Fact sheet

Tank Plan and Stream Depletion

Managing stream depletion effects from groundwater abstraction in the Heretaunga Plains

The aquifers and waterways of the Heretaunga Plains are all highly inter-connected.

Groundwater levels have a big impact on how much water is in rivers, streams, and wetlands (surface water) across the Heretaunga Plains. As groundwater levels drop in summer- and water is taken for irrigation, drinking water, urban water supply, food processing industries and other uses, the flows in the connected surface waters of the Heretaunga Plains also reduce. This reduction in water flows adversely affects the health of the aquatic ecosystems. High water temperatures and low dissolved oxygen levels also contribute to poor ecosystem health in these rivers.

After extensive studies and modelling of the aquifer and its connections with surface water, we have found it to be much more inter-connected than previously thought, and that a lot of water also flows through the aquifer.

Connected surface waters include the Karamū and Ngaruroro Rivers as well as lowland tributaries of the Heretaunga Plains, such as the Irongate, Raupare and Awanui streams.

More information

The full Heretaunga Aquifer Groundwater Model Development Report is at hbrc.govt.nz, search: #documentsandforms

An Executive Summary of the same report is also available.

For more information about the aquatic ecosystem health refer to the latest water quality and ecology state and trends report. A report on the life supporting capacity of the Karamū tributaries is also available here. A factsheet that explains more about how land use and water quality are to be managed is available here (link to come)

As a result of this new information, we are changing the way we will manage abstraction of groundwater from the Heretaunga Plains aquifers.

A new interim allocation limit specifies the amount of water that can be abstracted from the Heretaunga Plains as 90 million cubic metres per year. The limit is based on the level of 'actual and reasonable' water use taken on the Plains up to 2017. The previous allocation management differentiated between confined and unconfined parts of the aquifer and this will no longer be used to manage abstractions.

All applications to replace existing groundwater take consents will need to meet new Plan requirements. One of the main changes relates to how we manage stream-depletion effects. Other changes include requiring efficient use and allocation for actual and reasonable use that is based on water meter data or modelled demand using Irricalc. This will result in most water permit holders getting less water than they were previously allocated.

More Information

The Irricalc model is being upgraded to reflect Hawke's Bay's climate and cropping systems. Keep up to date on progress at hbrc.govt.nz, search: #tankreports

Information about allocation limits and how re-allocation of water is to be managed is available in a separate Fact sheet; *"The Tank Plan – Allocation Limits & Minimum Flows"* search: #tankreports

When evaluating applications for resource consents, proximity to streams and size of abstraction will influence the degree of stream depletion caused by that abstraction.

The cumulative effect of all groundwater takes strongly influences flows in the Ngaruroro River and lowland streams of the Heretaunga Plains. The stream flow maintenance requirements only apply to the Karamū and its tributaries – not the Ngaruroro River. The TANK Plan proposes that the Ngaruroro River stream depletion be resolved through water storage and release and that further work is required to assess the feasibility of this.

The Proposed TANK Plan introduces a Stream Depletion Calculator to measure steam depletion in the lowland streams from each point of take. Permit holders will need to offset the effect of stream depletion from their take or be subject to a water take ban.

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Permit holders can:

- Offset the depletion effects of individual takes by:

  (i) contributing to a scheme that maintains flows in lowland streams above trigger levels and

  (ii) enhancing aquatic habitats by activities like riparian planting and wetland creation

Or

- Be subject to a water take ban when low flow triggers are reached.

Stream flows might be maintained by pumping groundwater or through water storage and release schemes. Water permit contributions will depend on site specific characteristics and opportunities that Council is working with permit holders, iwi and other stakeholders to identify.

At present, the TANK Plan proposes that any groundwater needed to maintain flows will come from within the amount allocated to permit holders.

The TANK Group and the Regional Council considered different options to manage stream depletion.

Water take bans

The new Heretaunga Plains Groundwater Model showed that a ban on groundwater abstraction when flows reach a trigger flow will not be effective. The stream flows do not react quickly enough and it can take many weeks for stream flows to respond when groundwater abstraction is stopped.

Reduction in the allocation limit

We also considered whether reducing the total amount of water abstracted from the aquifer would be effective. This would be a costly option and it would not prevent all stream depletion. Such a move would impact all groundwater users – not just those close to a river or stream or those with a large effect on stream flows. Reductions would have to be substantial to prevent stream flow depletion and the beneficial effects of reducing overall water use would vary across different streams.

Stream flow maintenance

The Model was used to examine whether stream flows could be maintained by pumping from groundwater into depleted streams. This counter-intuitive management solution has already been successful in the Twyford area.

The Heretaunga Plains Groundwater Model showed that additional groundwater pumping is a feasible way to maintain flows in other lowland streams. Economic analysis also tested this feasibility, estimating the scale of capital and operating costs for pumping and discharge schemes. Collective management of these schemes will lead to more cost-effective and efficient solutions than were used to estimate costs.

For the Twyford irrigators, managing stream ecosystems is not just a matter of pumping water to maintain stream flows. It also includes management of individual bores, rostering water use, changing points of take and timing water abstraction to reduce the cumulative effect of abstraction on the Raupare Stream flows. The Twyford irrigators also embarked on a programme of riparian management to improve stream ecosystem health.

The stream flow maintenance and habitat enhancement scheme is not a favoured solution for everyone. Mana whenua in particular are concerned about the impact on the network of waterways in the Heretaunga Plains, especially upstream from scheme takes and discharge locations. Mana whenua are concerned about the untested nature of the modelled solutions.

More information

The Heretaunga Aquifer Groundwater Model Scenarios Report is at hbrc.govt.nz, search: #documentsandforms

The cost analysis report for stream flow maintenance pumping Lowland streams augmentation pre-feasibility assessment of capital and operating expenditure for the TANK catchments is at hbrc.govt.nz, search: #tankreports

TANK Group meetings 28, 31 and 38 considered the results of this modelling and discussed options. Meeting 28 included a presentation to the TANK Group explaining how the scheme might operate. For Twyford irrigators, managing stream ecosystems is not just a matter of pumping water to maintain stream flows. It includes managing individual bores and timing water abstraction to reduce the cumulative effects of water use on the Raupare Stream flows. Twyford irrigators also embarked on a programme of riparian management to improve stream ecosystem health.

TANK Meetings 28, 31 and 38 considered the results of this modelling and discussed the options. A presentation to the TANK group explained how the scheme might operate at Meeting 28.

Meeting records for TANK meetings are at hbrc.govt.nz, search: #tankreports

Refer also to the Section 32 report at section 8.7 – available at hbrc.govt.nz, search: #tank

Stream Depletion Calculator – how it works

Heretaunga Plains Groundwater Model to determine the amount of stream depletion caused by each groundwater abstraction.

Users enter the location and a litres per second rate of take for each abstraction point and a stream depletion amount in litres per second is generated. The stream depletion amount is currently based on weekly volume (converted to litres per second). Further work is underway to refine this so that only pumping that is affecting stream flow is subject to the calculation. It is likely to be based on a 'seasonal' allocation that reflects the timing and quantity of water taken during at risk months. In addition to water meter data, the water demand model IRRICALC will be used to help determine irrigation allocations.

This Stream Depletion amount determines the size of the contribution to a stream flow maintenance scheme for each abstraction permit. The Stream Depletion Calculator can also show stream depletion from a number of consents at the same time.

The stream depletion effect will be based on the allocated amount of water; not the amount of water used. This gives certainty and clarity about expectations and responsibilities. In practice, the amount needed to support a stream flow maintenance scheme will vary from year to year and all allocated water is not used every year. Wetter years will have less water use and less stream depletion.

For any groundwater abstraction, there might be a stream depletion effect on several streams. The stream most affected by an individual abstraction will be the one where that water permit will need to address stream depletion. The Proposed TANK Plan encourages and supports a collective approach to managing stream flow maintenance. It enables water permit holders to work together to develop efficient and cost-effective approaches to manage their water takes and stream flow maintenance pumping. This collective or community approach also enables other storage and release options to be considered.

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The management of water takes and stream flow maintenance is intended to be through collective action. This does not necessarily mean that a water permit is then part of a global permit. It does mean that each permit holder will be encouraged to contribute to a collective scheme. Schedule 36 (page 123) in the proposed TANK Plan describes how collective action for stream flow maintenance might be managed.

One of the objectives of stream flow maintenance is to develop solutions that maximise the length of stream that benefits from increased flows. A scheme design needs to consider the length of stream that can be improved by enhanced flows upstream of any flow trigger.

If a water permit holder does not wish to contribute to maintaining flow, they will be subject to a ban on taking water when the stream flow drops to the specified trigger flow.

More information

The Stream Depletion Calculator is available online. You can enter water permit details into the calculator to understand how this proposed plan provision works. Find the Stream Depletion Calculator at hbrc.govt.nz, search: #tankreports and look under 'TANK calculators'

Managing stream depletion impacts on the Ngaruroro River

The stream flow maintenance solution for lowland rivers and streams is not viable for all rivers. For example, the Karewarewa Stream is a special case. It rapidly loses surface water to groundwater. The level of pumping required to maintain flows will be too high and adverse effects will be too significant.

Further investigation into the ground and surface water connections and mitigation options is planned for the Paratua and Karewarewa streams.

The other river where pumping from groundwater to surface water will not work is the Ngaruroro River. The stream depletion effect for this river is significant. The amount of water required to offset that flow cannot be supplied by groundwater pumping. An alternative solution was tested that required storage during high flows and release at subsequent low flow triggers.

The TANK Plan proposes this solution to be investigated for feasibility and for the Regional Council, mana whenua and the community to develop this option if it is found to be feasible.

More information

The Regional Council is investigating a storage and release solution for the Ngaruroro River. Media release: Hawke's Bay gets more than $64 million from PGF

Other management actions

As well as stream flow maintenance, water permit holders need to consider opportunities to improve ecosystem health. This will be through better riparian land management, establishing shade to reduce weed growth in rivers and streams, considering wetland protection or creating new wetlands.

More information

The Life Supporting Capacity in Lowland Streams with a focus on the Karamu Catchment report investigates the factors most detrimental to ecological health. The report is online at hbrc.govt.nz, search: #documentsandforms

The Ecosystem health in highly modified lowland catchments report describes an expert assessment of management methods to improve ecosystem health in the Karamū catchment. The report is online at hbrc.govt.nz, search: #documentsandforms