Minimise the amount of exposed/ unprotected surfaces and protect from polluted runoff | H | H | C | | | Identify specific sediment control measures to be implemented throughout the project | |

Depending on the level of risk, the action may include installing some pollution control measures (sediment fences) or investigating the works schedule to identify if works can be done in an alternative way to reduce the risk (eg. not clearing an entire site at once, thus having a lesser area of exposed soils for a reduced period).

The Council will work together with the Contractor to ensure that the most critical aspects have been addressed appropriately. The risk assessment, once complete, forms the basis for the remainder of the SMP, which will include:

- Reference to any Contract Hold Points related to stormwater quality protection;
- Location and design criteria for stormwater quality protection measures; and
- Procedures for maintenance of stormwater quality protection measures.

Council will monitor the Contractor's compliance with the SMP. The monitoring program will vary in frequency depending on the risks identified as part of the Risk Assessment. Both Council and the Contractor should treat the SMP as a dynamic document, which may need review as the project progresses.