Spring source

This management advice sheet should be used as guidance for the operation and maintenance (O&M) of a spring water collection system.

Guidance for typical O&M activities is provided in Table 1 with suggested frequencies for each activity. To protect water quality, these activities are important for maintaining the spring water collection system in a good working condition. Table 2 lists potential issues associated with a spring water collection system and provides basic corrective actions to consider for each potential issue.

I. OPERATION AND MAINTENANCE

For non-professionally run systems, O&M can normally be carried out by the users of the system, or by a caretaker. Larger repairs may require skilled labour, which may be provided by local craftspeople. With individual springs, O&M is typically arranged by the users themselves.

Construction of new latrine pits, septic tanks, sewers, etc., should not be undertaken near to the spring unless hydrogeological studies demonstrate that it is safe to do so. Sources of naturally occurring (i.e. geogenic) contaminants, such as arsenic and fluoride, and contamination resulting from human activities, such as agriculture and industry, should be investigated to determine their impact on the quality of water entering the spring. An increase in turbidity during wet weather events could indicate contamination from surface run-off. The impact of local surface water sources on groundwater quality should also be considered.

Maintaining the integrity of the protective spring structure is important to ensure the risks from surface and sub-surface contamination entering the spring are minimized. Where a spring box needs cleaning or maintenance work, standard operating procedures should be followed to ensure contaminants are not introduced into the spring during the work.

Table 1. Operation and maintenance schedule guidance[a]

Frequency	Activity
Daily	• Inspect and clean the spring site. • Ensure the outlet is clean and functioning. • Check the fence or barrier is in good condition. • Where present, ensure the spring box inspection port lid is in place, locked and in good condition. • Where present, ensure the spring box air vent and overflow pipe is in place and in good condition. Ensure protective vermin-proof screens are in good condition.
Annually	• Perform detailed inspection of the protective wall or spring box and the backfill area for obvious signs of damage or failure. • Where a spring box is present, check the sediment levels.
As the need arises[b]	• Remove sediment, clean and disinfect the spring box[c] (e.g. chlorine disinfection). • Monitor water use and yield (e.g. during periods of drought). • Clear the storm water diversion ditch. • Clear the drainage channel.

Notes:

1. The suggested frequencies in Table 1 represent a minimum requirement and may need to be increased depending on the local context. A suitable timetable should be made for each site.
2. Only persons with relevant training/skills should undertake the activities in Table 1. Care should be taken when handling disinfection products or undertaking any activity that requires entry into a spring box (e.g. inspection, maintenance etc.).
3. For guidance on appropriate frequencies for monitoring (e.g. sanitary inspections and water quality testing), refer to *Guidelines for drinking-water quality, 2nd edition: Volume 3 - Surveillance and control of community supplies* (WHO, 1997).

II. ISSUES AND REMEDIAL ACTIONS

Table 2. Common issues associated with spring water collection systems and suggested remedial actions

Each issue in Table 2 is linked to a corresponding question in the *Spring source* inspection form (e.g. issue 1 below is linked to question 1 in the sanitary inspection form.)

Issue		Remedial actions to consider
1	The spring is not adequately protected by a wall or spring box, which may allow contaminants to enter the spring.	• If there is no structure in place to protect spring water from contamination between it leaving the ground and being collected by the user, a protective wall or spring box should be constructed. • Where a protective structure is present but inadequate to prevent contamination (e.g. damaged, eroded or with deep cracks), remedial actions should be undertaken to improve the structure.
2	The outlet pipe is unclean or inadequately positioned to prevent contaminants entering the spring.	• Where the outlet pipe is unclean, ensure that it is cleaned and maintained. • Where the outlet pipe is positioned near to the ground, allowing for potential ingress of surface water into the spring, consider repositioning the outlet at a higher location on the spring structure, ensuring it remains below the natural water level.
3	The backfill area is eroded or prone to erosion due to absence of vegetation and may act as a direct pathway for contaminants to enter the shallower groundwater as it approaches the spring structure.	• Rehabilitate the backfill area e.g. refill with suitable filler material and/or plant light vegetation (e.g. grass) to provide added protection against erosion. • Ensure adequate drainage is in place to prevent surface water from eroding the backfill area.
4	The drainage is poor (e.g. missing or inadequate drainage channel or slope), which could result in the ponding of stagnant water and contamination of the spring area.	• If a drainage channel does not exist, dig temporary channels to divert water away from the spring site until more permanent channels can be built. • If a drainage channel is present but not functioning correctly, consider if the channel needs maintenance (e.g. repair, cleaning), or if deepening/widening or extending is required.
5	The storm water diversion ditch above the spring is missing or inadequate to prevent contaminated surface water entering the spring.	• If there is no storm water diversion ditch, dig channels to divert surface water away from the spring facility. • If a diversion ditch is present but not functioning correctly, consider if the ditch needs maintenance (e.g. repair, cleaning), or if deepening/widening is required.
6	The fencing or barrier *around* the spring is missing or inadequate to prevent animals damaging or contaminating the spring area.	• If a fence or barrier is absent, construct a suitable fence/barrier to prevent animals from accessing the spring area (or to prevent unauthorized access if relevant). • If a fence/barrier is present but inadequate to prevent contamination, repair or replace the fence/barrier to ensure it can prevent animals from accessing the spring area.
7	The fencing or barrier *upstream* of the spring is inadequate to prevent animals from contaminating the shallower groundwater as it approaches the spring structure, or from contaminating activities such as agriculture or open defecation being practiced in this area.	• If a fence or barrier is absent, construct a suitable fence/barrier to prevent animals or contaminating activities (e.g. agriculture) upstream of the spring facility. • If a fence or barrier is present but inadequate to prevent contamination, repair or replace the fence/barrier. • If an upstream fence or barrier is present but is an insufficient distance from the spring, move the fence or barrier further upstream of the spring.
8	There is sanitation infrastructure (e.g. a latrine pit, septic tank or sewer line) within 15 meters of the spring that could affect water quality (e.g. by infiltration).	• Consider what immediate actions should be taken to minimize the risk to public health (e.g. if the risk posed is significant, advise users to seek an alternative safe water source or disinfect the water at the point of use). • Consider appropriate steps to eliminate the hazard in the longer-term.

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Table 2 Common issues associated with spring water collection systems and suggested remedial actions (continued)

Issue		Remedial actions to consider
9	There is sanitation infrastructure on higher ground within 30 meters of the spring that could flow towards the abstraction point and contaminate the spring.	• Consider what immediate actions should be taken to minimize the risk to public health (e.g. if the risk posed is significant, advise users to seek an alternative safe water source or disinfect the water at the point of use). • Consider appropriate steps to eliminate the hazard in the longer-term.
10	There are signs of other sources of pollution (e.g. animals, rubbish, human settlement, open defecation, fuel storage) within 15 meters of the spring that could affect water quality.	• Where practical, remove the source of pollution (e.g. clean-up animal excrement, remove rubbish etc.). • Consider what actions may be appropriate to eliminate the source of pollution.
11	There is a point of entry to the aquifer (e.g. open/uncapped well or borehole) within 100 meters of the spring that could provide a direct pathway for contaminants to enter the spring.	• Liaise with the appropriate stakeholders to cover the well or borehole as a short-term priority. • Consider what actions are appropriate to decommission/relocate the well or borehole in the longer-term if required.
Where there is a spring box		
12	There are visible signs of contaminants (e.g. animal waste, sediment accumulation) in the spring box, which constitutes a serious risk to water quality.	• Consider what immediate actions should be taken to minimize the risk to health (e.g. if the risk posed is significant, advise users to seek an alternative safe water source or disinfect the water at the point of use). • Drain, clean and disinfect the spring box. • Consider appropriate measures to minimize the risk of contamination entering the spring box from this source in the future (e.g. cover, fencing, barrier).
13	The inspection port lid is missing or inadequate to prevent contaminants or light from entering the spring box.	• If an inspection port lid is missing or inadequate (e.g. damaged or unsealed), provide a temporary cover (e.g. opaque, impermeable plastic sheeting) over the inspection port to minimize contamination or light entering the spring, before repairing or replacing the inspection lid.
14	The overflow pipe is inadequately designed as water from the pipe falls from a height and erodes the ground beneath the pipe, causing the spring box structure to be undermined, providing a route of entry for contaminants into the shallower groundwater.	• If the overflow pipe water falls from a height such that it erodes the ground beneath the pipe, modify/extend the overflow pipe to minimize erosion and direct overflow water away from the spring area (e.g. via soakaway or drainage channel).
15	The overflow pipe is inadequately covered (e.g. with a mesh or gauze) to prevent contaminants entering the spring.	• Where the overflow pipe is uncovered, cover the pipe with a vermin-proof screen (e.g. gauze or mesh).
16	The air vents are inadequately designed (e.g. angled upwards) or are not covered to prevent contaminants entering the spring.	• If the air vents are angled upwards, modify the vent so it angles downwards. • Where the air vents are uncovered, cover the vents with a vermin-proof screen.

a. For more details see: Brikké, F. and Bredero, M. (2003). *Linking technology choice with operation and maintenance in the context of community water supply and sanitation: A reference document for planners and project staff* (WHO, Geneva).

b. See Table 2 for potential issues that could trigger these activities.

c. Guidance for disinfecting springs may be found here: https://health.mo.gov/atoz/ehog/pdf/Ch_6.7.pdf

Water, Sanitation, Hygiene and Health Unit
Avenue Appia 20, 1211 Geneva 27, Switzerland
Telephone: + 41 22 791 2111 / Email: gdwq@who.int
Website: www.who.int/water_sanitation_health

World Health Organization