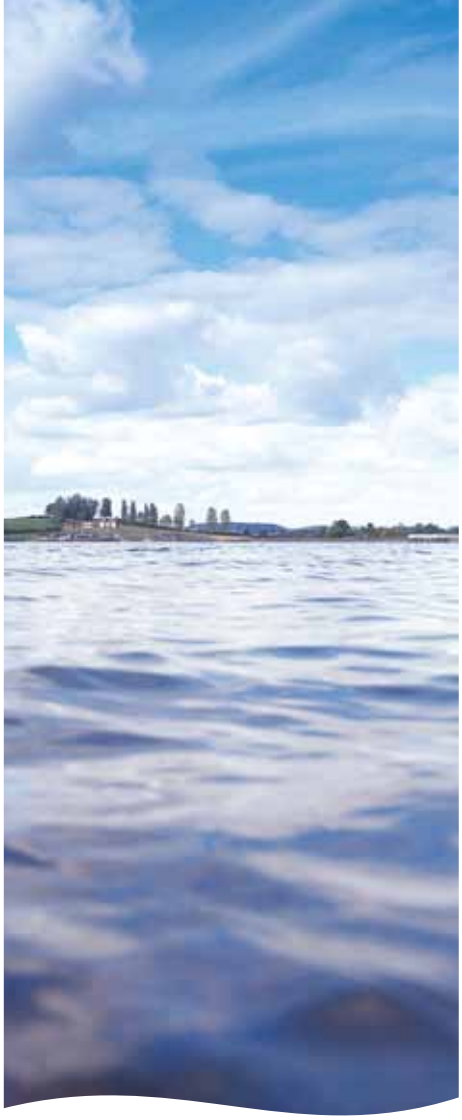
South Staffs Water

Customer Challenge Group

Water From Source to Tap



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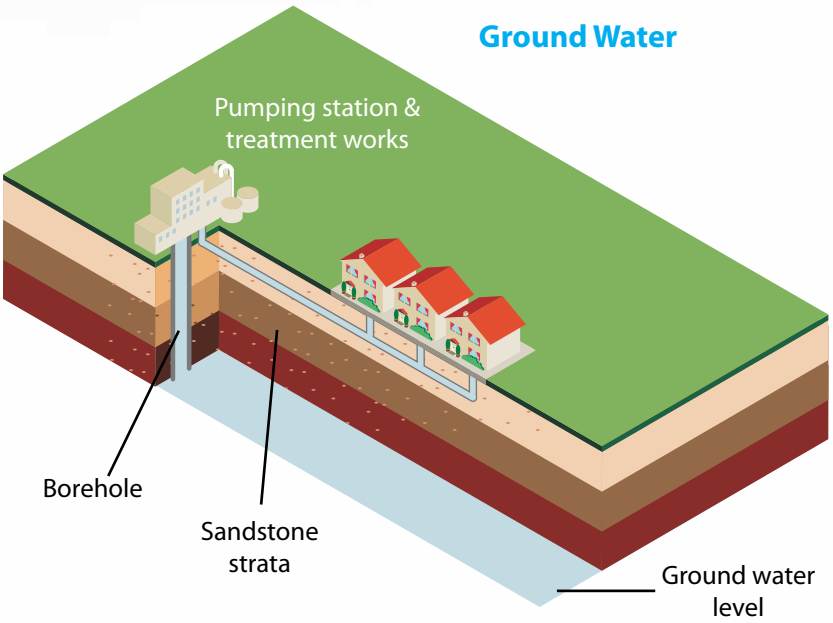
1. Abstraction

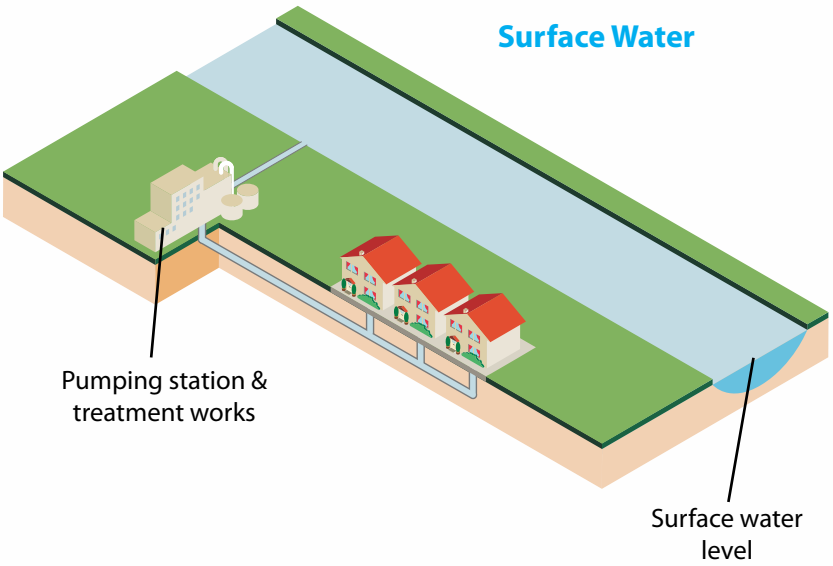
We have a good mix of resources we can use to meet customer demand. These fall in to two main categories:

- groundwater - underground aquifers where water is abstracted from the sandstone strata. There are 25 borehole sources which provide about 40% of our water and range from 320 metres deep at Churchill near Kidderminster to 46 metres deep at Crumpwood near Uttoxeter
- surface water - the River Severn and Blithfield Reservoir. Blithfield was constructed by building a dam across the valley of the river Blithe. These sources are treated at Hampton Loade and Seedy Mill Treatment Works respectively and provide the other 60% of the water needed.

All abstraction is controlled and authorised by licences granted by the Environment Agency.

We have been able to manage these resources during the last two dry years to good advantage and did not see any need for water restrictions this year.





2. Treatment

The water abstracted from each type of source has very different characteristics and each has a treatment requirement to ensure that the final product is wholesome and safe to drink.

In general, groundwater treatment is much less complex than surface water as a degree of filtration is carried out naturally through the earth's structure. However, over the years, changes to farming practice have introduced pollutants such as nitrates and pesticides that require removal by treatment.

The treatment of river water, which is subjected to the elements and can be polluted through farming, land use activities or just the environmental pollution we experience today, is considerably more involved as you will see on the visit to the Seedy Mill works.

Water treatment at Hampton Loade

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2.1. Surface Water Treatment - Seedy Mill Treatment Works

Seedy Mill Treatment Works is designed to treat river water stored at Blithfield Reservoir. The Reservoir, close to Abbots Bromley, was built in 1953 and captures water from the river Blithe. The water flows from Blithfield to Seedy Mill via two large diameter mains (36" and 33" in diameter).

Treatment at the works is conventional by design consisting of clarification, filtration and disinfection. Other treatments that are carried out to condition the final water are:

- pH correction - to adjust the alkalinity
- dosing of ortho-phosphoric acid - to prevent plumbo-solvency – lead leaching out of pipework and,
- fluoride at the request of the Area Health Authority.

Blithfield reservoir

Clarification

The process requires the addition of a chemical to collect together the impurities that give rise to poor raw water quality. The chemical used is poly aluminium chloride which is a coagulant that attracts the particles that cause the colour and turbidity, be they algae, fine soil particles or other debris and binds them together to create sludge. The Accelator clarifier (round structure) allows the sludge to sink in a hopper and to waste, whereas in the Dissolved Air Flotation clarifier the sludge is forced to the surface where it is scraped off into a channel to waste. The maximum amount of water that can be treated by the clarifiers is 160 Ml/d (megalitres per day).

Turbidity is the cloudy appearance created by fine particulate matter contained in the raw water.

Once the water has passed through the clarification stage it immediately travels to the filtration process.

Filtration

The filtration process consists of 32 tanks each containing 34m^3 of activated carbon with an overall bed depth of one metre. The carbon filter comprises small grains of carbon (like black sand) which acts as both a physical barrier to particles and adsorbs organic compounds that would otherwise cause poor taste and odour. The carbon is also very effective in removing pesticides found in raw water.

Periodically, usually every two to three years depending upon the volume of water treated, the carbon is removed from the tank and is regenerated. This process, which is carried out off site by a specialist contractor, involves heating up the carbon to 800°C through a furnace to burn off the adsorbed organics and to reactivate the carbon.

Following the first two stages of treatment, while the water may look clear enough to drink, may still contain harmful bacteria. The ph of the water is adjusted using lime; the correct alkalinity of the water is important in achieving effective disinfection.

Disinfection

To ensure that the clarified and filtered water is potable and fit for human consumption, chlorine is added to disinfect and kill any harmful bacteria. This process involves the water passing through a series of contact tanks allowing sufficient time for the chlorine to mix and be effective in the eradication of bacteria.

2.2. Borehole Treatment

In general, the treatment of borehole water is much simpler with largely chlorination being the only treatment required. Of course there are exceptions and where the aquifer has high levels of nitrate or pesticide removal techniques, such as ion exchange, carbon reactors or membrane systems, have been built to achieve drinking water quality standards. Where it is possible, source water is blended to ensure compliance with drinking water standards.

2.3. Fluoridation

Government research into the effects of fluoridated water supplies in the fight against dental decay led to a requirement by the Area Health Authority for us to dose fluoride to a concentration of 1 mg/l of all water. We began dosing in the late 1980s to all of our supply areas, except Uttoxeter where fluoride occurs naturally within the local aquifer.

2.4. Preventing Plumbo-Solvency

Lead piping was used extensively throughout the industry as communication and supply pipes and within properties until the late 1950s and early 1960s. To prevent lead dissolving from the pipes we dose ortho-phosphoric acid which lines the inside of the pipe preventing lead leaching into the water supply. During our programme of mains rehabilitation we replace the communication pipe to the customer's boundary with pipes made of polyethylene.

3. Distribution

Once treated to the required standard, water from all sources is pumped to a number of service reservoirs, 35 in total, across our area of supply. Service reservoirs are large closed tanks where water is stored until it is required by the customer and they vary in size from 0.3 million litres (Ml) to almost 100 million Litres (Ml).

To ensure water is in the right place at the right time and at the correct pressure the supply network is integrated with a series of booster pumps that move water around the pipe network to where it is needed to meet customer demand.

4. Energy

Electricity is fundamental to all of the processes at the production sites and we use around 105,000 MWh/year to run our business. A little over 95% of the electricity used is in the pumping and distribution of water to customers. This is enough electricity to power more than 30,000 homes.

Pumps at Hampton Loade

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