

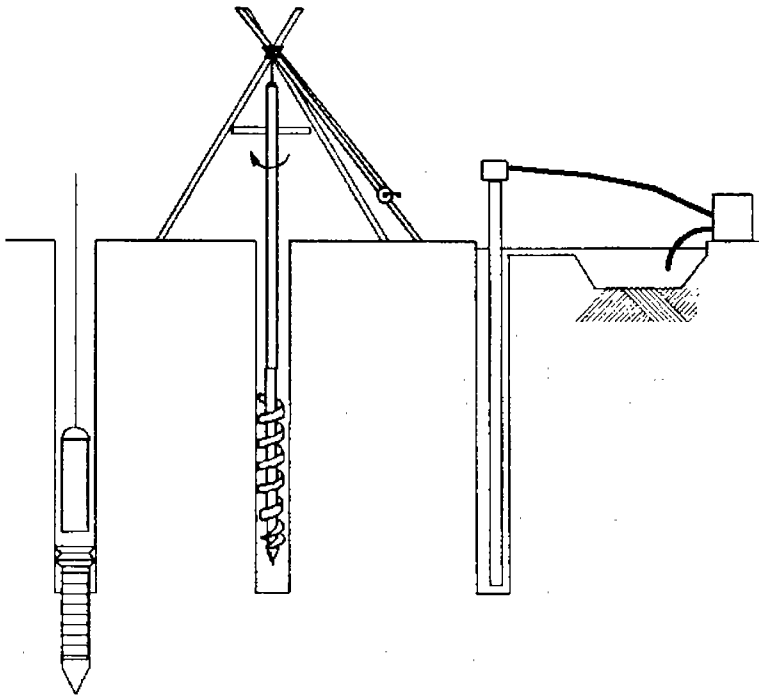
## Boreholes and tubewells

The traditional methods of drawing water from the ground, such as dug wells, have been replaced in many countries by small-diameter wells which are easier and quicker to sink and can be closed off when they are no longer needed, for instance when a refugee camp is closed. This type of well is usually fitted with a handpump to draw water to the surface, but water can also be raised using a small bucket or an electrical pump.

Boreholes and tubewells should, if possible, be sunk in the dry season and should extend some way below the water table to ensure a continuous supply of water. Water enters through holes or slots in the part of the pipe under the water table, called the well screen.

The tubewell is the cheapest to sink. The three types of tubewell illustrated in Figure 1 can all be sunk by hand :

- *Driven tubewell* made by hammering a metal pipe with a pointed end into the ground. Once the point reaches the ground water, water enters the pipe through small holes in the wall of the point and can then be pumped up to the surface.
- *Bored tubewell* made by drilling down to the water table using an auger (a special cutting tool).
- *Jetted tubewell* made by forcing water through a pipe into a hole. The water flows back up to the surface carrying soil from the bottom of the hole and making it deeper.



**Figure 1. Methods of sinking a tubewell**

Boreholes and deep tubewells need a drilling rig which may be mounted on the back of a truck or a trailer. Large drilling rigs can drill boreholes over 200 metres deep. Handpumps, however, can only be used where the water table is less than 60 metres deep; boreholes which are deeper than this will require a motor pump. Boreholes are expensive because of the equipment needed.

It is not within the scope of this Fact Sheet to cover well sinking or drilling techniques in detail. In both cases, trained staff are required to operate the drilling rigs and install the pumps.

## *Sanitary inspections of boreholes and tubewells*

Boreholes and tubewells require regular monitoring to ensure that an adequate and safe water supply is maintained. A suggested frequency of sanitary inspections is four times a year conducted by the community and at least once a year by an external surveillance agency (see Fact Sheet 2.1).

Where a well serves a community, water quality testing should be done twice a year, once in the dry season and once in the wet season. Where there are many household wells, the surveillance agency should only test a few of the wells in a community each year. The wells selected should be generally representative of wells in the community, thus wells in locations where there are several wells nearby should be selected. The results of the water quality analysis of the wells will show whether there is contamination, and the results of the sanitary inspections will enable the causes of contamination to be identified and eliminated.

The key observations to make in a sanitary inspection of tubewells and boreholes equipped with handpumps are shown in Figure 2. The points to check in a sanitary inspection of deep boreholes where water is abstracted using a motor pump are shown in Figure 3.

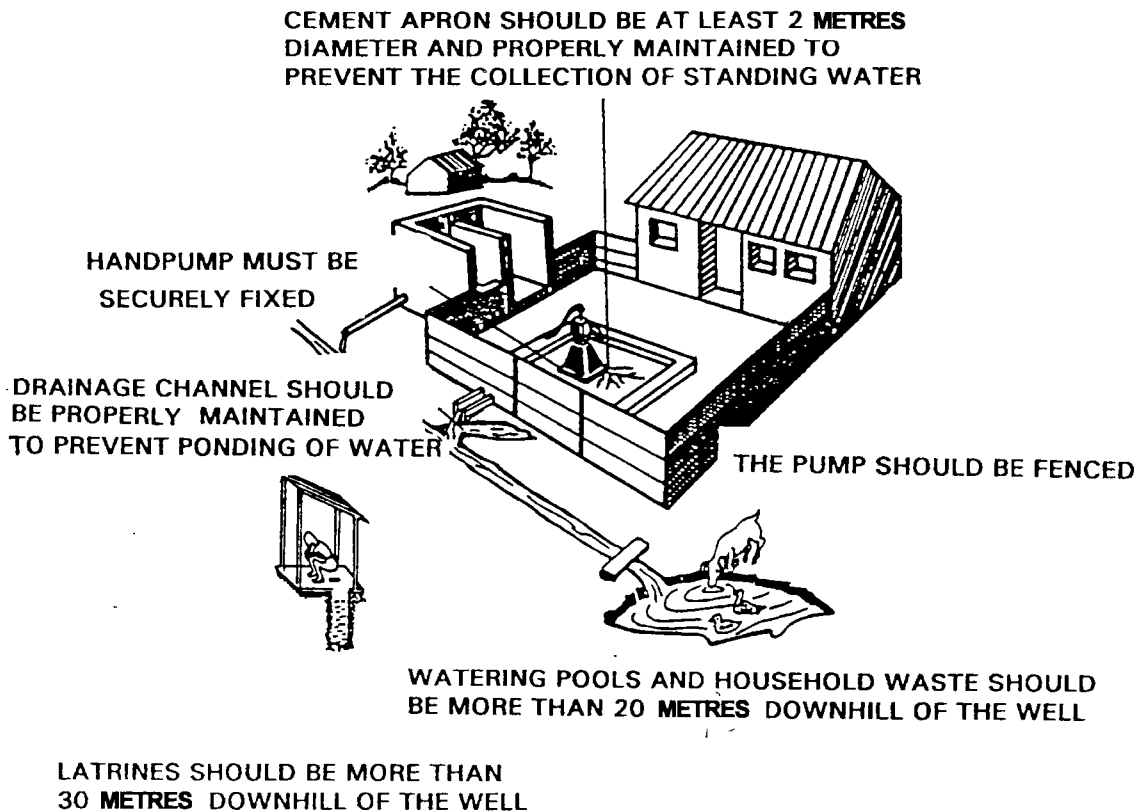


Figure 2. Sanitary inspection of a borehole or tubewell equipped with a handpump

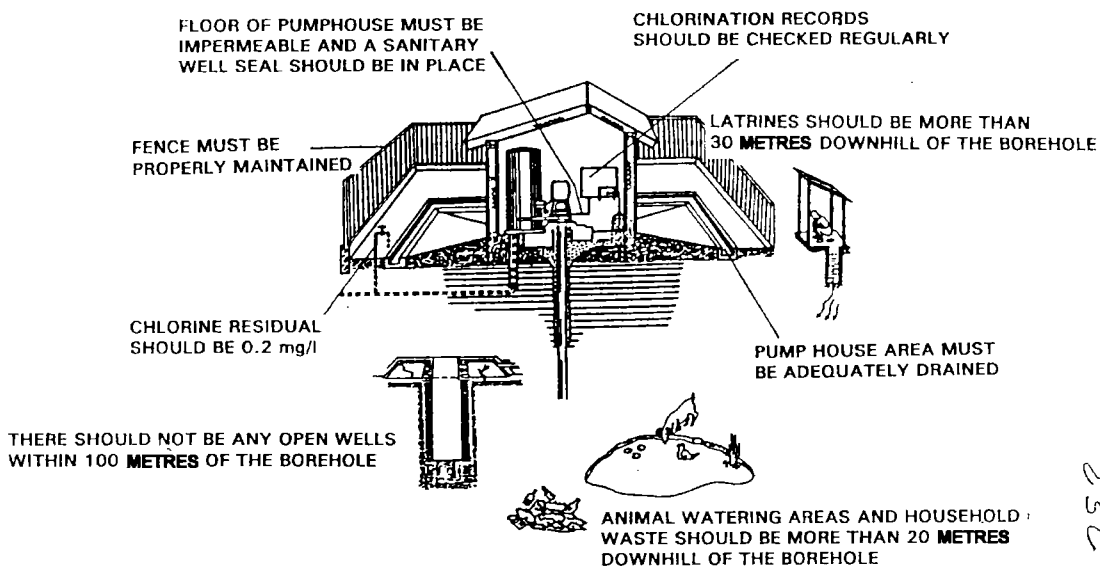


Figure 3. Sanitary inspection of a borehole with a motor pump

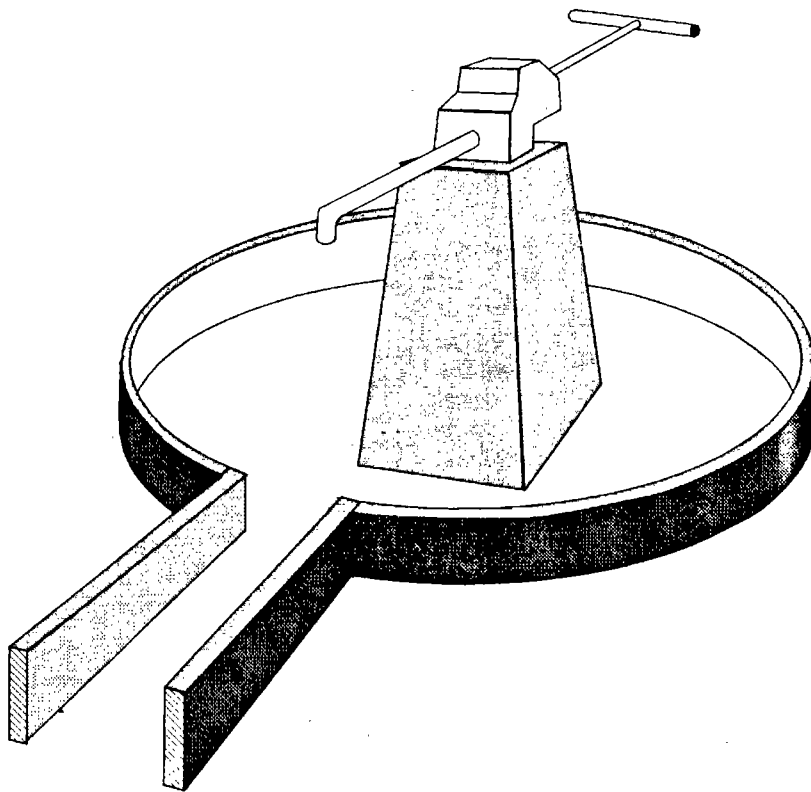
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## *Operation and maintenance of boreholes and tubewells*

It is important that boreholes and tubewells are well maintained and used properly to ensure they remain fully functional throughout their full life span.

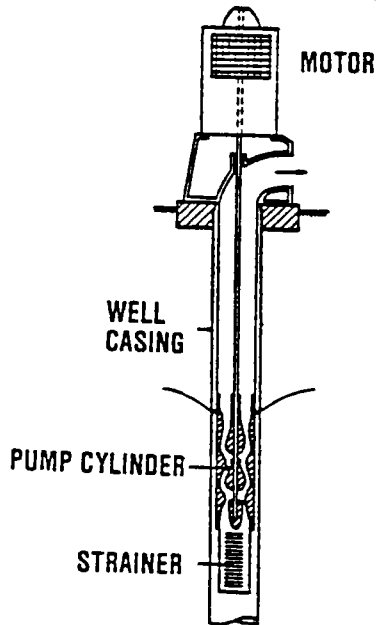
The top of the well should be completely covered to prevent any surface or spilt water from entering the well. This may be done by making a concrete plinth on which a handpump is securely fixed. It is important that the pump is fixed flush with the top of the plinth so no water can leak back into the well. Figure 4 shows a wellhead with a handpump.



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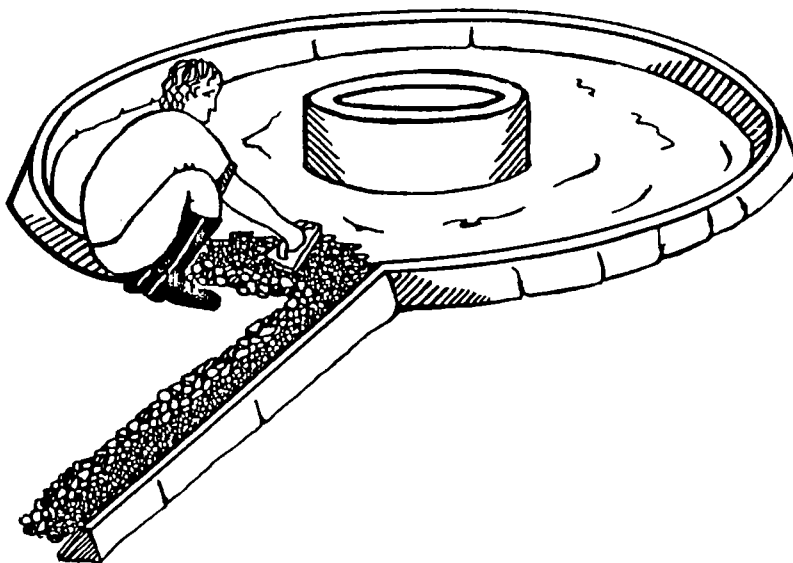
**Figure 4. Handpump fixed on a plinth**

Where an electric submersible or motor pump is used, a small plinth should be made to seal the well and the casing raised to top of the plinth, as shown in Figure 5.



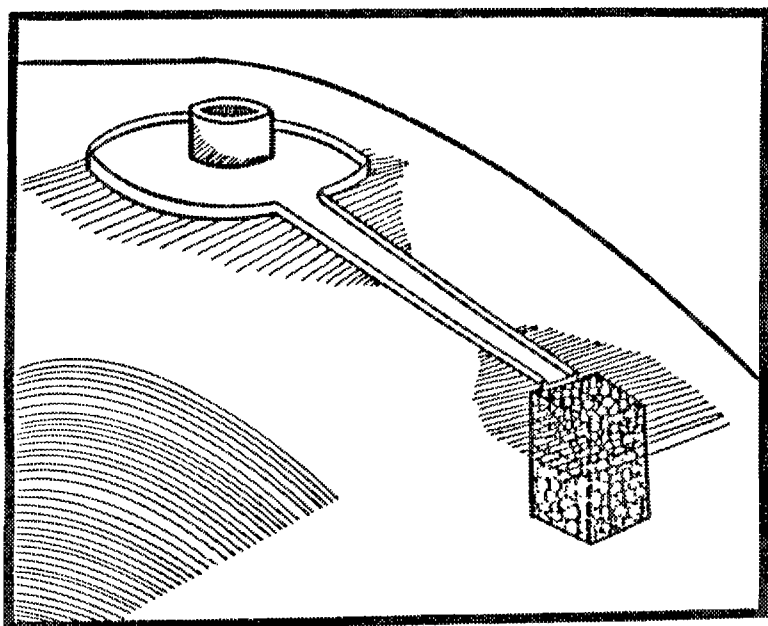
**Figure 5. Wellhead with shaft-driven turbine pump**

The plinth should be surrounded by an apron and a drainage channel built to allow spilt water to flow away from the wellhead to a soakaway (see Figure 6). The apron should be at least 3 m in diameter and made from reinforced concrete to prevent cracking. Any cracks will allow water to seep into the well. The edges of the apron should be built up to prevent pools of water forming outside the apron. The apron should be constructed so that it slopes towards the drainage channel.



**Figure 6. Making the drainage channel and apron**

The drainage channel must be long enough to take the spilt water well away from the wellhead and should flow to a soakaway (see Figure 7). The area around the soakaway pit should be planted with trees, sugar cane or other plants which absorb large quantities of water.



**Figure 7. Soakaway**

It is important that the plinth, apron and drainage channel are always kept clean, and that no pools of water are allowed to form around the well area. If any cracks appear on the plinth, apron or channel, these should be immediately repaired with mortar to prevent any contamination of the well. The drainage channel should be kept clear of any debris, otherwise the flow of spilt water may be obstructed and pools form which may lead to mosquito breeding.

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## *Pumps for tubewells and boreholes*

Tubewells and boreholes are much narrower than dug wells and it is impossible to draw water with a conventional bucket. Water must therefore be drawn from boreholes and tubewells using a pump. It is important that pumps are well maintained and kept in good working order because, unlike dug wells, should the pump break down there is no other means to raise water from the well. At least one member of the community served by the well should be trained in basic pump maintenance and repair. Tools and spares should be available to the community and a regular maintenance schedule established, paying particular attention to the replacement of washers, seals and valves.

Various types of pump can be used to bring water to the surface. In rural areas it is normally not possible to use electrical pumps as they are expensive to buy and run. Solar power can be used to run electrical pumps in isolated areas, but the initial cost is very high. Handpumps are the most popular type of pump for tube wells and boreholes as they are relatively cheap and easy to maintain.

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## *Protective fence and watering animals*

If there are animals in the area, it is a good idea to build a fence to keep them away from the tubewell. The fence must be well maintained and any breaks repaired immediately to prevent animals from entering the well area. Also, in the dry season it is common for people to take their animals to the tubewell to drink. This means that the animals leave excreta close to the tubewell and can damage the apron. It is good practice to provide a trough outside the fence and several metres away from the well for animals to drink from.

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## *Disinfection of wells*

Before a new or upgraded well is used, it is very important to disinfect the well thoroughly with chlorine solution (see Fact Sheet 2.25).