Memo

To:	Brent Wilson (Meridian Energy)
From:	Viculp Lal & Dr Grant Webby (Damwatch Engineering)
CC:	Kate Berkett (Meridian Energy)
Date:	18 June 2026
Subject:	**Tekapo B Power Station tailrace weir and chute – implementation of draft consent conditions**

1 Purpose of Memorandum

Meridian Energy Limited's (Meridian) Fast-track application to take and use water for hydroelectricity generation from Lake Pūkaki between RL 518 m and RL 513 m has received draft approval from the Expert Panel considering the application. The approval is subject to a draft set of conditions.

Canterbury Regional Council (CRC), as the Regulator, and Genesis Energy Limited (Genesis), as the owner and operator of Tekapo B Power Station which discharges into Lake Pūkaki, have both submitted comments on the draft consent conditions. Meridian are required to submit comments in response by midnight on Friday 19 June.

The purpose of this memorandum is to provide advice to Meridian and the Expert Panel considering Meridian's fast-track application on the practicality of implementing draft consent conditions 20 and 22 in respect of the Tekapo B Power Station tailrace weir and chute as proposed by the Panel, together with suggested changes to those conditions advanced by Genesis Energy Limited and Canterbury Regional Council.

The authors of this memorandum have both previously provided evidence to the Panel and outlined statements of their expertise, experience and the application of the Code of Conduct applicable to expert witnesses. They have provided this memorandum to the Panel on the same basis.

2 Draft Conditions 20 and 22

Draft conditions 20 and 22 as proposed by the Panel provide:

Condition 20

The Repair Strategy and Associated Works Programme must be prepared following consultation with Genesis, and, as a minimum:

a. *Incorporates all recommendation contained within the WSP memorandum "Tekapo B Power Station Submerged Weir – Damwatch Document Reviews" dated 26 March 2026 and the WSP report "Tekapo Submerged Weir Structural Condition Assessment" dated 25 March 2026, including but not limited to:*

i. Reinstatement of displaced riprap;
ii. Repair of concrete defects;
iii. Treatment of exposed reinforcement;
iv. Installation of new steel dowels to provide a positive and reliable connection between the concrete cap and base;
v. Investigation of unusual sill beam survey results and potential cracking;
vi. Removal of silt and vegetation or detailed inspection and concrete testing;.

b. incorporate any additional requirements identified by the SQEP in order to satisfy Condition 19;

c. provide timeframes for the works required by (i) and (ii) above to be completed;

d. identify the approvals and resource consents (if any) required to be obtained by the consent holder in order to implement the Repair Strategy and Associated Works Programme;

e. set out the post construction monitoring and management measures required to ensure that the lowering the lake level below 518.0 m RL does not adversely affect the Tekapo Temporary Tailrace or the operation of the Tekapo B Power Station;

f. be certified by the SQEP as satisfying the requirements of this Condition 20; and

g. be provided to Genesis and the Canterbury Regional Council (Attention: Manager Compliance) immediately on completion.

Condition 22

The Consent Holder must ensure that:

a. the works identified in the Repair Strategy and Associated Works Programme are completed in accordance with the Repair Strategy and Associated Works Programme and certified by the SQEP as soon as is practicable and, unless recommended otherwise by the SQEP, no later than 12 months following the commencement of this consent and before any lowering of Lake Pūkaki below 518.0 m RL under this consent; and

b. Genesis and Canterbury Regional Council (Attention: Manager Compliance) have been provided written confirmation that the requirements of Condition 22(a) above have been satisfied.

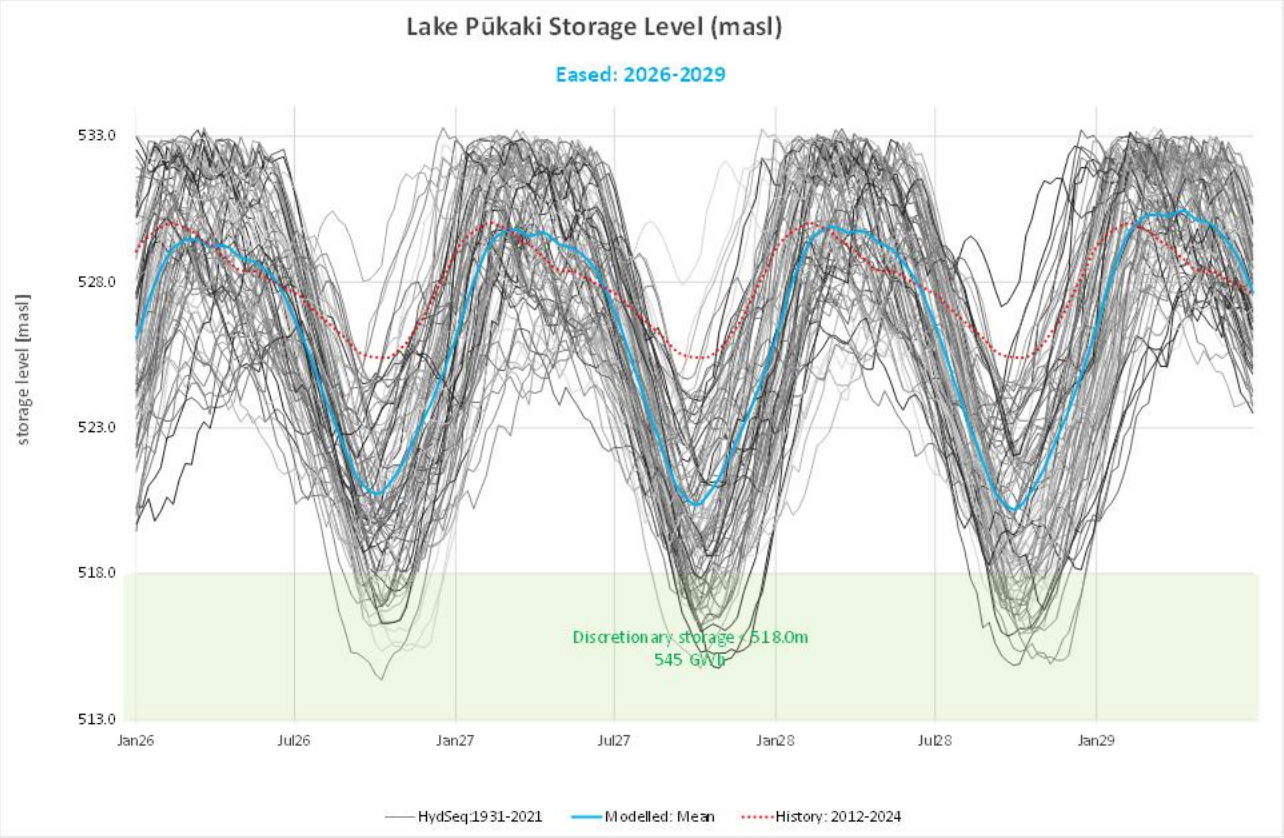
3 Practicality of Completion of Works Required Under Condition 20

Figure 1 shows predicted Lake Pūkaki storage levels for the period 2026-2028 under the draft consent based on historic lake inflows and estimates of projected future power demand and likely future generation availability. Preceding dry conditions with low inflows would need to occur for the level of Lake Pūkaki to fall below RL 518 m. As seen in Figure 1, this would typically occur within the August to December period.

The practicality of being able to complete all the works required under Condition 20 is highly dependent on hydrological conditions continuing to be favourable throughout the installation period. Based on historic inflow patterns, there is a high likelihood that, even if the lake is drawn

down to a level suitable for all works to commence in the dry, a moderate inflow event will occur which will cause the lake level to rise again and prevent completion of the works.

Our discussion below provides indicative time estimates for completion of each repair activity.



Source: Grant Telfar (Meridian Energy)

Figure 1: Predicted Lake Pūkaki storage levels for the period 2026-2028 under conditions of eased operation with draft consent

4 General Commentary on Condition 20

We note that draft Condition 19 requires the consent holder to engage the SQEP to prepare a Repair Strategy and Associated Works Programme (RSAWP) for the tailrace weir and chute structure. The purpose of the RSAWP is to set out the procedures to be followed and physical works implemented to ensure any lake level lowering under the consent will not adversely affect the tailrace weir and chute structure.

Condition 20(b) requires the RSAWP to "*incorporate any additional requirements identified by the SQEP in order to satisfy Condition 19*". We recommend that the wording of Condition 20 be clarified as follows to make it clear that the SQEP has sole responsibility for preparing the RSWAP after consulting with both Genesis and Meridian on the way to satisfying themselves on what the RSAWP should contain.

> *The Repair Strategy and Associated Works Programme must be prepared by the SQEP following consultation with Genesis and Meridian, and, as a minimum:*
>
> *a. …*

b. incorporate any additional requirements ~~identified~~ considered necessary by the SQEP ~~in order~~ to satisfy Condition 19;

The list of recommendations included in Condition 20(a) which are required to be repaired refers only to the recommendations contained in WSP (2026c) and WSP (2026d). We note that the dive inspection on which WSP's recommendations regarding the concrete elements of the tailrace weir and chute structure were based only covered the control weir[1] and Sill 2 (referred to by WSP as Rib 1). WSP interpolated the condition of Sills 2-5 based on the condition of Sill 2 and assumed that the defects observed on Sill 2 are also likely to be present on other sills.

In our view, the SQEP should be required to use all available information to form a judgement on what works are necessary to:

- assure the serviceability of the tailrace weir and chute structure to fulfil its function if the draft consent is exercised; and
- meet the requirements of Condition 19.

This includes the information obtained by Meridian:

- bathymetric survey imagery
- dive inspection notes and photos
- the condition assessment of the structure carried out by Damwatch (Damwatch, 2026a)
- other relevant Damwatch reports e.g. Damwatch (2026b), Damwatch (2026c)

The SQEP should also be empowered to direct further targeted investigations to define the precise nature and extent of the necessary work to assist with finalisation of the RSAWP.

The present wording of Condition 20(a) seems to oblige the SQEP to include all listed recommendations in the RSAWP whether the SQEP determines they are necessary or not. That does not seem appropriate and could lead to unnecessary effort if the SQEP determined that addressing one or more of the listed recommendations would not contribute to achieving the purpose of the RSAWP. We recommend that the SQEP should have discretion to:

- consider all available and relevant information (such as recent Damwatch reports for Meridian and historic information on the design and construction of the tailrace weir and chute structure e.g. (Thompson & Campbell, 1979) (Malan & Hancock, 1979) (MWD, 1979) (MWD, undated-a) (MWD, undated-b) (MWD, undated-c);
- undertake further targeted investigations to define the extent and nature of works required;
- undertake further assessments to determine whether specific repairs are necessary to enable the structure to function satisfactorily during the life of the consent (e.g. a Failure Modes and Effects Assessment); and
- apply judgment as to what remedial works need to be undertaken to meet the requirements of Condition 19.

[1] Sill 1 corresponds to the control weir at the top end of the tailrace weir and chute structure.

5 Comments on Required Work Activities in Condition 20

5.1 Reinstatement of Displaced Riprap

5.1.1 Modified Definition of Work Activity

The current definition of this work activity (item i in Condition 20(a)) is ambiguous.

As discussed in Damwatch (2026a) and Damwatch (2026b), the rock lining of the tailrace chute in Bays 2 to 7 was subjected to readjustment by water flows during early operations of the structure in 1977. No movement of the rock lining was observed in Bay 1 as the boulders forming the lining were very large and therefore resistant to mobilisation. After this period of initial operation, the rock lining was observed to have formed a tight and stable mosaic pattern.

The two scour failures which occurred downstream of Sills 5 and 9 (see Figures 6 and 7 in Damwatch 2026a) during early operation of the structure were successfully repaired and the structure continued to function satisfactorily as an energy dissipator till it was submerged by Lake Pūkaki in late 1978.

In view of the extensive movement of the rock lining during early operations of the structure, the current definition of this repair activity could be construed as implying reinstatement of the whole of the rock lining on the tailrace chute. We recommend rewording and tightening of the description of the work activity to "*reinstatement of any damaged areas of the rock lining of the chute*". This revised description is consistent with Sections 3.2.1.4 and 3.2.2.4 of WSP (2026c) which refers to areas of missing riprap.

5.1.2 Extent of Repairs

The limitation of the draft consents to being able to draw down the level of Lake Pūkaki to a minimum level of RL 513 m means that only Bays 1-4 between Sills 1 and 5 could be exposed to the highly turbulent mountain stream type flow seen in Figures 2 and 3 of Damwatch (2026b).

The high-quality bathymetric imagery of the tailrace weir and chute structure contained in Appendix C of Damwatch (2026a) provides a good picture of the current condition of the rock lining of the chute in all bays including Bays 1-4.

The condition of the rock lining is summarised in Section 4.2.2 of Damwatch (2026a). It was noted that:

- within Bay 3, there appears to be areas of large riprap material (as large as the material in Bay 2) interspersed with patches of smaller material; and
- within Bay 4, larger riprap material continues to be present in clusters with smaller material filling the gaps, and there also appear to be some unknown 'smooth' patches (see Figure 2 of Damwatch (2026a)).

Closer inspection of the apparent 'smooth' patches in the digital images indicates that these patches do in fact incorporate smaller riprap material, possibly covered in some deposited silt (which makes these patches look smooth when hard copy images are viewed).

The extent of any reinstatement work on the chute lining is therefore likely to be limited at most to a small number of selected areas within Bay 4 and possibly Bay 3. This would need to be confirmed

by a targeted dive inspection of the chute lining in these bays based on detailed examination of the bathymetric images contained in Appendix C of Damwatch (2026a).

The definition of the extent of the repair works covered by this activity would need to be determined by the SQEP.

5.1.3 Implementation Methodology

Reinstatement of any damaged areas of the chute lining would need to be implemented as follows:

- The repair activity would need to be undertaken with Tekapo B Power Station shut down so that the tailrace weir and chute structure was not passing any water. However, the repair works could be carried out with the tailrace weir and chute structure remaining partially submerged.
- To allow visibility for the placement of rock boulders, the level of Lake Pūkaki would need to be drawn down to within 1 m of sill level on Sill 3 for Bay 3 (i.e. lower than RL 515.87m) and within 1 m of sill level on Sill 4 for Bay 4 (i.e. lower than RL 514.14m). This requirement is similar to the condition imposed by the draft consent for the placement of riprap wave protection on the upstream face of the Pūkaki Dam.
- A temporary work platform, set slightly above current lake level, would need to be constructed on one side and parallel with the tailrace chute to allow excavators to work in the dry and place additional rock boulders to repair the chute lining. The platform would need to be constructed from clean earth-fill material. The excavator would need to be a long-reach one to enable the full width of the chute to be accessed for lining repairs.
- Materials for the repair works would need to be stockpiled. This includes materials to construct the work platform and the suitable rock riprap material.
- Following the completion of the chute lining repairs to the satisfaction of the SQEP, the temporary work platform would need to be removed.

Prior to the implementation of these repair works, a detailed construction methodology and management plan would need to be developed and approved by the SQEP in consultation with Genesis Energy. The plan would need to meet appropriate environmental standards for managing the short-term effects of construction in an aquatic environment (e.g. silt dispersal due to placement of earth-fill materials in water, or toxicity of proprietary construction materials/products to aquatic life). A discharge to water permit is likely to be required, similar to what will be required for the armouring works to be undertaken at the Pūkaki High Dam.

5.1.4 Likely Duration of Chute Lining Repair

The likely duration of chute lining repairs should only be a few days (at most less than a week), so long as the required repair materials were stockpiled in close proximity to the tailrace weir and chute structure and the areas targeted for repairs were clearly defined beforehand. Additionally, the lake level would need to remain below this threshold for the duration of the works, with the understanding that the lake will not be deliberately held at a low level solely to facilitate completion.

We note the repairs to the large scour hole that developed at Sill 9 during the first two weeks of operation of the tailrace weir and chute structure under conditions of full power station load were completed within 8 hours after Tekapo B Power Station was temporarily shut down (Malan &

Hancock, 1979). At the time, repair materials (gravel fill material and rock riprap material) were purposely stockpiled on site to enable such repairs to be rapidly carried out at short notice.

5.2 Concrete Repairs

5.2.1 Scope and Extent of Concrete Repairs

Condition 20(a) of the consent lists the repairs to be carried out on the concrete and embedded steel elements (items ii, iii and iv). The scope of these repairs warrants more precise definition:

- to target them towards those elements of the tailrace weir and chute structure which would be exposed to significant hydraulic loads at lake levels between RL 518 and 513 m (i.e. Sills 1, 2, 3 and 4[2]); and
- to align any repair strategy with the functionality provided by the concrete and embedded steel, and the severity of the defect/damage observed on the concrete.

The information from the previously completed dive inspections does not present a complete picture of the concrete defects/damage for the following reasons:

- The scope of the dive inspections was limited by the turbidity and flow in the channel at the time of the inspections, and the area of concrete elements that could be closely observed in the duration of the dive inspection. Additionally, much of the concrete was covered by a film of underwater biological growth and could not be inspected effectively.
- Isolated occurrences of concrete defects/damage at a few locations appear to have been interpreted (by WSP) as a generally widespread condition of the concrete elements in the tailrace channel, thereby affecting their ability to withstand structural actions. There is no correlation of the observed concrete defects/damage with the observed performance of the structure or anticipated structural actions when the lake level has been lowered.

Before applying an effective repair strategy for the concrete, it is necessary to investigate the reasons for the defects, so that any repair strategy is effectively implemented. The treatment of construction defects is not considered necessary unless the defect has compromised structural integrity and strength (i.e., it is not necessary if it does not go to the purpose of the RSAWP as set out in Condition 19). Concrete damage resulting from hydraulic actions, riprap impact, or foundation deformation and consequent settlement/misalignment of the concrete structures would need appropriate repair strategies, depending on the cause of concrete damage.

Further Investigation of Concrete Defects/Damage

In our opinion therefore, a more thorough investigation of the concrete defects/damage, and the causes thereof, is necessary before devising repair solution(s) for the concrete or embedded steel elements. The identified causes of the concrete defects/damage would then need to be carefully examined to determine the impact of the defects/damage on structural integrity, stability, and

[2] Rib 1 corresponds to the control weir at the top end of the tailrace weir and chute structure.

strength, and overall performance of the concrete structures. In our opinion the conditions should provide for this.

5.2.2 Implementation of Concrete Repairs (Item ii)

Underwater Repair

Underwater repair of concrete in flowing water is very challenging and inherently unsafe and is rarely adopted in the dam and hydropower industry.

If the repair is carried out in flowing water, the effectiveness of the repair is likely to be limited because some of the repair materials will invariably be washed out by the flow. This work is also unsafe for the dive crew undertaking the repair.

Underwater repairs are generally undertaken by creating still-water conditions in the channel by isolating/ shielding the work area. This generally requires the creation of a “compartment” in the channel in which water doesn’t flow. Most of the concrete/steel repair products on the market (largely proprietary products) have been developed for application in still-water conditions. The effectiveness of these repair products is limited by the skills, experience and workmanship of the dive crew involved in repair activity.

Dry Repair

An alternative to working in a wet environment is working in the dry under conditions of a lowered lake level. The lake level would need to be significantly lower than the sill level on each sill beam to achieve effective repairs.

Likely Duration of Concrete Repairs

The duration of repairs on the weir and sill numbers 1 to 4 will likely require several weeks, assuming that contractors are skilled and experienced in the nature of the work. If the selected contractor is not sufficiently experienced, and management of seepage in the dry work areas is an issue, then the repair duration is likely to be longer.

5.2.3 Repairs to Exposed Steel Bars/Reinforcement (Item iii)

The exposed steel bars (referred to as reinforcement in the WSP and consent documentation) that were used as formers for second stage concrete for the weir and sills, can be repaired by applying proprietary protective coatings in a wet or dry environment. Depending on the product selected and applied, further protection of the bars by providing a concrete “cover” may or may not be necessary. In a wet repair environment, the repair may be possible if a suitable product is available on the market. However, the application of such products in a wet environment is likely to require a very high standard of skill and workmanship and should preferably be carried out by professionals trained in wet application of the product.

The work can be carried out after thorough investigation and documentation of the areas where such protection is required.

Likely Duration of Repairs to Steel Bars

If the repairs to steel bars are carried out in wet conditions, the quality and effectiveness of the repairs is very likely to be lower than that of repairs carried out in a dry environment. For this

reason, the estimation of repair duration assumes that the steel bars are repaired in a dry environment (also refer Section 5.2.5).

Assuming that not more than 30% of the steel bars are exposed on any sill, the repairs to exposed steel bars can be carried out in 2 to 3 days for each sill. The overall duration for the repair activity, however, will include the creation of dry work areas and management of seepage (if any). For implementing the repairs on the weir and sill numbers 1 to 4, the overall duration is likely to be 4 to 6 weeks.

5.2.4 Installation of Steel Dowels (Item iv)

The requirement in consent condition 20 to drill new steel dowels from the top of any sill is very challenging, difficult and unsafe if implemented by a dive crew. This is because in order to penetrate the lift joints in the sills and provide positive and reliable connections between the two stages of concrete, the length of the new dowels will need to be at least 2.0 m for the weir and 1.2 m for the downstream sills. Drilling holes of these lengths will be extremely challenging and impractical with hand-held equipment (by construction crews) either in wet or dry environments and hence, a suitable drilling rig will need to be positioned on the top of the sill.

The drilling activity and installation of steel dowels will need the creation of a temporary platform or sand/gravel berm, for positioning of the rig. The dowels will need to be installed in a dry environment unless very specialist anchor dowels with central bore for grout injection are installed.

It may also be possible to mobilise a rock bolting machine rig[3] which has capabilities for drilling holes, installing anchor bars, and grouting the anchor in a sequential operation. Such machines are very quick and can be used to complete anchor (dowel) installation in a short duration. However, they are expensive machines, and most contractors may not have one at their disposal unless anchor bar installation is their core business.

Likely Duration of Dowel Installation

Once the dry work area has been created, the installation of dowels on a single sill can be carried out in about a week if done manually, and in about 2 to 3 days if done with mechanised equipment (i.e., rock bolting rig). Additionally, a significant amount of time will likely be required in preparatory activities such as earthmoving, setting up equipment, and maintaining a dry work environment.

[3] Also called rock bolting jumbos, these are very specialist machines deployed for anchor installation in rock. They can also be used for installing anchor bars in concrete. Refer the following links for more information:

- Rock bolting rigs | Epiroc
- HT92 Hydraulic Bolting Jumbo Video | Drilling Equipment
- Sandvik DS312 Mechanized Bolter - YouTube

For installing dowels on the weir and sill numbers 1 to 4, the total duration of dowel installation activity is likely to be at least 4 to 6 weeks if performed with ordinary equipment but may be compressed to less than 3 weeks if specialist mechanised equipment is deployed.

5.2.5 Indicative Duration of Concrete Repairs

The preceding discussion indicates that, while some limited repair activities may be technically possible in a wet environment, the concrete repairs and dowel installation contemplated by Condition 20(a) would require a level of access, surface preparation, drilling accuracy, grouting control, curing, inspection and quality assurance that is unlikely to be achievable reliably underwater. For this reason, the indicative programme durations presented below assume that these works are undertaken in a dry working environment created by temporary isolation, dewatering and/or sufficiently low lake levels.

Once the dry working environment has been created, the repairs to defective/damaged concrete (item ii), exposed steel bars (item iii), and installation of anchor dowels (item iv), can be carried out as sequential activities without any gap except durations necessary for curing of repair materials. The likely sequence and possible overall duration is anticipated as follows:

- Detailed investigation and mapping of concrete/steel defects/damage (1 to 2 weeks):
  - 2 weeks if carried out in wet environment.
  - 1 week if carried out in dry environment.
- Preparatory Work (3 to 6 weeks):
  - Planning and design of repair works.
  - Selection of repair products and methodology.
  - Procurement activities (materials, services, contractors).
- Repair Implementation (8 to 12 weeks):
  - Creation of dry work environment (with management of seepage) – 3 weeks.
  - Thorough cleaning of concrete structures – 1 week.
  - Repairs to exposed steel bars and concrete defects/damage (almost parallel activities)
    - Steel bars (4 to 6 weeks)
    - Concrete (6 to 8 weeks)
- Dowel installation (4 to 6 weeks) – to be implemented only after completion of repairs to exposed steel bars and concrete defects/damage.
- Total repair duration (Items ii, iii, and iv) = 16 to 26 weeks.

While these estimates are based on engineering experience and judgement, actual programme durations will need to be confirmed through detailed planning that considers resourcing, available working windows, plant capability, construction methodology, and site constraints.

5.3 Item v of Condition 20(a)

Item v of Condition 20(a) requires the "*investigation of unusual sill beam survey results and potential cracking*". This stems from WSP's review of Damwatch's condition assessment report (Damwatch 2026a) on the tailrace weir and chute structure and the summary of bathymetric survey data provided by the drawings in Appendix C of that report.

Table 1 of WSP (2026c) notes differences in levels between the left side, centre and right side of the sill beams of the structure of the order of tens of millimetres on Sills 2, 3, 5 and 9. WSP's report

postulates that these differences could possibly be due to ground deformation or settlement under the beam with the consequential potential for cracking of the unreinforced beams.

This postulation ignores:

- any potential inaccuracies in the bathymetric survey data; and
- the rough and ready nature of the construction of sill beams (Malan & Hancock, 1979) (MWD, undated-c).

Confirmation of any structural deformation and cracking of the identified sill beams can be easily addressed by a targeted dive inspection. Any inspection would only need to cover Sills 2 and 3 as other downstream sills will not be exposed to hydraulic loads if the draft consent is exercised.

5.4 Item vi of Condition 20(a)

Item vi of Condition 20(a) requires the "*removal of silt and vegetation or detailed inspection and concrete testing*". It is unclear what the first part of this item means unless it should read "*removal of silt and vegetation for detailed inspection"*.

Any further dive inspections need to be targeted based on the available high-quality bathymetric imagery and previous dive inspections. Silt removal will only be needed if existing silt deposition prevents observations being made about significant cracking of deformation of concrete elements.

The available bathymetric imagery does not seem to indicate any plant growth, only biological growth on concrete surfaces. Removal of biological growth in conjunction with removal of silt would allow unhindered observations of the condition of concrete elements. However, it should only be applied in a targeted manner.

The need for concrete testing has not been demonstrated by WSP in their advice to Genesis. It would be extremely difficult to obtain a concrete core sample when the structure is submerged. The need for this item is best left to the discretion of the SQEP.

6 Commentary on Condition 22

Condition 22 sets out a requirement for the works identified in the RSAWP to be completed in accordance with the RSAWP "… *no later than 12 months following the commencement of the consent* ..". The ability to meet this requirement depends entirely on favourable hydrological conditions over the preceding summer and autumn. In view of the high lake levels experienced over the recent summer period, reflecting the wetter than normal inflow conditions, the likelihood of the level of Lake Pūkaki trending down towards RL 518 m is very low.

In our opinion, this condition should be modified to allow the identified works in the RSAWP to be completed in accordance with the RSAWP any time within the duration of the draft consent, as lake level conditions allow.

7 Summary

Key observations and recommendations on draft Conditions 20 and 22 are

- The works required under Condition 20 would likely take a significant time to complete. It would require the level of Lake Pūkaki to be drawn down below sill level of sill beams 1-4 for

the duration of the works. The likelihood of favourable hydrological conditions prevailing (i.e. low lake levels and low inflow conditions) to enable the repair works to be practically carried out on any of the sill beams before the lake level starts to rise again is very low.

- The present wording of Condition 20(a) reflects the view of WSP and Genesis that remediation of all defects on the concrete elements of the tailrace weir and chute structure is essential. We recommend alternative wording that allows the SQEP the ability to consider all available and relevant information in preparing the RSAWP (including that obtained by Meridian), discretion to undertake further targeted investigations and assessments in developing the RSAWP and discretion in determining what repair works need to be included in the RSAWP.
- The wording of item i in Condition 20(a) needs to be refined and tightened to state: "*reinstatement of any damaged areas of the rock lining of the chute*". This removes any ambiguity from the current wording and allows this repair activity to be targeted towards those areas where the chute lining is potentially deficient.
- The likely duration of chute lining repairs should only be a few days so long as the required repair materials are stockpiled in close proximity to the work site.
- Item v of Condition 20(a) requires the "*investigation of unusual sill beam survey results and potential cracking*". Confirmation of any structural deformation and cracking of the identified sill beams can be easily addressed by a targeted dive inspection. Any inspection would only need to cover Sills 2 and 3 as other downstream sills will not be exposed to hydraulic loads if the draft consent is exercised.
- Item vi of Condition 20(a) requires the "*removal and silt and vegetation or detailed inspection and concrete testing*". It is unclear what the first part of this item means unless it should read "*removal of silt and vegetation <u>for</u> detailed inspection"*. Removal of biological growth in conjunction with removal of silt as part of any targeted dive inspection would allow unhindered observations of the condition of concrete elements.
- The need for concrete testing has not been demonstrated and is best left to the discretion of the SQEP.
- Repairs to the concrete and embedded steel elements (items ii, iii and iv of Condition 20(a)) warrant more precise definition. They need to be targeted towards those elements of the structure which would be exposed to significant hydraulic loads under the draft consent. They also need to align with the functionality provided by the concrete and embedded steel, and the severity of the defect/damage observed.
- Further targeted investigation of concrete defects/damage is recommended before any repair solutions are devised, taking into consideration the impact of the defects/damage on structural integrity, stability, and strength, and overall performance of the concrete structures.
- Underwater concrete repairs in this context may be possible but would best be carried out in the dry. This work would require the lake level to fall significantly below the level of each sill before the work could be undertaken, and remain at that level for the duration of the repairs. It would also require the shutdown of Tekapo B Power Station for the duration of the work.
- Installation of new dowel bars in Sills 1, 2, 3 and 4 (item iv in Condition 20(a)) would be very challenging underwater and would best be carried out in a dry environment. This work would also require the lake level to fall below the level of each sill before the work could be undertaken, and remain at that level for the duration of the installation. It would also require the shutdown of Tekapo B Power Station for the duration of the work.
- Condition 22 needs to be modified to allow the identified repair works in the RSAWP to be completed in accordance with the RSAWP any time within the duration of the draft consent.

8 Reference Documents

The following documents are referenced in this memorandum:

Technical memoranda previously prepared by Damwatch Engineering for Meridian Energy

Damwatch (2026a). *Tekapo B Power Station Tailrace Weir and Chute – Condition Assessment and Review of Bathymetric Survey Data*. Technical memorandum dated 19 March 2026

Damwatch (2026b). *Pūkaki Fast-Track Application: Review Panel Overview Conference Summary Memorandum – Tekapo B Power Station Tailrace Weir & Chute.* Technical memorandum dated 25 March 2026

Damwatch (2026c). *Pūkaki Fast-Track Application: Tekapo B Power Station Tailrace Weir & Chute - Response to Questions from Review Panel*. Technical memorandum dated 28 April 2026.

Technical memoranda previously prepared by WSP New Zealand for Genesis Energy

WSP (2025a). *Tekapo Submerged Weir Bathymetric Survey and Hydraulic Assessment*. Report final version 3 dated 19 December 2025.

WSP (2025b). *Tekapo B Weir Assessment – Summary of Findings*. Technical memorandum final revision 2 dated 19 December 2025.

WSP (2026c). *Tekapo Submerged Weir – Structural Condition Assessment*. Report version 3 dated 25 March 2026

WSP (2026d). *Tekapo B Power Station Submerged Weir – Damwatch Document Reviews*. Technical memorandum final version dated 26 March 2026.

Other references

Damwatch. (2025a). *Tekapo B Power Station Temporary Tailrace Weirs and Rock Chute: Hydraulic Review of Weir and Chute.* Report prepared for Meridian Energy by Damwatch Engineering, Issue 3.1, Ref. E2567, 28 October 2025.

Damwatch. (2025b). *Tekapo B PS Temporary Tailrace Weir and Rock Chute: Hydraulic Review of Weir and Chute - Addendum Report.* Technical Memorandum prepared for Meridian Energy by Damwatch Engineering, Ref. E2567, 5 December 2025.

Malan, D. J., & Hancock, B. L. (1979). Construction and Performance of the Rock-Lined Chute at Tekapo B Power Station. *Proc, Instn, Civil Engrs.*, Part 1, Vol, 66, pp 667-677.

MWD. (1979). *Tekapo B Temporary Tailrace Design Report.* Power Divsion, File 92/12/77/42, 29 June 1979.

MWD. (undated-a). *Tekapo B Power Station: Temporary Tailrace - Specification HD 1147.* Power Division, File 92/12/77/39.

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Document history and status

Issue no.	Issue date	Description	Prepared by	Reviewed by	Approved by
1	2026-06-18		VL & GW	DCE	DCE