What is the current state of groundwater?

The Groundwater Modelling process reviewed monitoring data from the Makauri Aquifer, the largest source of water for horticultural purposes.

The data showed that summer and winter groundwater levels are declining. A similar decline is seen in the Matokitoki aquifer.

In contrast, the shallower Waipaoa Gravel Aquifer, Te Hapara Sands Aquifer and Shallow Fluviatile Aquifer showed stable groundwater level trends.

The decline in the Makauri aquifer is due to a long-term increase in the amount of water being pumped out, which reduces the ability for the system to reach equilibrium.

The analysis showed that the time required for groundwater levels to recover following drought is increasing. As droughts get worse it will take longer for the Makauri Aquifer to recover.

We modelled what would happen to the aquifers using NIWA climate change predictions out to 2090.

The model predicts that increasing groundwater abstraction in response to climate change will make the Makauri Aquifer more susceptible to contaminants from overlying aquifers. It also predicts saltwater intrusion from the coast into the shallow aquifers and from the west in the Makauri Aquifer (the Western Saline Aquifer on the southern side of the Waipaoa River).

Finally, the model also predicts that our water use eventually reduces water availability to wetlands, rivers and springs connected to the shallower aquifers.

The centrefold of this brochure displays alternative findings to the current status – what could happen if we change how much groundwater is taken from the aquifers.

The results from this modelling process have:

1. Assisted current knowledge of the functioning relationships of each aquifer system.
2. Predicted potential impacts of groundwater human usage and the wider interactions with climate change and surface ecosystems.
3. Provided insight to where changes could be made to the current groundwater management policies.
4. Provided insight to concepts of surface water security and the impacts groundwater use or replenishment can also have on surface water features (river baseflows).
5. Highlighted the importance of increased groundwater monitoring in the western and coastal aquifers to assess saline intrusion and whether interventions are having an impact.

The modelling process was completed by Wallbridge Gilbert Aztec (WGA) and Aquasoil from 2021-2023 working closely with GDC and the community.

A number of reports have been completed detailing each aspect of conceptual and numerical modelling.

All council information referencing these reports will be accessible on the council website.

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Turanganui-a-Kiwa
Poverty Bay Flats Groundwater Modelling

A Groundwater Model has been developed for Turanganui-a-Kiwa, Poverty Bay Flats, which simulates the movement of groundwater in aquifers beneath the earth.

The model can help inform decisions about how to manage sustainable groundwater use and its interactions with surface ecosystems, activities and the environment.

Community asked questions of the Groundwater Model, to test different scenarios

The modelling process has used existing data and knowledge from Council, mana whenua and the community.

Community asked questions about groundwater, and we used the model to run different scenarios to help answer these questions, such as what could the future impact of climate change be on current groundwater use?

What effect would extreme dry weather have?

- During droughts, the model predicts an additional approximately one meter decline (~1m) in groundwater levels in the Waipaoa, Makauri and Matokitoki Aquifers, worsening the current summer groundwater levels and degrading aquifer quality. This is an additional 55% of summer drawdown in the Makauri Aquifer and 35% in the Waipaoa and Matokitoki Aquifers.

What effects would occur if the health of the groundwater was placed above human use?

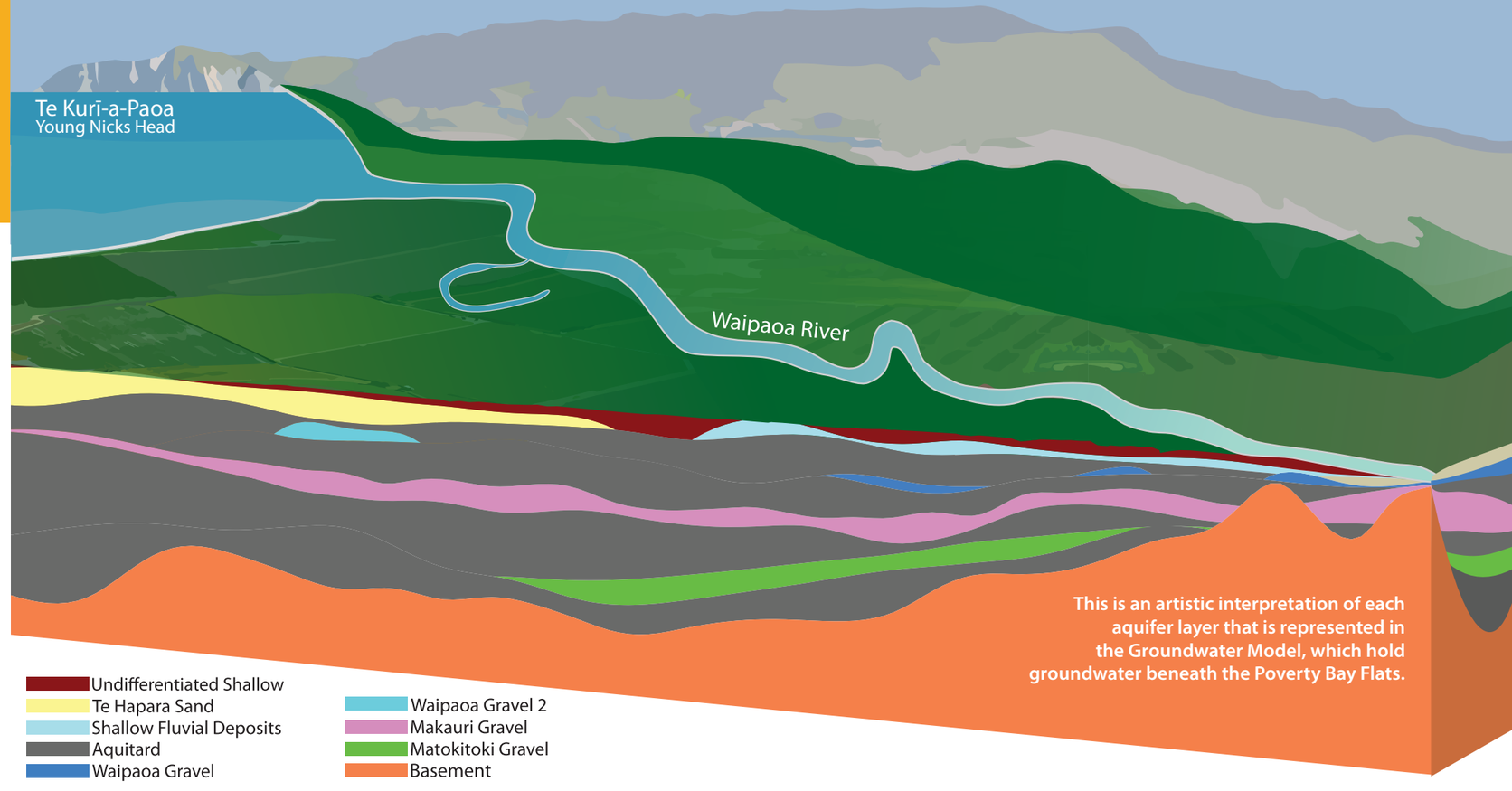
Would there be a change in groundwater salinity?

Would there be a change in wetland and spring persistence?

- The model predicts that when human use of groundwater stops, the summer groundwater levels in the Makauri Aquifer recover by 75%, the remainder being natural variation.
- Groundwater levels in summer can be ~2m higher in the Makauri Aquifer and ~1.5m higher in the Waipaoa and Matokitoki Aquifers.
- Coastal saline intrusion is still predicted, due to sea level rise, and intrusion rates would not benefit from ceased groundwater abstraction. However, western saline intrusion would cease.
- The Waipaoa River and Te Maungarongo o Te Kooti Rikirangi Wetland both experience increased water levels due to reduced losses to adjacent shallow aquifers

What is a "sustainable" allocation rate?

- The model predicts a 15% reduction of groundwater abstraction will stabilise aquifer groundwater level declines, taking into account the projected effects of climate change and droughts out to 2045.
- Waipaoa River summer baseflow will increase and Te Maungarongo o Te Kooti Rikirangi wetland will maintain current water levels



This is an artistic interpretation of each aquifer layer that is represented in the Groundwater Model, which hold groundwater beneath the Poverty Bay Flats.

What happens if current groundwater allocations are used to full entitlement?

- The model predicts an additional ~3m decline in groundwater levels, which is a further 120% drawdown on current summer groundwater levels in the Makauri Aquifer. This would also increase saline intrusion from the coast and the west, degrading water quality further.
- The shallower aquifers would see minimal change in drawdown, but their connection to the river would cause a decrease in the Waipaoa River summer base flow as well as a predicted 20cm decline in the surface water levels at Te Maungarongo o Te Kooti Rikirangi Wetland, which may affect the wetland ecosystem.
- Hydraulic pressures in the Makauri Aquifer would be reduced and the aquifer would be susceptible to receiving potential contaminants from overlying aquifers.

What effect would managed replenishment have on groundwater levels?

- The model predicts a groundwater level rise, during replenishment from October to January up to ~2m in the Makauri Aquifer (an 80% increase).
- Slight increases would also be experienced in the Waipaoa and Matokitoki Aquifers (during irrigation season only).
- Injecting freshwater in the central Makauri Aquifer is predicted to reduce the impacts of saline intrusion from the west, but a coastal placement of injected freshwater is required to prevent saline intrusion from the coast.