Lake Water Quality, Aquatic Ecology and Native Fish

Technical Discussion

1. This Technical Discussion statement relates to expert discussion on the topic of Lake Water Quality, Aquatic Ecology and Native Fish.

2. This statement relates to the Fast-track consent application lodged by Genesis Energy Limited under the Fast-track Approvals Act 2024 for a water permit to divert, take and use water and a discharge permit to discharge water and associated contaminants, all associated with the operation of the Tekapo Power Scheme (referred to in this document as the "**Tekapo PS**")

3. The technical discussion was held by Teams conference call on 30 June 2025 with Richard Allibone, Roger Young, Tina Bayer, Chris Meijer, Susannah Black and Richard Matthews. It was noted that Gail Tipa (advisor to Waitaki Rūnaka) was unable to attend because of the late notice for the meeting and other engagements.

4. Attendees at the conference were:

Person	Organisation	Role
Richard Allibone ("**RA**")	Water Ways Consulting ("**WWC**")	Advice to Genesis regarding native fish
Roger Young ("**RY**")	Cawthron Institute ("**CI**")	Advice to Genesis regarding water quality and aquatic ecology
Tina Bayer ("**TB**")	Canterbury Regional Council ("**CRC**")	Advice to CRC regarding water quality and freshwater ecology
Chris Meijer ("**CM**")	CRC	Advice to CRC regarding water quality and freshwater ecology
Susannah Black("**SB**")	CRC	Advice to CRC regarding planning matters
Richard Matthews("**RM**")	Mitchell Daysh Limited ("**MDL**")	Advice to Genesis regarding planning matters

5. The scope of the issues discussed included:

a. Discussions regarding matters raised by CRC.

b. Confirmation of areas of agreement/disagreement.

c. Discussions regarding draft consent conditions.

d. Any other matters we considered relevant.

7. The matters discussed and the positions reached are summarised in the following table:

Issue	**Comments / Discussion**
Proposed conditions of consent for native fishery matters.	**RA** noted that common bullies are relatively common in Lake Takapō and were probably introduced as food for trout (rather than being present naturally). Upland bullies are common in the Takapō River and kōaro would not naturally be present in the Takapō River (the Takapō River wouldn't naturally have a lot of native fish species). More flow in the Takapō wouldn't necessarily change things for native fish as there would be other complicating factors such as didymo and introduced species predation. Monitoring hydroelectric scheme effects would require eliminating the impacts of these other effects and most likely not show much as there is not much to look for. **CM** accepted that there are multiple factors affecting the Takapō River and it will be difficult to measure / monitor the potential effects of just the Tekapo PS. However, **CM** noted the risk of ecological effects that would potentially arise with changes to of scheme operation. **RM** noted that the Genesis hydrologists confirmed that they do not expect changes in the Takapō River (spill flows below Lake George Scott are anticipated to be similar to now), that while there may be changes in timing of level changes in Lake Takapō the changes would be within the present operating regime and that lake levels would be managed much as they are now (with a risk-based approach to ensure the required minimum and maximum lake levels are complied with) based on short term (weeks) basis. **RA** noted that it would be extremely difficult to determine any climate change effects and that effects of the Tekapo PS are relatively benign with respect to native fish.
Reestablishing recruitment of longfin eel elvers above the Lake Takapō/Tekapo dam.	**RM** confirmed that eel management was a matter being managed by Waitaki Rūnaka and Meridian.

Issue	Comments / Discussion
	RA considered that Lake Takapō should not be a favoured location for eel relocation as downstream migration needs would also need to be considered – Takapō is the furthest upstream location so would have the most difficult downstream migration pathway.
Screening of the intakes to the Tekapo A and Tekapo B stations.	**RA** observed that fish screening at Tekapo A/B would be challenging because of high flow rates and achieving the required through screen water velocity, large costs and logistics, that fish screening would be ineffective for common bullies due to the small size of larval bullies (noting that bullies are probably an introduced native species to the lake) and that screening would only be relevant if significant eel populations were present and even then, he considered that fish screening would not be a practicable consideration for Tekapo, is not necessary and would come with a large cost and little return. **TB** asked whether cost is related to access to the screens or the screens themselves. **RA** commented that engineering and practicality challenges added to the cost so it is the overall cost, not just the screens or ongoing maintenance. **SB** noted that operational costs could be high if stations needed to be shut down for installation, cleaning, maintenance etc.
Extending Canal fish salvage to include native fish.	**RM** noted that the sports fish salvage plan is focussed on extended operation of Gate 16 or extended spills over the Lake George Scott weir rather than dewatering exercises such as the canal dewatering that occurred for canal lining works – the latter would be addressed by way of specific consents for that purpose and are not part of the two operational consents sought. **CM** observed that concern related mainly to dewatering activities and that salvage relating to bullies wasn't necessary because of their abundance in the catchment anyway. **RA** noted that there would be difficulties with native fish salvage in terms of their size and inefficiency of techniques such as electric fishing. **SB** noted that there could be tweaks made to salvage conditions in that if native species are observed during salvage operations steps could be taken to recover them and return them to the lake, would consider and include if appropriate in her responses to the proposed conditions.

Issue	Comments / Discussion
Monitoring data for information to understand ongoing effects of the Scheme.	**TB** commented that there is an effect on macrophytes in Takapō due to lake level fluctuations and changes in water clarity so it would be useful to monitor those changes to understand what is happening in the lake. She considers that 5 yearly reviews of macrophytes (depth) alongside continuous turbidity monitoring would be useful to understand the changes that are occurring. In response to a question from **RM**, **TB** acknowledged that it would be difficult to differentiate between effects caused by changes in the catchment (such as a change from snow / glacier melt to precipitation runoff and / or increased sedimentation from peak runoff events) from changes related to scheme operation. The intention would be that linking macrophyte and turbidity results help to better understand what changes are occurring and the drivers of those changes. **RY** acknowledged that lake level variations affect lake edge ecology but also noted that no changes were proposed for the operating range. He agreed that effects would vary depending on water quality, noting that Takapō will become clearer over time because of less glacial melt and that monitoring of macrophytes and turbidity / clarity would assist with identifying any changes in the lake in response to climate changes.
Discussion of conditions.	**SB** considered that there were some matters that could be addressed by way of consent conditions and that she would aim to have those available for discussion at the planning meeting schedule for 1 July. Note: indicative draft conditions from SB appended to these notes.

Confirmed by email:

Richard Allibone	Email dated 3/7/25 8:12 am.	Chris Meijer	Email dated 3/7/25 8:04 am.
Roger Young	Email dated 3/7/25 2:31 pm.	Tina Bayer	**TB** unable to confirm as on leave, **SB** and **CM** have checked the wording and are comfortable that the notes reflect Tina's conversations.
Richard Matthews		Susannah Black	Email dated 3/7/25 8:53 pm.

Indicative Draft Conditions

Macrophyte monitoring – Lake Tekapo

The consent holder shall, at a frequency no less than every five years, conduct a survey of submerged aquatic plants (macrophytes) within Lake Tekapo. The survey shall:

a. Be undertaken and the numeric attribute state determined in accordance with the method described in Clayton J, and Edwards T. 2006. *LakeSPI: A method for monitoring ecological condition in New Zealand lakes. User Manual Version 2*. National Institute of Water & Atmospheric Research: Hamilton, New Zealand.
b. The consent holder shall provide a report of the findings of the survey to CRC attention: RMA Compliance and Enforcement Manager within three months of conducting the survey, specifically including but not limited to:
    a. LakeSPI Index
    b. Invasive Impact Index
    c. Native Condition Index
    d. Maximum Depth (m) of Submerged Aquatic Plants
    e. Names of native and invasive species present.

Advice note: *publication described in (a) can be found at* *https://niwa.co.nz/sites/default/files/import/attachments/lakespi_manual.pdf*

Turbidity / water clarity

The consent holder shall measure and record the level of turbidity of the water and water temperature at a frequency not less than a [60-minute, 2 hourly or 4 hourly – happy for Genesis scientists to advise their preference] average. The monitoring of turbidity and temperature shall:

a. Be undertaken in accordance with the National Environmental Monitoring Standards (NEMS).
b. Use a measurement location[1] that is:
    i. downstream of any bubble interference,[2]
    ii. more than 300m away from river mouths,
    iii. more than 50m from stormwater inflows and
    iv. where the lake has at least a minimum depth (at lowest lake level) of 3m.
c. All data shall be collated and provided to CRC attention Compliance and Enforcement Manager within the Annual Report provided for in condition (x); or all data may be provided to CRC daily via telemetry.

Advice note: *NEMS can be found at: [to be completed]*

[1] Note: Preference would be that the site location is agreed before approvals are issued, locking in a location for certainty would eliminate all of (b).

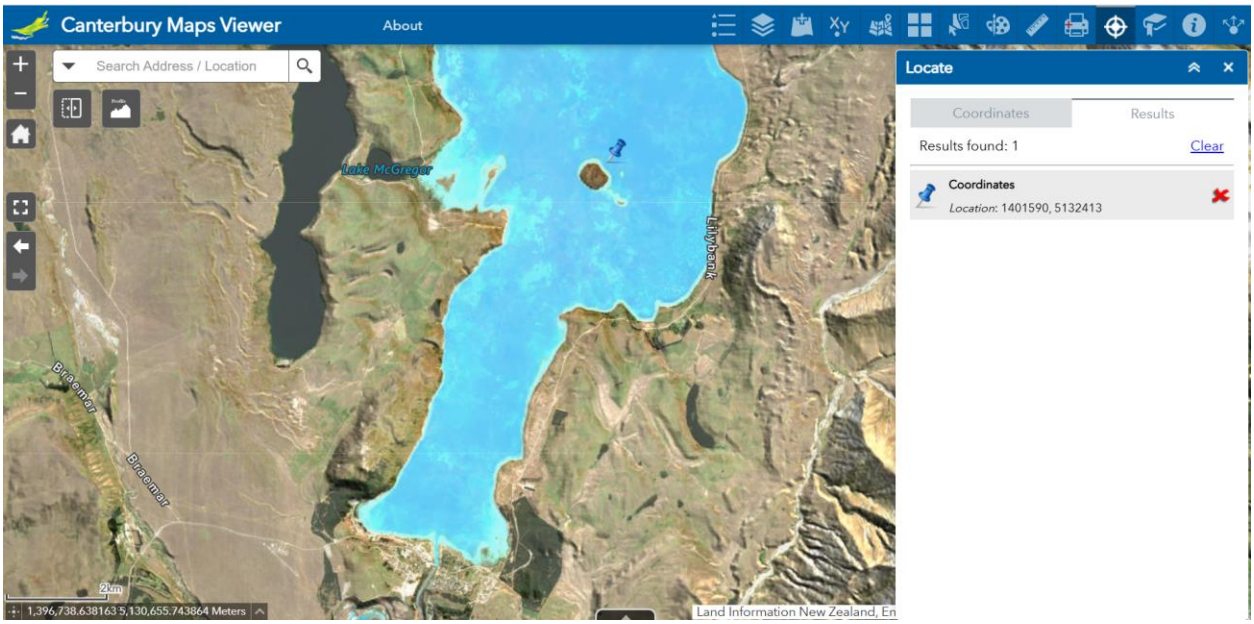
[2] Note: Can be measured alongside water level if practical, but not inside the stilling tower.

OR[3]

The consent holder shall measure water clarity of the water within Lake Tekapo on a monthly basis:

a. At a location[4] where:
   i. where lake depth is larger than max. Secchi depth, at a location away from river plumes and shore influence (a 'mid-lake' location).
   ii. more than 300m away from river mouths,
   iii. more than 50m from stormwater inflows ~~and~~
b. Measurements shall be made using a Secchi disk
c. All data shall be collated and provided to CRC attention Compliance and Enforcement Manager within the Annual Report provided for in condition (x).

Indicative location NZTMX 1401590 NZTMY 5132413



[3] Note: Alternative option for consideration, **TB** is ok with either.

[4] Note: Preference would be that the site location is agreed before approvals are issued.