Tubewell with a hand pump

A. GENERAL INFORMATION

A.1. Tubewell information

Tubewell location (e.g. village, town, community, parish, district, province, state)						
Additional location information State the reference system and units, if using coordinates (e.g. national grid reference coordinates, GPS coordinates)						
Year of construction of tubewell	**Depth of tubewell** (including units)	**Approximate number of households using this water source** Circle one of the options below				
		1–10	11–50	51–100	101–500	>500
Circle the options below				If **Yes**, describe (e.g. what happens, how often, for how long)		
Is the tubewell affected by flooding?	Unsure	No	Yes			
Is the tubewell affected by drought?	Unsure	No	Yes			

A.2. System functionality

Circle **Yes** or **No** to indicate if water is currently available from the tubewell. If **No**, describe why (e.g. broken pump, low water level) and then go to Section B. In Section C, record the corrective actions needed for the tubewell to provide water, and record the details of any alternative water source(s) currently being used.

Is water currently available from the tubewell?		If **No**, describe why (then go to Section B)
Yes	No	

A.3. Weather conditions during the 48 hours before inspection

Circle the temperature and precipitation options below to indicate the main conditions during the 48 hours before the inspection. More than one option may be circled if conditions changed during this time. Record additional information in Section C if needed.

Temperature	<0 °C	0–15 °C	16–30 °C	>30 °C
Precipitation	Snow	Heavy rain	Rain	Dry

A.4. Water quality sample information

Record details of any water quality samples taken during the inspection. Include information for any parameters tested. Add **NA** if information is not applicable. Record additional information in Section C if needed.

Sample taken? Circle **No** or **Yes**		**Sampling location**	**Sample identification code**	**Other information**					
No (go to A.5)	Yes								
Parameter tested		*E. coli*[a]	***or*** Thermotolerant (faecal) coliforms[a]	Additional parameter		Additional parameter		Additional parameter	
Results and units		Results	Units	Results	Units	Results	Units	Results	Units	Results	Units

A.5. Water treatment

Tick (✓) the appropriate box(es) and provide additional information as needed.

❑ **No treatment applied.**

❑ **Treatment applied at the tubewell.** Describe (e.g. chlorine dose, frequency of dosing, how it is applied).[b]

❑ **Treatment applied downstream of the tubewell.** Describe (e.g. household water treatment).

[a] The presence of *E. coli* (or thermotolerant [faecal] coliforms) suggests recent faecal contamination. If detected, further action is needed, such as additional sampling and investigation of potential sources of contamination, and/or household water treatment advisories (e.g. boil water notice). *Note* – thermotolerant (faecal) coliforms are distinct from "total coliforms", where total coliforms do not necessarily indicate recent faecal contamination.

[b] Where chlorine is applied, the free chlorine residual concentration in the drinking-water should be tested and the result recorded in Section A.4. Where possible, turbidity and pH should also be measured. For general information on chlorination, refer to Technical notes on drinking-water, sanitation and hygiene in emergencies: measuring chlorine levels in water supplies (WHO & WEDC, 2013).

General notes

- This form is intended for use on a single tubewell with a hand pump. Where there are multiple tubewells to be inspected, additional forms will be needed. Tubewells may be inspected on a rotational basis where there are too many to cover during each inspection.
- If other water sources are in use (spring, borehole), or if users collect and store water in the home, carry out additional sanitary inspections using the corresponding sanitary inspection packages.

B. SANITARY INSPECTION

IMPORTANT: Read the following notes before completing the sanitary inspection

1. Tick (✓) the appropriate box for each question. For guidance, refer to the numbered risk factors in Figure 1; the numbers in the figure are linked to the questions. Record any additional risk factors present in Section C. Refer also to the *Technical fact sheet* for information on the individual components of the tubewell. *Note* – the questions in this section are example risk factors only, which can be used as a starting point for adapting the form to the local context.
2. Tick the **NA** (not applicable) box if the question ***does not apply*** to the tubewell being inspected.
3. Tick the **No** box if the question does apply to the tubewell being inspected, but the risk factor ***is not present***.
4. Tick the **Yes** box if the risk factor ***is present***. For important situations that require attention, record the corrective actions to be taken in the last column. These notes can be used to develop a detailed improvement plan, documenting what will be done, who will do it, by when it will be done and what resources are required. For guidance, refer to the *Management advice sheet*. Where possible, address the most serious risk factors first, considering low-cost or no-cost improvements that can be made immediately.
5. If a question cannot be answered because access to a component is not possible, tick the **Yes** box. Record these issues in Section C for further investigation.

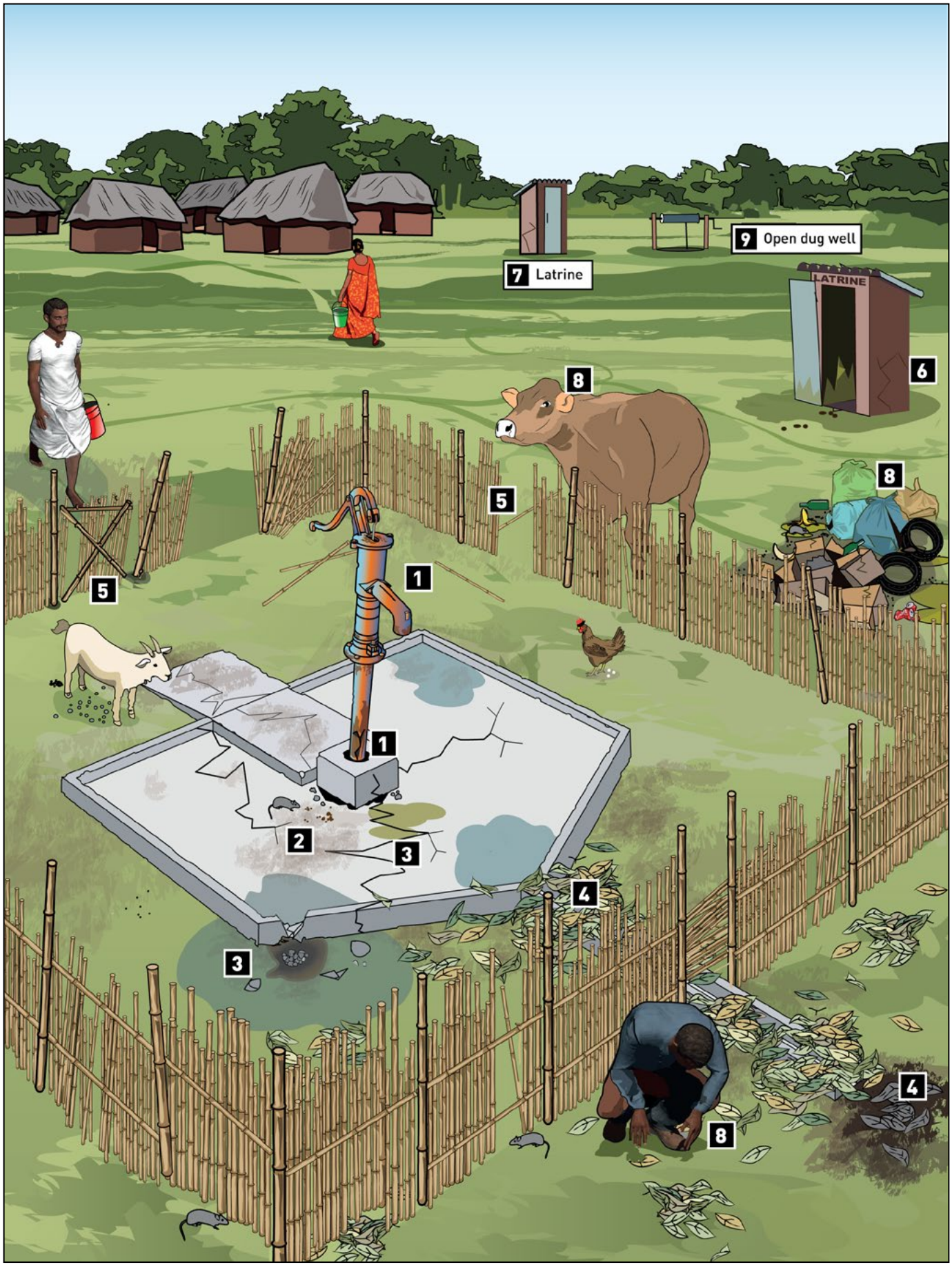

Figure 1. Typical risk factors associated with a tubewell with a hand pump

Sanitary inspection questions		NA	No	Yes	If Yes, what corrective action is needed?
1	**Is the pump in poor condition or loose at the point of attachment to the mounting block?** Contaminants could enter the water if the hand pump is damaged or severely corroded, or if the spout is dirty. Contaminated surface water could also enter the tubewell, particularly after rain, if the hand pump is loosely attached to the mounting block (i.e. if there is a gap between the hand pump and the mounting block).	❑	❑	❑	
2	**Is the area directly around the tubewell seal dirty?**[c] Contaminants could enter the tubewell, particularly after rain, if the area immediately around the tubewell seal shows signs of pollution (e.g. animals, faeces).	❑	❑	❑	
3	**Is the apron around the tubewell absent or in poor condition?** Contaminants could enter the tubewell, particularly after rain, if there is no apron. This could also happen if the apron is damaged (e.g. gaps, deep cracks). Erosion under the apron could also allow contaminated surface water to enter the tubewell.	❑	❑	❑	
4	**Is drainage inadequate, which could allow water to accumulate in the tubewell area?** Stagnant water could contaminate the tubewell if there is no drainage system in place. This could also happen if the drainage system is damaged (e.g. deep cracks) or blocked (e.g. from leaves, sediment). This is especially likely after rain. *Note* – the presence of pooled water and/or erosion under the apron may indicate poor drainage.	❑	❑	❑	
5	**Is the fence or barrier around the tubewell missing or inadequate so that animals could enter the tubewell area?** Animals could contaminate or damage the tubewell area if the fence or barrier around the tubewell is missing. This could also happen if the fence or barrier is broken or poorly built (e.g. has large gaps), or the entry point (e.g. gate) does not close securely.	❑	❑	❑	

SANITARY INSPECTION FORM: Tubewell with a hand pump

	Sanitary inspection questions	NA	No	Yes	If Yes, what corrective action is needed?
6	**Is there sanitation infrastructure within 15 metres of the tubewell?**[d] Sanitation infrastructure (e.g. latrine pit, septic tank, soakage field, sewer pipes) close to the tubewell may affect water quality. For example, waste could seep into the groundwater or overflow and be washed into the tubewell, particularly after rain. Visually check structures in this area, and ask community members, to see if the structures are sanitation related.	❑	❑	❑	
7	**Is there sanitation infrastructure on higher ground within 30 metres of the tubewell?**[d] Contaminated groundwater and surface water may flow downhill from sanitation infrastructure towards the tubewell. This could cause harmful microorganisms and other contaminants to enter the tubewell, particularly after rain.	❑	❑	❑	
8	**Can other sources of pollution be seen within 15 metres of the tubewell (e.g. open defecation, animals, drinking troughs for livestock, rubbish, commercial activity, fuel storage)?**[d] The presence of animals or faeces on the ground close to the tubewell poses a serious risk to the safety of the drinking-water. Contaminants from other waste (e.g. household, agricultural, industrial) could be washed into the tubewell during rain or seep into the groundwater.	❑	❑	❑	
9	**Is there any unprotected entry point to the aquifer within 100 metres of the tubewell?**[d] An unprotected entry point to the aquifer (e.g. uncapped borehole, open dug well) could allow contaminants to enter the groundwater and contaminate the tubewell.	❑	❑	❑	
	Total number of Yes responses				

[c] The seal protects the tubewell from contamination, filling the underground area between the tubewell casing and the surrounding earth. Refer to the *Technical fact sheet* for further information.

[d] General guidance only. Appropriate minimum safe distances depend on local factors including soil type and permeability, depth of the water table, and volume and concentration of contaminants. For guidance on determining minimum safe distances for polluting activities, refer to Guidelines for drinking-water quality: small water supplies (WHO, 2024).

C. ADDITIONAL DETAILS

Include any additional risk factors,[e] recommendations, observations or remarks from users of the water source (e.g. problems with the taste, odour or appearance of the water, water source reliability). Attach additional sheets and photographs if needed.

[e] These risk factors should be considered for future inclusion in Section B.

D. INSPECTION DETAILS

Name of inspector: _____

Organization: _____

Designation/title of inspector: _____

Signature: _____ Date: _____

Name of water supply representative: _____

Contact number (if available): _____

Signature (if available): _____ Date: _____

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Website: https://www.who.int/health-topics/water-sanitation-and-hygiene-wash

World Health Organization

Tubewell with a hand pump

This technical fact sheet provides background information on a tubewell with a hand pump, which supports the sanitary inspection of this drinking-water source.[a]

A tubewell consists of a drilled hole in the ground, with a water-lifting device (e.g. a hand pump) that is used to bring groundwater to the surface.

Groundwater is considered to be better quality than surface water in many places. However, appropriate treatment/disinfection are required for groundwater sources that are vulnerable to contamination.

Tubewells can be constructed by hand (e.g. using a manual auger) or by machinery (e.g. percussion drilling). The tubewell should be lined with a casing and have a screen, and be fitted with a secure water-lifting device (e.g. a hand pump in the case of shallower tubewells).[b]

Tubewells are generally 0.1–0.25 metres in diameter. For this reason, tubewells cannot be physically accessed by a person for inspection, operations and maintenance (e.g. sediment removal) or improvement works. These activities must be carried out from ground level once the hand pump has been removed.

Tubewells should have adequate capacity (i.e. have an appropriate depth below the water table and width) to meet the needs of users at all times of the year. Limited capacity could result in users seeking alternative drinking-water sources that could be less safe.

The water collection area should be built so it is accessible all users.[c]

Figure 1 shows a common type of tubewell with a hand pump. A section view of the belowground elements of the tubewell is shown in Figure 2. These figures show a typical design. Other designs can also provide safe drinking-water (e.g. using a motorized pump).

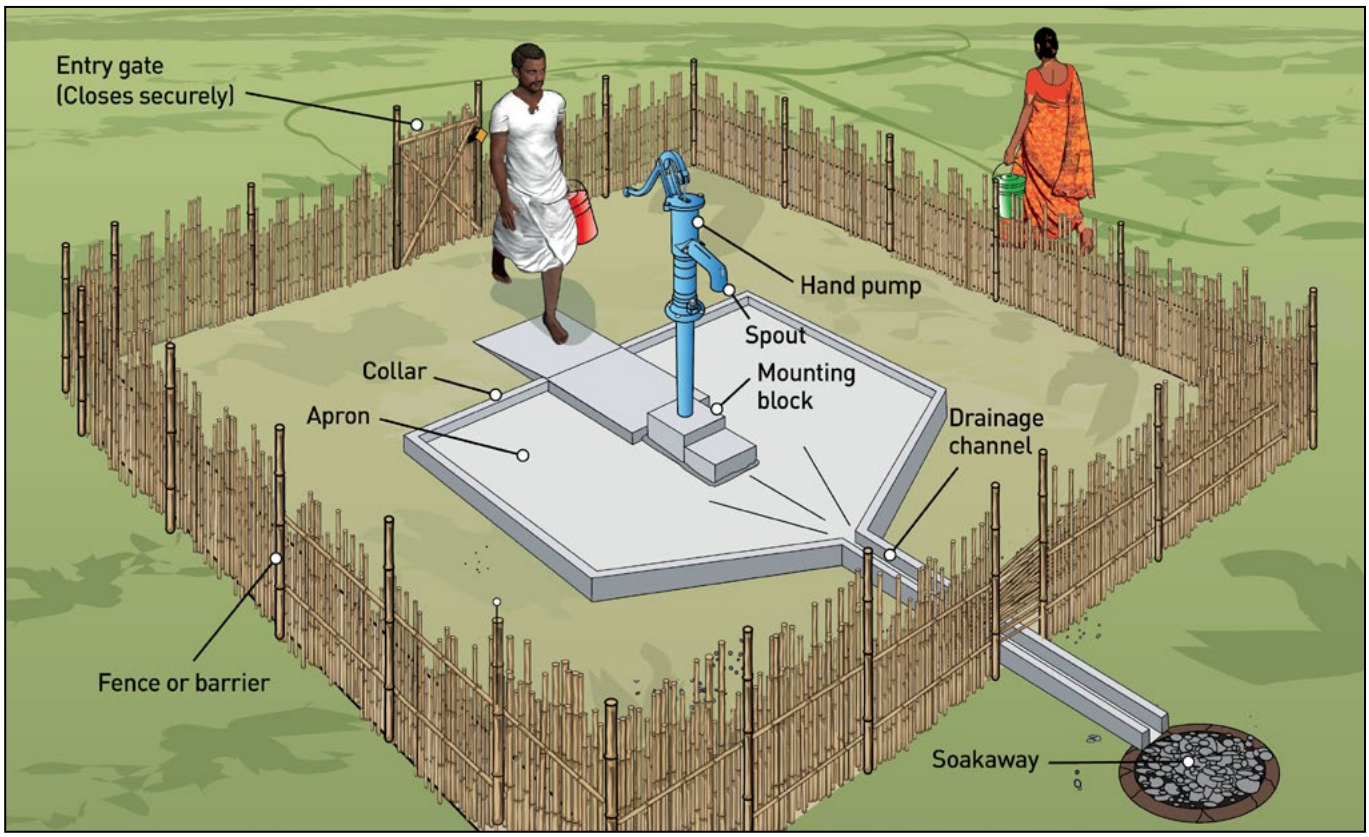

Figure 1. A common tubewell with a hand pump in a sanitary condition

[a] This fact sheet is not intended to serve as a guide to construction. For detailed guidance on the design and construction of a tubewell, refer to Hand-dug shallow wells: series of manuals on drinking water supply, Vol. 5 (Collins, 2000).

[b] Hand pumps (levered type) may be suitable for water abstraction depths of up to approximately 45 metres. Deeper than 45 metres, geared hand pumps or motorized pumps are likely required.

[c] For guidance on designing accessible facilities, refer to Water and sanitation for disabled people and other vulnerable groups: designing services to improve accessibility (Jones & Reed, 2005).

Typical risk factors associated with a tubewell with a hand pump are presented in the corresponding *Sanitary inspection form.*

A tubewell with a hand pump typically includes the following main components.

- **Hand pump:** Draws groundwater from the tubewell through a pipe (called a **rising main**) to the point of collection (the **spout**) above the surface. The hand pump should be securely fitted to the casing and mounting block (i.e. tightly fitting with no gaps) to prevent contaminants from entering the tubewell.[d]
- **Mounting block:** A raised stone, brick or concrete cover built over the tubewell to support the casing and rising main. The mounting block also provides a point of attachment for the hand pump.
- **Seal:** Provides structural protection for the upper part of the tubewell, and protects the tubewell from contamination. The seal is typically constructed using a mixture of cement, bentonite (clay) and sand. The seal should fill the gap between the casing and surrounding ground, and should not allow water to pass through it. For adequate protection, the seal should extend to a depth of at least 3 metres.
- **Casing:** Provides structural support for the walls of the tubewell and protects the rising main. The casing should have sufficient strength to resist collapse, and is typically made from water-resistant materials such as metals, plastic or fibreglass. Where practical, the casing should ideally extend to at least 0.5 metres above the ground to protect from surface water contamination.
- **Screen:** Provides structural support for the tubewell and allows water to enter the casing (acting also as a barrier to prevent larger particles from entering the rising main). The screen material should be resistant to corrosion and have sufficient strength to resist collapse.
- **Apron:** A reinforced stone, brick or concrete floor built around the tubewell to drain water away from the tubewell area. To ensure adequate protection, the apron should be at least 1 metre wide all around the mounting block. The apron should slope down from the tubewell towards a collar for adequate drainage. The apron also provides a standing area for users when collecting water.
- **Collar:** The raised edge of the apron that captures water and directs it to a drainage channel.
- **Drainage channel:** Directs water away from the tubewell to a drainage area or soakaway, where the water can drain into the ground. The drainage channel should slope down from the tubewell. This prevents water ponding and stagnating, which could contaminate the tubewell. Drainage water may be used to provide water for livestock or other activities, provided that these activities occur at a safe distance downhill from the tubewell.
- **Soakaway:** A hole in the ground filled with coarse material (e.g. gravel, stones, rocks), or that has a permeable wall, that allows water to drain back into the ground. The soakaway should be located at a safe distance downhill from the tubewell.[e]
- **Fence or barrier:** A physical barrier to prevent animals from contaminating the tubewell area or damaging the components. It may also prevent unauthorized access by people. The fence or barrier should have an entry point (e.g. a gate) that can be closed tightly and latched shut/locked. Where practical, the fence or barrier should ideally be constructed at least 15 metres from the tubewell (general guidance only).[e]

Additional considerations

Before the tubewell is constructed, sources of naturally occurring contaminants (e.g. arsenic, fluoride) and contamination from human activities (e.g. agriculture, industry) should be investigated to determine their impact on groundwater quality. Latrines and other sanitation facilities should be identified before choosing a site for the tubewell.

After a new tubewell is constructed, it should be cleaned, flushed and disinfected (e.g. with chlorine), and flushed again, to disinfect the components before the water is used.[f] Ideally, water quality testing should be conducted before the tubewell is commissioned to confirm the water is safe for consumption. Periodic disinfection and testing may also be required (e.g. after flooding, after maintenance).

The corrosion potential of the groundwater source needs to be considered when selecting components for the hand pump. If the groundwater has low pH, high salinity and high chloride, corrosion-resistant materials are required.

When constructing new tubewells or rehabilitating old ones, all materials used should be safe for contact with drinking-water (e.g. using materials approved through an appropriate certification scheme, including for lead-free or low-lead materials).

[d] For deeper tubewells that require motorized pumps, refer to the *Sanitary inspection package: borehole with a motorized pump*, which can be adapted for tubewells.

[e] For guidance on determining appropriate minimum safe distances for polluting activities, refer to Guidelines for drinking-water quality: small water supplies (WHO, 2024).

[f] See Technical notes on drinking-water, sanitation and hygiene in emergencies: cleaning and rehabilitating boreholes, (WHO & WEDC, 2013).

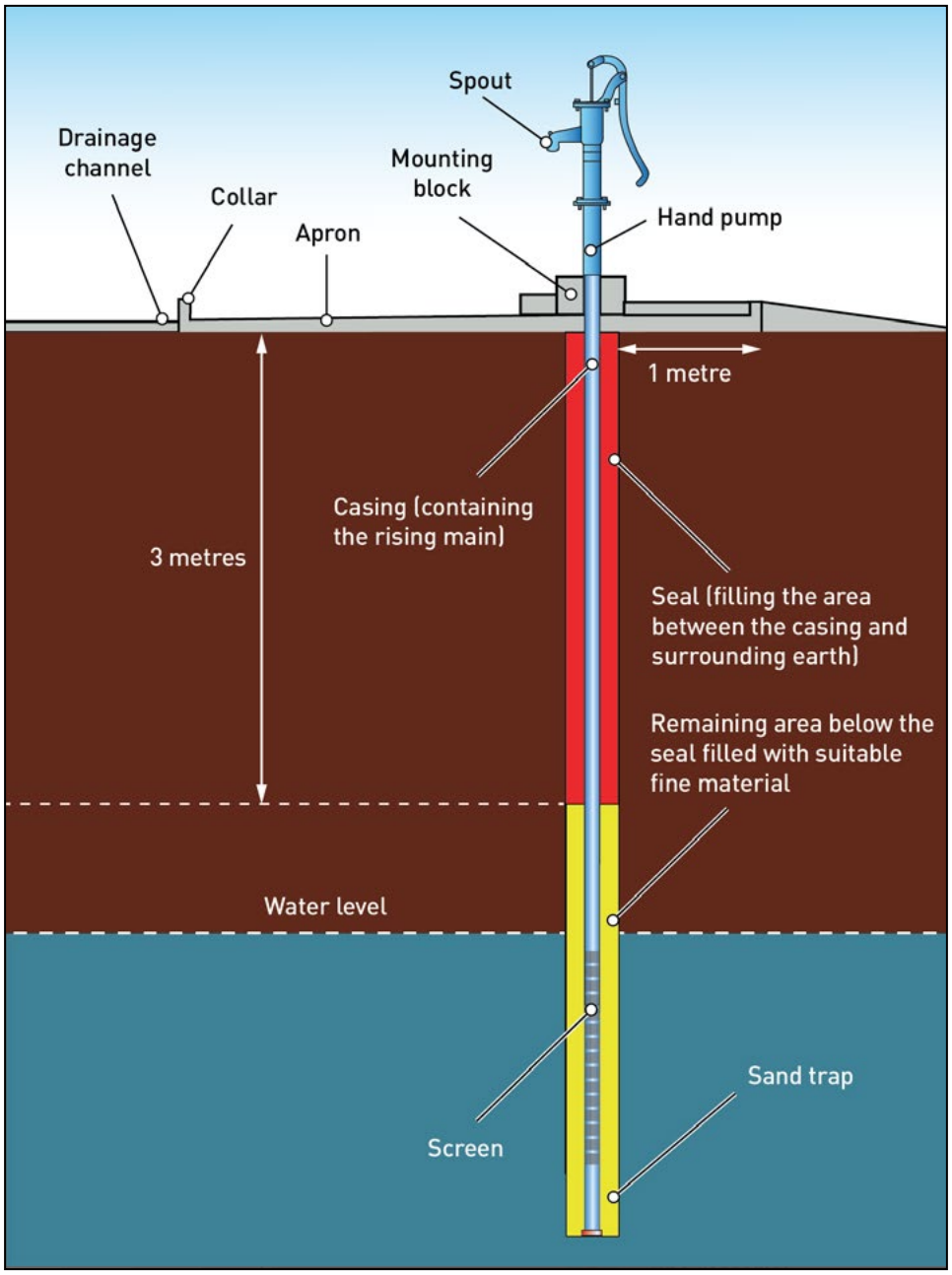

Figure 2. A tubewell with a hand pump in a sanitary condition (section view)

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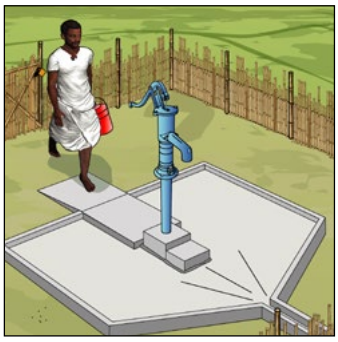
Website: https://www.who.int/health-topics/water-sanitation-and-hygiene-wash

Tubewell with a hand pump

This management advice sheet provides guidance for the safe management of a tubewell with a hand pump, which supports the sanitary inspection of this drinking-water source.



Guidance for typical operations and maintenance (O&M) activities is provided in Table 1, including suggested frequencies for each activity. These activities are important for keeping the tubewell and hand pump in good working condition and protecting drinking-water quality.

Table 2 lists potential problems that may be identified during a sanitary inspection, and provides basic corrective actions to consider for each problem.

This management advice sheet can also support routine management and monitoring practices, which are required to help ensure the ongoing safety of the water supply.

A. OPERATIONS AND MAINTENANCE

Basic O&M can usually be carried out by a trained owner, user or caretaker/operator (e.g. simple maintenance tasks such as cleaning the tubewell area). Larger repairs and maintenance tasks (e.g. repairing the apron, pump maintenance) may need skilled labour which can be provided by local craftspeople, or with support from outside of the local area.

The condition of the tubewell and hand pump should be inspected routinely to help prevent contaminants entering the tubewell. Any damage or faults should be repaired immediately (e.g. deep cracks in the apron, broken fence, soil erosion around the apron). Standard operating procedures (SOPs) should be developed for important O&M tasks (e.g. removing the hand pump for maintenance, inspecting the screen). These should be followed by trained individuals so the work is carried out safely and the tubewell is not contaminated during the work.

Consultation with the relevant authorities may be required to ensure that sanitation infrastructure (e.g. latrine pits, septic tanks, sewers, soakage fields) is not built near the tubewell unless hydrogeological studies show that it is safe to do so. Consideration should also be given to catchment activities that extract groundwater (e.g. for irrigation, mining, power) to ensure an adequate quantity of drinking-water to meet the needs of users.

Activities other than the collection of drinking-water (e.g. laundry, washing, bathing) should not be permitted at the tubewell area. These should be carried out at a safe distance downhill from the tubewell.

Adequate treatment/disinfection are required before consuming the drinking-water if the tubewell is vulnerable to contamination, or if the water could be contaminated due to unhygienic storage and handling by the user during transport or in the home.

Table 1. Guidance for developing an operations and maintenance schedule

Frequency	Activity
Daily to weekly	• Check and clean the tubewell facility, including the spout. Remove any polluting materials (e.g. faeces, rubbish). • Check that the hand pump is working.[a] Perform pump maintenance as needed, repair or replace damaged parts, then clean and disinfect (e.g. with chlorine) the hand pump. • Check that the drainage channel is clear and in good condition. Remove debris or repair as needed. • Check that the fence or barrier is in good condition and that the entry point (e.g. gate) can be closed securely and latched shut/locked. Repair as needed.
Annually	• Perform a detailed inspection of the tubewell structure (including the screen) for signs of damage or failure. Repair or replace damaged parts as needed.[b]

Table 1. ...continued

Frequency	Activity
As the need arises[c]	• Remove sediment, and clean (e.g. via high pressure water jetting) and disinfect the tubewell (e.g. with chlorine).[d] • Unclog the screen. • Rehabilitate the tubewell (e.g. deepen the tubewell).[b] • Replace any eroded earth around the tubewell, and fill any depressions in the ground where water ponds. • Monitor water yield and use to identify changes (e.g. during periods of drought). • Ensure procurement of any materials in contact with drinking-water and water treatment chemicals (where used) are safe for drinking-water use.

[a] Where practical, a broader assessment of hand pump functionality and condition can be performed during the sanitary inspection. For basic guidance on functionality checks, preventive maintenance and repair for common hand pump types, refer to the pump-specific guidance manuals at https://www.rural-water-supply.net/en/resources/, or the relevant manufacturer's guide.

[b] For guidance on construction aspects, refer to Hand-dug shallow wells: series of manuals on drinking-water supply, Vol. 5 (Collins, 2000).

[c] See Table 2 for potential problems that could trigger these activities.

[d] See Technical notes on drinking-water, sanitation and hygiene in emergencies: cleaning and rehabilitating boreholes (WHO & WEDC, 2013), which can be adapted for tubewells. This activity is required following a contamination event (e.g. flooding, *E. coli* detection).

General notes

- The suggested frequencies in Table 1 are a minimum recommendation. The frequency of activities may need to be increased depending on the local context. A suitable O&M schedule should be made for each site, including who is responsible for performing the work. Completion of activities as per the O&M schedule should be recorded, including additional details for any problems identified and corrective actions undertaken.
- Only persons with relevant training/skills should undertake the activities in Table 1. Care should be taken when handling disinfection products.
- For guidance on appropriate frequencies for monitoring (e.g. sanitary inspections, water quality testing), refer to Guidelines for drinking-water quality: small water supplies (WHO, 2024).

B. PROBLEMS AND CORRECTIVE ACTIONS

Each problem in Table 2 is linked to the same question number in Section B of the *Sanitary inspection form.* Where relevant, corrective actions should be completed by trained individuals according to SOPs. Where needed, develop awareness raising and education programmes, and if necessary, local rules or regulations, to support safe drinking-water management in the context of the guidance provided in Table 2.

If problems are identified that represent an immediate threat to drinking-water safety (e.g. likely presence of faecal contamination in the water supply, positive *E. coli* detection), consider what immediate actions should be taken to minimize the risk to public health (e.g. advise users to seek an alternative safe drinking-water source, disinfect the water at the point of use).

Table 2. Common problems associated with a tubewell source, and suggested corrective actions

Question	Problem identified	Corrective actions to consider
1	The hand pump is in poor condition, or it is loose at the point of attachment to the mounting block, which could allow contaminants to enter the water.	• Repair any damaged or severely corroded components of the hand pump. Then clean and disinfect the hand pump (e.g. with chlorine). • If the tubewell spout is dirty, clean and disinfect it. • Fix the hand pump unit so that it is firmly attached to the mounting block with no gaps. • Communicate the importance of routine cleaning/maintenance of the hand pump.
2	The area around the tubewell seal is dirty (e.g. signs of pollution such as animals, faeces), which could allow contaminants to enter the tubewell.	• Clean the area directly around the seal. • Communicate to the operator or caretaker the importance of maintaining the area around the tubewell seal in a clean condition.
3	The apron around the tubewell is absent, or it is in poor condition (e.g. with gaps, deep cracks, signs of erosion under the apron), which could allow contaminants to enter the tubewell (e.g. from contaminated surface water).	• If the apron is absent, construct an apron at least 1 metre around the casing, ensuring that it slopes downward to a defined collar. • If the apron is damaged or has deep cracks, repair it to ensure that it is adequately sealed. • If the area around or under the apron shows signs of erosion, replace any eroded earth to ensure that it is adequately sealed. (Where the erosion is caused by poor drainage, see row 4.)
4	The drainage is inadequate (absent, damaged or blocked drainage channel or soakaway), which could result in stagnant water contaminating the tubewell.	• If a drainage channel or soakaway is absent, dig a temporary channel to divert water away from the tubewell area. Construct a permanent solution as soon as possible. • If a drainage channel or soakaway is not working, consider whether maintenance is needed (e.g. repairing, cleaning), or if deepening, widening or extending is required.
5	The fence or barrier around the tubewell is absent or inadequate, which could allow animals to contaminate or damage the tubewell area.	• If absent, construct a robust fence or barrier with a lockable gate that closes securely. • If a fence or barrier is present but inadequate to prevent access, repair or replace it. • If the entry point (e.g. gate) to the tubewell area is damaged and/or does not close securely, repair or replace it.

Table 2. ...continued

Question	Problem identified	Corrective actions to consider
6	There is sanitation infrastructure (e.g. latrine pit, septic tank, soakage field, sewer line) within 15 metres of the tubewell that could contaminate the tubewell (e.g. from overflow, seepage).[e]	• Involve local authorities to assess the significance of the risk from the sanitation infrastructure. • Consider what immediate actions should be taken to minimize the risk to public health (e.g. advise the household to treat the water before consumption). • Consult with local authorities to consider appropriate steps to relocate or eliminate the source of pollution.
7	There is sanitation infrastructure on higher ground within 30 metres of the tubewell that could contaminate the tubewell.[e]	

8	There are other sources of pollution (e.g. open defecation, animals, drinking trough for livestock, rubbish, commercial activity, fuel storage) within 15 metres of the tubewell that could contaminate the tubewell.[e]	• Where practical, remove the pollution (e.g. remove animal faeces, rubbish). Communicate the importance of maintaining the tubewell area in a clean condition.
		• Consult with local authorities and users to consider:
		  ○ appropriate actions to relocate or eliminate the source of pollution
		  ○ other actions to minimize the issue from occurring again (e.g. signage, enforcement measures).

9	There is an unprotected point of entry to the aquifer (e.g. open or uncapped well or borehole) within 100 metres of the tubewell that could provide a direct pathway for contaminants to enter the groundwater and contaminate the tubewell.[e]	• Consult with local authorities to:
		  ○ assess the significance of the risk from the unprotected point of entry to the aquifer
		  ○ cover the point of entry in the immediate term
		  ○ consider what actions are appropriate to permanently seal, decommission or relocate the point of entry.

[e] General guidance only. Appropriate minimum safe distances depend on local factors including soil type and permeability, depth of the water table, and the volume and concentration of contaminants. For guidance on determining minimum safe distances for polluting activities, refer to Guidelines for drinking-water quality: small water supplies (WHO, 2024).

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