Northern Territory Government

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Water Fluoridation and Disinfection Information

For Health Professionals
and Community Organisations

Frequent Questions

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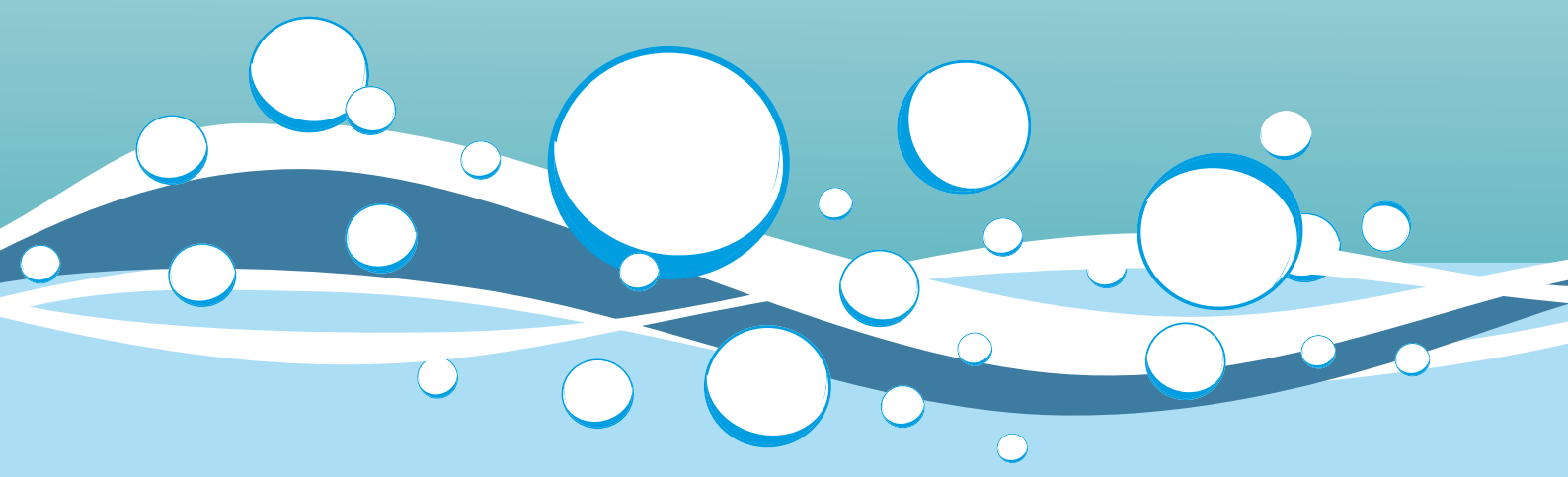
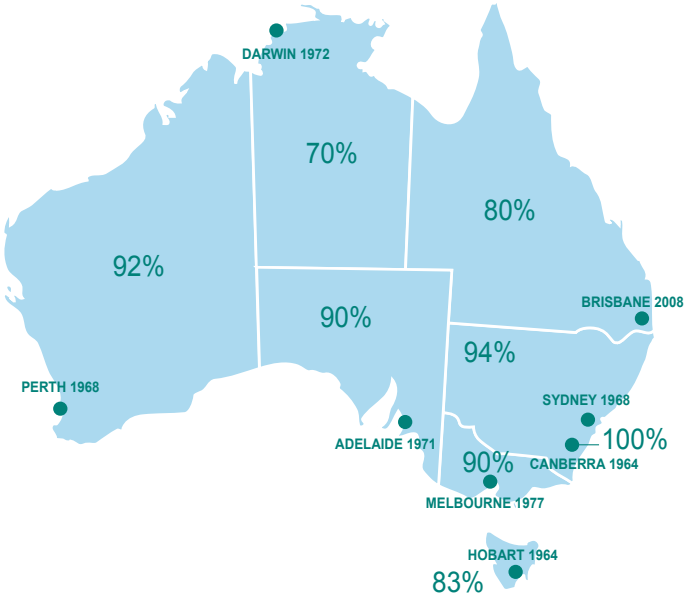


What parts of Australia are fluoridated?

The first Australian Water Fluoridation program started in Beaconsfield, Tasmania in 1953. Currently more than 80 per cent of Australians have access to fluoridated water. Water fluoridation is an effective, efficient, socially equitable and safe population health approach to the prevention of dental decay. The public water supplies of Top End communities have low levels of naturally occurring fluoride, while south of Elliott have higher levels. Darwin's water supply was fluoridated in 1972 and Katherine's supply is also fluoridated.



Is my drinking water fluoridated?

Public water supplies south of Elliott have naturally occurring fluoride at levels in the water that assist to prevent dental decay, so this region does not need fluoride added to the water. Darwin, Katherine and Gove currently have fluoridation plants. The Department of Health in partnership with Power and Water are planning to extend fluoridated water supplies to the growth towns of the Top End of the Northern Territory over the coming years. Remote communities have identified water fluoridation as a priority in their Local Implementation Plans (LIPS), a fantastic advancement as the importance for this public health initiative has been identified at the local community level.

Is water fluoridation part of Australia's National Oral Health Plan?

Australia has a National Oral Health Plan which has been endorsed by all state and territory governments and the Australian Government. The purpose of the Healthy Mouths Healthy Lives: Australia's National Oral Health Plan 2004 - 2013 is to improve health and wellbeing across the Australian population by improving oral health status and reducing the burden of oral disease. The plan aims to help all Australians retain as many teeth as possible throughout their lives, have good oral health as part of general health and have access to affordable, quality oral health services.

One of the plan's goals is the fluoridation of public water supplies to communities across Australia with populations of 1000 or more.

What is the Northern Territory Government policy on water fluoridation?

The Department of Health, Northern Territory published a position statement on The Use of Fluorides in the Northern Territory in November 2010. This position statement stipulates that water fluoridation should be extended to all people living in communities with a fixed population of 600 or more, living in areas where naturally occurring fluoride is less than 0.5 mg/L.

The position statement also explains that water fluoridation programs must be managed and monitored in accordance with best-practice standards. The responsibility for plant operation and water quality rests with the Department of Housing, Local Government, Regional Services, Power Water Corporation and relevant local government authorities.

Dental Decay

What is dental decay?

Dental decay or dental caries is a cavity (hole) in a tooth caused by bacterial acids. These acids are produced when bacteria in the mouth break down sugar-containing foods. The acid removes calcium and phosphates from the tooth structure, resulting in cavitation of the tooth.

What does dental decay look like?

The pictures below show a comparison between healthy teeth and teeth with dental decay.

Healthy ‘Baby’ or Deciduous Teeth

Deciduous Teeth with decay

Healthy ‘Adult’ or Permanent Teeth

Permanent Teeth with decay

Is dental decay serious?

Apart from being painful, dental decay can also extend into the vital tissues including the blood vessels and nerve of the tooth where it can cause dental infections such as abscesses, facial swellings and other spreading infections. These can have serious, potentially life-threatening consequences.

In the NT, in the calendar year from the 1st of January, 2010 to the 31st of December, 2010, 325 children under 10 years of age received dental treatment under a general anaesthetic. During 2011, 449 children under 10 years of age received dental treatment under a general anaesthetic, an increase of 124 children. Dental caries is the most common reason a child is admitted to a hospital for a general anaesthetic.

The consequences of dental decay are costly, in terms of time, money and personal pain and suffering. Once a tooth is filled, it becomes structurally weaker and may require further treatment in the future.

Are oral health and general health related?

Oral health is fundamental to overall health, wellbeing and quality of life. A healthy mouth enables people to eat, speak and socialise without pain, discomfort or embarrassment.

Dental infections and gum diseases have also been linked to other health problems such as cardiovascular disease, Rheumatic heart disease, diabetes and other chronic conditions. The biological rationale explains that sub gingival plaque is a constant source of bacteria, bacterial toxins and inflammatory products that enter the blood stream and affect other organs. There are two mechanisms; Direct mechanism – direct entry of bacteria into the bloodstream (bacteraemia) and Indirect mechanism– oral infection leads to inflammatory and/or immune responses that cause changes in blood vessels in sites away from the mouth.

Research also suggests that poor gum health can make it harder for patients with diabetes to keep their blood glucose levels stable.

How does fluoride help prevent tooth decay?

There are three main modes of action in which fluoride acts to reduce dental decay.

The first mode of action occurs when teeth are developing in the jaws before they come into the mouth (the ‘pre-eruptive’ phase). When fluoride containing food/drinks are ingested, fluoride is absorbed from the gastrointestinal tract and redistributed into developing tooth structure. Such tooth structure is more resistant to acid attack, so when the tooth erupts into the mouth it is better able to withstand the demineralisation that can occur when sugar-containing foods/drinks are ingested.

The second mode of action occurs when fluoride-containing foods/drinks are ingested and fluoride is absorbed from the gastrointestinal tract and redistributed into salivary glands and into saliva. This fluoride containing saliva then bathes the teeth over extended periods of time, again remineralising tooth structure which has commenced demineralisation. The benefit occurs topically, but does so after fluoride has been ingested.

The third mode of action occurs when fluoride containing foods/drinks wash over teeth during eating and drinking. The fluoride provides an instant benefit as it remineralises tooth structure which has commenced demineralisation. This is done topically.

The second and third modes of action occur after teeth have erupted into the mouth (the 'post-eruptive' stage).

Dental decay develops when acid destroys part of the tooth structure of the tooth. The acid is produced from sugar by bacteria in the mouth.

Fluoride can limit the amount of acid produced, and can also repair damage before it becomes permanent. A constant supply of low level fluoride in the mouth is best for this. In this way, **fluoride in the water acts like a constant 'repair kit' for teeth.**

Are there other ways to protect teeth?

Having healthy teeth requires a combination of a healthy diet, good oral hygiene, appropriate use of fluoridated toothpaste and regular dental check ups. A fluoridated drinking supply helps to provide further protection against dental decay and is a safe and effective way of allowing everybody access to the benefits of fluoride.

Are fluoride tablets recommended by dental professionals?

Whether water is fluoridated or not, fluoride tablets are not recommended for several reasons.

- They are most likely to be used by people who need them least – children with good oral hygiene and healthy diets
- People who brush regularly with fluoridated toothpaste receive little (if any) additional benefit from fluoride tablets
- People may not remember to take them or may take too many
- They increase the risk of dental fluorosis (mottled teeth) without clear benefits. Animal experiments have shown that fluoride given once a day is more likely to cause dental fluorosis than the same amount of fluoride given intermittently throughout the day.

Technical Information

What is fluoride?

Fluorides are abundant in the earth's crust and are found in rocks and soils.

All water sources, both fresh and sea water, contain some fluoride. Sea water typically contains fluoride at approximately the same level as used in community fluoridation programs.

Naturally occurring fluoride concentrations in drinking water depend on the type of soil and rock through which the water drains. Concentrations in surface water are generally low (<0.1-0.5 mg/L), while water from deeper wells might have quite high concentrations (1-10mg/L) if the rock formations are fluoride rich. Some soda lakes in Africa have fluoride concentrations up to 2,800 mg/L.

Virtually all food stuffs contain traces of fluoride. High amounts can be found in some dried tea leaves, for example, because it is naturally concentrated in the leaves of the tea plant.

What type of fluoride is added to community water supplies?

The National Health and Medical Research Council (NHMRC) recommends three compounds for fluoridating water: sodium fluoride (NaF), sodium fluorosilicate (Na_2SiF_6) and fluorosilicic acid (H_2SiF_6).

These fluoride compounds are added to water supplies in a controlled manner and dissociate in water to form fluoride ions (F-), the same way that fluoride compounds such as calcium fluoride dissolve out of rocks as a result of water passing over them.

To be acceptable to the NHMRC, any chemical added to drinking water must not be toxic when ingested at the recommended maximum concentration in drinking water.

The NHMRC Australian Drinking Water Guidelines (the 'Guidelines') provide health based guideline values for microbial, chemical and radiological quality of drinking water. Health-related guideline values are based on the World Health Organization recommendations and are designed to protect human health.

The Guidelines are available online at:
http://www.nhmrc.gov.au/publication/synopses/eh19syn.htm.

What is the optimal fluoride level in water fluoridation programs?

The optimal fluoride concentration for water fluoridation is dependant on the average maximum air temperature. In the Northern Territory the optimal level for water fluoridation is as follows.

Average Maximum Air Temperature (°C)	Fluoride (mg/L) Minimum	Maximum
32.6 and over	0.5	0.6
26.3 - 32.5	0.6	0.7
21.5 - 26.2	0.7	0.8
17.7 - 21.4	0.7	0.9

Must fluoride that is added to water be registered as a medicine?

In Australia, the Therapeutic Goods Administration (TGS) is responsible for regulating therapeutic goods to ensure their quality, safety and efficacy. The TGS does not require fluoride compounds such as standard fluoride toothpaste and fluoride that is added to drinking water supplies to be registered as medicines if they:

- are used for the prevention of dental decay
- are also not scheduled as a drug or poison in the *Standard for the Uniform Scheduling for Drugs and Poisons.*

In 2006, the NHMRC, the Australian Government Department of Health and the Ageing and New Zealand Ministry of Health included fluoride as a 'nutrient' in the *Nutrient Reference Values for Australia and New Zealand including Recommended Dietary Intakes*.

This document states:

> *"Because of its role in the prevention of dental caries (decay), fluoride has been classified as essential to human health."*

Companies that manufacture bottled drinking water can now also add fluoride to their products.

Does fluoride affect the taste of water?

Optimal levels of fluoride have no taste or smell, so water fluoridation will not change the taste or smell of drinking water.

How are fluoride levels in drinking water monitored?

Fluoride is added to the water at fluoridation plants especially designed to add carefully controlled amounts. The fluoride levels in the water supplied to consumers are monitored every day at the plant.

The concentration of fluoride is continuously monitored using an online monitor located downstream of the dosing point. This monitor records the fluoride concentration in the drinking water and automatically shuts down the plant in the event that the measured dose varies from the target dose. The accuracy of the monitor is assessed using a bench top unit weekly and by sending a sample to a NATA accredited lab monthly. For comparison, the mean fluoride dose is calculated every 24 hours by dividing the mass of fluoride consumed by the volume of water produced. These measures are used to ensure that the fluoride concentration in the drinking water remains within 0.1 mg/L of the target concentration.

Do home water filters remove fluoride from drinking water?

Many home water filtering systems do not significantly alter the fluoride content of the water, although reverse osmosis filters do remove most of the fluoride.

Some people choose to boil their drinking water. Boiling water will not significantly change the amount of fluoride.

Does fluoride come from the fertiliser industry?

Fluoride is found naturally in the environment in rocks, soil, air and water.

Fluoride is not a waste product of the fertiliser manufacturing process, but rather, a co-product. If fluoride is not actively collected during refining process for water fluoridation purposes, it remains in the phosphate fertiliser. However, due to the widespread practice of water fluoridation in Australia, fluoride is commonly extracted during the refining processes.

Water fluoridation research

Has water fluoridation been properly researched?

Water fluoridation has been practised internationally for over 60 years, in Australia for over 55 years and in the NT for over 30 years. During this time, the safety and efficacy of water fluoridation has been re-evaluated many times.

In terms of the latest evidence about water fluoridation, the National Health and Medical Research Council (NHMRC) is Australia's peak body for the achievement of the best possible standards for individual and public health. In 2007, the NHMRC commissioned a review to evaluate scientific data on fluoridation. The review affirms that water fluoridation remains the most effective and socially equitable means of achieving community wide exposure to the dental decay prevention effects of fluoride.

What research supports the benefits of water fluoridation in both children and adults?

In 2008 the Australian Research Centre for Population Oral Health presented a study which examined the effectiveness of water fluoridation on children's dental health across four Australian states. The study found that 5-6 year old children who had lived for more than half their lives in areas with optimal water fluoridation had 50 per cent less dental decay in their baby teeth than children who had lived in areas without optimal water fluoridation. 12-13 year old children who had lived for more than half their lives in areas with optimal water fluoridation had 38 per cent less dental decay in their adult teeth than children who had lived in areas without optimal water fluoridation.

Water fluoridation also helps protect against dental decay in adults, with studies demonstrating beneficial effects in young children and adults up to 75 years of age. The Australian Institute of Health and Welfare Report, Australia's dental generations: The National Survey of Adult Oral Health 2004-2006, showed members of the fluoride generation (born after 1970) had about half the level of dental decay that their parents' generation had developed by the time they were young adults.

One of the great advantages of water fluoridation is that it allows everybody to benefit from the protective effect of fluoride. It benefits people of all ages, regardless of education, income or access to dental care.

Health Concerns

Are there any health concerns associated with water fluoridation?

With the exception of dental fluorosis, scientific studies have not found any credible link between water fluoridation and adverse effects. While the safety of water fluoridation has been confirmed by the World Health Organisation and the National Health and Medical Research Council, some community members raise concerns about water fluoridation impacting upon general health. For a thorough break down of explanations about the lack of evidence connecting water fluoridation and other health concerns, please see the Water Fluoridation, questions and answers, developed by the Department of Human Services, Victoria, February 2009.

http://www.health.vic.gov.au/environment/downloads/fluori_qa07.pdf

Dental Fluorosis

Dental fluorosis is the altered formation of tooth enamel resulting from excessive fluoride ingestion during the period of tooth development, usually from birth to approximately six to eight years of age.

In its mildest (and most common) form it may manifest as barely noticeable whitish striations, while severe forms involve confluent pitting and staining of the dental enamel.

Determining the exact level of dental fluorosis within a community is difficult, as there are numerous other causes of enamel defects that may resemble dental fluorosis.

Points to note about dental fluorosis:

- It is usually barely noticeable and appears as very fine pearly white lines or flecks on the teeth
- It cannot develop after the teeth are fully formed
- It also occurs in areas without water fluoridation
- Mottled teeth should not be called dental fluorosis if fluoride is not the cause (other causes of mottled teeth include medications, injury to the teeth or childhood infections)

Since the mid 1990's, the prevalence of dental fluorosis in Australia has markedly reduced, mainly attributable to the use of low-fluoride toothpastes in young children and awareness raising of appropriate toothpaste use by children.

Reducing the risk of dental fluorosis, while at the same time reducing the risk of dental decay, can be accomplished by following these oral hygiene guidelines:

- Discouraging ingestion of toothpaste by children
- Cleaning children's teeth without toothpaste until the age of 18 months, unless otherwise recommended by a health professional
- Using only a pea size amount of low fluoride toothpaste, smeared over the toothbrush, between 18 months and five years (inclusive), unless otherwise recommended by a health professional
- Not rinsing after toothbrushing
- Ceasing the use of fluoride supplements, drops or tablets whether the water supply is fluoridated or not.

Can fluoride accumulate in the body after consumption?

Most ingested fluoride is absorbed into the bloodstream, predominantly from the stomach and intestine. Minimal absorption occurs across the oral mucosa. Rapid distribution to the intra and extracellular fluid of tissues occurs, with approximately 50 per cent of absorbed fluoride excreted and the remainder stored. Almost all (99 per cent) of the stored fluoride is retained in teeth and bones, where it becomes incorporated into the mineral structure. Fluoride is redistributed into saliva and its elimination from the body is primarily by urinary excretion.

Can you consume too much fluoride from optimally-fluoridated water?

Many substances we use everyday are beneficial in small amounts, but may be harmful in large amounts. Examples include salt and even water itself.

To help protect teeth against dental decay, only very small amounts of fluoride are needed in water. In the NT the following values are the optimal levels.

Average Maximum Air Temperature (°C)	Fluoride (mg/L) Minimum	Maximum
32.6 and over	0.5	0.6
26.3 - 32.5	0.6	0.7
21.5 - 26.2	0.7	0.8
17.7 - 21.4	0.7	0.9

This optimal level has been determined assuming fluoride intake from other sources such as foods, drinks, dental products and other environmental sources is occurring.

The NHMRC Nutrient Reference Values for Australia and New Zealand (2006), identifies 10 litres/day as the upper limit for consumption of fluoridated water for an average sized adult over the long term.

While some population subgroups, such as athletes, outdoor workers and military personnel, may approach this level of consumption occasionally, it is highly unlikely that these levels of consumption would occur over the long term to put an individual at risk. The National Research Council (United States) has noted that the highest estimated average daily water ingestion, at the 99th percentile, is 5.8 litres/ day.

Is it safe to reconstitute infant formula with fluoridated water?

Breastfeeding remains the preferred method of infant feeding and provides perfect nutrition to match the infant's needs. Although breast milk is the best feeding choice for babies, infant formula is readily available and nutritionally adequate. If infant formula is used, it is safe in Australia to reconstitute it using fluoridated water. Infant formula in Australia does not already contain fluoride before water is added.

In 2006 the Australian Research Centre for Population Oral Health published The Use of Fluorides in Australia: guidelines. They were developed by 35 experts from universities, health departments and health organisations. Guideline six states:

> *"Infant formula nowadays is safe for consumption by infants when reconstituted using fluoridated or non-fluoridated water."*

Is it safe to drink fluoridated water while pregnant or breastfeeding?

It is safe to drink optimally fluoridated water while pregnant or breastfeeding. No credible scientific study has linked drinking optimally fluoridated water with birth defects or other reproductive effects.

The level of fluoride in breast milk remains steady when a nursing mother drinks fluoridated water. Until six months of age babies only need breast milk or infant formula to grow and develop.

Fluoride and the Environment

Does water fluoridation pollute the environment?

Fluoride is naturally found in the environment in water, soil, rocks and air. The amount of fluoride naturally found in rocks and soil is about 300 to 700 times higher than fluoridated water.

Fresh-water streams have natural levels of fluoride as a result of fluoride being leached from rocks. Central Australia has naturally occurring amounts of fluoride in their water supplies.

Fluoride around the world

What other countries fluoridate drinking water?

More than 400 million people around the world benefit from water fluoridation programs – at least 350 million as part of community water fluoridation and at least 50 million as part of naturally fluoridated water. Countries with widespread water fluoridation schemes include New Zealand, the United States of America. Canada, the United Kingdom, Ireland, Spain, Israel, Brazil, Chile, Argentina, Columbia, Hong Kong, South Korea, Singapore and Malaysia.

Has water fluoridation been banned in Europe?

Europe has not banned water fluoridation. There has been no directive or

legislation banning water fluoridation. In some European countries, water fluoridation is not practical because they have very complex water systems without a single central point to add fluoride. Some fluoride plants in Eastern and Central Europe were not given adequate attention during the political turmoil in the late 1980's, and closed through neglect.

Sometimes fluoride is added to salt which is then used in numerous products such as bread and milk, to ensure that the community can still benefit.

Some European countries have ceased water fluoridation against Health Department advice.

Ethics

Why don't the public get to vote on water fluoridation?

In Australia, public health initiatives are generally not put to a public vote. For example, seatbelt, tobacco and drink driving legislation have not been voted upon by the general public.

The Northern Territory Government is committed to improving the oral health of all Territorians, particularly those most in need. The extension of water fluoridation to remote communities currently without this important public health measure is an essential component of this commitment.

Shouldn't water fluoridation be an individual choice?

Governments and health professionals have a responsibility to make decisions that balance the best possible community outcomes with individual choice. In 2004, all Australian Health Ministers endorsed water fluoridation as a national oral health initiative – a key action in *Healthy Mouths Healthy Lives: Australia's National Oral Health Plan.*

Preventing problems before they occur is vital to good health. Adding fluoride to water to prevent dental decay is similar to adding Vitamin D to margarine to maintain healthy bones, folic acid to breakfast cereals to reduce the risk of babies being born with neural tube defects or iodine into salt for thyroid health, as well as public health measures such as smoking restrictions, compulsory seat belts and immunisation.

Costs

Is water fluoridation cost effective?

The amount of fluoridated water used for drinking is enough to reduce dental decay in the community. The World Health Organisation concludes that water fluoridation is a safe and cost effective way to prevent dental decay. A study assessing the cost savings resulting from water fluoridation found that the reduction in costs of restorative treatment due to averted dental decay exceeded the cost of water fluoridation in communities of any size. Likewise, other studies concluded that fluoridation is highly cost effective, especially for communities with high proportions of children, Indigenous people or low socio-economic status.

In 2008, a cost-benefit analysis was completed in the Northern Territory about water fluoridation. It found that water fluoridation remains an effective, efficient, socially equitable and safe population approach to the prevention of caries in the Northern Territory. Water fluoridation should be extended to all people living in communities with a fixed population of 600 or more living in areas where naturally occurring fluoride is less than 0.5mg/L.

Water Disinfection

The drinking water supply is currently disinfected; however, the new treatment process when implemented will provide a more efficient disinfection system.

Water Chlorination is the preferred method of disinfection and ensures clean, good quality water from the tank to the household tap.

Power and Water is upgrading the current chlorine disinfection system. This will ensure that the right amount of chlorine is added to keep the water clean and free from micro-organisms (bugs).

Currently chlorine is added to the drinking water supply using a sodium hypochlorite system. The upgrade of the chlorination system will include installing a gas chlorination system. This new system will improve reliability and manageability of the treatment process.

During the treatment process chlorine is added to the water to disinfect the water supply.

Adding chlorine to the water will keep the water clean and free from micro-organisms as it travels through the system from the water tank, through the pipes to the taps in your house.