



## C2 REVEALING GOOD PRACTICE

# Protecting a spring (a water source)

## At a glance

This tool helps you protect a natural spring source of water so that the water remains clean and safe to use.

- Ensure full community and stakeholder participation. Develop ownership and sustainability.
- Choose a location with good access, avoiding places where there could be pollution.
- Ensure you understand government policies and standards.
- Design the spring protection structure.
- Construct the structure:
  - Clear the site of bushes, long grass, etc.
  - Dig narrow trenches uphill into the water flow.
  - Surround the spring source with clean stones.
  - Place rocks and then a layer of puddled clay on top.
  - Fill the trench in layers and cover with topsoil, planted with grass.
  - Choose the position of the headwall.
  - Excavate and divert the water.
  - Build the headwall and wings then the apron slab and steps.
  - Construct the surface water diversion ditch and fence.
- Ask the local government water supply office to inspect and approve the works.



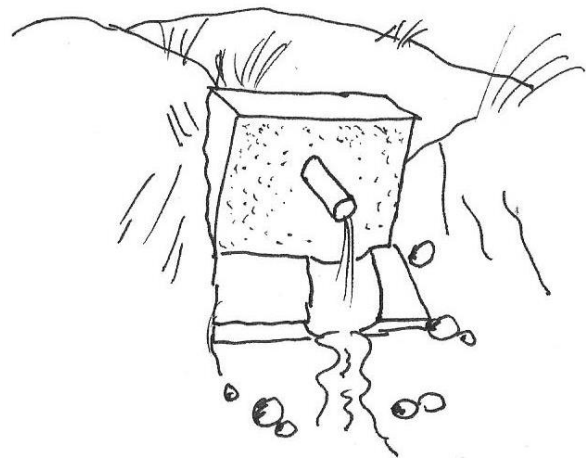
## Why use this tool?

If a natural spring is protected, it will provide a source of clean and safe water for drinking, cooking and other household use.



## A brief description

Guidance on the planning, design and construction involved in protecting a spring.



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## Why protect a spring?

A spring is a place where groundwater (water that is stored in the ground) naturally flows from the earth's surface. Before it reaches the surface, spring water often moves downhill through soils or cracks in rock until the water is at the same level as the ground. The main aim of spring protection is to protect water so it is safe to use. Before reaching the surface, spring water is usually very clean. However, groundwater can become contaminated as it leaves the ground surface, and even before then if polluted water mixes with it. Clean spring water can be made dirty from the waste of animals and humans who defecate near to the spring. Septic systems and fuel tanks close to the spring can also contaminate the water, as can pesticides, fertilizers and industrial waste. Therefore, spring water sources need to be protected.



## The words we use

**Contamination** – water being made dirty or 'infected' from faeces or other substances.

**Spring headwall** – a concrete wall at the spring outlet that protects against scouring or undermining of the spring structure

**Apron** – the concrete bed in front of the headwall, over which water flows. It stops the water from washing away the soil, undermining the headwall or changing course

**Puddled clay** – clay soil that has been compressed and smeared, so that it forms a dense, water-tight layer. Using bare feet is an effective way of puddling clay.



## Time taken

Site preparation and construction can take between one and three weeks. It is important to measure the flow of the spring in the dry season, to ensure that there is enough water for the community all year-round.



## You will need

- At least 4 people to clear the site and build the protection structure.
- Picks, shovels, spades, flat-ended iron rods for digging, cement trowels, a spirit level, a hammer, nails, a wood-saw, buckets, and a watch with a second hand.
- Cement, sand, gravel, a reinforcement bar (used in reinforced concrete), lengths of timber and plywood to make a mould to hold wet concrete, a length of galvanised (rust proof) iron pipe (1 ½ -inch diameter), lengths of PVC pipe (1 ½ -inch diameter), a source of clay soil / heavy clay, and rocks to form the foundation of the spring apron.
- A suitable spring source which gives enough flow all year round.
- Information on how many people are likely to use the spring.



## Keys to success

- **Location:** the spring should not be more than **500 metres** from the homes of people who will use it. It must be at least **50 metres** away from any latrine, garbage area, or other source of pollution, and never be sited down-slope of a latrine or defecation area. Also, ensure the spring site is not in a place that experiences flooding or it risks being washed away.
- **Legal standards:** ensure compliance with legal requirements including national water access policies. Also, be sure of land-ownership rights, both where the spring itself is located, and access to the spring by users.
- **Spring outlet:** ensure the outlet is not above the true source of the spring.
- **Quantity of water:** ensure the spring doesn't run dry – plants can help to replenish the aquifer.
- **Participation:** ensure the full participation of men, women and children, and vulnerable groups. Ensure that vulnerable community members are involved in the design, planning and management. Engage the community in providing the labour for preparation and construction. Encourage the community to form a **Water Users Committee** to manage the project and to ensure fair access to, and use of, the water.
- **Sustainability:** ensure a fair process is in place to help pay for maintenance of the protected spring structure.



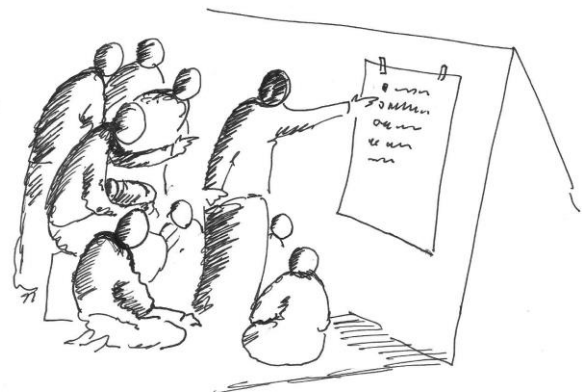
## What to do

### Understand the policy environment.

Start by finding out whether the national and/or local government has a policy or strategy for ensuring people in your area have access to safe and clean water. For example, there may be a national minimum standard of safe water quantity per person per day, or there may be a specific policy on payment or subscriptions for a community water supply. If this is the case, you may want to consider advocacy, calling on them to fulfil their responsibility, and seeing how you could work with them in the provision of water supply. See Section B1 for tools and guidance on advocacy, including **Tool C1 – Advocacy – communicating with people in power**.

### Ensure ownership and sustainability

- Ensure that women, men and children from the community participate in the design, planning and management of the spring structure. Ensure that vulnerable members of the community (single parents, people with HIV, people with disabilities) are fully involved.



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- Encourage and guide the community into forming a Water Users Committee (WUC). The WUC is a group of people who will manage the spring protection project, for example the finances, design, construction and community contributions. They may need to receive training in how to manage these different parts. Their role is also to ensure fair access to, and use of, the water. It is good practice for the WUC to appoint someone to monitor the spring structure, and at least two care takers to maintain and repair it.
- The WUC, and other key stakeholders, such as community health volunteers and representatives of the local government water supply office, should form their own Water Safety Plan, which will help them to protect water quality, and ensure that the benefits of the project are maintained.
- Ensure a fair process is in place to help pay for maintenance of the project.

### Decide the spring location.

- The spring should not be more than **500 metres** from the homes of people who will use it. If it is much greater than this, you could consider constructing a simple pipeline to transfer the water to a storage tank.
- Will you need to build an access path or steps?
- Make sure the spring site is not in a place that experiences flooding or it risks being washed away. You may need to build drainage ditches to divert flood water.
- Ensure the spring is at least **50 metres** away from a latrine, garbage area, or other source of pollution. The spring must not be sited down-slope of a latrine or defecation area.
- If the land is privately owned you need written permission to develop and use the spring for community purposes. Make sure people will be able to walk over the land to access the spring.



### Ensure you understand government policy and standards

- Is there a national water policy which gives minimum standards for water quantity and quality, as well as the appropriate distance from the supply to people's homes?
- Is the local district government water department aware and supportive of your project? It may be useful to include them in the design, planning and construction of the spring structure.

### Design the spring protection structure.

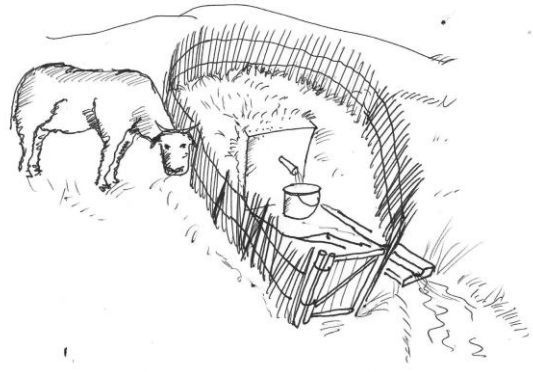
- Is the spring concentrated at a single point in the ground or slope, or spread a few metres across the ground? This will determine the type of protection structure needed.
- Measure the flow by timing how long the water takes to fill a container of known volume. Decide whether or not you will need to build a storage tank to collect the water so that there is enough flow available at the time people use it most.
- Ensure the outlet is not above where most of the spring water comes out, and that this location is never flooded. If you build the spring protection too high, its weight could hold

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the water back and it may cause the spring flow to move to another location on lower ground.

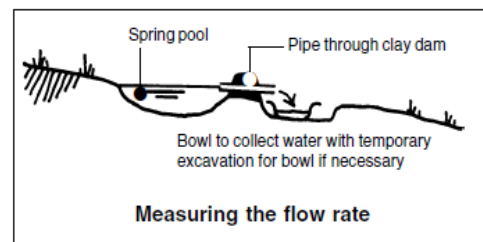
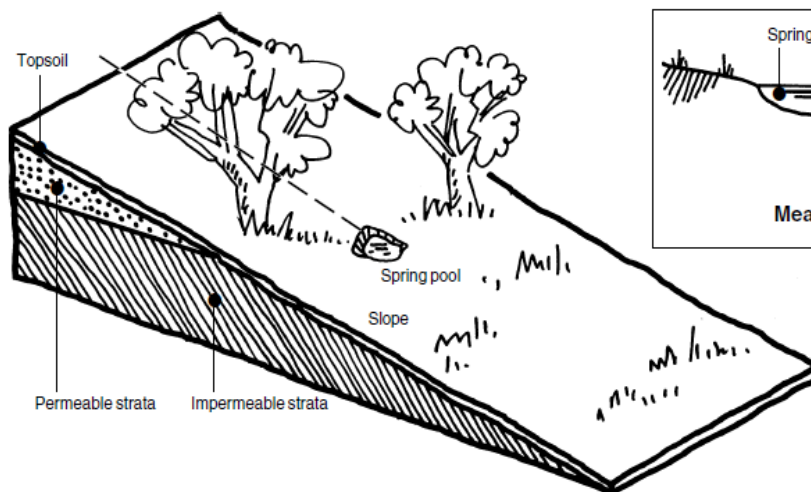
- The area around and above the spring must be fenced off to stop animals entering.
- Find out the 'catchment area' for the spring. This is the wider area which captures and directs ground water or surface water to supply the spring. The local government water department may be able to tell you. Think of ways to protect this area. Planting trees and bushes or making earth bunds or contours will help rainwater to seep into the ground to replenish the water supply.



### Construct the spring protection structure.

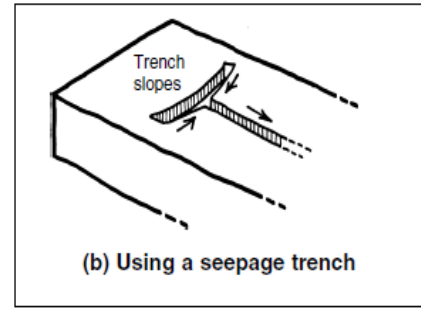
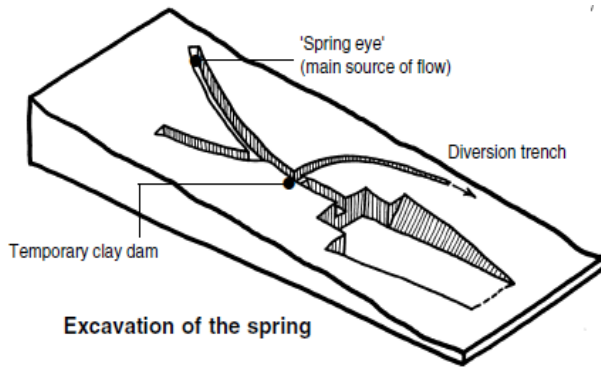
- Clear the site of bushes, long grass, etc.
- Starting at the highest point(s) at which there is evidence of water coming from the ground, dig narrow trenches downslope. Stop when the trench is about 1.0 metre deep, if there is a lot of water flowing into the trench.
- If there is more than one main source, several trenches can be joined. This takes a bit of work to be sure you've found the place where most of the water comes from the ground. If you get this wrong you could cause the spring to come out of the ground somewhere else. Ask for help from your local government water technical officer.

Engage the community in bringing the necessary sand and gravel to the site, preparing the site and building the spring protection structure.

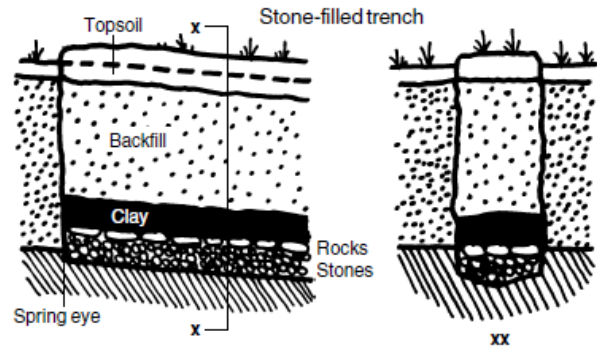


- The spring source at the head of the trench should be surrounded with clean stones through which water can flow into the trench. Stones of between 10 and 40mm size are most suitable, laid to a depth of at least 100mm. On top of this lay some larger rocks, and then a layer of puddled clay 100mm deep. This is clay prepared by wetting and kneading underfoot until it is evenly firm. Its purpose is to prevent surface water and replaced earth from entering the stone-filled channel.

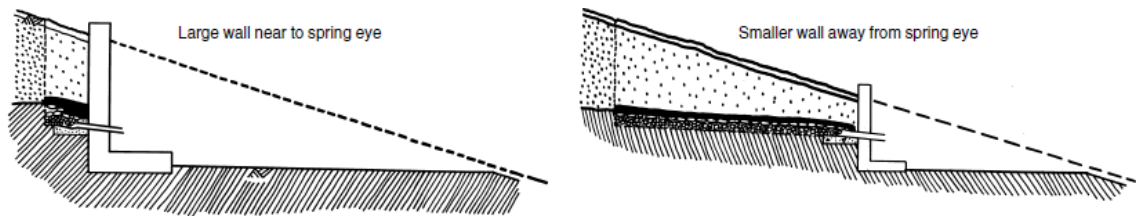
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- Once the clay has been trodden into place, the remainder of the trench can be filled with the earth you dug-out. It is best to compact it using your feet in layers of about 100mm. The final layer in the trench should be topsoil, which is planted with creeping grass plants to prevent it being washed away.

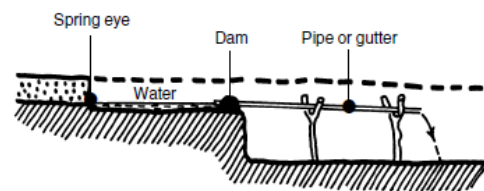


- Choose the position of the concrete headwall: the closer the headwall is to the eye of the spring, the higher and stronger the wall will need to be. A smaller headwall further away from the eye may be the cheapest solution:



An example of two options for the headwall position

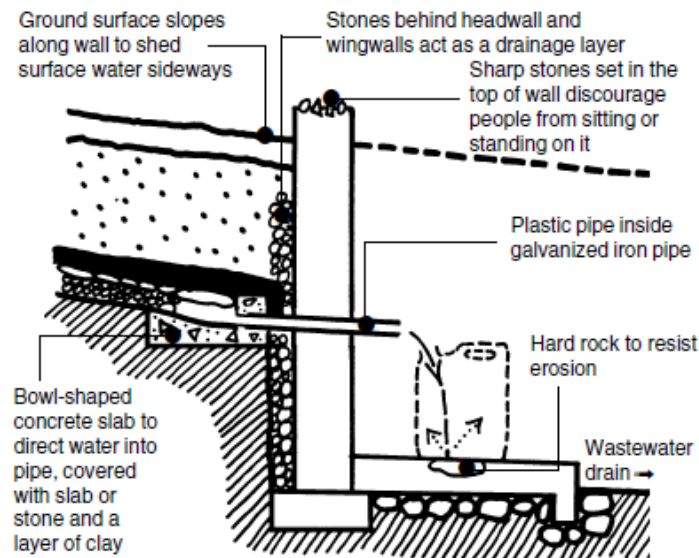
- Next, excavate for, and build the headwall. While you're building the headwall, divert the water using a pipe, supported on forked sticks, which extends over the excavation.
- Build the headwall and wing walls, using well-burnt bricks, concrete blocks or stones laid in a 1 to 3 mix of cement to sand. This is called mortar.



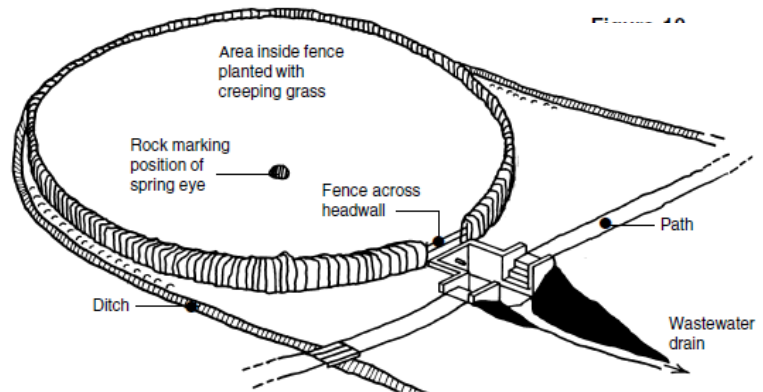
Carrying spring water over the excavation

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- Build the apron slab and steps. These allow access to the water pipe. The slab also protects the wall foundations, and it should slope to discharge any wastewater.
- Construct the surface water diversion ditch and fence.
- The area immediately above and uphill of the spring eyes needs to be fenced off to prevent pollution from people or animals. The fence should extend at least 10m uphill of the spring eyes. To prevent water from flowing through the fence onto the site of the spring, a free-draining ditch should be constructed uphill of the fence.
- Ask the local government water supply office to inspect and approve the works. They may also be able to offer help such as construction advice, providing materials, or tree-planting in the recharge zone.



### Finding out more

- Loughborough University Technical Brief Number 34, *Protecting springs, an alternative to spring boxes*: <http://www.lboro.ac.uk/well/resources/technical-briefs/34-protecting-springs.pdf>
- PACE Project - Spring Protection: <http://www.paceproject.net/Userfiles/File/Water/Spring%20protection.pdf>



### Notes

Many of the drawings in this document are copied with kind permission from the Loughborough University Technical Brief Number 34, *Protecting springs, an alternative to spring boxes*: <http://www.lboro.ac.uk/well/resources/technical-briefs/34-protecting-springs.pdf>

#### Related tools:

- B – Water for blessing (Bible study) [B: *Water, sanitation & hygiene-3*]
- B – Water for life (Bible study) [B: *Water, sanitation & hygiene-4*]
- C2 – Rainwater harvesting [C2: *Water, sanitation & hygiene-1*]
- C2 – Constructing a hand-dug well [C2: *Water, sanitation & hygiene-3*]
- C2 – Community involvement in siting and constructing boreholes [C2: *Water, sanitation & hygiene-3*]