

Attached table: Potential environmental effects and management

Potential environmental effect	Potential management measures
Ecological effects The Aniwhenua barrage and Pahekeheke head pond presents a barrier to fish passage. The potential for fish to enter the penstocks may result in mortalities.	Pioneer Energy are wanting to improve fish passage and have recently installed a physical conduit structure at the barrage to assist with upstream tuna passage and help to mitigate the effects caused by the physical dam barrier. This consists of a pipe which slopes upwards along the barrage, with “mussel rope” on the inside to assist with Tuna climbing. Pioneer Energy are also investigating putting in infrastructure to facilitate the down stream migration of mature Tuna to mitigate the effects caused by the dam barrier at the Pahekeheke headpond. A Tuna trap and transfer programme has also been occurring for many years. Matahina dam which is located within the Rangitāiki River downstream of the Aniwhenua dam also presents a barrier to fish passage. Elver transfer activities led by Kokopu Trust on behalf of Manawa Energy (operator of the Matahina hydroscheme) are undertaken to transfer elver upstream of Matahina Dam, with a large portion of elver transferred to Lake Aniwhenua. Ngāti Manawa, with support/funding from Pioneer Energy leads an adult Tuna trap and transfer programme to transfer Tuna Heke from Lake Aniwhenua and/or within the Pahekeheke Pond to downstream environments (downstream of Matahina dam). The resource consent renewal application and AEE will be focussed on compiling existing information on the approach to upstream and downstream fish passage, combined with liaison with Tangata Whenua, Manawa Energy (Matahina and Wheao), and catchment groups (Rangitāiki River Forum and Tuna Forum). The outcomes of the above may comprise a Tuna Management Plan prepared in collaboration with Tangata Whenua. This may include but not be limited to the following; • Continue working together with other hydroscheme operators and tangata whenua for a one-river coordinated approach. • Implementation of physical deterrents to prevent fish from entering penstocks to reduce the potential for mortalities. Ngāti Manawa have raised that they believe further screening protection is required. • Timing transfer efforts to maximise success of trap and transfer programme e.g. timed to falling limb of first fresh, and ensure that hydroscheme operational procedures do not compromise success as far as is practical to ensure the efficient generation of electricity. Ngāti Manawa have recently questioned whether climate change has altered the timing of Tuna Heke and the periods of rain events. • Adaptive management practises to be considered to reflect the above.

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	• Improvements to the physical conduit structure at the barrage. • Monitoring.
Lake may provide conditions for pest weeds/macrophytes to grow. Release/discharge rates below the barrage and/or below Power Station may influence periphyton growth (i.e. may provide favourable conditions for excess biomass) between the barrage and Matahina Dam. Residual flow release rates and rates of release during flood events may provide less optimal habitat conditions for macroinvertebrate communities downstream of the barrage. There is no proposed change to operational lake levels which may affect terrestrial ecology on the banks of the lake, nor is there any physical disturbance or modification currently proposed to any areas of indigenous vegetation.	Current management includes annual lake drawdown exposing approximately 50% of the lake bed. Further investigations are required to assess the effectiveness of this to remove/kill weeds. Data collection and further investigation required to be undertaken to determine whether this may be occurring. Data collection and further investigation required to be undertaken to determine whether this may be occurring. N/A – qualitative assessment indicates that there is not likely to be an adverse effect on terrestrial ecology. To be investigated further if sediment removal within upstream delta environment (discussed in hydrology section below) is required for flood management or enhancement of the lake management.
Hydrological effects A sediment delta has formed at the inlet to the lake (a depositional zone for the upstream catchment of the river and its tributaries) which has been attributed to the damming of the river and lake formation. Farmers perceive that this sediment delta is	High level hydrology assessment required to assess this in a technical sense. Notwithstanding the technical discussion regarding sediment transport and deposition process with the catchment, farmers have identified this as an issue to them. Therefore Pioneer Energy have confirmed that they need to investigate the feasibility of undertaking sediment removal from the delta to do what they can to alleviate this. BOPRC rivers and drainage also share similar concerns to the farmers with deposited sediment in the delta affecting upstream flooding. A separate resource consent application is currently with BOPRC to consent the removal of sediment/undertake sediment management at the delta. This application is currently on hold, and will likely remain on hold until the above high level hydrology assessment is completed, and the stakeholder and ecological values have been investigated further as part of this resource consent

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causing flooding of the adjacent low lying pasture land.	renewal process. Enhanced lake management through sediment management may be included as part of this consent renewal project to improve the overall efficiency of the hydroscheme operation.
Reduced flow in downstream Rangitāiki River environs (original course of Rangitāiki River) as a result of the damming of water.	A residual flow is provided to ensure the original Rangitāiki River course continues to flow, and there is flow over the Aniwaniwa falls. General hydrological conditions in the residual reach of the Rangitāiki River will be assessed, and reviewed from an ecological perspective to determine any adverse effects.
Dam safety effects.	The dam will be managed in accordance with the NZ Society on Large Dams Guidelines.
Erosion and river hydraulic effects The river bed and banks downstream predominantly consist of bedrock. No adverse erosion effects are currently observed or expected as a result of ongoing operations.	N/A – early qualitative assessment indicates that there is not likely to be an erosion effect, however this is to be qualified further in AEE.
Water quality effects Damming of water may result in changes to the physical and chemical properties of the waterbody which may affect the suitability of the watercourse to support healthy fish and invertebrate communities.	Data collection and investigation required to determine whether this is occurring.
Recreational effects Weed growth in lake may cause reduced ability to use lake for recreational purposes. The compensatory/residual flow over Aniwaniwa falls has likely been determined for aesthetic and recreational purposes. This residual flow will continue to be provided. Engagement with stakeholders will determine whether this is currently working well.	Methods for weed removal will be considered as will what is needed to ensure the scheme operates effectively, while stakeholder values recognised and upheld. The existing weed control method (discussed above) may not materially change, dependent on the effectiveness of the current management practise, stakeholder values, practicability and environmental benefits/costs of different options. N/A - qualitative assessment indicates that this is not likely an issue, however to be determined following stakeholder engagement.

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Natural character effect No adverse effects expected as the scheme forms part of the existing environment and there are no proposed changes to the operational level of the lake or the structures on site.	N/A
Cultural effects To be determined by Tangata Whenua.	To be discussed and determined with Tangata Whenua. Engagement to date suggests Tuna migration management is a fundamental matter of interest.