SUB-SURFACE DAMS

Introduction

In arid and semi-arid areas of the world, sand and gravel deposits associated with streams and rivers can provide water for drinking purposes as well as for irrigation. Such watercourses are generally seasonal, but can be perennial. Riverbeds which are dry, but have green vegetation along their banks and bed, indicate that there must be a source of water in the vicinity, below bed level.

Sub-surface dams

Natural sub-surface dams are often the reason for such areas of accumulated water and the resultant greenery. An outcrop of bedrock lying across a river acts as a dam and prevents the downstream flow of the sub-surface water within the sand bed of the river. Seasonal flood flow also saturates the riverbanks.

The improvement of natural sub-surface dams in valleys and rivers beds, and the construction of new ones is an effective and, usually, an inexpensive means of augmenting water resources. The dam can be constructed of concrete, masonry, blockwork, stone-filled gabions with waterproof membranes such as plastic sheet or clay layer, or stabilised soil.

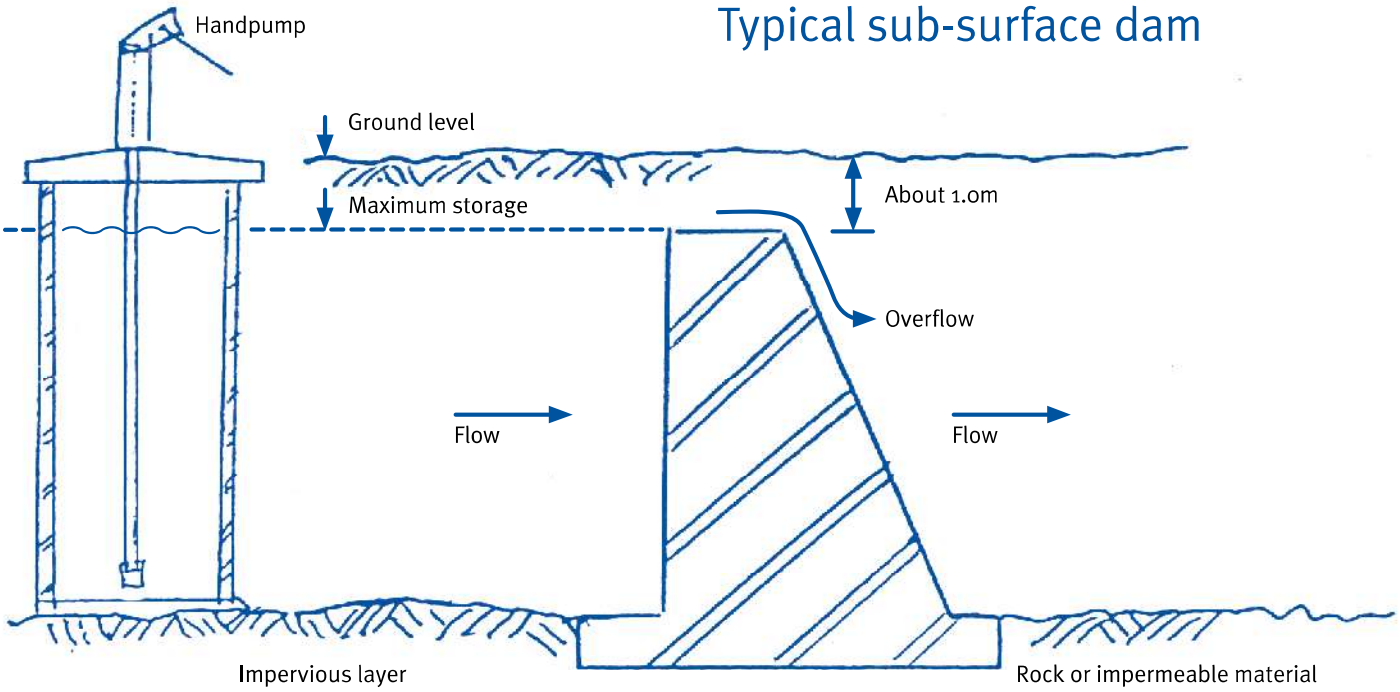
It is important that the dam is founded upon impermeable bedrock, that the ends of the dam are keyed in to the river banks and, where necessary, wing walls are constructed to prevent erosion and the bypassing of flow when the river valley is in flood. Several dams, in cascade, are often constructed to increase the total volume stored.

There are many advantages in the use of sub-surface dams compared to surface dams; these include:

(a) Losses from evaporation are very much less than the 2.0 metres lost annually from a free water surface in a dry tropical area.

(b) The breeding of insects and parasites such as mosquitoes and bilharzia parasites is prevented.

(c) Contamination of stored water, by people and animals, is greatly reduced, particularly as a well and handpump can be provided to abstract water in a hygienic and controlled manner.

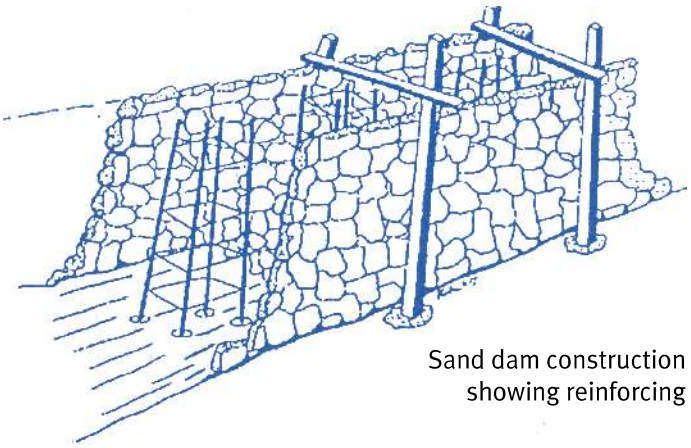


Sand dams

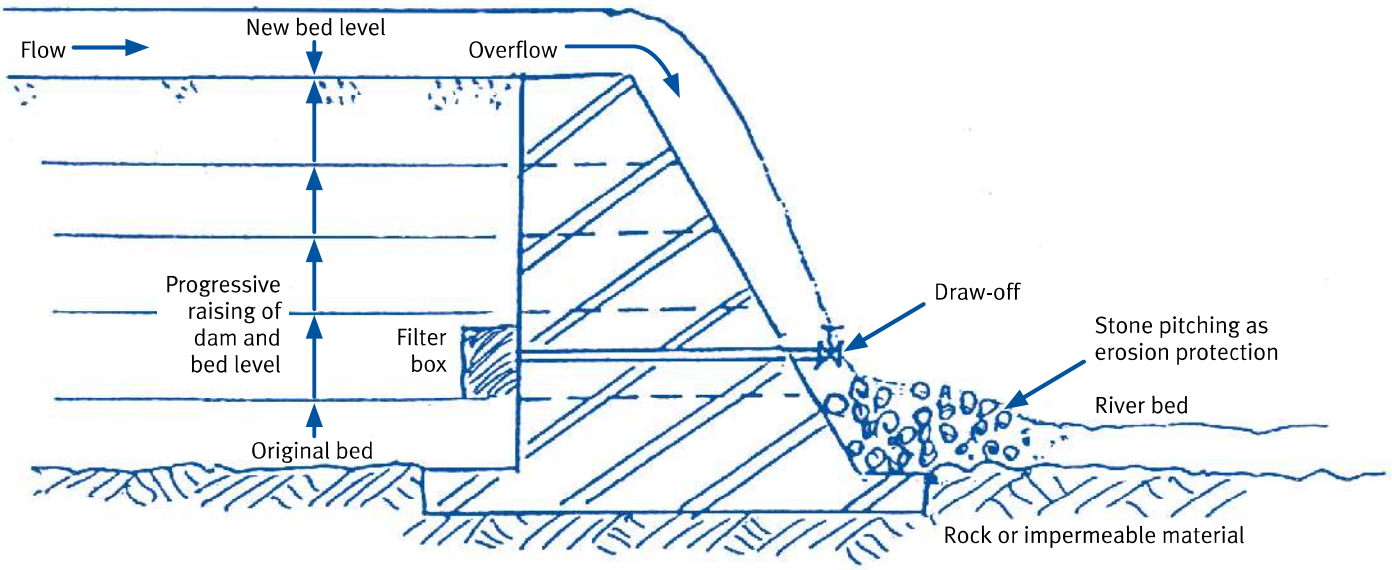
A sand dam is a special type of sub-surface dam built across a seasonal river. It provides a means of increasing water storage capacity by accumulating sand and gravel upstream of the dam, which is raised progressively before each rainy season until it reaches an appropriate height.

This incremental raising should be to such an extent that it allows finer material such as silts to be washed out of the deposited sand and gravel by the turbulence created at times of overflow. The coarser the sand and gravel collected by the dam, the greater the size of voids and, therefore, the potential storage capacity. Gravels and coarser sands can store up to 35% of their total volume as water.

The final height of the dam is governed by the bank height at its extremities and, in any case, should not be greater than about five metres. It should be constructed preferably of concrete or masonry, because its upper surface acts as an overflow weir and has to resist the erosive action of water which is laden with silt and sand in suspension.



Sand dam construction showing reinforcing



Abstraction

Water can abstracted from the sand, gravel or soil upstream of the sub-surface dam via a well or tubewell formed in this storage material. The use of a concrete well, sealed with a cover slab and provided with a handpump, is advisable. (See Hand-dug wells). Alternatively, a draw-off pipe, with a control valve downstream and a filter box upstream, can be provided in the dam wall.

However, If the river is in spate it can cause problems with either of these abstraction methods. The use of a Rower-type handpump, sited away from the impoundment and potential area of inundation, may help to make maximum use of the time available when it is safe to abstract water.

REFERENCES:

1 **Nilsson A** (1988) *Groundwater dams for small-scale water supply,* IT Publications

2 **Nissen–Petersen E** (1982) *Rain catchment and water supply in rural Africa: A manual,* Hodder and Stroughton, SUB-