Buffer Zones

SEDIMENT CONTROL TECHNIQUE

Type 1 System		Sheet Flow	✓	Sandy Soils	✓
Type 2 System		Concentrated Flow		Clayey Soils	✓
Type 3 System	✓	Supplementary Trap		Dispersive Soils	

Symbol

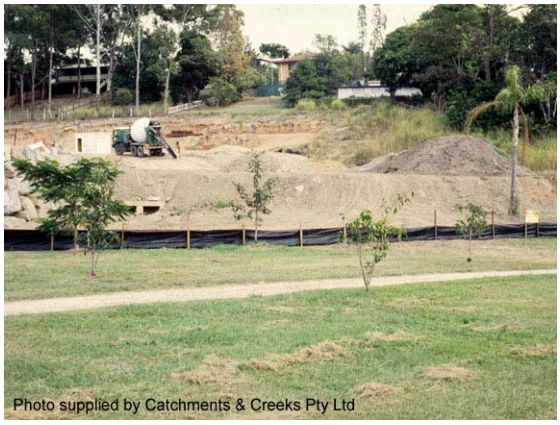

Photo 1 – Grassed buffer zone down-slope of a sediment fence

Photo 2 – Grassed buffer separating a stockpile from a grassed catch drain

Key Principles

1. In the erosion and sediment control industry, a 'buffer zone' is primarily a large area of grass sufficient in width to act as a Type 3 sediment trap. This should not be confused with the more traditional town planning definition, which refers to an area of well-vegetated land separating two distinct land uses.
2. Sediment trapping within buffer zones is primarily achieved through low-velocity sedimentation as the flow passes through the grass, plus the filtration of fine sediments as water infiltrates the soil. Therefore, the sediment trapping ability of a buffer zone increases with the infiltration capacity of the soil.
3. The sediment trapping efficiency of the buffer zone is significantly reduced once the soil becomes saturated. This is a critical issue when using buffer zones as sediment traps for site de-watering after storm events.
4. Critical design parameters are the flow per unit length (perpendicular to flow), and the width of the buffer (in the direction of flow).
5. Critical performance parameters include the retention of 'sheet' flow conditions through the grass (i.e. an even grass cover, with no drainage depression or wheel tracks), and not relying on the buffer zone as an effective sediment trap following heavy rainfall that results in soil saturation.

Design Information

The 'design' depth of sheet flow should be limited to the height of the grass, but typically not exceeding 50mm.

Maximum slope grade limited to approximately 10%.

The buffer zone must be treated as a non-trafficable area to avoid the formation of wheel ruts. Light fencing may be needed to exclude traffic from the buffer zone.

Minimum width (in direction of flow) is 15m or five times the percentage slope (whichever is larger), for broad disturbances (i.e. 50m width for a 10% slope). Table 1 provides minimum recommended buffer widths (in direction of flow), and maximum allowable unit flow rates for various land slopes.

Table 1 – Minimum buffer width (in direction of flow)

Land slope (%)	**1%**	**2%**	**3%**	**4%**	**5%**	**6%**	**8%**	**10%**
Minimum width (m) [1]	15	15	15	20	25	30	40	50
Max. unit flow (L/s/m) [2,3]	4.5	6.4	7.8	9.0	10.1	11.1	12.8	14.3

[1] Width of grassed buffer zone measured in the direction of sheet flow.

[2] Maximum flow rate is based on a maximum flow depth of 50mm and assumed Manning's n = 0.15.

[3] The maximum allowable inflow rate may be increased by the expected infiltration capacity of the buffer zone. It is noted that once the soil is saturated, the infiltration rate across will be negligible.

Incorporation of sediment fence with a buffer zone

The sediment trapping ability of grassed buffer zones is often improved through the incorporation of a sediment fence either up-slope (preferred) or down-slope of the grassed buffer.

Placing a sediment fence along the contour line up-slope of a buffer zone can help collect coarse sediment and assist in the delivery of uniform flow conditions into the buffer zone.

A sediment fence down-slope of the buffer zone (left) can assist in sediment collection during periods of heavy rainfall when the soils within the buffer zone become saturated.

Wheel damage to buffer zone

Wheel track marks within the grassed buffer zone can destroy the ideal 'sheet' flow conditions and thus significantly limit the sediment retention benefits of the buffer zone.

Inappropriate use of natural bushland

Natural bushland should **not** be used as a sediment trap.

Even through the bushland can act as an effective sediment trap, the adverse environmental effects resulting from the trapping of sediments within bushland can be significant, including weed infestation.

Bushland is often less effective at trapping sediment than grassed buffers due to its inability to maintain ideal 'sheet' flow conditions over an extended flow length.

Description

Buffer zones consist of an evenly grassed surface of sufficient width to act as a Type 3 sediment equivalent to that of a traditional sediment fence.

Technically, buffer zones can be areas of remnant bushland; however, it is noted that in **most** cases, remnant bushland should not be used as a sediment trap.

Buffer zones, as used within the erosion and sediment control industry, should **not** be confused with the more commonly referenced bushland buffer zones used within the town planning and waterway management industries.

Buffer zones differ from *Grassed Filter Strips* because their substantial width allows the buffer zone to act as a Type 3 sediment trap.

Purpose

Used as a Type 3 sediment control system down-slope of rural construction activities, stockpiles, unsealed access tracks, and other forms of strip construction.

Most commonly used in rural areas where the grassed buffer zone can be left undisturbed by construction vehicles. For example, the utilisation of the extensive grassed areas surrounding rural building sites.

Buffer zones can also be used for turbidity control during minor de-watering operations.

Limitations

At best, buffer zones should be considered as a Type 3 sediment control system that has only limited control over turbidity if the flow rate exceeds the infiltration capacity of the underlying soil.

Suitable only for the treatment of sheet flow with a flow depth less than the height of the grass.

Suitable for slopes up to 10%.

Advantages

Typically no establishment costs as the buffer zone usually consists of existing grassed land.

A buffer zone down-slope of a work site or a sheet flow sediment control device can increase the overall efficiency of the site's sediment control system.

Best used on low to medium slopes.

Disadvantages

Typically only suitable for use in rural locations where the buffer zone can be isolated from construction traffic.

Generally ineffective during periods of heavy or extended rainfall.

Easily disturbed or damaged by construction traffic.

Generally requires large areas of land.

Common Problems

If the flow passing through the buffer zone concentrates within drainage depressions or wheel tracks, the sediment trapping efficiency is significantly reduced.

Buffer zones containing an uneven grass cover or clumping plants can also cause a reduction in sediment trapping efficiency.

Special Requirements

To be effective, the soil needs to be highly porous and there needs to be significant (75% minimum) grass cover.

Light fencing may be required to exclude traffic from the buffer zone.

Any existing drainage depressions, such as swales, rills or wheel tracks, must be filled in to allow uniform sheet flow conditions to exist throughout the buffer zone.

Stockpiles should not be located within buffer zones.

The buffer zone must remain undisturbed during its required operational life.

Location

Commonly used in rural house construction where the grassed buffer zone can be fully contained within the property.

Site Inspection

Check that all 'visible' sediment is trapped within the first quarter of the buffer zone.

Check that the buffer zone is free of drainage depressions and wheel tracks that might allow the concentration of flow.

Check for excessive sediment deposition that is affecting the health of the grass.

Preparation

1. Refer to approved plans for location, extent, and dimensional details. If there are questions or problems with the location, or extent, contact the engineer or responsible on-site officer for assistance.
2. Take all necessary steps to ensure disturbance to the buffer zone is minimised throughout the time it is used as a sediment trap.
3. To the maximum degree practicable, ensure flow passing through the buffer zone is not allowed to concentrate within drainage depressions, swales, rills or wheel tracks.
4. Where necessary, install appropriate drainage controls up-slope of the buffer zone to distribute the inflow along the fully length of the buffer zone as 'sheet flow'.
5. Where necessary, install a coarse sediment trap, such as a sediment fence, up-slope of the buffer zone to reduce the quantity of sediment passing onto the grass. Generally this is required if large quantities of coarse sediment are expected.
6. If required, install a light barrier fence to clearly identify the buffer zone and help exclude construction traffic.

Maintenance

1. Inspect the buffer zone on a regular basis and after runoff-producing rainfall.
2. Ensure that there is no soil erosion and that sediment deposition is not causing the concentration of flow through the buffer zone, or flow bypassing.
3. If the buffer zone has been disturbed, take necessary steps to re-establish suitable sheet flow conditions.
4. Remove excessive accumulations of sediment that may cause the concentration of flow. Excessive sediment should be removed after each runoff-producing rainfall event, or where appropriate, evenly raked into the soil. Sediment should be removed in a manner that avoids damage to the buffer zone or the creation of wheel tracks down the slope.
5. Excessive sediment may be defined as:
   - any sediment that covers a portion of the grassed surface; or
   - sediment deposition such that the grass strand height above the sediment is less than 50mm; or
   - a deposition of sediment in excess of 750 grams per square metre (approximately the equivalent of three 70mm diameter balls of dry soil).
6. The source of any excessive sediment should be investigated and controlled where practical.
7. Take appropriate steps to maintain at least 75% grass cover over the buffer zone.
8. Where practical, maintain any groundcover vegetation at a height greater than the expected depth of water flow, and at least 50mm.