Technical Memorandum

To:	Danielle Petricevich, Principal Planner	**From:**	Nicola Pyper, Principal Freshwater Ecologist Pete Wilson, Principal Marine Ecologist
Company:	SLR Consulting New Zealand (on behalf of Environment Southland)		**SLR Consulting New Zealand**
cc:		**Date:**	30 May 2025
		Project No.	880.016784.00001

RE: Waituna Lagoon Ecology Technical Review
APP-20242456

1.0 Introduction

SLR Consulting New Zealand (SLR) has been engaged by Environment Southland (ES) as the consent authority and regulator to undertake a technical review of a resource consent application submitted by joint applicants, namely Te Rūnanga o Awarua, the Department of Conservation Te Papa Atawhai, and Environment Southland (collectively referred to as the applicant). The applicant is seeking authorisation to periodically open the Waituna Lagoon for the purpose of maintaining and restoring the ecological health and cultural values of the lagoon ecosystem. A memorandum, dated 15 May 2025, provided by Danielle Petricevich on behalf of ES outlines the scope of the ecological peer review.

We have reviewed the relevant sections of the Assessment of Environmental Effects[1] (AEE), the Science Advisory Report[2] (Appendix B of the AEE), the conditions proffered by the applicant (Appendix C), the photos of lagoon opening events (Appendix E), the restoration plan (Appendix F), the vegetation technical report[3] (Appendix I), the summer vegetation reports (Appendix J), a memorandum regarding the impacts on the Coastal Marine Area[4] (CMA), and the application addendum[5]. We have also briefly reviewed the summary of submissions.

2.0 Review

The questions raised by ES relating to the potential ecological impacts of the proposed opening regime have been reproduced below (italicised and highlighted in green), and SLR's response follows.

[1] Taylor Planning. (2024) Periodic opening of Waituna Lagoon to maintain and restore ecological health and cultural values of the lagoon ecosystem. Prepared for Te Rūnanga o Awarua, Department of Conservation Te Papa Atawhai, and Environment Southland. 136 p. plus appendices.
[2] H. Robertson, N. Atkinson, M. de Winton, M. Schallenberg, R. Holmes, A. Rable, K. Wilson, C. Jenkins, D. Whaanga. (2024) Technical review of conditions for opening Waituna Lagoon. Prepared for the Department of Conservation, Te Rūnanga o Awarua and Environment Southland. 60 p.
[3] M. de Winton, I. Zabarte-Maeztu, A. Taumoepeau. (2023) Technical report on vegetation status in Waituna Lagoon: 2009-2023. Prepared for the Department of Conservation. 24 p.
[4] A. Rabel. (2024) Advice on impact to CMA from Waituna opening. Environment Southland. 2 p.
[5] Environment Southland, Te Rūnanga o Awarua, Department of Conservation. (2025) Update to resource consent officer and submitters 14 May 2025. 28 p.

Do you agree with the existing environment values stated by the applicant?

The Science Advisory Report identifies the following ecological and cultural values of the Waituna Lagoon:

- Taonga species.
- Cultural significance.
- Water quality.
- Submerged macrophytes.
- Fish and aquatic invertebrate populations.
- Indigenous species dominance.
- Bird populations.
- Fringing wetlands.

The application presents and/or references data resulting from repeated monitoring events undertaken over many years. Descriptions of the Waituna Lagoon and wider wetland complex have also been provided. Together, these provide a clear picture of the state and value of the existing lagoon environment. It is evident that the ecological values are diverse and, in some instances, unique to the ecosystem of the Waituna Lagoon. While not explicitly stated, the data and descriptions provided in the application are indicative of an environment that supports very high ecological and cultural values, although some features of the environment are existing in a degraded state, for example, the lagoon's water quality can have elevated nutrients and fine suspended sediments due to pressures from wider catchment land uses.

Are the opening triggers proposed appropriate for achieving the outcomes sought by the applicant (maintain and restore the health of the lagoon), including overall values of the wetland?

The Science Advisory Report presents the results of modelling exercises that have been supported by monitoring data collected over several years. The results of the modelling were used by the applicant to determine the proposed triggers for the mechanical opening of the lagoon. The triggers have been selected to promote the maintenance and enhancement of the ecological values of the lagoon, achieving a balance between returning the lagoon to a more natural hydrologic regime, while mitigating the effects of high nutrient loads and consequent degraded water quality.

It is evident that substantial consideration and analysis has been invested to determine appropriate triggers for opening that will support submerged macrophyte, migratory native fish, and water quality values. However, other ecological values, specifically fringing wetland plant communities and avifauna values, do not appear to have been specifically considered when determining an appropriate opening regime. This is discussed in more detail below.

With regard to water quality, the proposed consent conditions include triggers to manage poor water quality within the lagoon that may arise from algal blooms and/or low dissolved oxygen events. The triggers proposed (Science Advisory Report, Appendices 1A & 2A) are deemed to be appropriate as they align closely with the documented attribute bands of the National Policy Statement for Freshwater Management 2020 (NPS-FM), with critical indicator levels similar to the 'national bottom lines' of the NPS-FM. The warning indicator levels are generally set to alert those monitoring the lagoon to ecosystem health and water quality decline and allow the consent holder to monitor the lagoon more closely and prepare for action should a critical level (similar to the national bottom lines of the NPS-FM) be reached. Monitoring and reporting of the primary and secondary indicators of lagoon water

quality and ecosystem health are required by proposed condition 14a). We note this condition doesn't specify the regularity or timing of monitoring. Including a requirement around the frequency and timing of monitoring may be beneficial to ensure sufficient data are collected to enable informed decisions on opening events. We recommend that the conditions be updated so that the parameters to be monitored and frequency of monitoring are clearly specified. In addition, monitoring conditions should include the requirement to sample and measure parameters immediately prior to an opening event and over the period of time the lagoon is open, as well as between openings. This will allow the effects of the opening to be measured and assessed to inform ongoing adaptive management of the opening regime and the lagoon. Due to the complexity of the monitoring regime and the adaptive management approach, the preparation of a monitoring and management plan may be an appropriate way to direct a lagoon monitoring programme.

The applicant is also proposing to follow a transitional regime (in accordance with feedback received through consultation) and will gradually adjust opening triggers over the duration of the consent. The details of the proposed transition regime have been recently updated (cf. the application addendum) in response to further feedback received through submissions. While this transition period may not be optimal for ecological values, we acknowledge the need to balance various stakeholder interests.

The transitional regime also provides the applicant with the opportunity to monitor the adverse effects of opening at various levels and whether the opening regime triggers are resulting in the intended positive effects. The applicant has proposed conditions that will require regular reviews of the consent. This will allow for adaptive management of the lagoon and lagoon opening triggers can be reconsidered with reference to ongoing monitoring data.

Please specifically consider: The use of lagoon water quality and ecosystem health indicators (as specified in Appendix 1 to the proposed conditions) and any potential effects on other ecological values that should be considered.

We consider the use of water quality and ecosystem health indicators appropriate. The water quality indicator levels align closely with the documented attribute bands of the NPS-FM, with critical indicator levels similar to the 'national bottom lines' of the NPS-FM. The ecosystem health indicators (i.e., macrophytes, nuisance macroalgae, and diadromous fish) have been informed by long-term monitoring of the lagoon and a good understanding of the lagoon's values and dynamics.

However, potential effects on other ecological values should be considered, namely fringing wetland plant communities and indigenous avifauna. The application acknowledges that prolonged periods of lower water levels will dewater fringing vegetation and wetland habitats and that a lack of high water levels can promote the growth of exotic species. Little detail has been provided on the existing characteristics of the fringing wetland plant community, although there is some indication that threatened plant species may be present. As the lagoon has been subject to artificial openings in the past and severe fluctuations in water level, it is likely that the existing plant community is well-adapted to these conditions. However, more commentary on this and details on the character of the existing community would further understanding and help confirm that effects on wetland vegetation will be low.

Similarly, we are of the opinion that potential effects on indigenous avifauna need to be considered in more detail. The application notes that the Waituna Lagoon and wider wetland complex support a wide diversity of birdlife, including At Risk and Threatened species. While the application considers that the overall effects of the changed regime will be neutral for avifauna, the potential effects on these populations have not been discussed in detail. However, we are of the opinion that there should be an assessment of whether there will be any meaningful change in foraging habitat for threatened bird species, as well as an analysis

of the effects on breeding birds and any risks associated with increased predation. Of particular concern is the impact on breeding/nesting birds. Nesting birds are not able to easily relocate and there is a risk that nesting wetland species, for example cryptic species that nest on vegetation rafts/platforms, could be at greater risk of predation if water level reductions result in a nest sitting above dry mud/sediment. The risk of this could be reduced if lagoon opening events are avoided or minimised during the breeding season (spring/summer). Alternatively, nesting bird surveys could be undertaken prior to an opening event to identify and manage any nests that may be adversely affected by an opening event. A loss of foraging habitat within proximity of nests during the breeding season would also be considered an adverse effect. These effects have the potential to be significant and impact threatened species during vulnerable parts of their life cycle.

Please specifically consider: The effect of the proposed opening regime on erosion and sedimentation of the lagoon.

A review of a summary of the submissions on the application revealed that submitters are concerned about the adverse effects of erosion and sedimentation associated with extended closure of the lagoon (i.e., not the activity for which consents are being applied), which will likely result in longer and more frequent periods of inundation. The proposed opening of the lagoon will reduce water levels and, therefore, it is considered unlikely that there would be an adverse effect associated with the opening of the lagoon on erosion and sedimentation. However, we note that the potential for erosion and sedimentation effects has not been considered by the application and more information in this regard could improve understanding of the potential erosion risks created by the proposed opening regime.

Please specifically consider: Whether the fish passage opening triggers are considered appropriate.

The fish passage opening triggers are considered appropriate. In a natural state, the lagoon would be expected to open less frequently than under the proposed opening regime, therefore, effects on fish passage are expected to be positive. The opening period of 1 April to 30 November captures at least a portion of the peak upstream and downstream migration events of all indigenous fish species known to use the catchment.

Please specifically consider: The locations of the openings, process for identifying these / risk assessment and whether the potential adverse effects have been appropriately addressed and mitigated through the proposal.

The Science Advisory Report assessed the risks and benefits associated with three sites that could be used for lagoon opening. Based on the assessment, the report recommends that the Walker's Bay location continue to be used as the primary opening site. This is considered appropriate, as potential effects on ecological and cultural values, water quality, and fish passage have all been assessed and comparative information has been provided to support the recommendation for ongoing use of the Walker's Bay site.

The applicant is also proposing that, should it be determined that another site may be more appropriate, a risk assessment will be prepared and submitted to the consent authority prior to any alteration to the opening location. The proposed conditions require that the assessment consider the risk to the ecological values of the lagoon as well as the suitability of the location for managing poor water quality. As the consent holder will be required to consider the effects on ecological values and as the risk assessment will be reviewed by the Consent Authority, this is considered an appropriate way to manage potential effects on the lagoon and respond in an adaptive way to the results of ongoing data collection.

Please specifically consider: The actual or potential adverse effects on fringing wetland and terrestrial indigenous vegetation as a result of the proposed opening regime.

As noted above, there is the potential for native fringing wetland and terrestrial vegetation to be adversely impacted as a result of the proposed opening regime. While it is likely that the existing plant community is well-adapted to these conditions, more commentary on this and details on the character of the existing community would further understanding and help confirm that adverse effects on wetland vegetation will be low.

Are the effects on the coastal environment assessed appropriately and do you agree with the conclusions in relation to effects on the CMA.

The Science Advisory Report describes adverse water quality effects associated with the extended closure of the lagoon (i.e., not the activity for which consents are being applied for). Once opened, nutrient and chlorophyll-a levels within the lagoon typically decrease (improved water quality). As such, there appear to be no adverse water quality effects in the Waituna Lagoon from opening to the sea. As the lagoon historically periodically opened to the sea naturally, the increased salinity that may occur within the lagoon when it's open is not considered an adverse effect.

The key potential adverse water quality effects from opening the Waituna Lagoon are due to the discharge of water from the Waituna Lagoon into the CMA. This water may contain elevated levels of nutrients, fine sediment, faecal bacteria, and algae (potentially toxin-producing cyanobacteria if opened during a bloom event).

The Science Advisory Report provides no assessment on the potential effects of discharging from the Waituna Lagoon into the CMA. A brief, supplementary memo prepared by Environment Southland (Advice on impact to CMA from Waituna opening – dated 20 November 2024), does however provide some comment on this. The memo identifies the following effects during and following a lagoon opening event on water quality in the CMA:

- A visible plume. A different colour to water in the CMA but similar to that of the Waituna Creek. This colour is likely due to tannins in the water, but also presumably to some concentration of fine, suspended sediment.
- A discharge of nutrients into the CMA. Nutrient concentrations in the initial discharge were higher than in most Southland estuarine environments, except for New River.

The memo is silent on the discharge quality or effects in the scenario that the lagoon is opened to manage an algal bloom (which may include toxin-producing species) and on the effects of elevated levels of faecal bacteria.

After the initial discharge from the lagoon, the ongoing discharge has a relatively low flow as the largest contributing waterway, the Waituna Creek, has a mean flow of 1.67 m^3/s. This allows for substantial mixing with oceanic water.

The memo notes that water quality is not monitored in the CMA, making it difficult to infer whether there are adverse effects resulting from the discharge and whether any effects may persist.

Overall, there is limited assessment on the effects of the discharge of water from the Waituna Lagoon into the CMA. I agree with the statement in the memo that the CMA at the opening locations is likely to be a high-energy environment with high water movement. This provides a large potential for mixing and dilution of nutrients, faecal bacteria and algae, and the resuspension of deposited fine sediments. The most likely adverse effects in the CMA from discharges from the Waituna Lagoon are elevated levels of nutrients resulting in algal blooms, or sustained blooms in the CMA once discharged from the lagoon. The memo notes that there have been no reports of algal blooms in the CMA during the 80+ years of lagoon

opening. As such, I agree that it's unlikely that the discharge of water from the Waituna Lagoon is having long-lasting effects on water quality in the CMA. High water movement generally does not provide the right conditions to sustain algal blooms. Recording observations of visible water quality in the CMA during and following an opening event may be one approach to confirm this.

The nearest urban activities to the Waituna Lagoon are Tiwai Point and the Bluff Township, located approximately 15km west. Substantial dilution of the Waituna Lagoon discharge would occur in the high-energy marine environment over this distance, and it would be unlikely to have measurable effects on water quality near the entrance to Bluff Harbour. It may be helpful to confirm this by monitoring water quality (before, during, and after opening) or with a modelling-based approach.

One risk not assessed in the Science Advisory Report or technical memo is that of human health. There may be elevated levels of faecal bacteria and/or toxin-producing cyanobacteria in the discharge, which is likely to make the water unsuitable for swimming or gathering shellfish near the point(s) of discharge. The Waituna Lagoon is in a fairly remote part of the Southland Region and I understand it is not known to be a popular swimming location. As such, the actual risk to people is likely to be low. However, consideration of whether signage would be beneficial during opening events to warn/educate may be warranted if there is a chance that people may interact with the water. The risk to people in the CMA is likely to be no greater than the risk people would have interacting with the water in the Waituna Lagoon itself; however, the lagoon water may not be suitable for human recreation at times due to elevated levels of faecal bacteria and/or cyanobacteria.

Whether there is sufficient information to understand the adverse effects of the proposal and, if not, what further information is required.

Overall, there is a high degree of information and analysis that provides reasonable certainty as to the potential adverse and positive effects of the proposal on water quality and fish communities. However, we are of the opinion that insufficient information has been provided to enable a clear understanding of the adverse or positive effects on native avifauna populations and fringing wetland vegetation communities. We recommend further information be sought, specifically:

- An assessment of effects on native avifauna communities should be provided. This should include an assessment of whether there will be any meaningful change in foraging habitat, as well as an analysis of the effects on breeding birds and any risks associated with increased predation.
- Further commentary on the potential effects of lagoon opening on fringing wetland vegetation communities and their extent should be provided. This will allow for some certainty that any effect will be at an acceptable level.

Confirm that the data used in the assessment is reliable and up to date and that the scientific methods employed are both appropriate and up to date. Identify any outdated or inappropriate methodologies and recommend alternative approaches where necessary.

We consider the methods employed for data collection to be appropriate and the data is considered up to date and reliable. The lagoon is regularly (i.e., annually for many parameters) monitored for a broad range of attributes, including trophic level index, nutrient concentrations, suspended solids, phytoplankton, and macrophyte biomass, with this monitoring having occurred over a significant period of time (at least 15 years for most metrics). In addition, fish monitoring commenced in 2020 and is ongoing. This data is considered sufficient to support robust modelling and the application's consequent recommendations for the proposed opening regime.

Whether the monitoring proposed is sufficient, or whether you recommend additional monitoring, including any changes to proposed consent conditions.

Regular monitoring of water quality and ecological attributes of the Waituna Lagoon has been occurring over several years. The applicant is proposing to continue monitoring which will allow a response to the critical indicators proposed in the conditions of consent. However, the specifics of monitoring (i.e., timing, frequency, location, parameters to be measured) is not prescribed by the conditions. Therefore, we recommend that the conditions be updated so that the parameters to be monitored and frequency of monitoring are clearly specified. In addition, monitoring conditions should include the requirement to sample and measure parameters immediately prior to an opening event, over the period of time the lagoon is open, and when the lagoon is closed. This will allow the effects of the opening to be measured and assessed to inform ongoing adaptive management of the opening regime and the lagoon. Due to the complexity of the monitoring regime, the preparation of a monitoring and management plan may be an appropriate way to direct the lagoon monitoring programme.

Additionally, further information is required regarding impacts on fringing wetland vegetation and native avifauna populations, and this information may highlight the need for ongoing monitoring of other ecological parameters.

Evaluate whether all assumptions and limitations are clearly stated in the assessment and have been appropriately addressed. Recommend any additional clarifications or mitigations needed to manage these limitations.

No clarification regarding limitations is necessary.

3.0 Closure

We have reviewed the application seeking authorisation to periodically open the Waituna Lagoon in order to maintain and restore the ecological health and cultural values of the ecosystem. Information gaps and concerns that have yet to be addressed by the applicant have been highlighted. In particular, we recommend that further information be sought regarding effects on fringing wetland vegetation and native avifauna populations.

Regards,

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