

Runoff control measures for erosion control in cropping land

Soil erosion in cropping land causes a loss of productivity, sedimentation in downstream areas and reduces water quality. It can be controlled by maintaining as much cover on the soil surface as possible and by managing runoff.

When runoff occurs, it concentrates as it moves downslope towards drainage lines, creeks and rivers. Whenever runoff concentrates, its potential to cause erosion greatly increases.

There are a number of measures that manage runoff in cultivated paddocks in order to minimise erosion including:

- Diversion banks
- Contour banks
- Constructed waterways.

To work effectively, these measures involve careful planning, design and implementation.

Diversion banks

Runoff from the land above a cultivated paddock can cause erosion as it flows over the paddock. To prevent this, a diversion bank can be constructed on the top side of the paddock to intercept the runoff and direct it along a grassed channel to a waterway or drainage line. Chapter 8 of the *Soil Conservation Guidelines for Queensland* contains more information.

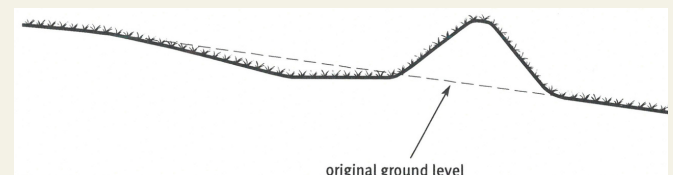


Figure 1: Diversion bank cross-section.

Contour banks

Contour banks are earthen banks constructed at intervals across a slope to intercept and channel runoff into waterways or natural depressions. They have a slight gradient which is close to the natural contours of the land. Any crop or stubble in a contour bank channel will filter runoff as it moves slowly along the channel.

Contour banks are either:

- **Broad-based** – batters that can be easily cultivated and planted to crops. They are more costly than narrow-based banks and may be impractical to construct once land slopes exceed 5%.
- **Narrow-based** – grassed batters that are too steep to cultivate. They cover 2–7% of the total cultivated area and are not suited to cracking clay soils.

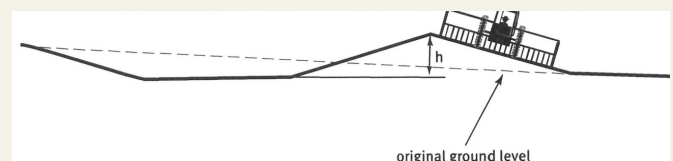


Figure 2: Broad-based contour bank cross-section.



Image 1: Constructing a broad-based contour bank.

Contour banks play a useful role in dry seasons when there is no crop and minimal stubble in the contour bay. If a heavy rainfall event occurs, soil losses of up to 50 tonnes per hectare could occur. Well-maintained contour banks can trap up to 80% of this soil that may otherwise be lost from the paddock.

Contour banks may fail in big rainfall events especially if they are poorly maintained and there are low spots where they cross old gully lines. Well-maintained contour banks should rarely fail when their channels are bare because they can handle a considerable amount of runoff under these conditions.

If the channel is restricted by a crop or standing stubble, contour banks are more likely to fail by overtopping but the erosion risk will be minimal because of the good cover conditions.

In horticultural areas a variety of structures are used instead of contour banks to intercept and manage runoff including mounds for crops like bananas and papaws, and raised beds for fruit and vegetable crops.

Chapter 7 of the *Soil Conservation Guidelines for Queensland* contains more information on contour banks.



Image 2: Runoff research site using contour banks on the Darling Downs.



Image 3: Contour bank layouts.



Image 4: Contour bank layouts.

Constructed waterways

Waterways for soil conservation purposes collect runoff from contour bank systems and convey it at a safe velocity to a grassed disposal area, cross road drainage structure, drainage line or creek system.

Waterways are wide, flat-bottomed structures and usually need retaining banks on both sides. The bases are planted with grass to protect them from erosion.

Waterway design takes into account the size of the catchment area, soil type, land slope, land use and expected grass cover.

Ideally, waterways are built in natural drainage lines. If none exist, then a waterway may be constructed adjacent to a fence or some other suitable location.

Waterways are especially vulnerable to erosion because of the concentrated flows that they need to accommodate. They should be carefully designed, constructed, stabilised and maintained to reduce the risk of failure by gullying or by overtopping. Chapter 9 of the *Soil Conservation Guidelines for Queensland* contains more information on waterways.



Image 5: Grassed waterway in a paddock.



Image 6: Close-up of a wide, grassed waterway.

Maintenance

Runoff control measures require regular maintenance if they are to carry out their role effectively, including:

- Removing silt from channels and waterways
- Maintaining the recommended bank height
- Repairing any breaks or low spots in banks
- Maintaining grass cover in waterways

By ensuring that contour banks are protected from erosion by either a crop or crop residues, there will be minimal movement of sediment into the contour bank channels and maintenance costs will be greatly reduced.

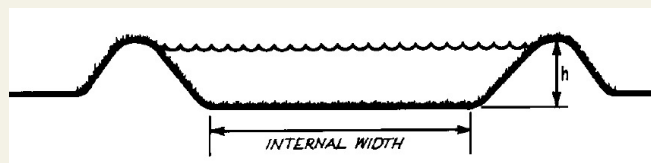


Figure 3: A typical waterway cross-section.



Image 7: Grassed waterways can extend for over a kilometre.

Legal aspects

Runoff control measures require careful planning to ensure the coordination of runoff as it flows between properties and across road and rail reserves towards natural drainage lines.

Proposed runoff control measures may change the manner in which runoff flows between properties and across roads and railway lines. Should there be the possibility that runoff water may impact neighbouring properties or infrastructure, land owners are encouraged to discuss this with their neighbours and seek professional advice.

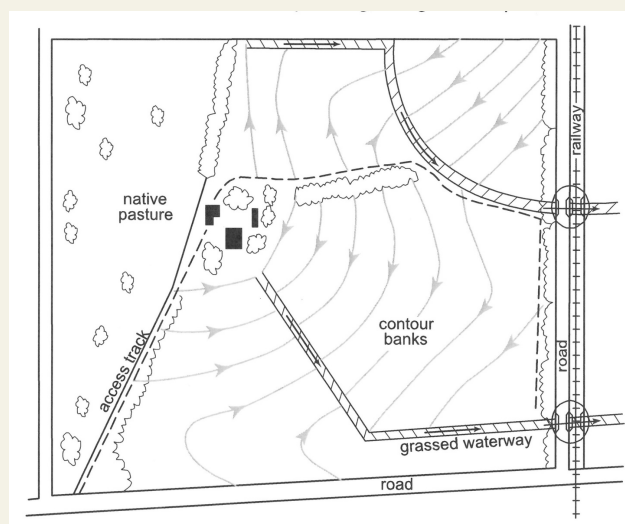


Figure 4: A property plan showing examples of runoff control measures.