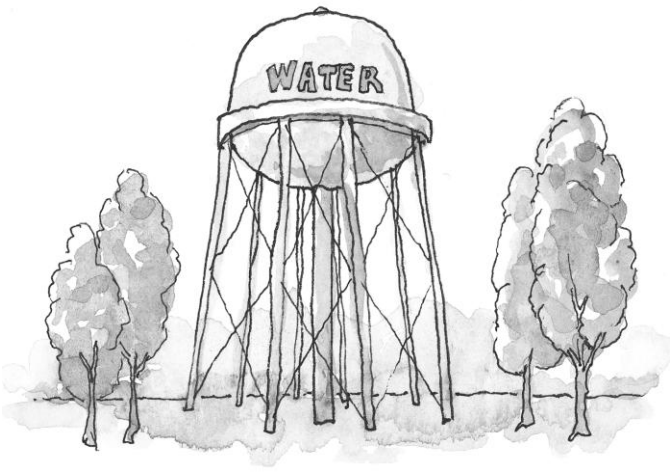
Water Distribution

Here in the San Antonio area, water is pumped out of both the Edwards and Trinity aquifers through 91 production wells located at 19 primary pumping stations and 26 secondary stations. Some of the wells are as deep as 1,000 feet and some as shallow as 400 feet depending on site elevation and underground water levels.



Once the water is brought to the surface, it is disinfected with chlorine gas. Disinfection, in a broad sense, means destroying disease-causing organisms (pathogens). Chlorine is injected as a gas to a stream of water. It takes some time for the chlorine to spread through the water and for disinfection to occur. This is known as contact time and is a significant element in chlorination.
(Information courtesy of TEEX, Water and Wastewater Training Division, Texas A&M University)

A Quick and Simple Lesson on Water Hydraulics

Water flows in a system when it is under a force that moves it (i.e. pressure). Pressure is the force on a unit area of water. Pressure can be:

- Static, existing although the water does not flow
- Dynamic, existing as moving energy

If a cube which is one inch squared and weighs one pound is placed on a table, it exerts a force of one pound on the table. The pressure is one pound per square inch, or 1 psi. Two identical stacked cubes exert a two-pound force and a 2-psi pressure.

A one-inch cube of water weighs 0.036 lb. A column of twelve such cubes (one cubic foot) exerts a total weight of 0.433 lb or 0.433 psi.

Pressure usually is measured in pounds per square inch (psi) or in head (feet of height of the water column). The pressure in pounds per square inch is equal to 0.433 times feet of head.

Although there may appear to be nothing to restrict the flow of water in a pipe, there is always friction between the water and the surface of the pipe. No matter how smooth the interior surface of a pipe seems, it still has imperfections. These imperfections cause the water to flow more slowly and to be more turbulent. Friction losses in a pipeline depend on:

- The velocity of the flow
- The diameter of the pipe
- The length of the pipe
- The roughness of the pipe
- The type and number of valve fittings

(Information courtesy of TEEX, Water and Wastewater Training Division, Texas A&M University)

Distribution

Once the water is removed from the ground and the disinfection takes place, energy (pressure) is added to the water by pumps which force the water through thousands of miles of distribution main.

Energy is stored using elevated water tanks. The tanks provide gravitational potential energy by elevating the water. The water tank must be at least 80 feet higher than the area it serves in order to maintain a high level of pressure to all of the houses and businesses in the area of the tank (pressure zone). Each foot of height provides 0.43 pounds per square inch (psi) of pressure.

The pumps then add kinetic energy by moving the water through pipes. The pipes help maintain energy (internal water pressure) throughout the distribution system. According to the regulations, the pressure in the water system must be maintained between 35 and 175 PSI (major appliances require at least 20 to 30 PSI) throughout its fourteen different zones of pressure (service areas). SAWS serves houses located as high as 1500 feet above mean sea level (MSL) to as low as 420 feet above MSL.

A water tower's tank is normally quite large. A normal in-ground swimming pool in someone's backyard might hold close to 20,000 or 30,000 gallons. A typical water tower might hold 50 times that amount. Typically, a water tower's tank is sized to hold about a day's worth of water for the community served by the tower.

One of the big advantages of a water tower is that it lets a municipality size its pumps for average rather than peak demand. That can save a community a lot of money. For example, say that the water consumption for a pumping station averages 500 gallons of water per minute. There will be times during the day when water consumption is much greater than 500 gallons per minute, say in the morning when lots of people are waking up and getting ready for work. They take a shower, brush their teeth, etc. Water demand might peak at 2,000 gallons per minute. Because of the water tower, SAWS can purchase a 500 gallon-per minute pump and let the water tower handle the peak demand. At night, when demand is relatively low, the pump can make up the difference and refill the water tower.
(Excerpts courtesy of howstuffworks.com)

Fast Fact

When a home is at a higher elevation and/or farther away from the water source (pump station), more energy is needed to provide water to these homes. When the homes are relatively lower than the water source, a surplus of energy may be created with the water moving toward these homes. This energy must be slowed down or de-pressurized through pressure reducing valves (PRV) or damage can occur to water pipes or even fixtures in the house.