SEQ Catchments
Healthy Land – Healthy Water

Rural Dams

Clean water – wildlife – flood detention in the Lockyer Valley

A dam good contribution

Dams on rural properties can play a positive role in helping to improve water quality in catchments. They can help reduce the movement of gully heads by covering them with water, filter water both at the inlet and outlet of the dam; trap sediment and detain water flows to reduce flood peaks downstream.

The most effective method of limiting siltation in dams is to protect the soil resource across the paddock by maintaining a good vegetative cover at all times.

It is very important for dams to be well constructed in order to limit erosion and sediment loads entering waterways. Erosion and sedimentation can occur from ungrassed spillways, breaching of dam walls that allows sediment to flow into waterways and from insufficient vegetation cover on dam walls contributing to erosion of embankments.

Many properties in the Lockyer catchment have dams, and the positive contribution of these dams can be greatly enhanced if they are fenced off and a good sward of vegetation is maintained at the inlet, at the dam fringes and at the outlet (or bywash).

Preferably the dam should be completely fenced off to restrict stock access. If this is not possible, access points to the dam should be limited by fencing and a gravelled base built to lessen pugging and erosion.

Vegetation associated with dams can play important roles in stabilising soils, filtering and removing nutrients from incoming water. In addition to these water quality contributions, they can also provide many benefits for wildlife.

Note the difference: Neighbouring dams in the Forest Hill area. One dam (top) has no stock access and water enters via a well grassed flowline. The other dam (bottom) does not limit stock access and water enters flowing over bare soil.

Australian Government
Department of the Environment, Water, Heritage and the Arts

HEALTHY WATERWAYS
Because we're all in the same boat

Planning a dam

A broken dam in the Withcott area on the highly erodible soils typical of the Marburg geological formation. Construction of dams in this soil need particular attention to compaction and other preventative measures.

A farm dam is a long term investment and proper design and construction will pay dividends. Dams are primarily intended to provide water for domestic use, stock, irrigation and often provide greater flexibility in pasture and stock management. Dam water supplies can have a significant impact on the way you use and enjoy your property.

To get the best outcome, planning your water supply in conjunction with other farm planning such as fence-lines, erosion control, house site development, wildlife areas and proposed land use will result in the best long term outcome for you and your property.

Guidelines for planning a dam

1. Decide on the size of the dam

Water requirements vary considerably according to location, the proposed use of the water and the type of farm enterprise. If you will be relying on your dam for much of your water supply, plan on designing one that will last 2-3 years without replenishment.

2. Consider the catchment water yield

A catchment is the area that collects rainfall runoff for a dam. Approximate yield of a catchment can be calculated after a study of the catchment's characteristics. Factors affecting the amount of runoff are:

- soil type
- rainfall intensity
- ground slope/cover
- existing drainage patterns
- area of catchment

You also need to consider whether water will be available from sources other than surface runoff (e.g. a spring, or pumping from another water source).

3. Dam location and construction

Many dams fail because they were not properly planned or constructed. Most farm dams are compacted earth structures built at depressions, gullies or on hillsides. Dams require the same planning and attention to detail as other building developments.

Site suitability should take into consideration the soil type and the location of the dam on the property. Usually a stable low gradient gully floor with a small ridge either side perpendicular to the flowline is a suitable site. This reduces the cost of construction allowing maximum storage with minimal earthmoving requirements. If a suitable gully in not available, hillside dams will often suffice.

If possible avoid steep country, eroded gullies and wide alluvial deposits. These sites are difficult to build on and cause bywash and cutoff problems. A steep bed and/or banks will limit the storage capacity of the dam.

Factors to consider when selecting a dam site for either stock or domestic water supply include:

- Water requirements and the capacity of storage. One large dam may be better than a number of smaller dams, particularly if this dam can be made deeper thus reducing the amount of water lost due to evaporation.
- Catchment area available. The volume and rate of runoff should be calculated to ensure storage requirements can be met and an adequate spillway can be constructed.
- Site suitability. Dam shape, storage to excavation ratio, ground slope, soil type, stability of spillway, material availability, site preparation, maintenance and stock access need to be considered.
- Risks of future siltation, pollution and salinisation.
- Proximity to vegetation remnants or planned revegetation areas to enhance wildlife habitats.
- Planting of local native trees, shrubs and grasses upslope of dams to intercept nutrients (do not plant trees on dam wall – their root system can interfere with the compaction of the soil).
- Legal requirements including the need for licensing.

4. Consider the Soil Type

The type of soil at a dam site must be able to hold water. Sites with water holding clay soils are preferable. Some clay soils, however, can be highly dispersible and when wet form tunnels. Dispersible clay soils require special construction methods including ‘sheepsfoot’ rollers for intensive compaction and frequent wetting between layers of earth. These methods may increase the cost of construction but can be a good long term investment.

A high level of grass cover on the embankment is also important to prevent drying out and cracking. Soils at the site will have to be tested to the depth of anticipated excavation.

5. Prepare the site

The location of the embankment and spillway should be indicated by clearly placing markers. Prior to construction, the embankment area only needs to be stripped of topsoil and all vegetation. The spillway discharge slopes must remain in a stable grassed condition. The stock-piled topsoil can be spread over the embankment and spillway to allow a good grass cover to be established.

No shrubs or trees should be planted on the embankment. Below the dam trees should be no closer together than twice the estimated total height of that particular tree.

6. Construction Techniques

Successful construction of an earth dam relies heavily on having a well compacted embankment.

Other important factors for construction are:

- Cutoff trench – a trench 600 millimetres in depth, underneath the embankment into impermeable material and filled with compacted clay provides a water seal
- Exposed rock – needs to be covered with 300 millimetres of compacted clay
- Clay core – to create an impermeable barrier and balance of material in the embankment for structural stability
- Embankment batter placement
- Spillway design – adequate width and a well grassed discharge area
- Settlement on the embankment will occur – construct crest level higher than design level
- Freeboard design – height of the dam wall above spillway height should be 800 millimetres to two metres
- Crest width – minimum width 2.5 metres

The completed embankment should have a compacted layer of 150 millimetres of topsoil. The spillway should have a compacted layer of 100 millimetre taken down to the water level.

It is important to engage a knowledgeable and experienced contractor to undertake construction works. It may also be useful to inspect similar works completed in the area under similar situations. The knowledge gained from this may reduce the chances of problems happening during and after the dam construction.

Adequate design and construction of farm dams is vital in the prevention of dam failure and reducing the deposition of sediment into our waterways.

Additional information regarding dam construction techniques can be obtained from the Department of Natural Resources and Water.

Keeping the water clean

Soil particles and organic fragments are the most common materials suspended in farm water supplies with resulting poor water quality.

Turbidity is a measure of the degree to which the water loses its transparency due to the presence of suspended particulates. Undisturbed waters have a much lower potential turbidity problem than do disturbed waters. A turbidity content greater than 25 milligrams per litre is regarded as undesirable for domestic supplies (based on World Health Organization research).

Causes of turbidity

Most turbid water on rural properties is caused by erosion and siltation of water bodies. If this water is collected in a dam, the coarser and denser particles will rapidly settle to the bottom, but the smaller particles may stay suspended for a longer period. Some soils contain clays which are particularly susceptible to dispersion in water. Turbid waters are most likely to be found in areas where these soils occur.

Farm dams can produce their own turbidity problems if the water flowing into the storage travels down steep sided, unprotected excavations. Further, turbidity can be initiated, aggravated and maintained in farm dams by wave action, stock trampling and activities from other fauna (e.g. geese, ducks and feral animals).

Minimising stock access to farm dams reduces turbidity. Provide watering points away from water storages.

Preventing turbidity

Water catchment areas need to be well managed so they can deliver clean water. This requires:

- keeping a high level of ground cover,
- protecting vegetation and the physical condition of drainage lines,
- preventing and repairing erosion areas,
- properly designing and maintaining roads and tracks,
- supplying off-stream watering points for stock.

Manage dams and their adjacent areas to minimise the risk of turbidity problems. This requires:

- creating a filter zone just upstream of the storage (thick grassy sward),
- avoiding or treating dispersive clay soils,
- minimising stock access to the water storage areas,
- reticulation of water from the dam to strategically placed drinking troughs.

Checklist

- Could additional water points improve property management?
- Have you calculated all the water supply requirements?
- Have you prepared a regular maintenance program for the dams on the property?
- Have you considered how to maximise wildlife habitat benefits?
- Have you checked legal requirements and the need for licensing?

The subject of dam construction is complex. Some details may not be included here. It is recommended that you seek further assistance and advice for your particular situation.

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