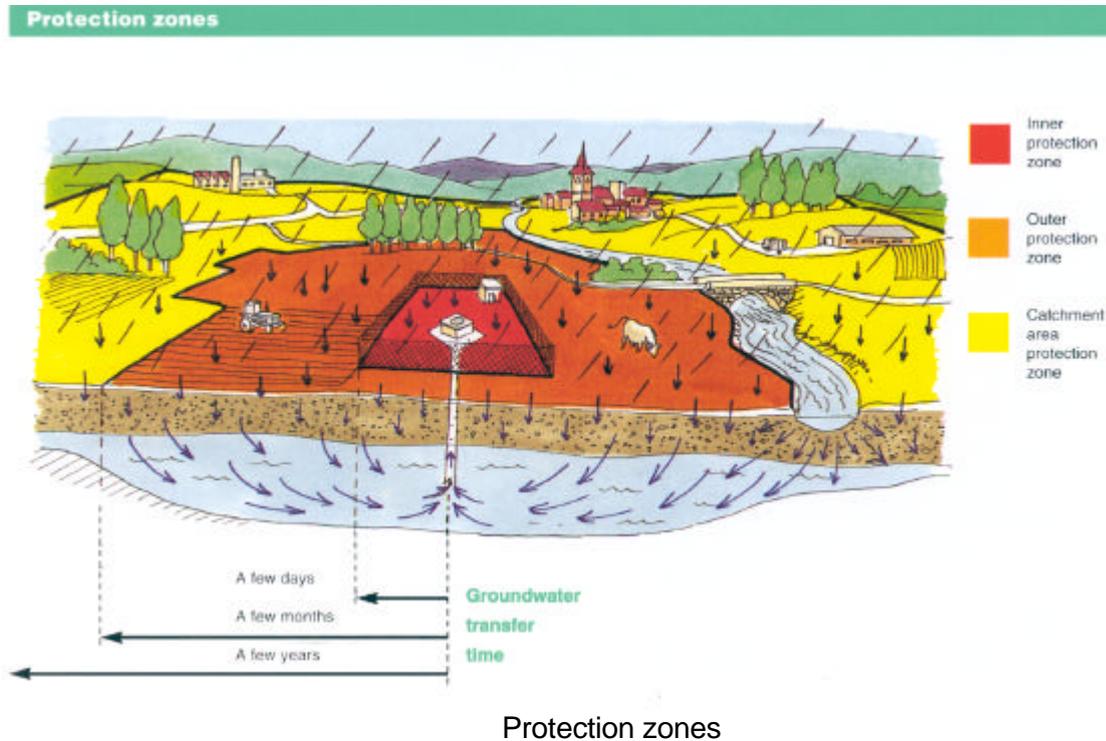


## TREATMENTS AVAILABLE

The first option to providing a clean supply is to instigate a protection zone around the head of the abstraction point. The purpose of this is to reduce the risk of surface water contamination from entering the supply.



As the above diagram illustrates it can take a matter of a few days for contaminated surface water to enter an aquifer. If this contamination contains faecal pathogenic bacteria insufficient time is available for the offending bacteria to be filtered from the water.

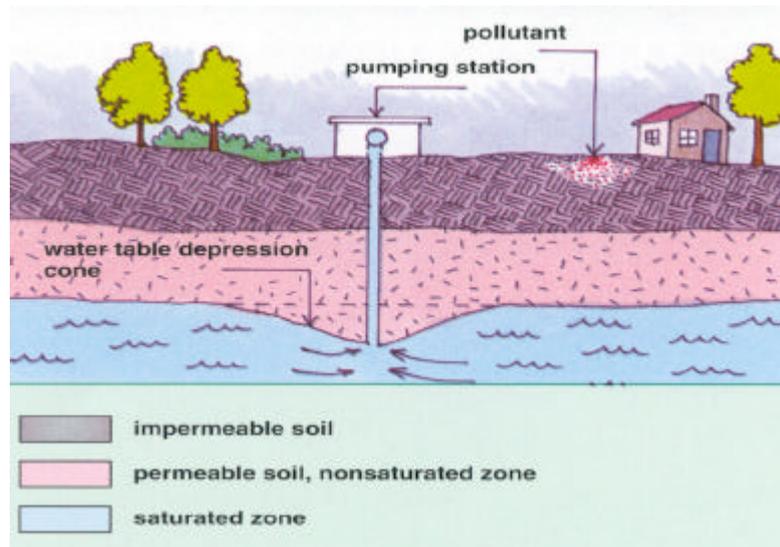
Ground water supplies are particularly vulnerable to the impact of pollution, and are closely linked to the local hydrological conditions.

This can depend on the following factors:

- The volume of groundwater and its recharge rate
- The protection of the aquifer

The thickness and nature of the zone of aeration (the distance between surface of the soil and the water table) also affects the time of transfer of pollutants and the effectiveness of any purification of the runoff water.

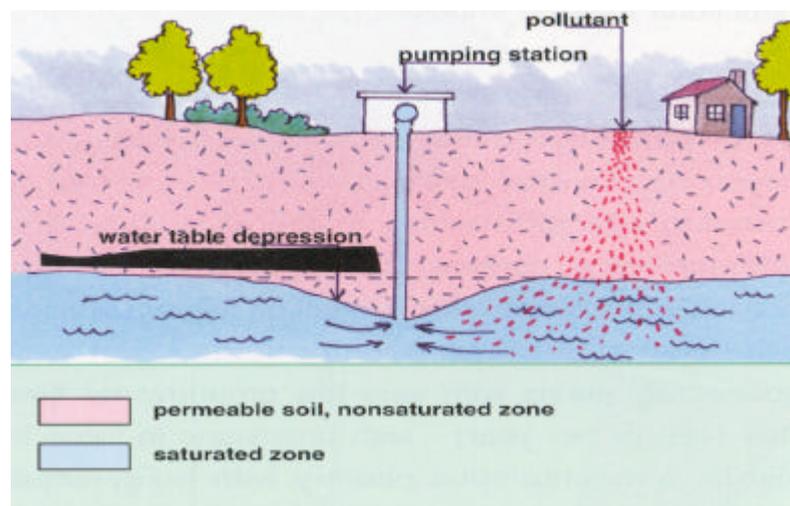
The groundwater flow rate affects both processes of dilution, fixation or filtration of pollutants.



Well-protected water table

A well-protected water table with impermeable or slightly permeable topsoil as a natural means of protection of the ground water.

A vulnerable water table due to the water table being covered by a permeable soil, which would be more sensitive to pollution as runoff water, can penetrate directly into it.



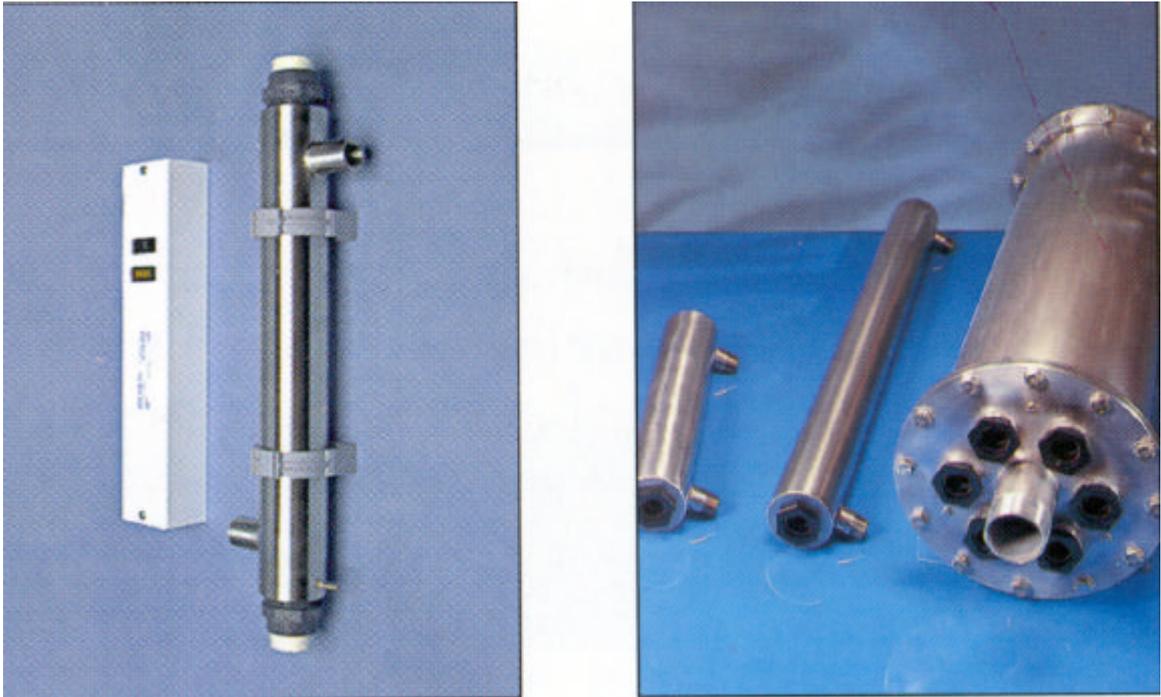
Vulnerable water table

### **Treatment of Small Water Supplies**

A number of devices and systems can be used to disinfect small water supplies, each with its own advantages and limitations.

#### **Ultra-violet**

Ultra violet systems expose the water to irradiation from a special lamp, at a specific wavelength, which is capable of killing common bacteria. Potentially the system adds nothing to the water, producing no tastes or odours, and usually requires only a few seconds of exposure to be effective. Ultra violet radiation systems however, have no action beyond the point of application, the light penetration of water is shallow, usually only 2-3 inches, suspended solid particles and organic matter can shield organisms against the light, and the ultra violet lamp must be cleaned frequently to ensure proper exposure of the water to the light.



Ultra Violet Systems

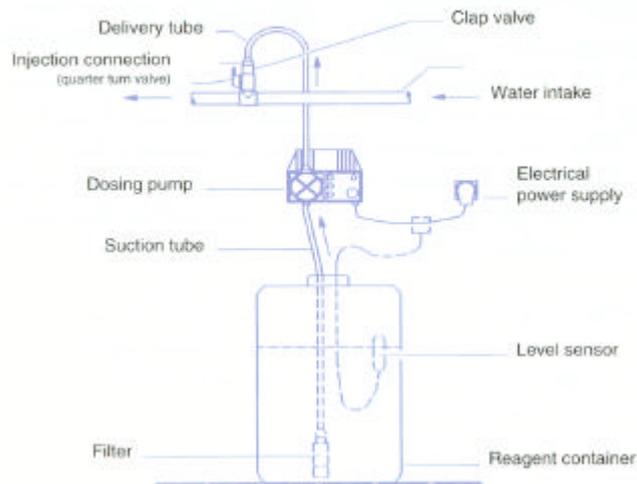
## **Chlorine**

The use of chlorine and its compounds is the most common disinfection method used in the United Kingdom. Chlorine is known to be effective against bacteria, is readily available in several forms, there is a simple test for chlorine residual, which is a measure of its effectiveness.

If iron, turbidity and organic matter are not present, five to ten parts per million of chlorine will kill the bacteria in a few seconds. If slow reaction organic matter is present in the water, longer contact time will be required.

The chemical feed-pump in can be electrically wired to operate with the well pump so that the chlorine solution can be injected into the water line between the well pump and the pressure tank. This would give good proportion of the chlorine solution to the flow of water. The provision of an activated carbon filter in the water line following the pressure tank will move any precipitated matter and excess chlorine, thus avoiding the bad tastes and odours of high chlorine concentrations.

If the well water is clear and free from organic matter, the above equipment is all that is required. If however organic matter is present, and long contact time is required, additional tanks, coils or hoses may be installed between the pressure tank and the filter.

**Installation for injection of a chlorinated solution using a dosing pump****Chlorine Dosing****Ozone**

Ozone generators can be used in some systems to produce small quantities of gas and facilitate the use of a very strong oxidising agent, which is effective in killing bacteria with short exposure times. Ozone is also effective in the oxidising organic matter, iron and manganese, and produces no tastes and odours. The gas is so active that it must be generated at the point of use, and the equipment does not lend itself to on/off and unstable operation or variations in flow rates in addition to being expensive.