

Unit 6: Tō tātou mātāwainuku | Our aquifer



Topic introduction for teachers

Key ideas in this topic

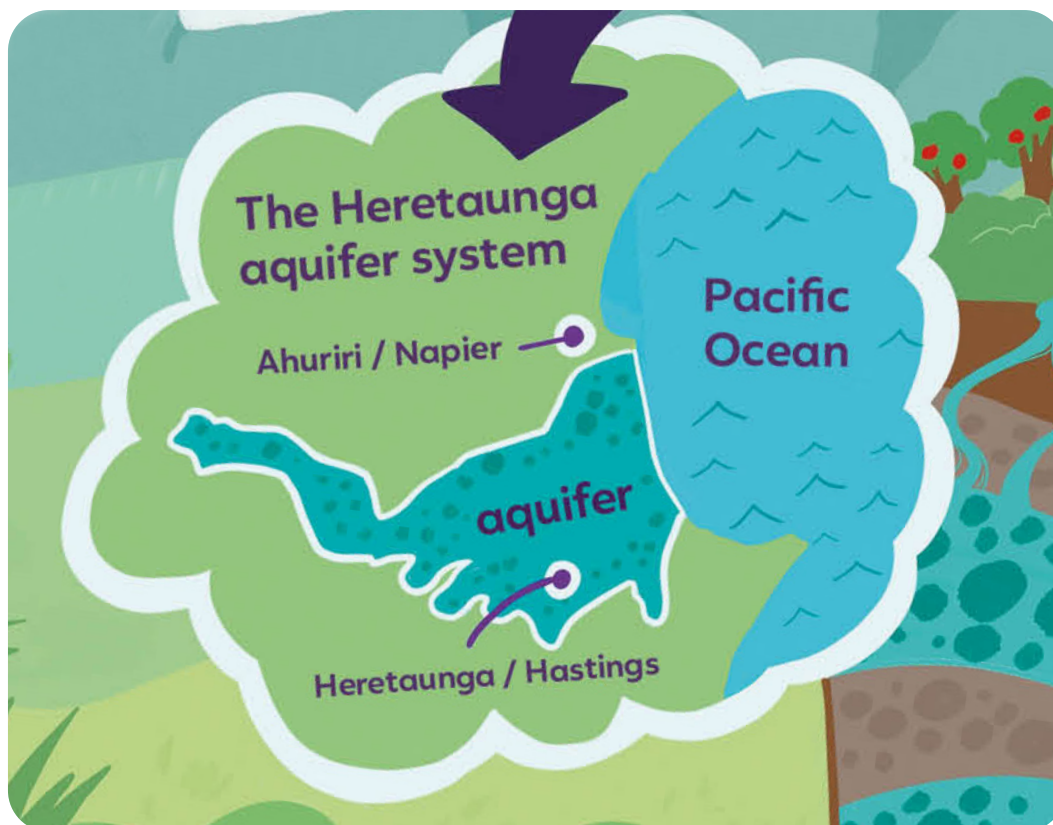
- An aquifer is an area of underground rock or gravel that is saturated with water. This water is known as 'groundwater'.
- The Heretaunga aquifer – Heretaunga Haukūnui – is the lifeblood of our district. It supplies our drinking water and helps to keep our springs and rivers flowing.
- Our aquifer is vulnerable to surface pollution and over-use.



Background

A hidden taonga

The Heretaunga aquifer is a huge, hidden source of water for our district. Deep below our feet, it stretches across about 460 square kilometres, from the northern-western foothills to Napier on one side to Havelock North on the other.



The aquifer is known to local iwi as Heretaunga Haukūnui – the great source of life-giving dew, and the lifeblood of Papatūānuku. According to Ngāti Kahungunu traditions, the goddess of the aquifer is Takotowai. She is the mother of the ancient limestone layers, gravel and stones that filter our wai.

Our main source of fresh water

Councils draw drinking water from the aquifer, then treat it to supply both Hastings and Napier cities. Hastings' drinking water is extracted from about 50 to 70 metres deep. Groundwater is also used extensively for irrigation for fruit and veggie growing and small amounts of farming.

Bore-drilling began in the late 1800s. Today, there are thousands of bores pumping water from the aquifer. The council closely manages how much is extracted.

More like a sponge than a swimming pool

An aquifer is not a huge underground 'tank' or cave full of still water. Instead, the water is constantly soaking in and moving slowly through layers of sediments, gravels and rock. Sometimes the pressure of the water means that it pushes up through the ground surface either on land or in rivers to form springs.

Aquifers in Aotearoa

There are many different types of aquifer found throughout the North and South Islands. Most contain gravels and sediments, others have water flowing through fractured volcanic rock or limestone.

For more information:

Location and extent of New Zealand aquifers: <https://statsnz.contentdm.oclc.org/digital/collection/p20045coll34/id/13/>

Location of aquifer zones in New Zealand: https://www.researchgate.net/figure/Location-of-aquifers-zones-across-New-Zealand-Modified-after-Moreau-and-Bekele-2015_fig4_326279178

Heretaunga Aquifer: <https://www.hbrc.govt.nz/assets/Document-Library/Projects/Outstanding-Water-Body/Heretaunga-Aquifer-candidate-OWB-report-201807111.pdf>

'Confined' and 'unconfined' aquifers

There are two main types of aquifer. The Heretaunga aquifer system includes both.

Confined aquifers are 'trapped' between impermeable layers of rock or clay. This puts the water under pressure, which means it will spurt up out of the ground if it's drilled into. It also means the water can be moving through the aquifer for a very long time. Water in confined parts of the Heretaunga aquifer might be hundreds of years old. The water in some aquifers kilometres deep in Canada and South Africa is estimated to be more than a billion years old!

Unconfined aquifers are more 'open' to the surface, meaning water from rivers can flow down into them. The water in unconfined aquifers can be just days old and can sometimes move back up into springs that feed rivers, helping to keep them flowing in dry times.

Why is the water so clean?

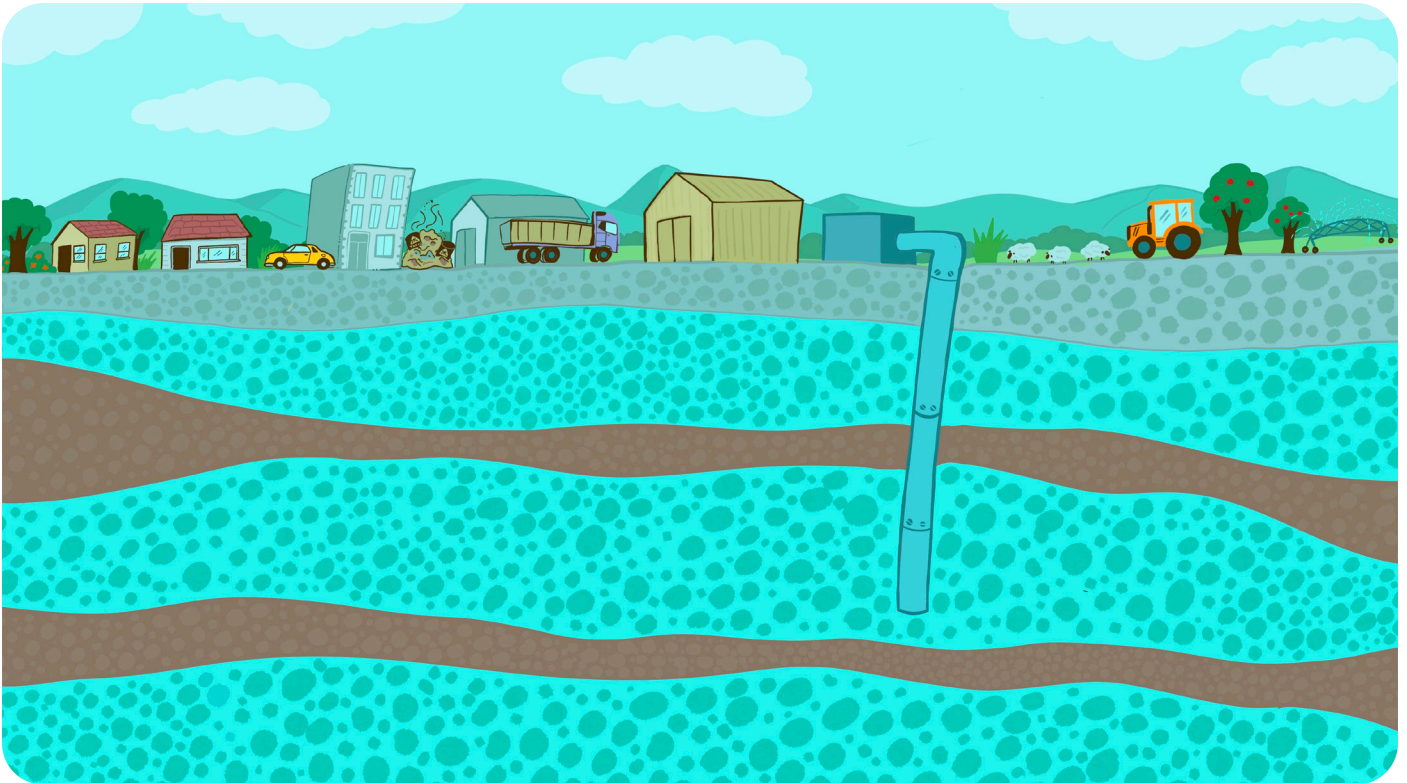
The water in the Heretaunga aquifer is very clean. As water from rain and rivers seeps underground, it is filtered through multiple layers of fine gravels, sands and silt. Stygofauna, tiny invertebrates that live in the groundwater, also help with the cleaning. They eat biofilms that build up on sand particles, helping to aerate the water and keep it flowing.



In confined parts of the aquifer the groundwater is especially pristine, because the clay 'lid' protects it from surface pollution.

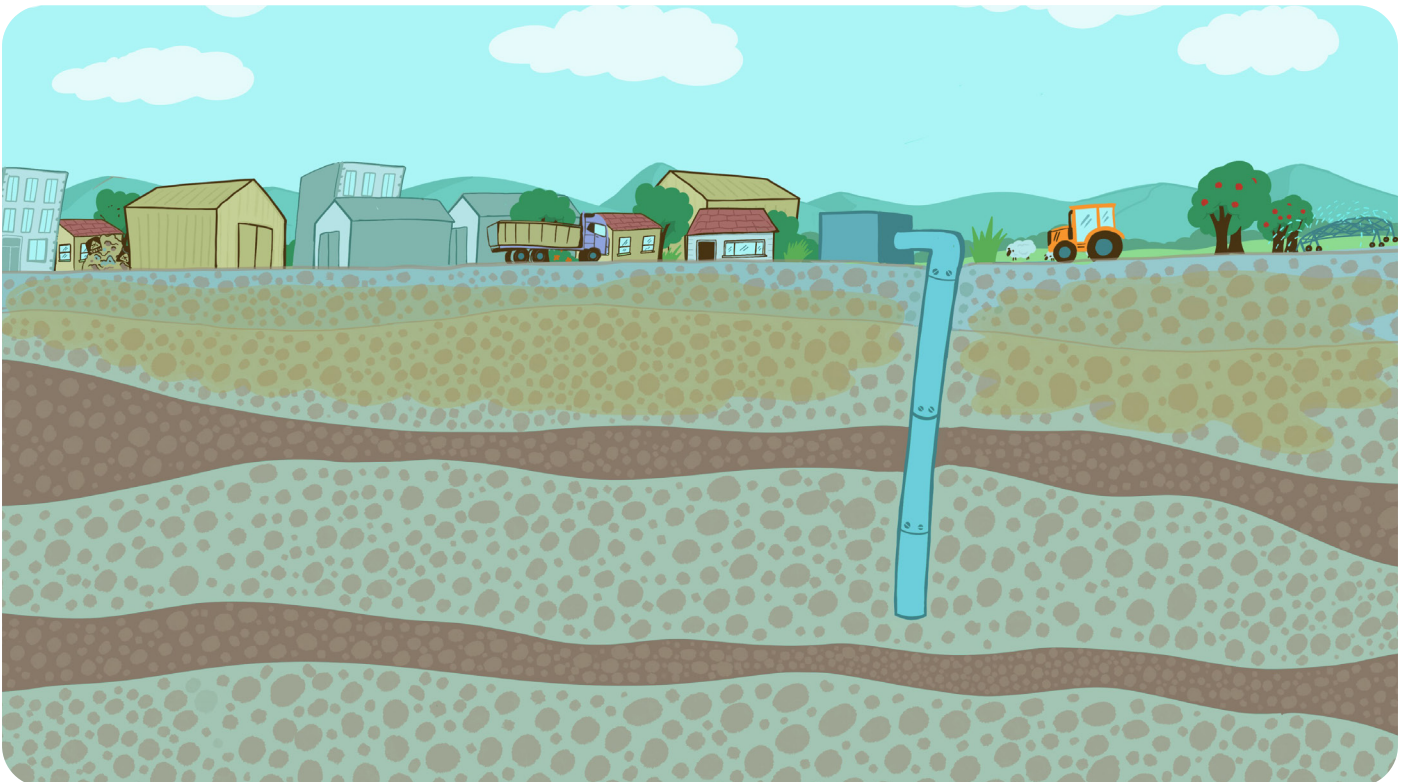
How does aquifer water get to your tap?

- Engineers drill a deep hole into the aquifer, then line it with a steel casing. This is called a bore.
- At the bottom of the bore a screen is attached to 'sift' out the sediment and gravel in the water.
- The water is either pumped up or just spurts up naturally.
- It's treated and sent into a holding tank for a while.
- Finally the water is pumped into underground pipes and to your house.



Threats

The Heretaunga aquifer is vulnerable - to pollution, to being contaminated with saltwater where it lies near the coast, and to running out if we take too much.



Activities in this unit

- Make an aquifer
- Make a water filter
- Make a diatom mobile

Other ideas

Before your visit to Waiaroha

- Ask the class where our drinking water comes from. Does anyone know it's from underground? How did they know that?
- Pose an 'I wonder. . .' question. 'How many aquifers do we have in New Zealand?' or 'What is an aquifer made of?' or 'How does water get into an aquifer and how does it come out?' Ask the students to come up with their own 'I wonder. . .' questions. Make a list and research the answers.
- Watch a video that explains what groundwater is and how important aquifers are. This one from GNS is a great place to start. <https://www.youtube.com/watch?v=fqWmweBsDnA>
- Learn what the word 'stygo fauna' means. Research how these tiny creatures have adapted to life deep in the dark aquifer. Then ask the class to act and move like stygo fauna!

At Waiaroha

- In the Whare Waiaroha discovery centre, watch the video about our amazing aquifer. Ask students to share two things they learned from the film.
- Outdoors, find the tube of material that was drilled through to reach the water below Waiaroha. Clue - it's by the big tank to the left of the drinking water treatment plant. Discuss what you can see in the tube. What's surprising about it?
- Find the outdoor panel about the Heretaunga aquifer. Clue - it's near the entrance to Te Whare Waiaroha discovery centre. Learn some facts about stygo fauna. Discuss why these creatures are so important.

After your visit to Waiaroha

- Use natural materials to create a collaged cutaway of the aquifer, showing the different layers of rocks, gravels and sediments. Add in pictures of stygofauna from class research.
- Do the 'Make an aquifer' or 'Make a water filter' activities.
- Research some of the problems aquifers are facing around the world. What is salt water intrusion? Where has this happened? Where have aquifers dried up? Share what you know!
- Discuss what happens if the demand for aquifer water is greater than its capacity.
- Have a class debate using a topic such as 'We will be able to draw water from our aquifer for ever.' Students could debate from the perspective of a farmer, factory owner, school student, kuia or koroua or scientist.