

Where do we go from here
Weir options



Rahui Weir. Winter operation. Water level will be higher than base of weir almost all of the time.



Rahui Weir. Summer operation. Fish passage will be included.

He ao te rangi ka uhia, he huruhuru te manu ka tau.
As clouds deck the heaven, so feathers adorn the bird.

Mā te huruhuru ka rere te manu.
By feathers are birds enabled to flight
(Feathers often equate to resources to enable progress).

Construction Type - Inflatable vs Conventional

Construction	Pros	Cons
Inflatable	<ul style="list-style-type: none"> Greater control over water level height Effective weir height can be adjusted with lighter machinery (air compressor) More expensive (\$800K) Less well known in NZ 	<ul style="list-style-type: none"> More susceptible to damage Shorter lifespan (20 years)
Two stage conventional	<ul style="list-style-type: none"> Cheaper (\$350K) Well known in NZ Long life span (50 years) Will easily accommodate beautification attempts 	<ul style="list-style-type: none"> Currently only designed to allow 2 set levels (although this can be seen as a benefit) Requires heavy machinery on site to lift slabs into place



What do we do about
High lake water level in spring

Restoring a taonga

Whakakī is taonga to the Whakakī community. The wetland is considered of national importance. The lake currently has poor water quality, is heavily silted and is unsafe for swimming. However, aquatic vegetation will recover and stabilise the lake **if action is taken now**. Our goal is to **restore Whakakī Lake** so tuna (eels) are fit for consumption and people can swim safely. Restoration will help ahi kaa to provide a self-sustainable future. **Let's work together to make this happen.**

The issue

Lake openings from September to April create conflict in the Whakakī catchment. The lake has traditionally been opened when the level reaches reduced level (RL) 11.8 (1.8 metres above sea level) as prescribed by National Water and Soil Conservation Authority (NWASCA) stipulations since 1958 and reiterated by guidance from the Parliamentary Commissioner for the Environment (PCE) in 1992.



RL 11.8 metres is 1.8 metres above mean sea level.
RL refers to **Reduced Level** and this HBRC reference point is taken as 10 metres above Mean Sea Level.

Current situation

Recent leadership in the Whakakī Lake Trust (WLT), however, has adopted a position that the lake should not be opened after 1 September, unless the water level has reached a level they deem unacceptable. There is no official policy, but this has meant extended periods with the lake above RL 12.2 (2.2 metres above sea level) in recent years.

The position of the WLT is based on concerns around the lake level dropping to extreme levels if enough rain is not received over the summer months to keep the lake topped up. The lake can drop at least 10cm in height every 2 weeks over the warmer months if significant rainfall is not received. The WLT's position is supported by western science which confirms that extreme-low water levels in summer pose a risk to tuna (eels), lake and wetland values.



Lake level diagram

Shows the effect a proposed weir will have on the lake level over a dry summer



Weir RL 11.5 Dry Christmas (darker line)
No Weir Dry Christmas (lighter line)

How will the weir look?

That's partly up to you. It could be a plain structure, or designed with decorative details (as shown in the artist impression to the left).

There are some pros and cons associated with both options:

Plain option: Pros

Construction has been budgeted for under the Freshwater Improvement Fund (FIF).

Plain option: Cons

A purely functional structure may be considered ugly by some.

Decorative option: Pros

Would allow the community to take pride in the structure. It could also be educational, telling a story of interest to locals.

Decorative option: Cons

Any additional ornamentation of the weir structure is not currently budgeted for.



Where do we go from here Options to be considered



Current HBRC preferred option

Do nothing

- The current situation is intolerable.
- Surrounding landowners have a legal right to have the flood levels lowered when the lake level hits RL 11.8.
- But, the lake should not be opened if it increases the risk of critically low lake levels over summer, to protect the significant values of wetlands.
- Compelling arguments could be made to force an opening, as well as to prevent an opening.
- Identifying a solution is preferable to doing nothing.

Forced Closure

- Use diggers and bulldozers to plug the outlet channel at the end of the Rahui channel, rather than letting the sea close the mouth naturally.
- Likelihood of success is currently unknown but it would be worth trialling.
- Need to stop the lake at a level no lower than RL 11.5 for it to benefit the summer water levels.
- When the lake has reduced to RL 11.5, the outflow is still at least 20 m³ per sec on average, including high tide.

Pumping or siphon system to sea

- An expensive exercise that would create a lot more disruption to the wetland system.
- The Rahui Channel is 20 metres wide so it can convey the flows required to drain the lake (approximately 30 cubic metres per second when the lake is full, reducing as the lake level falls during drainage).
- Without a large channel and high outflow the sea shuts the bar too quickly. So any other outlet point would require similar channelling to mimic what currently happens via the Rahui.
- Any structures to maintain a permanent outlet would require significant engineering and construction costs (\$1 to \$3M as a rough estimate).
- Pumping is a costly exercise.
- If the lake rose to a level of 12.2m, it would take 84 days or more with a pump rate of 1 cubic metre per second to lower it back to 11.5m.



We could try to beautify any stopbank or weir structure, like these retaining walls at Kopupaka Reserve

Rahui Weir option

- **This is currently the preferred option**, due to uncertainty around the likely success of forced closure.
- Construct a short weir along the Rahui channel which is height adjustable.
- The lower height option would not hinder the current opening approach.
- The higher height option would prevent the lake losing water when the level dropped to an agreed height (e.g. RL 11.5).
- This would enable normal opening operations to continue during winter.
- It would give confidence the lake would not lose too much water in the spring/summer period.
- Opening management would be very simple and straightforward. Whenever the lake hits RL 11.8, it can be opened.
- In winter, the opening would occur as it currently does and water level would drop to somewhere between RL10.8 and RL11.2. In spring/summer, the lake would retain water up to the agreed water level (e.g. RL 11.5) while still providing flood relief.
- The weir would still allow fish passage.

Only if the Rahui Weir option is rejected

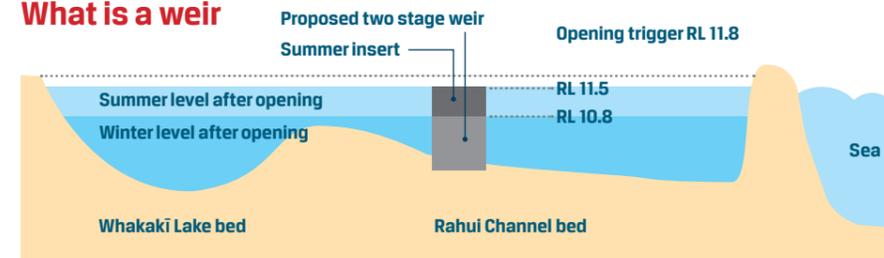
Iwitea Weir option

- Build a stopbank and weir system to temporarily hold Iwitea level at RL 11.8.
- Any structures would not impede fish passage.
- When lake level hits RL 11.8, block connection between 2N and main lake and open lake via Rahui Channel.
- Wait 2-3 days for main lake to drain and outlet to close.
- Release water from Iwitea end to 'top up' lake to safe summer level.

Where do we go from here Weir options



What is a weir



Possible locations of proposed weir (only one is needed)



Location	Pros	Cons
A Rahui Channel Near Lake (Preferred option)	<ul style="list-style-type: none"> • Close to existing sill so minimal risk of a length of channel silting up • Minimal compromise of existing flushing effect of opening • Follows existing contours and creates a more natural looking delineation 	<ul style="list-style-type: none"> • A completely new artificial structure • Requires more access agreements as no public road access
B Rahui Channel at Bridge	<ul style="list-style-type: none"> • Would be within the footprint of an existing artificial structure • Easily accessible via public roads • The bridge may facilitate insertion and removal of the adjustable weir section 	<ul style="list-style-type: none"> • A longer length of channel may silt up because Waikatuku stream is on the lakeside of the weir • May reduce the current flushing ability of lake opening events
C Rahui Channel On Coast		<ul style="list-style-type: none"> • Difficult substrate to anchor in • Difficult to delineate the start and finish of the weir • Higher outlet level may decrease flushing effect • More exposed to damage from the sea • Much more expensive construction
D Iwitea (retain water at Iwitea end, to top lake back up after bar closure)	<ul style="list-style-type: none"> • No risk of Rahui channel silting up • No compromise to flushing effect 	<ul style="list-style-type: none"> • Will need a 200m stop bank with provisions to maintain wetland connectivity • Needs access at high lake levels • Will require access to be constructed • Disturbance to sensitive habitat

Why a weir?

- The purpose of the proposed weir is to retain more water in the lake during openings, and protect the lake from dropping too low in summer.
- The weir will help make opening decisions faster and avoid flooding in the upper catchment while retaining enough water in the lake during spring openings.
- The weir helps those wanting a high level and those wanting a low level.
- It is a key structure that will help bring certainty around water level management at critical times of the year.

Summer - September 1st to March 30th

Lake water level will stop dropping at a minimum 'safe for summer level' (proposed as 11.5)

Winter - April 1st to September 30th

Lake water level will stop dropping at the existing sill level during cooler seasons (usually 10.8 - 11.0). ie it will be status quo for cooler seasons.*

* Details on levels and timing to be confirmed with the community