UPPER RIVER TORRENS LANDCARE GROUP

Data Sheet
Structures for Stabilising Watercourses

This information sheet provides some detail on the techniques that can be used.

The techniques described are low cost ones that the group and others have found to be effective. You may need to adopt them to suit your purpose. Before acting, watch what happens and obtain specialist advice. Be guided by a specialist through the suite of permitted options.

A Water Affecting Activity (WAA)

Water affecting activities (WAA) outlined in the *Landscape SA Act 2019* may require a permit relating to the management of **watercourse water.** WAA are activities that can potentially have adverse impacts on the health and condition of water resources, other water users and ecosystems that depend on water resources.

Remedial measures or activities that relate to the stabilisation of watercourses could include building of structures, obstructing or depositing solid materials in a watercourse; excavating material from a watercourse; and destroying vegetation in a watercourse, and would require a WAA permit.

Managing erosion

There are various techniques and engineering works that can be used to manage erosion within a watercourse system if revegetation and limiting stock is not enough to combat this. These should be investigated as erosion can impact greatly on land production, water quality and the environment. Seek specialist advice and permits if you have areas prone to severe erosion within a watercourse before commencing works. Bed deepening, bank slumping and undercutting are common watercourse erosion types, with several factors influencing these processes. There are low cost alternatives to manage erosion, such as fencing alignment, rock walls and utilising existing fallen timber to stabilise creek banks. For additional information please refer to the documents ***– Manual for Small Scale Watercourse Erosion Control Works*** and ***Watercourse Erosion and Low Cost,*** available from a Landscape SA H&F office.

Stream bed stabilisation

If stream beds are eroding, ie if clay can still be seen rather than rock or silt in the bed, streambeds are often still eroding.

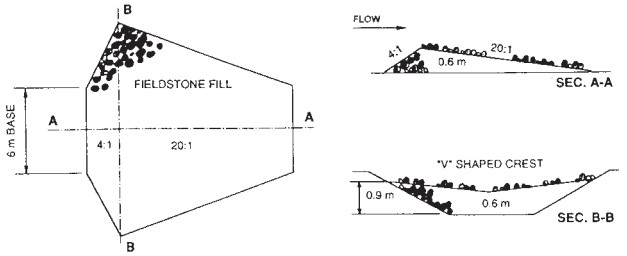
Gradient control structures

Constructed rock riffles

(Natural riffles are the mixed rocks or projecting rock reefs which are natural features of our river systems). Installing rock riffles and mimicking nature is a cost-effective means of stabilising watercourse beds.

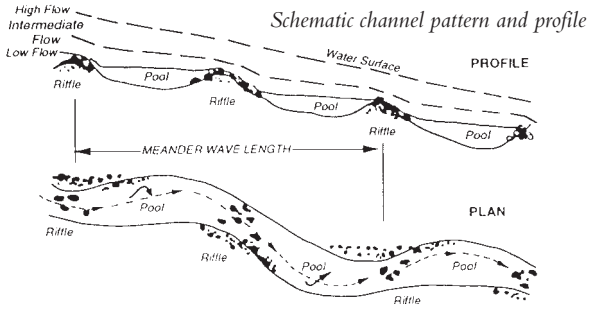
From the stream bed profile and a range of cross section data collected during an initial catchment and site survey, rock riffle structures are spaced so that their stability will be reinforced by natural geometry.

The graded rock is placed by machinery across the stream from bank to bank, based on survey data and hydraulic formulas.



Typical paddock stone riffle plan and sections

Each riffle also creates a backwater effect that protects upstream banks by reducing the velocity of flow and dissipating the river's erosive force.



Schematic channel pattern and profile

Riffle spacing - 6 x stream width

Helical flow: secondary currents cause the main flow to rotate

These processes will allow the stream to reach a new equilibrium of channel depth and width, which slows down or stops the process of channel widening and bank slumping.

The riffles should be monitored to evaluate their effectiveness before determining whether far more costly bank resloping and armouring (reinforcing the toe and batter zone) are justified.

For further information and advice contact the nearest Landscape SA office. Note: Permit exemptions exist for some water affecting activities which may relate to this section so in addition please contact the Policy Officer Water Permits.

Stream bank batter stabilisation

The siltation process put in place by the construction of a gradient control structure will stabilise many bank batters as a matter of course. Those that are still eroding can be controlled by regrading and replanting.

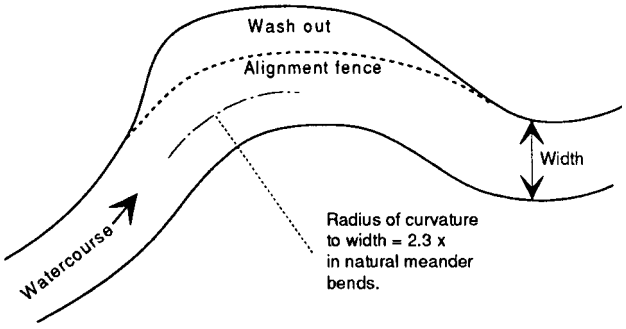
Alignment fencing

Alignment fencing can be used to rehabilitate and stabilise creek banks when erosion is significant. The fence ensures all eroded sediment and material is captured behind the fence. It is not designed to stop erosion but to capture the sediment behind the fence and allow vegetation to re-establish, therefore stablisling the banks as a long-term measure. Alignment fencing is a low cost option for small scale erosion issues. See the watercourse management video produced by the Landscape SA H&F Board in partnership with local consultants.

Alignment fences consist of timber or steel posts to which is attached wire mesh, brush, stock cyclone or barb wire. Such fencing trains the main stream flow along the outside of the fence and away from the bank area. This type of bank batter stabilisation is very cheap and will solve problems of this nature, only if the stream bed has first been stabilised.

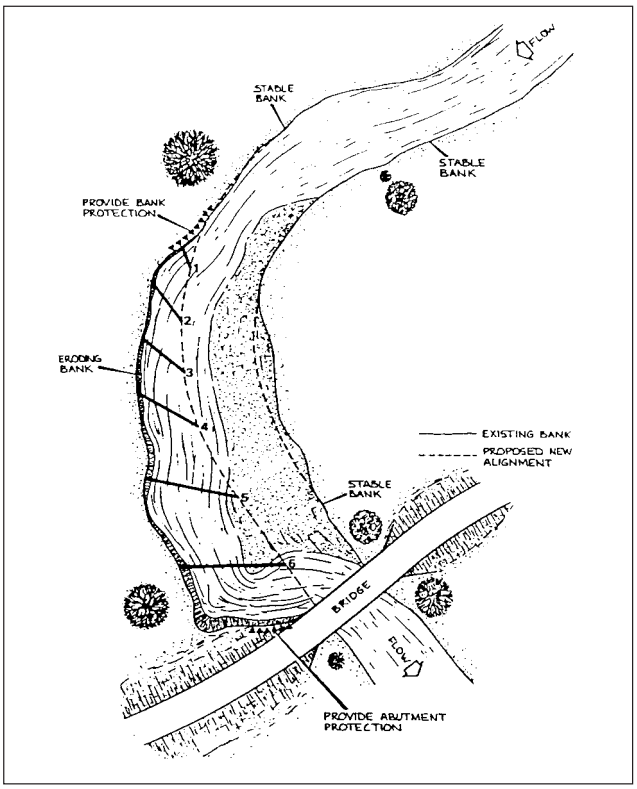
After severe flooding, the fence may collapse and will need to be repositioned from time to time. This does not depreciate from the stabilisation process, which will take four or five years.

Vegetation will quickly establish on the primary batter which, in turn, increases the stability of the structure. Refer to the Australian Water Environments for information and case studies relating to watercourse management, such as alignment fencing designs. Contact your local Landscape SA Board for technical advice and support to plan your restoration project.



Groynes

Groynes can be utilised to stabilise severe bank erosion that will not respond to other methods, eg stock exclusion, alignment fencing. Groynes are basically short fences jutting out into the stream from destabilised banks. Formulae for placement are available for major works.



Groynes direct the main flow of water back into the main or required stream and away from eroding banks. Fences are permeable and slow water between the groynes causes sediment to deposit, which in time, establishes with vegetation and stabilises the area. However, care must be taken not to narrow the stream channel locally.

Off-stream water chutes

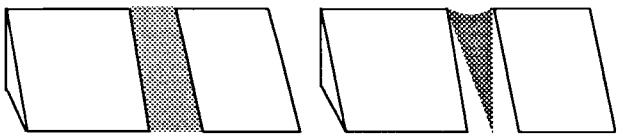
This form of structure is used adjacent to watercourses where major tunnel and/or gully erosion are a problem.

There are two forms of chutes - grassed and rock formed.

1. Grassed chutes

Heavy earthmoving equipment is used to construct the chute, which will spread the flow of catchment run-off across the chute and deposit it safely into the stream. Bed grade within the chute can vary from 10:1 to 20:1.

It is very important the bed of a chute has a level plane, as too much variation will encourage water to channel down the chute.



Even spread of water *Channelling of water*

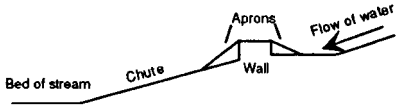
The bottom of a chute should be low enough in watercourses, so that water entering the stream from a chute is buffered by flows of water in the stream.

In our Upper River Torrens Catchment area, a chute will need to be let down onto the stream bed. Approaches to a chute, especially grassed chutes, need to be level to allow the flow of water to spread before it enters the chute.

To ensure that water flows evenly into the chute, across its entire width, a low wall of soil needs to be placed at the point of entry into the chute. This 'wall' needs to have an approach and departure apron.

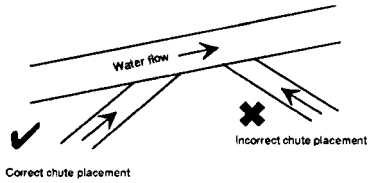
It is important that the top of the 'wall' is perfectly level. It does not need to be very high - a height of 6cm at its lowest point would be okay.

Cross section of chute showing approach and departure aprons



After construction, any chute will need to be grassed immediately with perennial pasture species.

The angle of a chute entering watercourses should direct water into it in the same direction as water flowing in the stream. This decreases the action of turbulence.



2. Rock-formed chutes

After the chute is constructed, a layer of 26mm rubble approximately 50mm thick is laid down on the chute and levelled. A final layer of very large rock up to 300mm is laid down on the rubble.

Matting is available that can be laid on the soil surface of chutes before any rock is placed. The matting is expensive and can only be purchased in large quantities, but it does hold the rock together, provides stability to the soil beneath and allows water to penetrate into, but not erode, the soil.

CAUTIONARY NOTES

1. For various reasons there can be a high rate of failure with many hydraulic structures. The most common mode of failure is by side-cutting or undercutting of the structure. Even simple low erosion control structures across creek beds should have 'wings' to prevent side-cutting.
2. SPECIALIST ADVICE SHOULD **ALWAYS** BE SOUGHT FOR WATERCOURSE WORKS.

References

Katsantoni, G. 1990, *Environmental Guidelines for River Management Works*, Dept of Conservation and Environment, Victoria

Riffle data:

Daufin Lake Basin Advisory Board 1994, *Stream Rehabilitation*, Canada

Newbury, Robert 1993, *Stream Analysis and Fish Habitat Design*, Newbury Hydraulics Ltd, Canada

Resources

Manual for Small Scale Watercourse Erosion Control Works (2003). Earth Tech Engineering. Kent Town, Adelaide SA. Contact a Landscape SA H&F office for a copy of this document.

Moore, Steve (2003), Watercourse Erosion and Low Cost Solutions. Formerly of PIRSA Rural Solutions. Supported by PIRSA, Environment Protection Authority and Department for Environment and Water.

Landscape SA H&F

Best practice operating procedures for water affecting activities, Council and Natural Resources Adelaide and Mt Lofty Ranges, factsheet (2014).

Water Affecting Activities, factsheet 2, Natural Resources Adelaide and Mt Lofty Ranges.

- https://landscape.sa.gov.au/hf/water/managing-water/water-affecting-activities
- https://landscape.sa.gov.au/hf/water/managing-water/water-courses

Other:

Watercourse Erosion – Part 1. Erosion types and their causes (2010), Catchments & Creeks Pty Ltd, Ferny Hills QLD 4055, Australia. Page 8.
Website:
https://www.catchmentsandcreeks.com.au/
Fact sheet:
https://www.catchmentsandcreeks.com.au/waterways_field_guides.html

Waterwise No. 1, Managing Your Watercourses, Waterwise No. 1 factsheet. EPA, South Australia.

Waterwise No. 6, Watercourses and Earthworks, Waterwise No. 6 factsheet. EPA, South Australia.

Acknowledgements

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