High Flow Management Plan (Draft)

Lake Takapō / Tekapo High Flow Management Plan

Purpose

The purpose of this High Flow Management Plan (**HFMP**) is to document how the flows via structures controlled by Genesis Energy Ltd (**Genesis**) (Tekapo Intake structure, Lake Tekapo Control Structure (**Gate 16**), Tekapo A and B Power Stations, Lake George Scott weir and Gate 17) will be managed to reduce lake levels as required by Schedule One of CRC240290 and CRC240291 and to protect the integrity of the Tekapo Power Scheme structures during periods when inflows to Lake Takapō / Tekapo raise the lake level above the maximum lake level specified in Schedule One 1(a) of CRC240290 and CRC240291.

Maximum Control Level

1. When the level of Lake Takapō / Tekapo exceeds the maximum lake level specified in Table 1 during the relevant period, the Tekapo Power Scheme will be operated in accordance with this HFMP so as to return the level of the lake to the maximum lake level specified (or less).

Table 1: Maximum Control Level

Period	Lake Level (metres above sea level)
March	710.00
April	710.30
May	710.60
June and July	710.90
August	710.30
September to February (inclusive)	709.70

Design Flow

2. The design flow for the Tekapo Power Scheme structures are listed in Table 2.

Table 2: Design Flow of Tekapo Power Scheme Structures

Location	Design Flow (m3/s)
Gate 16	850
Gate 17	130
Lake George Scott Control Weir	600

Combined Total Discharge Flow

3. When lake levels are above the maximum lake level specified in Table 1 the Combined Total Discharge Flow (Tekapo A Power Station (via the Tekapo Intake Structure) plus Gate 16) shall not be less than the value given in Table 3:

Table 3: Combined Total Discharge Flow

Height above MCL (m)	Combined Total Discharge (m3/s)
0.0	60
0.2	110
0.4	125
0.6	165
0.8	190
1.0	215
1.2	240
1.4	265
1.6	295
1.8	320
2.0	345
2.2	370
2.4	395
2.6	425
2.8	450
3.0	475
3.2	500
3.3	515
3.4	525
3.5	535
3.6	550
3.7	560
3.8	575
3.9	585
4.0	595
4.1	610
4.2	620
4.3	635
4.4	645
4.5	655

4. The values in Table 3 are minimum discharge requirements; Genesis may discharge in excess of these requirements.

Initial Discharge Steps

5. The initial discharge to the Lower Takapō / Tekapo River from Lake George Scott (over the Lake George Scott weir) must not exceed a maximum rate of 20 m^3/s for a period of not less than six hours.

6. The second discharge step to the Lower Takapō / Tekapo River from Lake George Scott (over the Lake George Scott weir) must not exceed a maximum rate of 45 m^3/s and must not be increased for at least three hours.

7. Unless lake levels are 0.4 m or more above the maximum control lake level specified in Table 1, further increases in discharges below the Lake George Scott weir must ensure that:

    (a) The maximum increase in flow at each gate change must not exceed 20 m^3/s; and

    (b) There must be at least one hour between gate changes.

8. Gates may be required to be operated in advance of the MCL being reached to meet the required Combined Total Discharge Flow and/or if the lake level is rising rapidly, and/or if there are significant inflows forecast.

Recession

9. On a falling lake the Combined Total Discharge Flow shall be progressively lowered only if the estimated inflow is lower than the next scheduled discharge.

10. The discharge to the Lower Takapō / Tekapo River from Lake George Scott (over the Lake George Scott weir) must be reduced at a maximum rate of 20 m^3/s per hour.

11. When the discharge over the Lake George Scott weir is at or below 20 m^3/s, the following minimum flows over the Lake George Scott weir must be maintained to simulate natural recession of the Lower Takapō / Tekapo River:

    - Step One: 20 m^3/s for 24 hours;
    - Step Two: 12 m^3/s for 24 hours;
    - Step Three: 5 m^3/s for 24 hours;
    - Step Four: 2 m^3/s for 48 hours; and
    - Step Five: cease flow over Lake George Scott weir.

General Provisions

12. Should it be required to use the Lake George Scott weir when Lake Takapō / Tekapo is below the maximum control lake level specified in Table 1, then Lake George Scott weir must be operated within the provisions set out in this HFMP.

13. Reasonable endeavours must be taken to operate Gate 16 and Gate 17 to minimise the rate of change of flow down the Lower Takapō / Tekapo River to manage flow fluctuations.

Notification Procedures

14. When it is anticipated that the Initial Discharge Steps of this HFMP will be implemented, 24 hours advanced written and/or verbal notice of the intention to exercise the necessary rights within this HFMP shall be given to:

    a. [Waitaki Rūnaka] – [Titles]

    b. Canterbury Regional Council [Titles RMO + Flood controllers/River Engineers]

    c. Department of Conservation, Twizel – [Titles]

Review

15. This HFMP will be reviewed at intervals of not more than 10 years by a suitably qualified and experienced person(s).

16. Any amendments to this HFMP will be provided to the Canterbury Regional Council for certification, following consultation with Canterbury Regional Council, and the operators of the Waitaki Power Scheme.

Fish Salvage Management Plan

Dated: 13 December 2023

Sports Fish Salvage Management Plan for the Tekapo Power Scheme

Background

The Tekapo Power Scheme (**TekPS**) operates within sports fish habitat. Sports fish, especially brown and rainbow trout, migrate from Lake Takapō into and within the scheme under regular generation and during alternative operational practices. When alternative operations occur within the scheme, sports fish may be subject to temporary and ongoing stranding and sports fish mortalities can occur. However, overall, the TekPS provides one of the most popular and successful sports fisheries in New Zealand and this Sports Fish Salvage Management Plan (**FSMP**) is viewed in that context.

The FSMP was developed by Genesis Energy Limited (**Genesis**) and Central South Island Fish & Game Council (**CSIFGC**) and is provided for in the Agreement in relation to the Tekapo Power Scheme between Genesis and CSIFGC dated [7/02/24] (**Agreement**) in recognition of the significant value of the canal sports fishery. The Agreement identifies that Genesis is responsible for sports fish salvage and the funding for it). The FSMP is subject to, and governed by, the provisions in the Agreement. Through application of the FSMP, CSIFGC and Genesis are assured that sports fish are salvaged, handled, and released in a timely and efficient manner to provide for both the health of fish that are stranded, and for the return to normal power scheme operations.

Observations and monitoring of stranding events have informed the development of this FSMP. CSIFGC produced a summary report (Adams, 2021) of outcomes of sports fish salvage for the period 2013-2021 undertaken as a result of sports fish stranding in the TekPS. The FSMP aims to ensure sports fish are relocated to permanent water promptly after flow events specified in clauses 1 to 7 of the FSMP. Sports fish stranding may occur during other events and ongoing communication between CSIFGC and Genesis required by the Agreement will provide for timely and efficient salvage. Significant stranding event responses relate to four locations specified in clause 2.2 below. These have been distinguished based on the numbers of fish identified as being potentially stranded and the safety issues associated with anglers attempting to catch them. Sports fish salvage may also be required at other locations on an as agreed basis, recognising the significant benefits of the canal fishery.

The FSMP is intended to be an adaptable document and CSIFGC and Genesis must review the FSMP at least once every 5 years as part of the relevant annual meeting as provided for in clause 8.2 of the Agreement. Ongoing stranding monitoring and salvage operation reporting will further inform the types of flow-release events that cause stranding events of sports fish that necessitate salvage.

This FSMP does not apply:

- In the event that permanent flow regimes are imposed upon Genesis for affected waterways within the New Consents as defined in clause 6.1 of the Agreement, Fish and Game and Genesis will meet to determine if any form of varied FSMP is required, and if so, will develop it in a timely manner;
- To the extent it is inconsistent with Genesis' compliance with its consent condition requirements (including but not limited to recreational releases) and operation of the Tekapo Power Scheme within statutory and regulatory requirements, but the FSMP will reapply as soon as reasonably practicable after such requirements and Genesis will promptly notify Fish and Game of such requirements occurring.

- In the event of mechanical or system failures; unforeseen maintenance, repairs or upgrades, flood events/management and/or any operational or management response to protect human health and safety or prevent damage to structures, but the FSMP will reapply as soon as reasonably practicable after such events and Genesis will promptly notify Fish and Game of such events occurring.

Genesis will engage in consultation with CSIFGC a suitably experienced person(s) (the **Salvage Contractor(s)**) to undertake salvage required by the FSMP. If CSIFGC is the Salvage Contractor, the costs for its work are set out in **Schedule 3**. At its discretion and cost CSIFGC may take part in any sports fish salvage operation under this FSMP but shall not hinder the Salvage Contractor for delivering the requirements of Genesis' consent conditions.

Salvage details

1. **Extended Flow Event**
   1.1. Extended Flow Events are defined as any single or multiple flow releases having:
      (a) Flows of 13 m^3/s* or greater released from Gate 16 on 40 or more days of any 60-day period; or
      (b) Overall average daily flow released from Gate 16 exceeds 50 m^3/s for any continuous 25-day period; or
      (c) Spill flows occur over the George Scott weir exceeding 15 days in any 30-day period.

      *As measured by the half-hourly compliance flow in the Genesis Hilltop Hydrology system.

   1.2. Genesis is not required to notify CSIFGC and the Salvage Contractor of any flow event that either will not or is not anticipated to meet the definition of an Extended Flow Event under clause 1.1.

   1.3 Genesis will notify CSIFGC and the Salvage Contractor:
   a) at commencement of any flow events anticipated to qualify as an Extended Flow Event as defined in clause 1.1, and of the expected duration of the flow event.
   b) Within 2 days, that a flow event has qualified as an Extended Flow Event, and the expected remaining duration of the flow event.
   c) Of the cessation of an Extended Flow Event within 12 hours.
   d) In October each year or on request of CSIFGC of the scheduled recreational flow releases for the coming season.

1.4. Genesis will use reasonable endeavours to notify CSIFGC and the Salvage Contractor:

      (a) The date and time of predicted Extended Flow cessation (where practicable), including as relevant 5 days in advance and again between 1 to 2 days before cessation.**
      (b) Any predicted temporary cessation** of an Extended Flow Event whereby the cessation will be of a duration exceeding 48 hours.

      **Cessation is often not known in advance and commissioning of plant often requires intermittent and changing flow.

   1.5. If an Extended Flow Event ceases and a further Extended Flow Event is expected within 30 days, the parties will consult to determine the best times to isolate Gate 16 to enable sports

fish salvage and review in good faith the management of top-up flows to determine if these can be operated during the interim period to minimise ongoing stranding, taking into account Genesis' operational requirements.

2. **Significant Stranding**

For avoidance of doubt, Significant Stranding is a measure of sports fish numbers and is independent of the defined Extended Flow Event under clause 1.1.

2.1. A Significant Stranding occurs when:

(a) a recorded observation by CSIFGC or Genesis staff on regular inspection duties after an Extended Flow Event identifies the number of sports fish at one or more of the locations in clause 2.2 as being at or above the numbers set out in **Schedule 1**; and

(b) CSIFGC or Genesis notify the other party in writing of the recorded Significant Stranding and its location(s).

2.2. The locations where a Significant Stranding in clause 2.1 may be identified, and responded to, are (Refer to **Schedule 2** map):

(a) Gate 16 stilling basin.

(b) Upper Takapō River, Area 1 to Canoe Course.

(c) George Scott weir stilling basin.

(d) Lower Takapō River, Area 6.

2.3. To avoid doubt, the trigger numbers in clause 2.1 apply independently to each named location. Triggering salvage in one area does not necessitate a salvage response in another (or all) areas. For example, a trigger in Area 1 to Canoe Course and providing for salvage in that area does not necessitate the pump down of the Gate 16 stilling basin unless that trigger number in clause 2.1 is also met or exceeded.

3. **Pump down at the Gate 16 stilling basin and/or George Scott weir stilling basin**

3.1. Following:

(a) an Extended Flow Event as defined in clause 1.1 and using reasonable endeavours before Lake George Scott top-up flows recommence, or

(b) on notification of a Significant Stranding as defined in clause 2.1 at the Gate 16 stilling basin and/or George Scott weir stilling basin:

Genesis will confirm the date for pump down with the Salvage Contractor and notify the contractor of the date and time that Gate 16 will be isolated for safety and when riverbed salvage can commence. Following that:

(c) Subject to clause 3.1 Genesis will:

i. undertake any pump down within 10 working days of cessation of an Extended Flow Event or notification under clause 2.1 (unless otherwise agreed with CSIFGC); and

ii. pump down Gate 16 stilling basin and/or George Scott weir stilling basin to facilitate Salvage Contractor access;

iii. ensure the pump intake has a porous screen with open spaces no greater than 20mm to prevent sports fish entering the pump.

(d) The Salvage Contractor will complete salvage following pump down and notify Genesis in accordance with clause 8.2 – clause 8.4 and will also let the Genesis Tekapo contact

know when salvage is complete (where any salvage overlaps with salvage under clause 4.1 the Salvage Contractor will use reasonable endeavours to undertake a combined salvage operation for clause 3.1 and clause 4.1 within 24 hours);

(e) From the time Gate 16 stilling basin is pumped down to an agreed level appropriate to successfully facilitate electric fishing, isolate Gate 16 for up to 24 hours to enable salvage. If time beyond this is requested by the Salvage Contractor, Genesis will consider further isolation pending operational, health and safety, or consent requirements;

(f) Gate 16 will only be isolated and Lake George Scott top up flows disabled for a maximum of 5 days at a time;

(g) The Salvage Contractor will use reasonable endeavours to complete riverbed salvage prior to Gate 16 stilling basin salvage to enable Gate 16 isolation time to be minimised; and

(h) The Salvage Contractor will report in writing the outcome of salvage to Genesis and CSIFGC, including number of live, dead, and remaining sports fish within 20 working days of completing salvage.

4. **Sports fish salvage at Upper Takapō River, Area 1 to Canoe Course and Lower Takapō River, Area 6**

4.1. Following an Extended Flow Event under clause 1.1 or notification of a Significant Stranding under clause 2.1 for any salvage in the Upper Takapō River, Area 1 to Canoe Course or the Lower Tekapō River, Area 6:

(a) Genesis will confirm the date and time for salvage in consultation with CSIFGC and the Salvage Contractor. For Area 1 to Canoe Course the salvage shall align with 3.1(g) should a pump down and salvage of Gate 16 stilling basin and/or George Scott weir stilling basin also be occurring;

(b) Where any salvage overlaps with salvage required under clause 3.1 the Salvage Contractor will use reasonable endeavours to undertake a combined salvage operation under clause 3.1 and 4.1 within 24 hours from the time the Gate 16 stilling basin is pumped down to the agreed level;

(c) For salvage within Area 1 to Canoe Course, Gate 16 must be isolated and the provisions in clause 3.1(f) to (g) shall apply as relevant;

(d) if an agreed time for sports fish salvage in Area 1 to Canoe Course is not attended by the Salvage Contractor, future isolation of Gate 16 is not required for the same event unless safety and operational requirements can be met;

(e) The Salvage Contractor will adhere to all requirements outlined in accordance with clause 8.1 – 8.4 (Safety) and will also notify Genesis immediately upon completion of salvage; and

(f) The Salvage Contractor will report in writing the outcome of salvage to Genesis and CSIFGC, including number of live, dead, and remaining sports fish within 20 working days of completing salvage.

5. **Sports fish salvage at Upper Takapō River, Area 1 to Canoe Course and Lower Takapō River, Area 6 to be completed by Genesis subject to Clause 5.**

5.1. Following an Extended Flow Event under clause 1.1 or notification of a Significant Stranding under clause 2.1 for any salvage in the Upper Takapō River, Area 1 to Canoe Course or the

Lower Takapō River, Area 6, subject to clause 5, Genesis will engage the Salvage Contractor to complete salvage as follows

(a) In accordance with clause 3.1(c), Genesis will revise and advise the date and time for salvage in consultation with the Salvage Contractor.

(b) Genesis will notify CSIFGC.

(c) The Salvage Contractor will report in writing the outcome of salvage to Genesis and CSIFG, including number of live, dead, and remaining sports fish within 20 working days of completing salvage.

6. Stranding events at the Tekapo A draft tube and the Tekapo Canal

6.1. Subject to any dewatering (pump-out) of the Tekapo A Power Station draft tube, salvage will occur as follows:

(a) Genesis to notify CSIFGC and the Salvage Contractor at least two working days before commencement of pump-out.

(b) Genesis will engage the Salvage Contractor to salvage sports fish and relocate to the Tekapo Canal subject to the method of fish salvage to be developed by Genesis in consultation with CSIFGC.

(c) The Salvage Contractor will report the outcome of salvage, including number of live, dead, and remaining sports fish to Genesis and CSIFGC within 20 working days of completing.

(d) CSIFGC in consultation with Genesis may request presence of CSIFGC staff to collect information to assist with fishery management, e.g. fish species, size and tag recapture information but shall not hinder the Salvage Contractor for delivering the salvage requirements. This would be at no cost to Genesis.

6.2. Any dewatering of the Tekapo Canal requires:

(a) Genesis to provide a canal salvage management plan to CSIFGC for comment 2 weeks ahead of commencing salvage.

(b) Any comments made by CSIFGC on the canal salvage management plan shall be considered by Genesis, and if not accepted, reasons shall be provided and further consultation with CSIFGC will take place.

(c) The Salvage Contractor will complete salvage in accordance with the canal salvage management plan.

(d) The Salvage Contractor will report the outcome of salvage, including number of live, dead, and remaining sports fish, and other fish statistics to Genesis and CSIFGC, within 20 working days of completing salvage.

7. Relocation

Any sports fish that are salvaged shall not be relocated to any areas where there are projects or measures are in place to exclude sports fish from habitat.

8. Safety

8.1. The Salvage Contractor and CSIFGC (if CSIFGC staff decides to attend a salvage) and any volunteers will adhere to all safety instructions given by Genesis staff. The Salvage Contractor will maintain current First Aid certificates and complete the required Genesis online induction 'Working around Power Schemes' (or any subsequent requirement).

CSIFGC staff and volunteers will only attend if they have completed a safety induction by Genesis staff or the Salvage Contractor prior to salvage.

8.2. At any time when Gate 16 is not isolated, Salvage Contractor and CSIFGC staff and volunteers if they attend, will call into the Genesis Control Room on 07 384 7210 (or at the number notified by Genesis to the Salvage Contractor from time to time) to advise of their expected presence within the riverbed.

8.3. At any time when Gate 16 is isolated for sports fish salvage, a four-hour recall time will be placed on the gate in the event the operational needs determine that flow is required through Gate 16. This will require all personnel and equipment to be removed from the riverbed within four hours of notification using the phone number in clause 8.2.

8.4. The Salvage Contractor and CSIFGC staff and volunteers if they attend, must notify Genesis through the phone number in clause 8.2 prior to entering and after exiting the Takapō River for salvage or stranding observations, to ensure gate isolation for health and safety reasons.

9. **Construction**

(a) Any counts toward the defined Extended Flow Event under clause 1.1 will be reset upon completion of sports fish salvage.

(b) This FSMP shall be read in light of the Agreement and the provisions set out in the Agreement take precedence over this FSMP in the event of any inconsistency.

10. **Communications**

The preferred method of communication between Genesis and CSIFG is via voice to voice and/or e-mail correspondence. To avoid doubt clause 8.2 provides a specific number that must be used for specified communications as set out in this FSMP.

11. **Review**

This FSMP shall be reviewed by Genesis and CSIFG every 5 years or more frequently by agreement, to review the effectiveness of the FSMP in achieving its purpose (as per clause 3.1 of the Agreement).

Genesis Energy Limited by:

Name: Tracey Hickman

Title: Chief Wholesale Officer

Central South Island Fish and Game Council by:

Name: Steve McKnight

Title: Chief Executive Officer

References

Adams R. (2021) Salvage and Monitoring of Sport Fish Strandings in the Tekapo Power Scheme 2013 – 2021. *Central South Island Fish and Game Council report*. 31p.

SCHEDULE 1 - Visual observation criteria

A significant stranding event will be observed and notified for Gate 16 stilling basin when at least:

- 90 fish are observed in 'very good' observability.
- 80 fish are observed in 'good' observability.
- 60 fish are observed in 'poor' observability.
- 40 fish are observed in 'very poor' observability.

A significant stranding event will be observed and notified for George Scott weir stilling basin when at least:

- 25 fish are observed in 'good' or 'very good' observability.
- 20 fish are observed in 'poor' or 'very poor' observability.

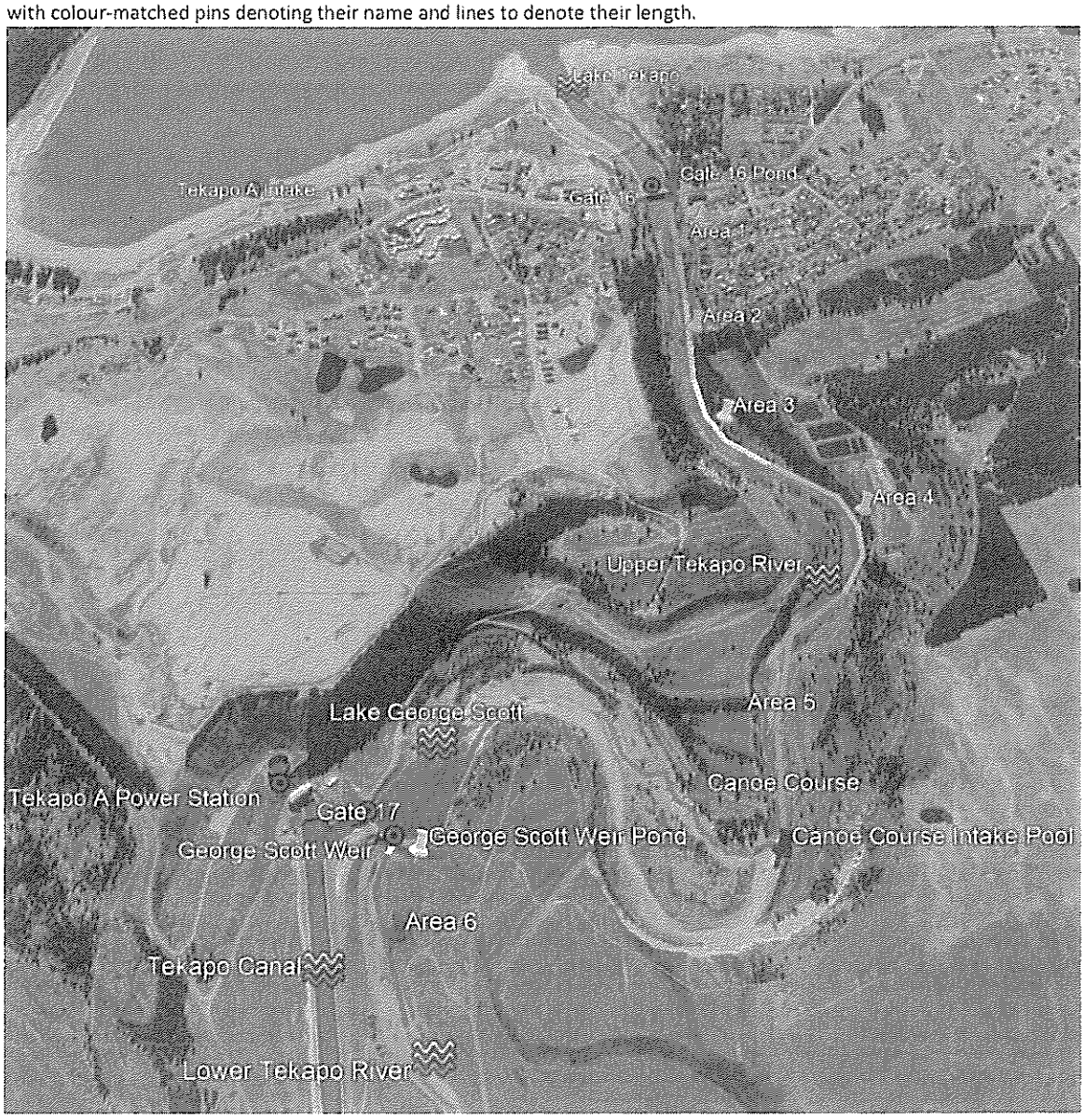
Observability of Gate 16 stilling basin and George Scott weir stilling basin is defined as:

- Very good – the bottom of the stilling basin is clearly visible.
- Good – can view most of the area but cannot see the bottom.
- Poor – affected by silt but still some visibility to about half stilling basin depth.
- Very Poor – highly effected by silt and visibility possible to a depth of about 30cm or less.

A significant stranding event will be observed and notified when at least:

- 50 fish are observed in the Upper Takapō River, Area 1 to Canoe Course; or
- 30 fish are observed in the Lower Takapō River, Area 6 when at least 30 fish are observed.

SCHEDULE 2 – A Google Earth image of the Tekapo Power Scheme with named features denoted. Waterways are marked with wave icons, scheme infrastructure is marked with red dots, and named monitoring sites and areas are marked with colour-matched pins denoting their name and lines to denote their length.



Lake Shore Erosion Management Plan (Draft)

Draft Lakeshore Erosion Management Plan – Lake Tekapo/Takapō

Prepared by Genesis Energy in consultation with Martin Single (Shore Processes and Management Ltd.)

Date April 2025

Purpose

An assessment of the physical shoreline of Lake Tekapo/Takapō and the effects of the existing Tekapo Power Scheme (TPS) was completed and reported on in Single (2022) and was included as part of the consent application for continued operation of the TPS by Genesis Energy Ltd. (Genesis).

The purpose of this lakeshore erosion management plan is to provide a methodology to identify, avoid and/or mitigate lakeshore hazards resulting from the operation of the TPS through monitoring and assessment of shore change.

Summary of Lake Tekapo/Takapō Physical lacustrine processes and lakeshore geomorphology

The lakeshore has not reached an equilibrium state regarding the extended operating range since 1952 and will adjust dynamically to short-term changes in the environment, while the position of the beach and shoreline will be stable over the medium term (five to twenty years). Potential hazards are described by Single (2022) and include shore erosion, inundation and adverse effects on structures on or adjacent to the lakeshore. In summary, the continued operation of the TPS on the physical lakeshore processes may include:

- Continued but episodic erosion of currently eroding cliffs at high lake levels (above 710.9 m amsl);
- Continued alongshore transport of sediment from fluvial source (rivers and streams) and backshore erosion;
- Slow landward movement and raising of the elevation of barrier beaches by wave action at high lake levels; and
- Continued inundation of low-lying land and river and stream mouths at high lake levels.

Appendix A (Figures 1 and 2) show the projected effects on the physical lakeshore environment of the continued operation of the scheme under the existing operating regime. Table 2 (Appendix A) shows areas, located on Figures 1 and 2, of potential shoreline change due to geomorphological development of the shore. None of these areas demonstrate active hazards that warrant changes to the present lake level operational regime for the TPS or active management options at the current point in time, but may require consideration of management options within the next 35 years. Therefore, the focus of the Lakeshore Erosion Management Plan is on monitoring and identification of shore change that may lead to adverse effects on the shore resource use (hazards).

Baseline data

The most recent LiDAR map of Lake Takapō/Tekapo should be used as a baseline of the shore line position. Available at time of writing is CAI LIDAR 2016/17 (Lake Tekapo), flown 6/01/2017.

A database of photography from previous studies (Single 2013a, 2013b, 2019, 2022) and for monitoring under this plan will be maintained by Genesis.

Monitoring Programme

Change to the shore is generally episodic but slow over the long-term. The monitoring programme reflects the nature of historical and projected change under operation of the scheme, and consists of scheduled monitoring and event-driven monitoring.

1. *Scheduled Monitoring*

A visual inspection of the shore and comparison to historical photographs and description of the shore geomorphology as described by Single (2022) and in Table 2 of this plan should be carried out and reported on by an appropriately qualified person at the start of the consent (within 6 months) and at 7-yearly intervals thereafter. If event-driven monitoring has been triggered, the period for the next scheduled monitoring will be re-set.

2. *Event-driven monitoring*

Event driven monitoring to assess the effects of the lake level management regime on shoreline geomorphology should be carried out by an appropriately qualified person following occasions when lake levels have exceeded 710.9 m asl for more than 7 consecutive days. Inspection will occur within 30 working days after lake levels have receded to below 710 m asl.

Reporting

A report will be prepared within 3 months following any scheduled or event-driven monitoring.

The monitoring report should include the following:

- A copy of the lake level record and an assessment of the potential effects on the lakeshore geomorphology since the last inspection;
- An assessment of the wave environment since the last inspection;

- An assessment of shore change from a shoreline inspection comparison with historical photographs;

- Where a hazard to resource use is identified:

    1. the cause of the hazard should be determined;

    2. the extent and magnitude of change should be quantified;

    3. recommendations made as to avoidance and/or mitigation measures of the hazard should be made; and

    4. timeframes for implementing those measures taking into account the nature of the remedial actions required will depend on the location and specific erosion effect that is identified.

- Recommendations should be made as to the appropriateness of the monitoring regime going forward.

Appendix A

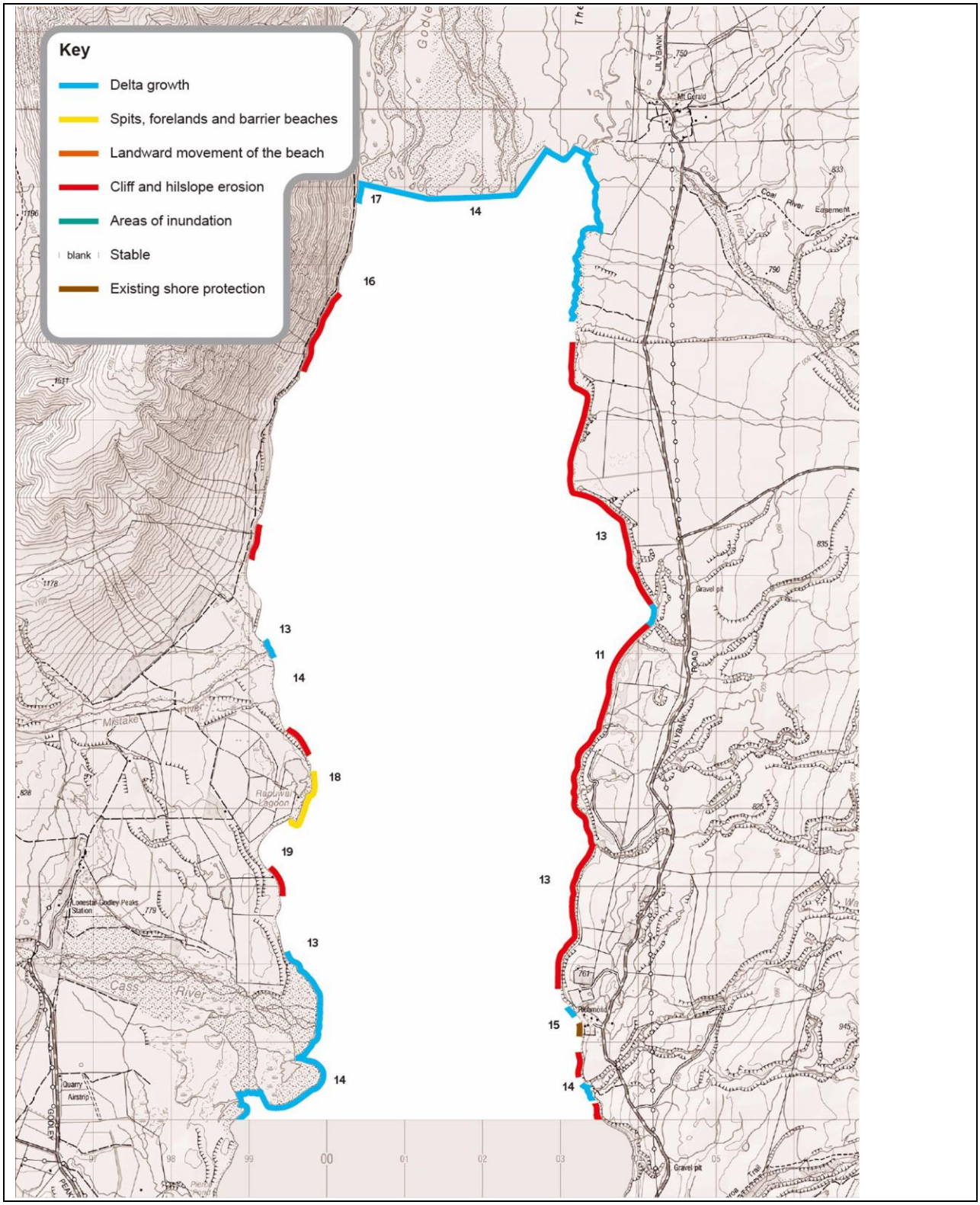


Figure 1 Northern section of Lake Takapō/Tekapo showing sites indicative of potential effect of proposed lake level regime. Numbering relates to site numbers in Table 1 (base map from NZTopo50-BY17 Lake Tekapo, with the shoreline at 710 m amsl)

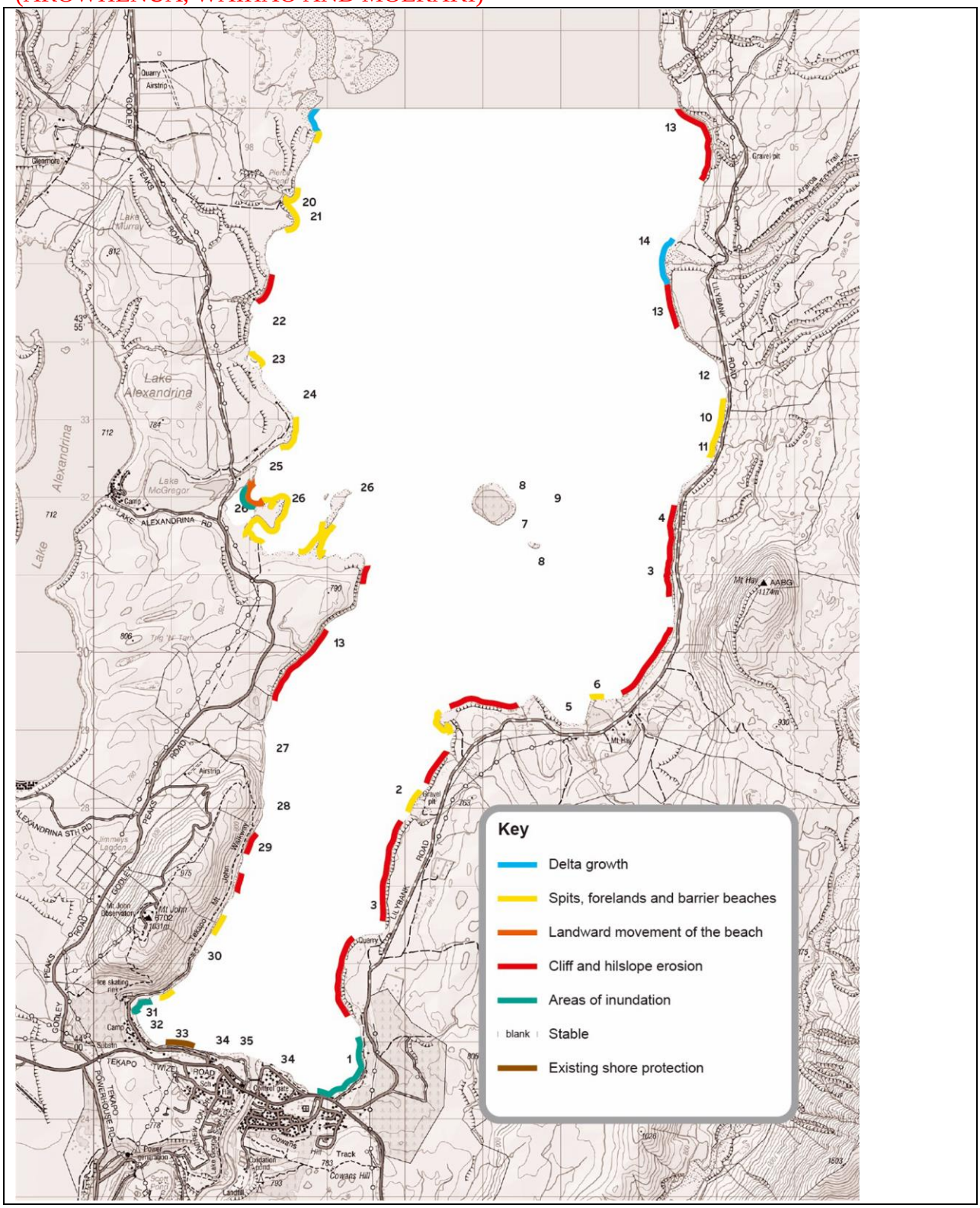


Figure 2 Southern section of Lake Takapō/Tekapo showing sites indicative of potential effect of proposed lake level regime. Numbering relates to site numbers in Table 1 (base map from NZTopo50-BY17 Lake Tekapo, with the shoreline at 710 m amsl)

Table 2 Shoreline observations and projected future effects of the TPS operation on lakeshore resource use (site numbers relate to Figures 1 and 2, starting from the southeast corner of the lake and going generally counter-clockwise)

Site Number	Shore Description	Projected future effects of TekPS
1	Low-lying, with large trees, picnic area and walking/cycling tracks	Regular inundation of land below 711 m, and occasional inundation of land between 711 to 712 m No change to current character of area
2	Gravel pits between shore and road	Potential for erosion due to groundwater flow from pit to shore No change to current character of area
3	Cliffs within ~50 m of road, gravel beach	Ongoing episodic erosion of cliff at slow rate No hazard to the road No change to current character of area
4	Cliffs within ~50 m of road, rock at base	Probably stable, but winnowing of fine sediments from wave splash at high lake levels may lead to slope instability No change to current character of area
5	Fine gravel beach with willow trees near top of main operating range	Additional sediment to beach due to alongshore transport from the north No change to current character of area
6	Barrier beach with low, swampy area to landward	Slow landward movement of barrier, reduction in size of swampy area Inundation of low-lying swamp area at high lake level No change to current character of area
7	Beach scattered with large rocks and backed by pine trees	Continued erosion of backshore at high lake levels, addition of gravels to beach and loss of fine sediments from the nearshore shelf No change to current character of area
8	Trees and scrub at low elevation, low-lying wide beach	No change to current character of area
9	Rock hazards to boats	Boating hazard at higher levels when rocks are partially covered No change to current character of area
10	Road close to cliff edge but at high elevation	Ongoing episodic erosion of cliff at slow rate, offset by sediment contribution to the beach from Boundary Stream and adjacent streams Possible long-term hazard to Lilybank Road No change to current character of the area
11	Steep hillslope near stream mouth	Ongoing episodic erosion of cliff at slow rate, offset by sediment contribution to the beach from Boundary Stream and adjacent streams No change to current character of the area
12	Perched barrier beach and low-lying hinterland	Slow landward movement and increased height of barrier beach Occasional inundation of hinterland No change to current character of the area
13	Active cliff erosion, with cliffs >5 m high	Ongoing episodic erosion of cliff at slow rate Occasional re-activation of cliff erosion where presently stable Supply of sediment to alongshore transport No change to current character of the area
14	River fan and low-lying delta	Continued deposition of sediment at stream/river mouth, growth of delta/fan and supply of sediment for alongshore transport by waves

Site Number	Shore Description	Projected future effects of TekPS
		No change to current character of the area
15	Richmond Station – rock structure lakeward of farm building; "Folly" near top of operating range	Potential for wave run-up to small building ("Folly") Ongoing potential for erosion around base of revetment No change to current character of the area
16	Road on steep hillslope with numerous slips; fractured rock basement and hard, rock cliff	Ongoing hillslope erosion, gullying and slumping Potential earthquake landslip hazard to road and impulse wave generation in Lake Tekapo Ongoing slow removal of sediment at base of active slips No change to current character of the area
17	Hillslope failure undercut by lacustrine processes	Ongoing hillslope erosion, gullying and slumping Potential earthquake landslip hazard to road and impulse wave generation in Lake Tekapo Ongoing removal of sediment at base of active slips during southerly wave conditions and potential hazard to Godley Peaks Road Continued delta accumulation from the Godley River No change to current character of the area
18	Rapawai Lagoon behind low barrier beach ridge	Slow landward movement of barrier beach Occasional flooding of lagoon No change to current character of the area
19	Low-lying farmland	Beach at elevation nearly equal to elevation of lower slopes of farmland No change to current character of the area
20	Pierces Pond situated behind low barrier beach	Slow increase in barrier beach height and width due to continued sediment supply from the shore to the north No change to current character of the area
21	Shoaling gravel and sand deposits at about 706 m elevation	Area will continue to shoal due to alongshore transport of sediment from the north, with an increase in the elevation of shoal surface Medium to long-term hazard to boating No change to current character of the area
22	Gravel beach at base of stable cliff – concrete bunker at limit of wave run-up	Continued beach development due to alongshore sediment transport from south and north Occasional inundation of old building in flood events (over 711 m amsl) No change to current character of the area
23	New houses on terrace above active beach ~725 m terrace elevation, with access road on lower terrace ~ 718 m elevation	Continued beach development due to alongshore sediment transport from south and north No change to current character of the area
24	Gravel beach at base of stable cliff and house on high terrace ~720 – 725 m elevation	Continued beach development due to alongshore sediment transport from south and north Possible increase in elevation of top of beach with foreland accumulation of sediment No change to current character of the area
25	Low-lying channel mouth from Lake McGregor with willow trees on banks	Continued occasional inundation of low-lying channel Growth of beach due to accumulation of sediment from alongshore transport, and landward movement of the barrier beach *Possible enhancement of existing processes of change due to sediment pulses arriving at this section of shore*
26	Low-lying flat area with mobile barrier	Continued mobility of barrier beach gravels and

Site Number	Shore Description	Projected future effects of TekPS
	beach fed by gravels from south and north	growth of tombolo landforms joining high lake level shore to outlying high paleo-ridge lines Continued slow movement of barrier beach towards Godley Peaks Road Potential for occasional inundation of informal camping area lakeward of Godley Peaks Road Ongoing boating hazard by extended area of shoaling around islands at high lake levels *Possible enhancement of existing processes of change due to sediment pulses arriving at this section of shore*
27	Rock outcrops along eroding cliffs in Mt John Formation gravels and base rock, with stream channels to lake	Mainly stable shoreline, with some alongshore transport of gravels from north to south No change to current character of the area
28	Very fractured and erodible rock cliff	Continued slow episodic erosion of the cliff backshore with periods of stability when the base of the cliff is protected from waves by accumulations of beach sediments No change to current character of the area
29	Mt John Observatory walkway within 10 m of cliff edge	Continued episodic erosion of cliff Threat to walkway stability and short to medium-term to users of the walkway due to close proximity of cliff No change to current character of the area
30	Northern end of 4WD track along southwestern shore	Ongoing episodic erosion and inundation of low-lying land at the end of track Areas of sediment accumulations due to alongshore sediment transport from the north No change to current character of the area
31	Low-lying swampy area lakeward of car park	Regular inundation of land below 711 m, and occasional inundation of land between 711 to 712 m No change to current character of area
32	Boat ramp on gravel beach	Ongoing intermittent sediment movement across ramp requiring maintenance removal for boat launching No change to current character of area
33	Lake Tekapo Intake Structure and revetment along length of shore	Placed rock revetment structure with mobile gravels along lakeward edge No change to current character of area Ongoing maintenance of structure at base and ends due to undermining by abrasion and loss of fine sediments, and end effect on the structure of waves at lake levels above 709 m amsl respectively
34	Large rocks on upper foreshore below the developed hinterland	Stable shore, subject to inundation at high operating range No change to current character of area
35	Beach ridges at limit of old high water events ~712 m elevation	Beach ridge deposits in the backshore that indicate the limit of high lake level events and extreme wave processes No change to current character of area

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Single, M.B. 2013a *Tekapo power scheme environmental scoping studies - Lake Tekapo lakeshore high water level inspection*. Shore Processes and Management Ltd Report to Genesis Energy, January 2013, 6pp

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Kahu Ora – Draft 10-year Strategic Plan

Indigenous Biodiversity Enhancement Programme

KAHU ORA

THE REVIVING CLOAK

10-year strategic action plan for enhancing indigenous biodiversity related to the Waitaki and Takapō Power Schemes' operating consents

2025

Department of Conservation
Te Papa Atawhai

Te Kāwanatanga o Aotearoa
New Zealand Government

Cover photo: The Tasman River / Te Awa Whakamau flowing into Lake Pūkaki. Photo: R. Maloney.

About the project logo

The top right koru with shades of blue is reflective of and represents the colours of the upper lakes and rivers. Evoking river braids, it spreads out on its journey down through the catchment tapering gently to reflect the lower reaches of the river and the river mouth.

The meaning of Kahu Ora - the Reviving Cloak

Kahu Ora is a cloak woven in kotahitanga between Papatipu Rūnanga, Te Papa Atawhai and the Generators. It represents togetherness, collaboration and coming together for a shared purpose.

EXECUTIVE SUMMARY **4**

MIHIMIHI AND WHAKAPAPA O AORAKI **6**

KARAKIA **7**

WHAKATAUKĪ **7**

1 INTRODUCTION **8**

1.1 Indigenous Biodiversity Enhancement Programme - Kahu Ora 8
1.2 Kahu Ora strategic action plan 8
1.3 Information sources 9
1.4 Indigenous biodiversity and cultural values in the Waitaki catchment, and pressures on those values 9
1.4.1 Manawhenua connections to the Waitaki *12*
1.4.2 The ecological values of braided rivers, wetlands and lakes in the Waitaki catchment *14*
1.4.3 Pressures on braided river, wetland and lake ecology in the Waitaki catchment *17*
1.5 The Combined Waitaki Power Schemes' commitments to biodiversity enhancement through Project River Recovery and Kahu Ora 21

2 METHODOLOGY AND FRAMEWORK FOR DEVELOPING THE STRATEGIC ACTION PLAN **23**

2.1 Methodology for deriving actions and focal sites for the first 10 years 24
2.2 Detail of investment across the four geographic zones 26
2.3 Monitoring the delivery and benefits of actions within the zones 27
2.4 Scope and constraints of the programme 27

3 ZONE PLANS **28**

3.1 Zone 1. The upper catchment rivers, lakes and associated wetlands 28
3.1.1 Values, pressures and past investments in Zone 1 ..... *28*
3.1.2 A 35-year vision for Kahu Ora in Zone 1 ..... *29*
3.1.3 Priority actions for the first 10years of Kahu Ora in Zone 1 ..... *29*
3.1.4 Outcome monitoring of actions in Zone 1 ..... *32*
3.2 Zone 2. The mid catchment braided rivers, tributaries and associated wetlands 32
3.2.1 Values, pressures and past investments in Zone 2 ..... *34*
3.2.2 A 35-year vision for Kahu Ora in Zone 2 ..... *34*
3.2.3 Priority actions for the first 10 years of Kahu Ora in Zone 2 ..... *34*
3.2.4 Outcome monitoring of actions in Zone 2 ..... *36*
3.3 Zone 3: Lakes Ruataniwha, Benmore, Aviemore and Waitaki, and associated wetlands 36
3.3.1 Values, pressures and past investments in Zone 3 ..... *38*
3.3.2 A 35-year vision for Kahu Ora in Zone 3 ..... *38*
3.3.3 Priority actions for the first 10 years of Kahu Ora in Zone 3 ..... *39*
3.3.4 Outcome monitoring of actions in Zone 3 ..... *39*
3.4 Zone 4: The Lower Waitaki River and associated wetlands 40
3.4.1 Values, pressures and past investments in Zone 4 ..... *42*
3.4.2 A 35-year vision for Kahu Ora in Zone 4 ..... *43*
3.4.3 Priority actions for the first 10 years of Kahu Ora in Zone 4 ..... *43*
3.4.4 Outcome monitoring of actions in Zone 4 ..... *44*

4 DELIVERY OF THE STRATEGIC ACTION PLAN **45**

4.1 Priority knowledge gaps 45
4.2 Action milestones 46
4.3 Principles for delivering strategic priorities 49

4.4 DELIVERY IN THE CONTEXT OF OTHER WORK IN THE CATCHMENT 50
4.5 DETERMINING FUTURE PRIORITIES FOR ACTIONS UNDER A CHANGING ENVIRONMENT 50
5 BIBLIOGRAPHY 51
6 ACKNOWLEDGEMENTS 53
7 APPENDIX I 54
8 APPENDIX II 56
9 APPENDIX III 58
10 APPENDIX IV 59

Executive Summary

Kahu Ora is a 35-year Indigenous Biodiversity Enhancement Programme (IBEP) developed through an agreement between the Department of Conservation (DOC), Meridian Energy, and Genesis Energy as part of the reconsenting process for the Waitaki Power Schemes. Kahu Ora is a compensation agreement and does not seek to directly mitigate the impact of the consent-related works within the catchment. Rather, it seeks to use the compensatory fund to target management of cultural and biodiversity values to sites where related values can be best protected within the catchment.

Objective

Kahu Ora builds upon the legacy of Project River Recovery and represents a bold, enduring commitment to integrated environmental stewardship and Treaty-based partnership in one of Aotearoa's most iconic and ecologically significant landscapes.

It takes a whole-of-catchment approach. Its core objective is to restore and enhance the ecological integrity and cultural values of braided rivers, lakes, wetlands and taonga species within the Waitaki catchment—an area of immense ecological significance and cultural importance to Ngāi Tahu whānui.

The specific objective of the agreement, and therefore of Kahu Ora is: "to improve the condition, resilience, indigenous biodiversity, ecological processes and other values of the braided rivers and associated environments, including wetlands, within the Waitaki Catchment" (Appendix 2, Clause 3).

The Kahu Ora programme aligns directly with DOC's strategic goals by embedding biodiversity protection, cultural partnership, and adaptive management at its foundation.

Strategic action plan

The programme will be funded by an annual $2.3 million (CPI-adjusted) investment run by DOC and guided by a 10-year strategic action plan, which outlines targeted actions and measurable outcomes to be implemented and monitored across the catchment.

The Waitaki Catchment has been divided into four geographic management zones, each representing varying degrees of ecological and cultural value, as well as differing impacts from hydroelectric development:

- **Zone 1: Upper Catchment** – Characterised by high ecological integrity and low human impact. Focus: maintain biodiversity through weed and predator control.
- **Zone 2: Mid Catchment Rivers** – Moderately impacted by hydro infrastructure. Focus: protect and restore through targeted wetland and river habitat enhancement and predator control.
- **Zone 3: Hydro Lakes** – Heavily modified ecosystems with pockets of ecological value. Focus: education, weed management, and targeted habitat restoration.
- **Zone 4: Lower Waitaki River** – Significantly altered by river engineering and invasive species. Focus: support Rūnanga-led wetland restoration, enhance bird habitat, and control key predators and weeds.

There is a complex mix of values, pressures and opportunities across the catchment. In some sites in the upper catchment much of the natural habitat is intact and functional, and the focus is on restoring flora and fauna populations through predator and weed management. In lower parts of the catchment, the habitat is extremely modified and the focus is on restoring basic habitat condition and targeting pressure management to restore a small number of key threatened species. In other sites, the focus is on provision of restoration of habitats that connect rūnanga to place, and provide mahinga kai.

The strategic action plan team have addressed that complexity by taking a prioritising and balancing approach in the spread of investment across zones and in the types of values being protected, noting that the budget is not enough to respond to all catchment pressures everywhere, and that there is no "right" approach here.

Quality assurance

Kahu Ora is managed by DOC with the support of Te Rūnanga o Arowhenua, Te Rūnanga o Moeraki, Te Rūnanga o Waihao alongside Meridian and Genesis, ensuring that cultural values and mahinga kai aspirations are integrated with ecological outcomes. All actions have been prioritised through a robust qualitative assessment of values, pressures, feasibility, and cost-effectiveness.

A strong monitoring and research framework underpins the programme, enabling responsive, evidence-based management. Cultural monitoring led by Rūnanga partners ensures that indigenous perspectives guide adaptive practices and outcomes.

Environmental Legacy

This is the first of three 10-year strategic action plans continuing and expanding on the journey that Project River Recovery started over the previous consenting period. It is a step in the journey to protect, enhance and restore biodiversity values and cultural values related to biodiversity across the Waitaki catchment. The vision for the future is one of thriving, healthy, functioning biodiversity and established strong tangata whenua connects at place. To achieve this, Kahu Ora will take a collaborative, inclusive approach to the mahi, and will aim to support and grow the involvement of others alongside its work.

Mihimihi and Whakapapa o Aoraki

Ko te mauka ariki o Aoraki	The ancestral mountain, Aoraki
Me tōna whānau o Rakiroa, Rakirua me Rārakiroa	and his family, his brothers
Ko kā mauka, ko Kakiroa rāua ko Horokōau	Mount Sefton and Mount Tasman
Ko te whānau o Kā Tiritiri-o-te-moana	And the family of the Southern Alps
Ko Haupapa rāua ko Aroaro Kaehe	the Tasman Glacier and the Hooker Valley
Huri noa ki te awa tapu, ki Kā Roimata o Aoraki	Then to the source of the tears of Aoraki
Ko te roto o Pukaki, ko te roto tapu o Takapō	The sacred lakes of Pukaki and Takapō
Ko te roto Ōhau, ko te whenua o Te Manahuna	Lake Ōhau and the land of Te Manahuna
Ko te tihi o te mauka o Te Ruataniwha	And to the mountain, Te Ruataniwha
Huri noa, ki Te Ao Marama!	And to the world of light, Te Ao Marama
Ko te wharenui o Te Whakaahua-araki nō Te Maiharoa	And to the wharenui, Te Whakaahuaaraki of the chief, Te Maiharoa
Ko Te Poho o Rakitamau	The burial mound on Māori Hummock
Ko Te Kai-hikihiki ki Ōtamatakou	Te Kai-hikihiki, to Ōtamatakou
Ko Te Warokuri ki Te Awakino	And Te Warokuri and Te Awakino
Ko Te Kohurau ki Ōteake	Te Kohurau and the Ōteake,
Ko Ōtekaieke, ki Te Maerewhenua	Ōtekaieke and Duntroon
Ko Te Awamako ki Te Puna a Maru	Te Awamako and the settlement of Te Puna a Maru
Ko Te Korotuaheka te kāika tūturu	And finally arriving at the Waitaki River mouth and
Ko Te Whare Tapu o Matiti	the house Matiti
Tēnā koutou, tēnā koutou, tēnā tātou katoa!	Greetings to you all, greetings to us all!
Ko Rapuwai	Rapuwai
Ko Waitaha	Waitaha
Ko Kāti Māmoe	Kāti Māmoe
Ko Kāi Tahu	Kāi Tahu
Na Te Po, ko Te Ao	From eternity came the Universe
Na Te Ao, ko Te Ao Marama	From the Universe, the bright clear light
Na Te Ao Marama, ko Te Ao Turoa	From the bright clear light, the enduring light
Na Te Ao Turoa, ko Te Kore Te Whiwhia	From the enduring light, the void unattainable
Na Te Kore Te Whiwhia, ko Te Kore Te Rawea	From the void unattainable, the void intangible
Na Te Kore Te Rawea, ko Te Kore Te Taumaua	From the void intangible, the void unstable
Na Te Kore Te Taumaua, ko Te Kore Matua	From the void unstable, the void endowed with paternity

Na Te Kore Matua, ko Te Maku	From the void of paternity, came moisture
Na Te Maku. ka noho ia Mahoranui atea	From moisture, came limitless thought
Ka puta ki waho ko Raki	Then came the visible heavens
Na Raki, ka noho ia Poko haru a te Po	The visible heavens combined with the great abyss to produce the numberless sorceries and the ultimate calamity!!!
Ko Aoraki me Rakamaomao, tana a Tawhirimatea	Thence to Aoraki and the winds and weather
Ko Tu Te Rakiwhanoa	To the creator of the land
Ui ra ki Te Maha-a-nui a Maui	And the canoe of Maui
Ko Te Ao Takata!	And finally to people!
Tihei mauri ora!	I cough the breath of life!

Waitaki Iwi Management Plan (2019)

Karakia

Mā te mōhio, ka mārama	By discussion comes understanding
Mā te mārama, ka mātau	By understanding comes enlightenment
Mā te mātau, ka tau te mauri ora	By enlightenment comes wisdom
O kā taoka katoa	With wise consideration the sacred essence of life
Mō kā uri whakaeke mai rā	Imbued in all living things
Mō ake tonu atu	May manifest as life sustaining treasures
	For all generations to come

Waitaki Iwi Management Plan (2019)

Whakataukī

Tē tōia, tē haumitia

Nothing can be achieved without a plan, work-force, and a way of doing things.

1 Introduction

1.1 Indigenous Biodiversity Enhancement Programme - Kahu Ora

At the time of writing Meridian Energy Limited (Meridian) and Genesis Energy Limited (Genesis) are seeking replacement of consents held in relation to the Waitaki and Takapō Power Schemes. These consents are due to expire in June 2025, and replacement consents are being sought for a further 35 years.

Prior to applying for consent, Meridian and Genesis worked with the Department of Conservation (DOC) on an agreement to compensate for the Waitaki Power Scheme's impacts on biodiversity (Appendix 1). That agreement was modified through discussion between Te Rūnanga o Arowhenua, Te Rūnanga o Moeraki, Te Rūnanga o Waihao rūnanga (henceforth Waitaki Rūnanga), DOC and the Generators and a subsequent draft agreement clarifying target habitat types and improving the alignment to cultural values (Appendix 2). Because there is better alignment to cultural values alongside biodiversity ones, reference to "agreement" hereafter refers to the modified agreement given in Appendix 2. The agreement will come into force when consents are granted.

A key element of the agreement was the development of a programme of works, described as the Indigenous Biodiversity Enhancement Programme (later named "Kahu Ora"). Kahu Ora will be delivered by DOC, with technical oversight by a governance group including representatives of DOC, Te Rūnanga o Arowhenua, Te Rūnanga o Moeraki, Te Rūnanga o Waihao, Meridian, and Genesis.

Kahu Ora is a compensation agreement and does not seek to directly mitigate the impact of the consent-related works within the catchment. Rather, it seeks to use the compensatory fund to target management of cultural and biodiversity values to sites where related values can be best protected within the catchment.

The specific objective of the agreement, and therefore of Kahu Ora is: "to improve the condition, resilience, indigenous biodiversity, ecological processes and other values of the braided rivers and associated environments, including wetlands, within the Waitaki Catchment" (Appendix 2, Clause 3). The programme of works will match the 35-year duration of the consent once issued and will comprise of a $2.3m annual CPI adjusted investment.

1.2 Kahu Ora strategic action plan draft

A key requirement of Kahu Ora is to develop a document detailing a strategic plan to deliver priority actions for the first 10 years (hereafter "strategic action plan"). This document is that draft strategic action plan, and includes a description of what work will occur, where it will be focussed and why, with the aim of supporting and guiding the development of annual work plans. It is a draft until it is finalised and approved by the governance group.

The strategic action plan aligns to the broader DOC strategic settings, to Te Mana O Te Taiao Aotearoa New Zealand Biodiversity Strategy and to the Waitaki Iwi Management Plan. Notably, the proposed Kahu Ora strategic action plan aligns to 10 of the 13 objectives in the Biodiversity Strategy. Those objectives fit under all three of the biodiversity strategy pou: Tūāpapa/Getting the system right, Whakahau/Empowering action, and especially Tiaki me te whakahaumanu/Protecting and restoring.

Individual actions and priorities within the strategic action plan will contribute significantly to these wider objectives – Kahu Ora is a major national project working at a large-scale to protect a wide range of values

in a complex environment. Alongside achieving its catchment-based goals, the strategic action plan will fill knowledge gaps, develop tools and demonstrate approaches to management that have national application. Within DOC, work under the strategic action plan will be kept separate as a series of nested "outcome plans" under several of its outcomes-focused programmes within BioInvest (BioInvest: biodiversity investment approach, where all of DOCs biodiversity work is held). All Kahu Ora work is expected to have an associated outcome plan, and this will link the work to wider Departmental processes, such as monitoring standards and reporting, and provide transparency in how this work relates to other activities that DOC undertakes within its wider remit.

Generally, the strategic action plan will focus work on protecting ecological and cultural values within the rivers, wetlands and lakes of the catchment. This will primarily, but not exclusively, be in areas directly affected by the Combined Waitaki Power Schemes, and will incorporate some of the values, interests and aspirations expressed by Waitaki Rūnanga. The strategic action plan has been prepared by a strategic action plan team comprised of representatives of DOC, Waitaki Rūnanga and the Generators, and reporting to the Governance Group.

Kahu Ora and the strategic action plan are introduced in Section 1, the methods for developing and selected actions in the plan are described in Section 2. Section 3 outlines the details of each of the four Zone – what values are protected at sites and with what actions, and what % of the budget is allocated to those plans. Section 4 focusses on the delivery of the strategic action plan, including the milestone and targets for key actions across the zones.

1.3 Information sources

Information to assist the preparation of this strategic action plan was provided by current and previous Project River Recovery staff (see *6.3 The Combined Waitaki Power Schemes' commitments to biodiversity enhancement through Project River Recovery and Kahu Ora*, p 21), experts within DOC, and representatives from Waitaki Rūnanga. A wide range of published literature was also sourced from Project River Recovery's expansive collection of reports and previous strategies and from cultural and ecological reports prepared for Meridian and Genesis specifically for the reconsenting process. A bibliography of some relevant key references is provided at the end of this document.

1.4 Indigenous biodiversity and cultural values in the Waitaki catchment, and pressures on those values

The Waitaki Catchment is the third largest freshwater catchment in Aotearoa (Poole 1983), spanning a total of 1.2 million hectares from the Southern Alps to the Pacific Ocean. Snowmelt and rainfall are carried through the catchment and out to sea by a complex network of freshwater streams, rivers and lakes, the most prominent of which are the eleven main braided rivers in the catchment (Figure 1) and their tributaries.

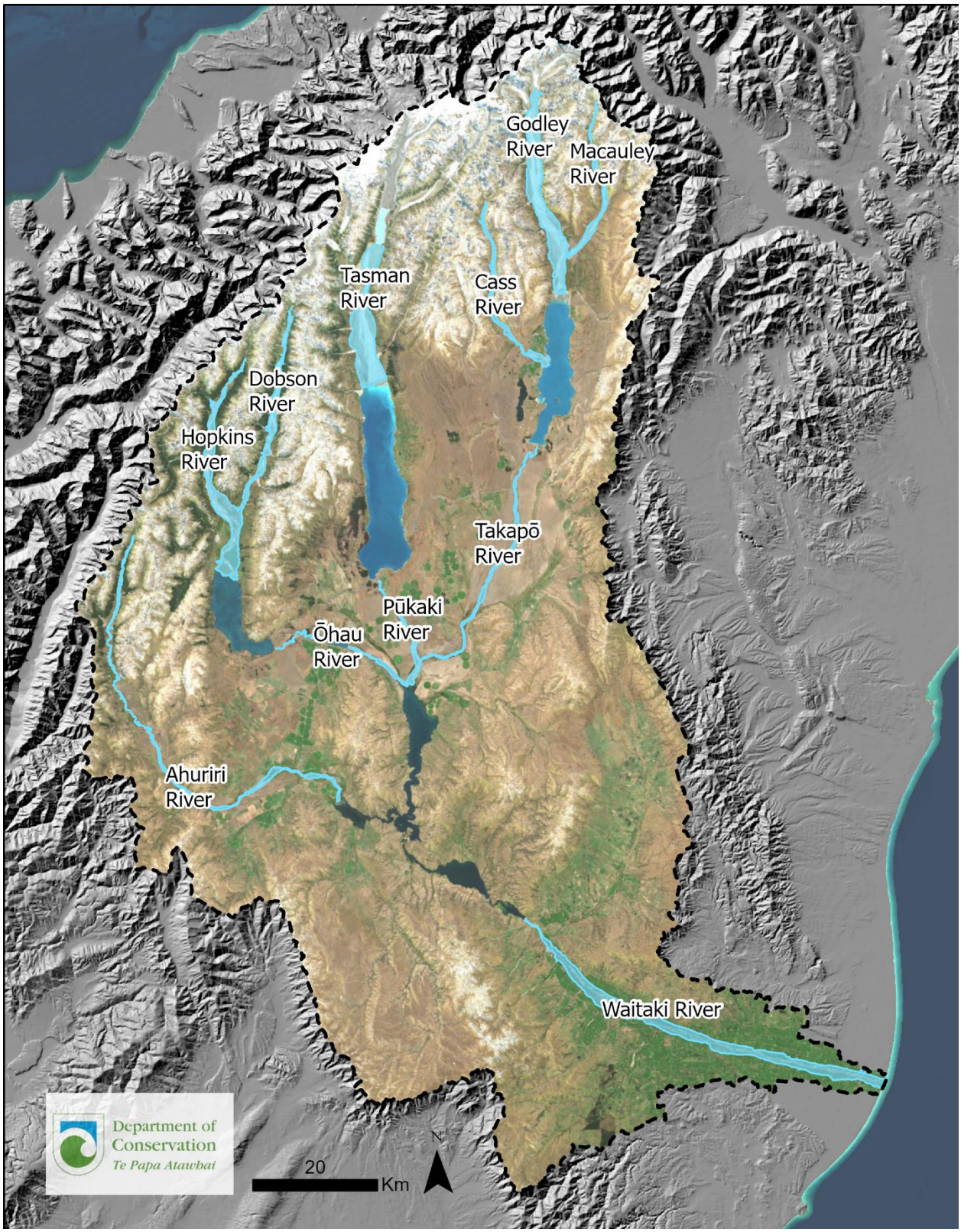

Figure 1. The Waitaki Catchment, and eleven of the most prominent braided rivers that connect the Southern Alps to the Pacific Ocean.

Braided rivers are a globally rare form of river and are only found in similar extents to Aotearoa New Zealand in the Himalayas, and in North and South America. They are characterised by several unique features which separate them from other river types. They have multiple channels of different flows, widths and depths that weave across a gravelly braid plain leaving a series of gravel islands at various stages of

succession. This weaving of channels forms a braiding pattern which gives these rivers their name (Figure 2). Braided rivers are highly dynamic physical environments that give rise to complex and specialised ecosystems, habitats and communities. These features form under a unique combination of conditions including variable flows, a continuous but variable supply of gravels, and a moderate gradient.

A key feature of braided rivers is the constant process of erosion and the deposition of sediments creating and removing both islands and shallow water riffle areas. During elevated flows caused by precipitation or seasonal snow melt, the alluvial transport of gravels increases and fresh gravels from the headwaters enter the river system. As flow begins to drop, alluvial transport lessens, and new islands begin to form between the braids. Thus, the locations of islands and channels regularly move, causing a mosaic of surfaces of various ages and stages of succession.

Wetlands form in these systems when river channels detach from the main flow, or when groundwater reemerges from the riverbed. Various forms of wetlands can occur in braided river ecosystems, especially along their margins, including swamps, marshes and ephemeral wetlands. Transitional habitats (lake deltas, lake margins and flats exposed during lake level change) are key habitats for a range of species. The connection between the braided rivers and the lakes in the upper catchment provides habitat at critical periods for species such as black stilt/kakī, and the seepage areas on lake flats are key habitats for threatened plants (e.g., New Zealand fish-guts plant).

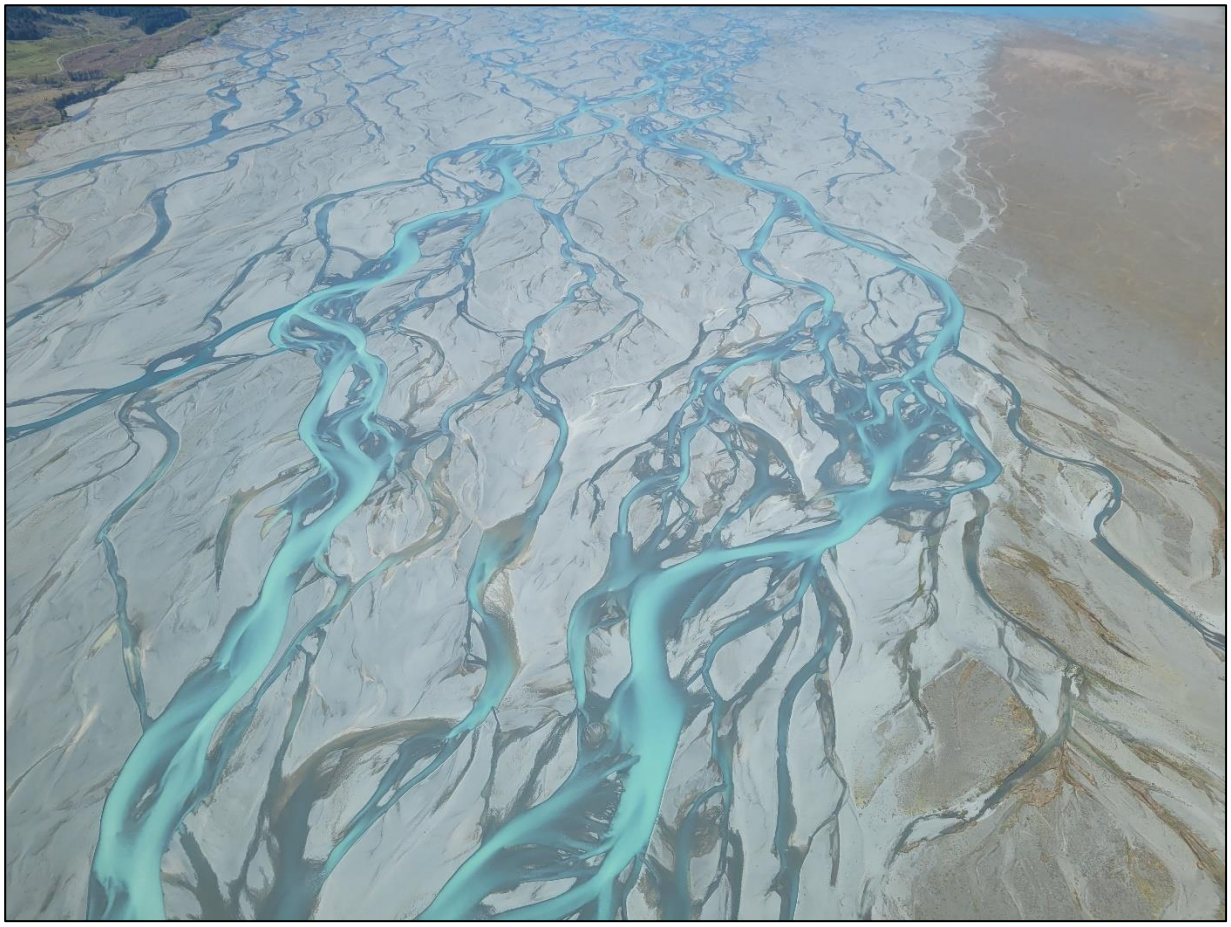

Figure 2. The many diverse channels of the Tasman River braid across its gravel bed. Photo: J. Schori.

In the Waitaki catchment, the headwaters of the major rivers are fed by glaciers and snowfields nestled in the Southern Alps/Kā Tiritiri o te Moana. The process of geological uplift and erosion along the main divide provides the upper rivers with a constant supply of gravels, whereas, in contrast, in rivers below natural and artificial lakes in the catchment, the gravels come from local sources such as tributaries, edge and island erosion.

1.4.1 Manawhenua connections to the Waitaki

Te Rūnanga o Arowhenua, Te Rūnanga o Moeraki, and Te Rūnanga o Waihao are the kaitiaki rūnanga representing Manawhenua in the Waitaki catchment. Manawhenua have a relationship with the Waitaki that comes with responsibilities and obligations. This relationship is grounded in a tikanga-based mahinga kai culture that has been practiced over many generations, strengthening the immense sense of belonging whānau and hapū have to the Waitaki catchment.

The Waitaki is a continuous and connecting cultural landscape from Aoraki to the mouth of the river. Over many generations, whānau and hapū have developed a powerful sense of belonging in the Waitaki landscape. Over the past 200 years, this landscape has changed dramatically but its significance to Manawhenua remains constant and enduring (Figure 3).

Figure 3. The Lower Waitaki River, Takiroa is located in foreground to the right. Photo: Kāi Tahu.

Through Te Tiriti o Waitangi, Kāi Tahu holds and exercises rangatiratanga[1] within the Kāi Tahu Takiwā with Manawhenua having done so since before the Crown began exercising its powers from 1840. Through Te Tiriti, both the Crown and Parliament recognise and affirm Ngāi Tahu rangatiratanga in the Takiwā. In recognising rangatiratanga, the Crown also acknowledges and guarantees the customary rights of Māori.

[1] Section 2 of the Ngāi Tahu Deed of Settlement 1997 and section 6(7) of the Ngāi Tahu Claims Settlement Act 1998: “the Crown recognises Ngāi Tahu as the tāngata whenua of, and as holding rangatiratanga within, the Takiwā of Ngāi Tahu Whānui

Mahinga kai

Mahinga kai is at the heart of culture, identity, and practice today, and is a constantly changing practice. Manawhenua have been adapting to changes in species and landscapes over hundreds of years. The population and availability of species suitable for mahinga kai have ebbs and flows, with some species flourishing and others declining.

Manawhenua have a symbiotic relationship with the land. As kaitiaki, they care for, preserve, and restore the whenua from which we gather food. In return, the species thrive and the whenua provides. This care for the environment is not only specific to particular sites but also for the landscape as a whole.

Mahinga kai areas in the Waitaki Catchment include rivers (including their mouths and confluences), lakes, wetlands, springs, land, and nohoaka. Mahinga kai species in these areas traditionally included eels, weka, turnips/potatoes, aruhe, kōareare, birds, kākāpō, and kāuru. However, in contemporary times, they now include ducks, watercress, trout, eels, salmon, whitebait, raupō, and birds.

Ultimately, practising Mahinga kai is a way of life underpinning values of whanaungatanga, manaakitanga and kotahitanga. It is essential to Manawhenua hauora, boosting cultural and spiritual well-being and strengthening connections with whakapapa and Te Ao Māori. It is a significant representation and generational knowledge transfer about places to gather, the resources they yield, and the methods of gathering and processing resources.

Waitaki cultural landscapes

Wāhi tūpuna, landscapes of cultural importance made up of both ancestral and contemporary significance, are important to Manawhenua. The Waitaki Catchment in its entirety is a wāhi tūpuna, where ancestors lived, practised mahinga kai and raised their families. We understand historical occupations and patterns as a result of whakapapa and place names, linked by traditional trails. The arrival of European settlers has meant that the cultural landscape has been impacted, whether it has been destroyed completely, damaged or modified. However, this has not impacted the kaitiaki responsibilities of Manawhenua and the landscape of the Waitaki remains significant, upheld by mahinga kai practices.

Today, groupings of whānau practise mahinga kai throughout the different areas of the catchment depending on the season. Manawhenua have adapted to the changes in the Waitaki Catchment. Land areas and species have been lost to farm and housing developments, damming, and hydro-generation infrastructure meaning restoration of impacted mahinga kai practices is crucial and a priority for kaitiaki rūnanga (Figure 4).

Figure 4. Takiroa, with rock art site and wetlands (left; photo: D. Robertson) and wetland planting on right (right; photo: G. Riley).

1.4.2 The ecological values of braided rivers, wetlands and lakes in the Waitaki catchment

The geographic scope of Kahu Ora includes the braided rivers, the tributaries directly feeding into those rivers, and the natural and artificial lakes contained within the Waitaki catchment. This includes all of the associated terrestrial and wetland habitats (generally termed the "braid plain") that are in the immediate environs of those rivers and lakes.

Native plants

Diverse communities of vegetation and rare plant species can be found throughout the braided river systems in the Waitaki, including on the seemingly barren braid plains and on the wider wetlands, lake edges, and river deltas.

On the braid plains of rivers in the Upper Waitaki (above Lake Benmore), 11 different plant communities are recognised. Early pioneering communities generally comprise lichens, mosses, cushion plants, and small native grasses, and some may have a large portion of bare gravels as a defining feature of the community. As the surface ages, larger species such as tussocks and woody shrubs begin to appear and eventually dominate the community. A total of 264 native vascular plant species are recognised throughout the Upper Waitaki braided rivers, of which some have a limited distribution and occur only in a specific part of the catchment. Within these rivers there are 18 Threatened and At Risk plants, as classified by the New Zealand Threat Classification System (https://nztcs.org.nz/), for example curly sedge (*Carex cirrhosa*; Nationally Endangered). At the river deltas, some specialised plant communities including turflands can be found, along with Buchanan's sedge (*Carex buchananii*; Declining) and *Carex kaloides* (Declining).

In the ephemeral zones at the constructed Ruataniwha wetlands pygmy goosefoot (*Dysphania pusilla;* Nationally Endangered), the once thought to be extinct, grows alongside sneezeweed (*Centipeda minima* subsp. *minima*; Nationally Endangered) and pygmy clubrush (*Isolepis basilaris*; Naturally Uncommon). The exceptionally rare fish guts plant (*Chenopodium detestans*; Nationally Critical; Figure 5), aptly named for its detestable smell, similarly occurs through the ephemeral shallow bays of Lake Takapō. These small native species require the periodic wetting and drying of these habitats to survive.

Further downstream through the catchment, representative vegetation communities associated with riverine and braidplain habitats include bog rush and *Carex* sp. sedgelands, turflands, pūrei tussockland, harakeke flaxlands and raupō reedlands. Some rare species including swamp nettle (*Urtica perconfusa*; Naturally Uncommon), Buchanan's sedge and Lady's tresses orchid (*Spiranthes australis*; Nationally Vulnerable) occur through the wetlands, the latter potentially at its southern-most limit. The small

perennial mud buttercup (*Ranunculus limosella*) and *Gunnera dentata* can be found in wetlands through the Waitaki valley despite both being locally uncommon.

Figure 5. The Critically Endangered fish guts plant (*Chenopodium detestans*, inset) in a bay area of Lake Takapō. Photos: A. Rebergen.

Native fish

The braided rivers and the associated tributaries and wetlands provide habitat for a range of native fish within the catchment. There are three threatened non-migratory galaxiids that exist in these habitats. The small upland longjaw galaxiid (*Galaxias* aff. *prognathous* “Waitaki”; Nationally Vulnerable) generally occurs at mid to high altitudes and is found in small side braids of the rivers in the upper part of the catchment. Through the middle of the catchment, bignose galaxiids (*Galaxias macronasus*; Nationally Vulnerable) – a species endemic to the Mackenzie Basin can be found mostly in small spring fed tributaries. The lowland longjaw galaxias (Waitaki River; *Galaxias* aff. *cobitinis* "Waitaki"; Nationally Endangered) occur in similar habitats, but their distribution is limited to 7 sites through the mid-catchment and into the Waitaki Valley, and into other catchments nearby. The wetlands through the Waitaki valley provide some limited habitat for several threatened fish including Canterbury mudfish/kōwaro (*Neochanna burrowsius*; Nationally Critical) and lamprey/kanakana (*Geotria australis*; Nationally Vulnerable). Longfin eel/tuna (*Anguilla dieffenbachii*; Declining) also occur through the rivers and wetlands in the mid and low catchment, and along with lamprey and kōaro (*Galaxias brevipinnis*; Declining), they rely on passage to the ocean to complete their life cycle – although the latter has formed land-locked populations in Lakes Takapō and Pūkaki. The management of tuna populations is excluded from the agreement (Appendix 2), and therefore from Kahu Ora.

Native invertebrates

Invertebrate values throughout the catchment are very high, with high levels of species diversity and local endemism. Almost all native invertebrates in Aotearoa New Zealand are endemics. Most of the diversity of

life within the catchment will be invertebrates, and they form key components of all trophic levels and therefore are critical for ecosystem functioning, including where plants are less prominent. There are large knowledge gaps here, and species identity, distribution and invertebrate-specific pressures within the habitats of the catchment are not well understood. For example, 919 recognisable taxonomic units were identified from a *Raoulia haastii – R. australis* cushion-field vegetation community in the Tasman River (Murray & Anderson 2019), but it remains unknown how this compares to the other 10 vegetation communities that can be found in the upper and mid catchment, or to any of the other lower rivers where similar sampling has not been undertaken. Two Threatened and At Risk grasshopper species are endemic to the rivers in the Mackenzie Basin. The robust grasshopper (*Sigaus robustus*; Nationally Endangered; Figure 6) is associated with the Ōhau, Pūkaki and Takapō river catchments and found in sparsely vegetated river gravels and older surfaces. The small but diversely coloured minute grasshopper (*Sigaus minutus*; Declining) tends to be associated with low-stature plant communities on river margins throughout the basin. Other invertebrates are found through the rivers and wetlands in the catchment and provide important food resources for indigenous fauna.

Figure 6. An upland longjaw galaxias (*Galaxias prognathus*; left; photo: S. Elkington), and a pair of robust grasshoppers (*Sigaus robustus*) at Forks Gravel pits (right; photo: J. Schori).

Native lizards

At least 2 geckos and 6 skinks are found within the Kahu Ora geographical area throughout the catchment. Generally, surveys for lizards are incomplete and new small populations of these lizard species are still being discovered within the catchment. However, it is unlikely that there are major healthy populations of any of the threatened lizards in the Kahu Ora area. Currently, key known locations include the terraces of the Ōhau, Pūkaki and Takapō rivers which support populations of large-bodied skinks including Lakes skinks (*Oligosoma aff. chloronoton "*West Otago*"*; Nationally Vulnerable), Scree skinks (*Oligosoma waimatense*; Nationally Vulnerable), and Mackenzie skinks (*Oligosoma prasinum*; Nationally Vulnerable - endemic to the Mackenzie Basin). Two of the smaller bodied lizards; the McCann's skink (*Oligosoma maccanni*; Not Threatened) and the Southern Alps gecko (*Woodworthia "Southern Alps"*; Declining) are relatively widespread throughout the catchment.

Native birds

Over 25 species of native native waterbirds are characteristic of the braided river and wetland habitats in the Waitaki. The small grey wrybill/ngutu pare (*Anarhynchus frontalis*; Nationally Increasing) – the only bird in the world with a laterally curved bill adapted to feed under stones in its habitat - nests exclusively on unvegetated or lightly vegetated gravels of braided rivers and is found predominately throughout the mid and upper catchment (Figure 7). Black-fronted tern/tarapirohe (*Chlidonias albostriatus*; Nationally Endangered; Figure 7) can be found throughout the catchment during the breeding season, but each spring a large colony comprising approximately 10% of the global population gathers to nest on a river island in the Upper Ōhau River. Black stilt/kakī (*Himantopus novaezelandiae*; Nationally Critical) was once widespread across Aotearoa, but its range has contracted such that almost all of the current population is found only in the Upper Waitaki Basin. Black-billed gull/tarāpuka (*Chroicocephalus bulleri; Declining*)

populations breed largely on braided rivers of the South Island. While the total population of gulls is large they are declining in many parts of their range, possibly through recruitment failure. The black-billed gull population in the Waitaki catchment was historically large but in recent times has been very low. Increases in colony size in the Tasman River may relate to predator control. Banded dotterel/pohowera (*Anarhynchus bicinctus*; Declining) also utilise sparsely vegetated riverbeds and outwash surfaces in the catchment for nesting before migrating back to coastal wetlands and estuaries, and/or to Australia, for the remainder of the year. The secretive Australasian bittern/matuku-hūrepo (*Botaurus poiciloptilus*; Nationally Critical) and marsh crake/kotoreke (*Zapornia pusilla*; Declining) can be found in wetlands throughout the catchment from sea level right through to around 800 metres above sea level. The Waitaki River mouth provides equally critical nesting and foraging habitats for many shore birds. Many of the shorebirds that migrate inland to the braided rivers for breeding, travel back to the coast to spend the winter months foraging along the shorelines. White-fronted terns/tara (*Sterna striata*; Declining) spend much of their life cycle along the coast, although some colonies occasionally establish further inland on braided rivers.

Figure 7. A wrybill/ngutu pare (*Anarhynchus frontalis*) sitting on a nest in the Tasman River (left; photo P. Guilford); a black-fronted tern/tarapirohe (*Chlidonias albostriatus*) at the Upper Ōhau River (right; photo: D. Nelson).

Ecological connectivity

Connectivity at all scales in braided river systems and across wetland habitats is crucial for maintaining ecological values and resilience. Longitudinal connectivity is vital for species that move through the catchment in any of their life stages. For example, some river birds migrate seasonally between the coast and inland riverbeds for nesting, so require a variety of habitats across significant distances. Longitudinal connectivity also supports gene flow between populations within the catchment, enhancing species resilience by facilitating adaptation and reducing inbreeding impacts. Connectivity is also important to allow movements of species so that they can respond to changes in environmental conditions such as a decrease in frost days or an increase daily mean temperature brought about by climate change. Without connected habitats along altitudinal or climatic gradients, then populations would be stranded and at increased risk of extinction. Lateral connectivity within braided river systems is also important because of the dynamic nature of braided river systems. For example, as river channels change course, erode out existing habitat and create new habitat surfaces in other places, a critical factor for local species survival can be the proximity and availability of other suitably mature areas of preferred habitat so that the species may seek out and find habitats to which they are specialised.

1.4.3 Pressures on braided river, wetland and lake ecology in the Waitaki catchment

Multiple human induced pressures to braided river, wetland and lake ecology are present within the Waitaki catchment, the most common of which are introduced weeds, predator species, land use changes, agricultural encroachment, recreation impacts, river engineering, and impacts from the Combined Waitaki Power Schemes including dewatering of channels, flooding from spillways, and the

creation and expansion of lakes and canals. Climate change is an additional driver that changes the levels and types of pressures on the values in the system over time, other potential pressures include novel pathogens such as HPAI (Highly Pathogenic Avian Influenza). Additional pressures occur on the populations that use these habitats that occur outside of the project areas (and the catchment) such as land use change, wilding conifers, wind and solar farms. These additional pressures are out of scope for this action plan.

The relationship between the various pressures in braided rivers are complex, and particularly the relationship between invasive weedy species, water flows, mammalian predators and their impacts on the indigenous braided river floral and faunal communities.

Invasive plant species pose a major threat to the biodiversity of braided rivers and wetlands, often resulting in loss of habitat for endemic species. Weeds such as Russell lupin (*Lupinus polyphyllus*), broom (*Cytisus scoparius*), gorse (*Ulex europaeus*) and tree weeds including willows (*Salix spp.*), poplar (*Populus* spp.), wilding conifers, silver birch (*Betula pendula*) and alder (*Alnus glutinosa*) can outcompete native vegetation for resources including sunlight and nutrients (Figure 8). When they occur in dense stands, these weeds can alter the natural dynamics of the braided rivers by binding together the gravels and preventing alluvial transport. They also smother the open bare gravels that are essential for nesting birds, lizards and invertebrates, alter the thermal dynamics of these habitats, and provide cover to predatory mammals, and their prey. In wetlands, tree weeds can alter hydrology by taking up large quantities of water. Aquatic weeds and invasive algae, such as monkey musk (*Erythranthe guttata*) and didymo (*Didymosphenia geminata*) and lagarosiphon (*Lagarosiphon major*), also have negative impacts in waterways; clogging flows, smothering native plants and degrading habitat quality for benthic invertebrates and native fish.

Figure 8. Russell lupins (*Lupinus polyphyllus*) smothering habitat in the Takapō River. Photo: J. Schori

Predators pose a key threat to the indigenous fauna in braided rivers, wetlands and lakes. Cats (*Felis catus*), ferrets (*Mustela furo*), stoats (*Mustela erminea*), weasels (*Mustela vinalis* vulgaris), hedgehogs (*Erinaceus europaeus*), rats (especially Norway rats, *Rattus norvegicus;* Figure 9) and mice (*Mus musculus*) have all been introduced to Aotearoa New Zealand within the last 300 years and are common predatory mammals in the Waitaki catchment. Hedgehogs pose a substantial threat to braided river fauna. They are predators of lizards and invertebrates and depredate the eggs of ground-nesting birds such as black-fronted tern/tarapirohe and banded dotterels/pohowera. River islands with reasonable water flows are known to be barriers to hedgehog invasion and result in reduced visits from other mammalian predators. Cats are highly skilled predators, are widespread throughout the catchment and pose threats to birds, lizards and invertebrates.

Within the waterways, introduced salmonids such as brown trout (*Salmo trutta*) and rainbow trout (*Oncorhynchus mykiss*) pose threats to indigenous fish values, particularly to the small pencil galaxiids (lowland longjaw and bignose galaxiids) in the mid-catchment. Despite being a native species, the southern black-backed gull/karoro (*Larus dominicanus*) is super-abundant and is a common predator of the eggs and chicks of indigenous birds throughout the catchment. Karoro and kahu populations occur at much greater densities than historically. Karoro have taken advantage of recent land use intensification in the wider catchment, and kahu populations fluctuate with rabbit densities.

The trophic relationships among elements of braided river habitats, the native fauna, and introduced pests (rabbits, mammalian predators) is complex. For example, rabbits are key prey for cats, ferrets, stoats and kahu, and rabbits at high densities have a direct impact on vegetation communities and threatened plant species within the catchment. Control of rabbits will both reduce rabbit-eating predator populations thereby protecting native fauna, and at the same time directly protect native vegetation communities eaten by rabbits. Noting that the likelihood of unwanted outcomes such as meso-predator release (e.g., increases in mice following control of the larger mammalian predator guild) is largely unknown. Ideally, managing rabbit numbers to hold them at consistently low levels prevents surges in predator numbers followed by rapid declines and diet switching to native fauna when rabbits are scarce.

Figure 9. A Norway rat (*Rattus norvegicus*) captured by trail camera depredating an adult black-fronted tern/tarapirohe (*Chlidonias albostriatus*) at the Upper Ōhau River. Photo: Project River Recovery.

Land use change and intensification pose another key threat to the biodiversity values in rivers and wetlands within the catchment. Development of adjacent land, including the dewatering of wetlands and clearance of vegetation for conversion to agriculture, leads to habitat loss and compromises connectivity

between habitat types and throughout the catchment. River engineering works including planting willows and constructing stop banks can have a profound impact on the natural dynamics of river channels. River engineering often aims to constrain a river within a defined bed, which is often smaller than the natural width of the braid plain as a method to prevent flooding of private land or the destruction of structures or assets such as bridges and roads. As a higher volume of water travels through a narrower area, the water channels may deepen, resulting in reduced braiding complexity and fewer opportunities for lateral erosion that is needed to activate, redistribute and replenish gravels. Consequently, habitat diversity within the river declines and results in a loss of biodiversity within the system.

Recreational activities such as four-wheel driving, motor biking, jetboating, fishing and dog walking (particularly off-lead) can also have detrimental effects on braided rivers and wetlands, although it is uncertain how much or how frequently these pressures drive native species population declines. Vehicles travelling across riverbeds during the bird nesting season can crush the camouflaged eggs and chicks of ground-nesting birds and vehicles that do not use established tracks can disturb fragile communities of plants. The wakes of jet boats can flood out nests that are close to the water's edge. Direct disturbance from humans and their pets can also lead to nesting failure if parent birds are kept off their nests for extended periods.

Climate change poses a long-term threat to braided rivers and wetlands. Changes in precipitation and temperature patterns can affect river flows and the availability of water, and the timing of floods through the system. It may cause some species to shift their current distribution; for example, to move higher in elevation to avoid the increasing mean temperatures. There are likely to be worse storms affecting the catchment, which could cause destruction to some ecosystems. Climate change may also exacerbate the impacts of other threats, such as the proliferation of invasive species.

The development of the Combined Waitaki Power Schemes has dramatically altered the Waitaki catchment. Since the 1930s, water from the Waitaki catchment has been used to generate electricity. The Waitaki Dam was the first hydro-electric dam in the Waitaki River and opened in 1935. A further two dams, Benmore Dam (commissioned in 1965) and Aviemore Dam (commissioned in 1968), were built further upstream of the Waitaki Dam. The three dams combined, form the Mid-Waitaki Hydro Scheme which drowned the upper portion of the Waitaki River and formed Lakes Waitaki, Aviemore and Benmore.

The Upper Waitaki Hydro Scheme was constructed between 1968 and 1985. The upper scheme uses the existing glacially-fed Takapō, Pūkaki and Ōhau Lakes for hydro storage. To generate hydroelectric power, the lakes' outflows are diverted through five stations—Takapō A and B, and Ōhau A, B, and C—made possible by the raising of Takapō and Pūkaki dams, the construction of Ruataniwha dam and 56 kilometres of connecting canals.

The diversion of lake outflows resulted in substantially reduced inflows to the Pūkaki, Takapō and Ōhau Rivers (Figure 10).The dams raised the natural levels of Lakes Takapō and Pūkaki; the latter was raised by 37 m and increased in length by 50% because of the inundation of the gently sloping delta. In total, it is estimated that the Combined Waitaki Power Schemes inundated 12,537 ha (27.5%) of braided river flood plain in the Waitaki catchment and impacted a further 4,188 ha (9.2%) by diverting inflows. Diverted or modified flows of braided rivers through the catchment has changed the regularity and size of flooding events, and artificial lakes have interrupted the supply of gravels through the system. Consequently, the dynamic nature of impacted rivers has been disrupted such that braids rarely migrate laterally across the braid plain, and flows are rarely high enough to flush weeds out of the system.

1.5 The Combined Waitaki Power Schemes' commitments to biodiversity enhancement through Project River Recovery and Kahu Ora

An Order in Council for the Upper Waitaki Hydro Scheme was obtained by Electricity Corporation of New Zealand (ECNZ) in 1970 during the construction and commissioning of the Scheme and had a life of 21 years. In 1988, the Waitaki Catchment Commission began discussions about obtaining a consent to secure ECNZ's water rights. Several compensatory agreements were made between ECNZ and other user groups, including an agreement signed in 1990 between ECNZ and DOC, that specifically aimed to mitigate the ecological impacts of hydro-electric power generation in the Upper Waitaki.

This agreement resulted in the formation of Project River Recovery (PRR), a project dedicated to the protection, restoration and management of braided river and wetland ecology in the Upper Waitaki catchment, above Lake Benmore. The project started in 1991, and its term was tied to the duration of the resource consents which expire in 2025. Meridian Energy took over the agreement from ECNZ in April 1999, and Genesis Energy, which acquired the Takapō Power Scheme (comprised of Takapō A and B power stations and the Takapō Canal) joined the agreement in June 2011.

In its 34 years of delivery, Project River Recovery has achieved substantial progress in conserving and restoring braided river and wetland habitats in the Upper Waitaki Basin. The project has advanced the understanding and management of important braided river species and raised public awareness about these rare ecosystems. Key work has included the following examples of targeted management and habitat enhancement, resulting in some of the best examples of protection of threatened species and habitats in the country: containment and elimination of weeds in the upper rivers, part-funding of the largest braided river-centric trapping programme to supress mammalian predators for the benefit of several threatened native braided river birds, reduction of black-backed gulls/karoro populations to more natural levels, protection of New Zealand's largest black-fronted tern/tarapirohe breeding colony and concurrent protection of lake skinks at the same site, development of tools to better control predators (e.g., hedgehog toxins, rat movements, new trap types for feral cats, feral cat movements), wetland work to first successfully create and restore wetlands, and to understand impact of weir manipulations on wetland plants, and successfully raising the profile of braided river and associated habitats through education (school visits, posters, pamphlets, signage) and advocacy.

Over the next 35 years, this Kahu Ora strategic action plan aims to build on the PRR legacy over a much wider geographical and cultural scope. It will include cultural values and aspirations in its core purpose, objectives and delivery, and cover the entire Combined Waitaki Power Schemes' footprints from Upper Waitaki Basin through to the Waitaki River mouth. The Kahu Ora compensatory agreement spans the duration of the proposed 35-year consent period and is valued at $2.3M (CPI-adjusted) per annum.

Kahu Ora's objective, as described in the agreement conditions (see Appendix I), is to improve the condition, resilience, indigenous biodiversity, ecological processes and other values of representative examples of lake margins and deltas, wetlands and springs, braided rivers and their margins, and areas of functional connection between those features, especially in waterbodies that have been affected by hydro-electric development. The intention of Kahu Ora is compensate for the effects of the Combined Waitaki Power Schemes by treating the catchment as a whole and focusing on enhancing key ecological river, lake and wetland habitats and improving the size, health and resilience of those habitats and of the populations of indigenous species that live within them.

Figure 10. The Ōhau Canal (left of image) carries water diverted out of the Lower Ōhau River. The flow remaining in the river comes from an upstream spring, seepages, a drain under the canal and, further downstream (off this photo), the Twizel River. Photo: J Schori.

2 Methodology and framework for developing the strategic action plan

To facilitate the delivery of Kahu Ora across Waitaki's extensive geographic scale, the catchment has been divided into four geographic management zones that group together rivers and/or lakes and/or wetlands with similar ecological and cultural values and with similar impacts as a result of the Combined Waitaki Power Schemes (Figure 11):

1) The upper catchment rivers, lakes, and associated wetlands
2) The mid catchment rivers, and associated wetlands
3) Lakes Ruataniwha, Benmore, Aviemore and Waitaki, and associated wetlands
4) The Lower Waitaki River, and associated wetlands.

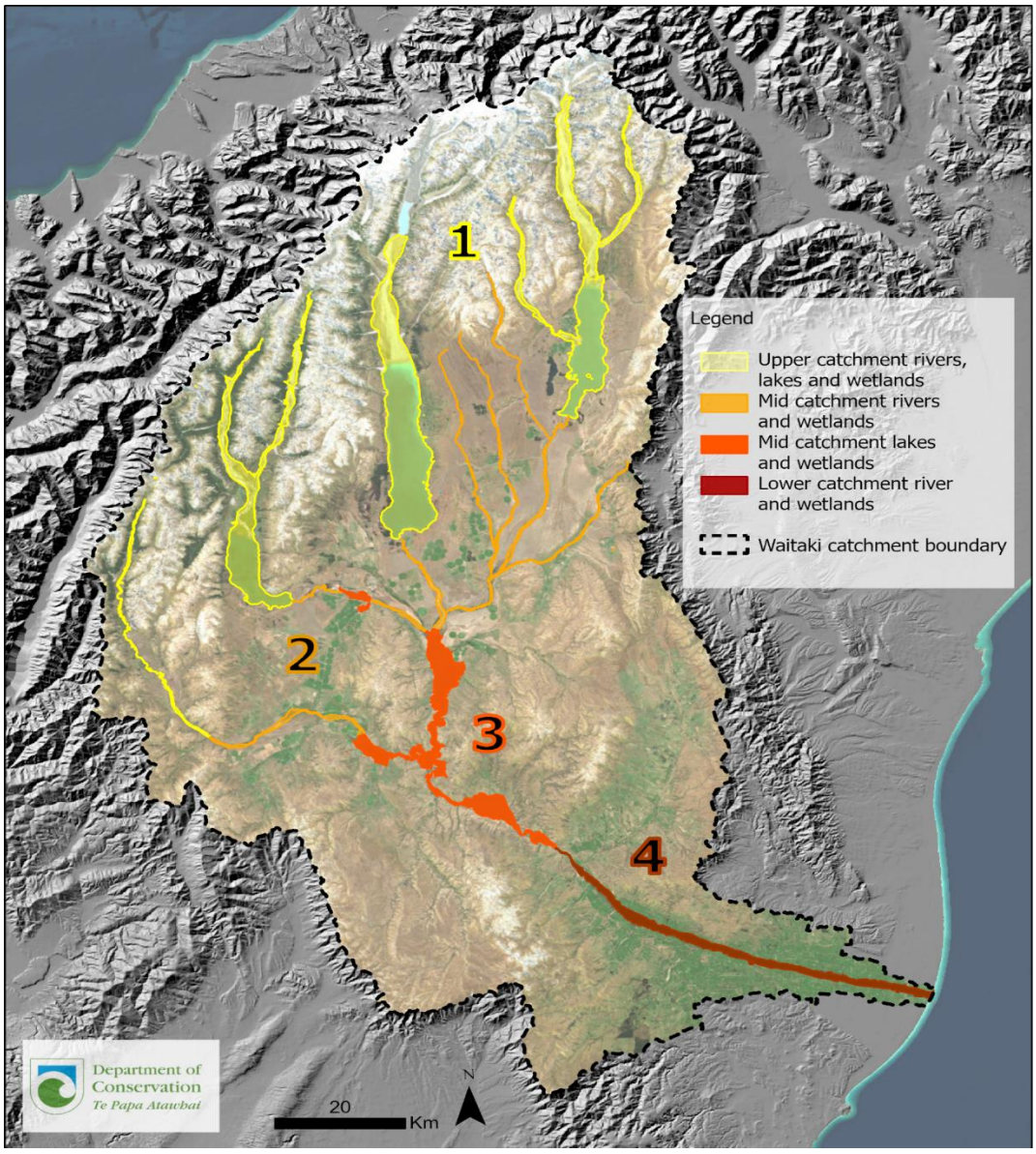

Figure 11. The Waitaki Catchment divided into four geographic zones based on current ecological and cultural values, the impacts from the Combined Waitaki Power Schemes, and geography: Zone 1, the upper catchment rivers, lakes and wetlands (yellow); Zone 2, the mid-catchment rivers and wetlands (pale orange); Zone 3, the mid-catchment lakes and wetlands (deep orange); and Zone 4, the lower catchment river and wetlands (red).

2.1 Methodology for deriving actions and focal sites for the first 10 years

Methods for determining actions and sites were guided by the fixed future Kahu Ora budget ($2.3m per annum), and the list of activities and sites that needed to be covered under the agreement document (Appendix 2). In addition, there has been 35 years of prior Project River Recovery work in the upper catchment and some specific work in the lower catchment that was available as information and action to draw upon. It was clear to the strategy action plan team that not all values or sites could be protected, and nor could all actions be undertaken within these constraints. Therefore, the team used a 5-step process (Figure 12) to determine the priority focal sites and actions to describe Kahu Ora work over the 10-year life of this plan. The steps the team worked through are described next.

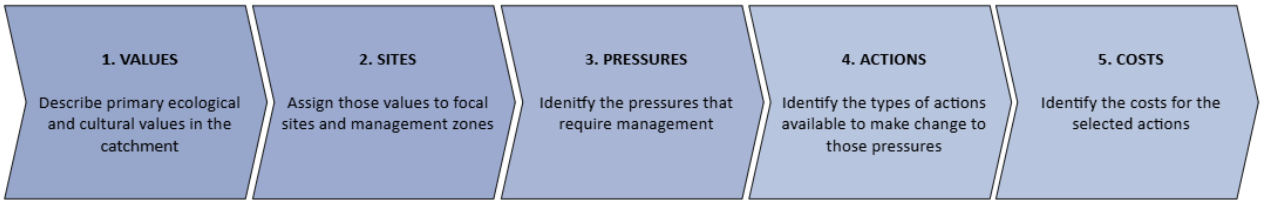

Figure 12. The 5-step process undertaken by the strategic plan team to identify priority focal sites and actions for the first 10-years of Kahu Ora.

Step 1: Consideration of values

To understand the indigenous biodiversity and cultural values associated with braided rivers, wetlands, and lakes in the Waitaki catchment, representatives from Te Rūnanga o Arowhenua, Te Rūnanga o Moeraki, and Te Rūnanga o Waihao and DOC were consulted; and Meridian and Genesis's consultants' reports, Project River Recovery reports and the scientific literature (including research papers and books) were reviewed.

Values were limited to those within the geographic limits of Kahu Ora. All indigenous fauna and flora values at the population, community and ecosystem level were included, as well as consideration of elements of ecological function such as connectivity and resilience. Cultural values included restoring the connection and relationship to place, including mahinga kai and nohonga sites, and took a whole of catchment approach to working on Kahu Ora.

The values are not all listed here, but selection of work sites and areas considered a full range of species taxa types (i.e., birds, lizards, fish, plants, invertebrates, lizards) and ecosystems (e.g., braided rivers, wetlands, swamps, river terraces, alluvial fans, islands, lake edges, seepages and tarns). Consideration was given to the threat status of both habitats and species, both at a catchment and national scale.

Step 2: Location selection

Within each zone the team scored all the geographic locations and habitat types including rivers, lakes, deltas, river mouth, wetlands, and additional key sites (e.g., Tern Island). A simple low, medium or high scoring system was used, based on the team's assessment of the relative degree of naturalness of variables: habitat, health of key species populations (particularly threatened species), patchiness/connectedness of habitat, logistics of management, Waitaki Rūnanga values, and providing for a relative balance across the sites to ensure complementarity. These variables generally represented the

team's view of the relative indigenous biodiversity values and potential for conservation. For example, for this assessment, there are 11 braided rivers deemed in-scope within the project area: Tasman, Godley, Macaulay, Cass, Hopkins, Dobson, Takapō, Pūkaki, Ōhau, Waitaki, Ahuriri) and several rivers that were out-of-scope: Murchison, Jolly, Hakataramea, and smaller rivers such as Edwards, Twizel deemed out-of-scope in this first 10 year period. Of the in-scope rivers, we scored the Hopkins, Dobson, Lower Takapō and Upper Ōhau rivers as relatively low compared to rivers such as Cass, Tasman, Godley and Upper Takapō which in contrast, were scored as relatively high.

Step 3 and 4: Action and pressure selection

The team recorded all actions to manage key pressures at all sites, then, based on the size of the fixed total available budget, the team excluded all the locations with low and medium ranked scores from initial inclusion in action ranking. For the high ranked locations, we reviewed all the listed actions and ranked these as high, medium and low based on our assessment of the relative potential impact of the action on the highest values at the location. That is, the team selected actions that were likely to impact on key pressures more than other actions and therefore would have the biggest impact on protecting and enhancing the values at the location. In considering relative rank, the following criteria were considered:

1) the feasibility of delivering lasting change and benefits to values through that action, including assessment of the presence of other non-target pressures that might prevent benefits being realised,
2) the balance of work across the catchment zones,
3) that actions and their anticipated results aligned well with the legal agreement (Appendix 2) in the first 10 years of Kahu Ora.
4) whether the action would benefit multiple values
5) whether other similar sites available in the catchment where values could more easily or affordably secured.

Assessments (potential synergies, avoiding duplication) included considering work that has been delivered across the catchment and throughout similar environments in Aotearoa New Zealand, such as work delivered by Project River Recovery, DOC generally, Ngā Awa, Te Manahuna Aoraki, and by Waitaki Rūnanga, and by other land managers and crown agencies. The key actions that were identified are:

- **Weed Control** to maintain, improve and increase habitat availability and quality for indigenous flora and fauna
- **Predator Control** to support long-term persistence and growth of indigenous invertebrate, lizard, fish and bird populations
- **Grazer and Browser Control** to protect indigenous flora and regulate populations of predatory mammals
- **Education and Advocacy** to improve public awareness and understanding of braided rivers, lakes and wetlands as important ecosystems and what is required to protect them
- **Enhancement** of wetlands, braided river islands and nohoanga sites to support Threatened and At Risk indigenous species, mahinga kai, and improve condition, resilience and ecological processes
- **Fill knowledge gaps** to reduce costs, and inform the urgency and delivery of future work in the catchment
- **Monitor success** to quantify and report on the delivery of actions, measure the benefits to indigenous flora and fauna and cultural values, and guide improved delivery over the duration of Kahu Ora.

The team then scanned the low and medium ranked locations, and on a few occasions, it was clear that some actions in a low or medium sites would be beneficial to selected values, and these were included. For example, the team included predator control (the key action) for black-fronted terns and lakes skinks (both with significant populations) in the Upper Ōhau River, even though the Upper Ōhau River was not ranked highly as a site.

The strategy action plan team noted a well distributed set of Public Conservation Land (PCL) across the catchment. As an action, it may be advantageous to consider updating tenure status, with the view of enabling increased access for Waitaki Rūnanga, and in some places, the public. While Kahu Ora can highlight and communicate these issues future actions would be for DOC to resolve. Clearly such information flow between Kahu Ora and the wider Department of Conservation is key for the programme's success.

Step 5: Costing actions and matching budget

Once the selection of actions for managing key pressures at the nominated locations was complete, the team calculated the cost of those actions at those locations. This was generally done using existing cost data held by DOC (and in some occasions, other agencies) for the same or similar actions within the catchment. Where no costs were available at a location, the nearest exemplar was used and costs were adjusted to scale appropriately (i.e., by site size, or by unit effort required). The total cost of actions per zone was compared to the total available budget.

The team's initial selection of high priority sites and actions was slightly over budget so the extent and number of actions at selected sites was reduced to balance the budget. The team did this taking note of the relative proportion of work within each zone (holding to an approximately 1/3 split among zones 1,2 and 4) and of previous investment by Project River Recovery (supporting past investment to keep the gains already made was considered more important than new investment in sites not already managed). The 1/3 split was because these three zones have high values across the full range of indigenous biodiversity and cultural parameters that we considered and subsequently require substantial investment to manage pressures. Zone 3, in contrast, is highly modified and has relatively fewer ecological values. Therefore, we applied a small percentage of the budget to Zone 3.

2.2 Detail of investment across the four geographic zones

Part of fitting the priority actions to the available budget was to ensure an appropriate split of investment across the catchment (Table 1).

Table 1. The proportional financial investment of Kahu Ora into each of the four geographic zones within the Waitaki catchment over the first 10 years.

Zone	Investment
1. The upper catchment rivers, lakes and associated wetlands	33.2%
2. The mid-catchment rivers and associated wetlands	34.1%
3. Lakes Ruataniwha, Benmore, Aviemore and Waitaki and associated wetlands	2.1%

4. The Lower Waitaki River and associated wetlands	30.6%

2.3 Monitoring the delivery and benefits of actions within the zones

Monitoring the success of delivery of actions and the benefits of actions once delivered is essential for guiding Kahu Ora to succeed (see *Principles for delivering strategic priorities* p 49), and to measure achievement of milestones (p.46). To record the benefits that Kahu Ora has delivered to indigenous biodiversity values within each of the zones, the project will monitor the following outcomes: how values have been protected or increased (e.g., the recovery of wetlands), impacts of actions on pressures (e.g., residual levels of weeds following control), the improvement in understanding the level of intensity of actions (e.g., most effective trap spacings for predators). By measuring all of the outcomes and the impacts of the pressures and actions it allows the program to take an adaptive management approach. For example, applying predator control for top predators (e.g., cats) may result in meso-predator release (e.g., mice) that may change the management requirements to protect impacted values such as lizards, invertebrates and ground nesting birds.

Monitoring of indigenous biodiversity values significant to Manawhenua will be essential for understanding the baseline state of those values that are present throughout the project area (e.g., changes in Mahika kai resource and access leading to sustainable harvest) and the benefits from actions delivered under Kahu Ora. Cultural monitoring will be conducted by the Waitaki Rūnanga, with the results shared with the wider Kahu Ora team. Kahu Ora will work with Waitaki Rūnanga to understand the results of all monitoring undertaken.

A key requirement before annual work planning begins is to confirm the targets (what does the work achieve/protect), measures (how will the achievement be measured) and milestones (what is the progress at set points / key stages) for each set of objectives (i.e., actions at sites to protect nominated values). Guidance is provided in sections 3 and 4 for work in each of the zones over what those targets, measures and milestones should be.

2.4 Scope and constraints of the programme

The delivery of Kahu Ora will be primarily at the hydro storage lakes, the braided rivers that directly feed and drain them, and any wetlands that are hydrologically connected to these catchment features. Small, low-order tributary streams and disconnected wetlands are not within the scope of the project within this first 10-year period, except where they provide important habitat for braided river and/or wetland species or are a source of weed incursions. Thus, the project area is defined as: The braided rivers, tributaries and lakes within the Waitaki catchment and associated habitats including wetlands. Kahu Ora will incorporate the values, interests and aspirations of the Waitaki Rūnanga, including those in relation to taonga species and mahinga kai. However, management of tuna is not within the scope of the project (see Appendix I).

The impact of Kahu Ora within the catchment is bounded by the project's budget and constrained by the availability of tools and technologies to deliver some actions. Kahu Ora must also work within the legal framework set by the Waitaki and Mackenzie district councils and the Canterbury Regional Council, meaning that some actions will require a consent and be bounded by any conditions that may accompany that consent. Additionally, Kahu Ora will be limited to working in lakes, rivers and wetlands where permission is granted by the legal landowner. Noting that where we apply work for the protection of the targeted values, we anticipate that other non-targeted values will also benefit. For example, predator

control for the benefit of braided river birds is likely to also benefit wider fauna values, and rabbit control for the protection of plant values is also likely to result in the reduction of predator densities.

The strategic direction presented here was developed based on the current state of values and pressures on the environment and the current investment towards weed and predator control throughout the catchment. Any changes to these conditions or the consent conditions and funding proffered at the time of writing this strategic plan may require adjustments to the strategic action plan.

3 Zone plans

In this section, a description of each zone is provided, including its geographic scope and an overview of its indigenous biodiversity and cultural values. A 35-year vision for each zone is outlined to guide the delivery of work over the first 10 years and the subsequent 25 years of Kahu Ora. The priority actions and sites for the first 10 years are presented, along with the proportional investment within each zone. The minimum requirements for outcome monitoring are also detailed.

3.1 Zone 1. The upper catchment rivers, lakes and associated wetlands

Zone 1 encompasses the upper portion of the catchment with source water flowing from Aoraki, a landscape of paramount importance to Ngāi Tahu whānaui. It includes Kā roimata o Aoraki (the tears of Aoraki). Within the zone lie lakes Takapō, Pūkaki and Ōhau, the braided rivers of the Tasman, Hopkins, Dobson, Godley, Macauley, Cass, and upper portion of the Ahuriri (upstream from Longslip Creek), and the wetlands connected and occurring adjacent to those sites (Figure 13). The focal wetlands for the first 10 years are Mailbox Inlet, Rapuwai Lagoon, Tasman Downs Pond.

3.1.1 Values, pressures and past investments in Zone 1

The braided rivers in Zone 1 provides the only river habitats in the catchment that are relatively pristine and for which hydrology is unaffected by the hydro scheme. Continued control of weeds and minimal modifications for flood protection mean that habitat values are high through this zone. Diverse plant communities with a relatively high proportion of native, including Threatened and At Risk species, occur here because there is low competition from exotic weeds. The invertebrate communities supported in this portion of the catchment are likely highly diverse as well. The braided rivers here support populations of Threatened and At Risk river birds, some of which are uncommon in the lower reaches of the catchment because of poor habitat quality. While low levels of weeds may reduce some impacts of mammalian predators, densities are still high and require targeted control to protect fauna populations in this zone.

The lakes in Zone 1 are all of natural origin and have been modified to different extents by the Combined Waitaki Hydro Schemes. The lakes' deltas and shallow bays are habitats for some threatened species including plants such as fish guts plant and pygmy clubrush, and birds including kakī, wrybill, banded dotterel, and black-fronted tern. Many of these species have been recognised by the Crown as taonga species. The Hopkins River delta and much of its margin have stable native wetland, turf and shrub communities. Exotic weeds are more prevalent around the lake margins and lake-adjacent wetlands than in the braided rivers in this zone, because of their closer proximity to modified areas (e.g., townships, state highways and farming stations), and their accessibility to the public, but impacts remain low compared to other lakes within the catchment. Lake level changes resulting from hydro-electricity management sustain some habitats and make managing others more challenging.

There is some pressure from recreational activities, but most is currently contained or is of low impact. This may change over a 10-year horizon. Some disturbance occurs from recreationalists such as hunters and hikers using four-wheel drive vehicles to access the upper catchment. In general, agriculture in adjacent landscapes is low intensity but gradually increasing. Cropping lupins to improve soil quality is becoming increasingly common, and if not well implemented, has the potential to provide escapees if the Regional Pest Management Plan rules are not adhered to, and these can have a major impact on braided river and lake edge habitat integrity, and the cost of future control at these sites.

Although this zone is highly significant to Ngāi Tahu due in part to its proximity to Aoraki, with respect to mahinga kai, access for whānau remains a challenge and shifts pressure to the habitats that remain accessible both physically and legally.

Past investment into predator and weed control by Project River Recovery, DOC, Te Manahuna Aoraki Project and others has successfully limited the spread of invasive weed species and reduced the impact of predators on key native species (e.g., black-fronted terns in the Tasman River). Weed management in particular, has ensured that available habitat to support biodiversity values remains in a largely natural state.

3.1.2 A 35-year vision for Kahu Ora in Zone 1

Because Zone 1 contains outstanding biodiversity values and is the least modified of the four zones, maintaining these areas is a key priority for conserving biodiversity values in the wider catchment. This is critical. Many of the existing biodiversity values across the catchment are found in Zone 1. Strategically, the vision for Kahu Ora cannot be met if it achieves a modest improvement in the three lower zones but fails to prevent loss of values in Zone 1. Therefore, over the next 35 years, Kahu Ora aims to:

- Keep habitat available for indigenous flora and fauna by:
    - Preventing further invasions and eliminating current populations of weedy species in braided river habitat
    - Reducing the impacts of weedy species on wetland and lake edge habitat
- Support stable and growing populations of indigenous flora and fauna by suppressing populations of browsers and predators
- Understand and implement opportunities to improve cultural values including taonga species.

3.1.3 Priority actions for the first 10years of Kahu Ora in Zone 1

The focus of work in Zone 1 is to maintain high values across an extensive area with low investment per hectare, and Kahu Ora will invest 32% of its resources into this zone in the first 10 years. There is a strong focus on weed control to keep habitat available, and predator control in selected places to protect populations of indigenous fauna from decline (Table 2).

Table 2. The proportional split of investment (rounded to the nearest whole number) into sites and actions within Zone 1 in the first 10 years of Kahu Ora.

Action	Tasman River	Cass River	Dobson River	Godley River	Macauley River	Upper Ahuriri River	Wetlands	Lake Takapō bays	Lake Pūkaki bays	Share of action investment (%)
Weed control	✓	✓	✓	✓	✓	✓		✓	✓	**58.8**

Predator control										
Mammals	✓									**38.8**
Karoro	✓	✓	✓	✓	✓	✓				
Grazer and browser control	✓	✓		✓						**6.7**
Education and advocacy	✓	✓	✓	✓	✓		✓	✓	✓	**1.0**
Fill knowledge gaps and support research	Throughout zone									**0.6**
Share of site investment (%)	**49.8**	**11.0**	**6.1**	**13.9**	**2.8**	**2.8**	**0.4**	**6.7**	**6.4**	**100**

Over the first 10 years, Kahu Ora aims to achieve the following outcomes:

- **habitat for indigenous flora and fauna secured** by controlling weeds in 6 rivers and on lake shore wetlands
- **indigenous flora values protected** by maintaining low densities of rabbits in 3 rivers
- **indigenous bird values protected** by maintaining low densities of karoro in 6 rivers
- **indigenous invertebrate, lizard and bird populations** enhanced by suppressing predatory mammals (cats, rats, stoats, ferrets, hedgehogs) to low levels in 1 river, indirectly through rabbit control for cats, ferrets, stoats in an additional 2 rivers, and seasonal control of cats in 3 rivers
- **users informed of ecological and cultural values** by interpretation signage installed at 6 braided rivers, the shore areas of 2 lakes and 3 wetland habitats.

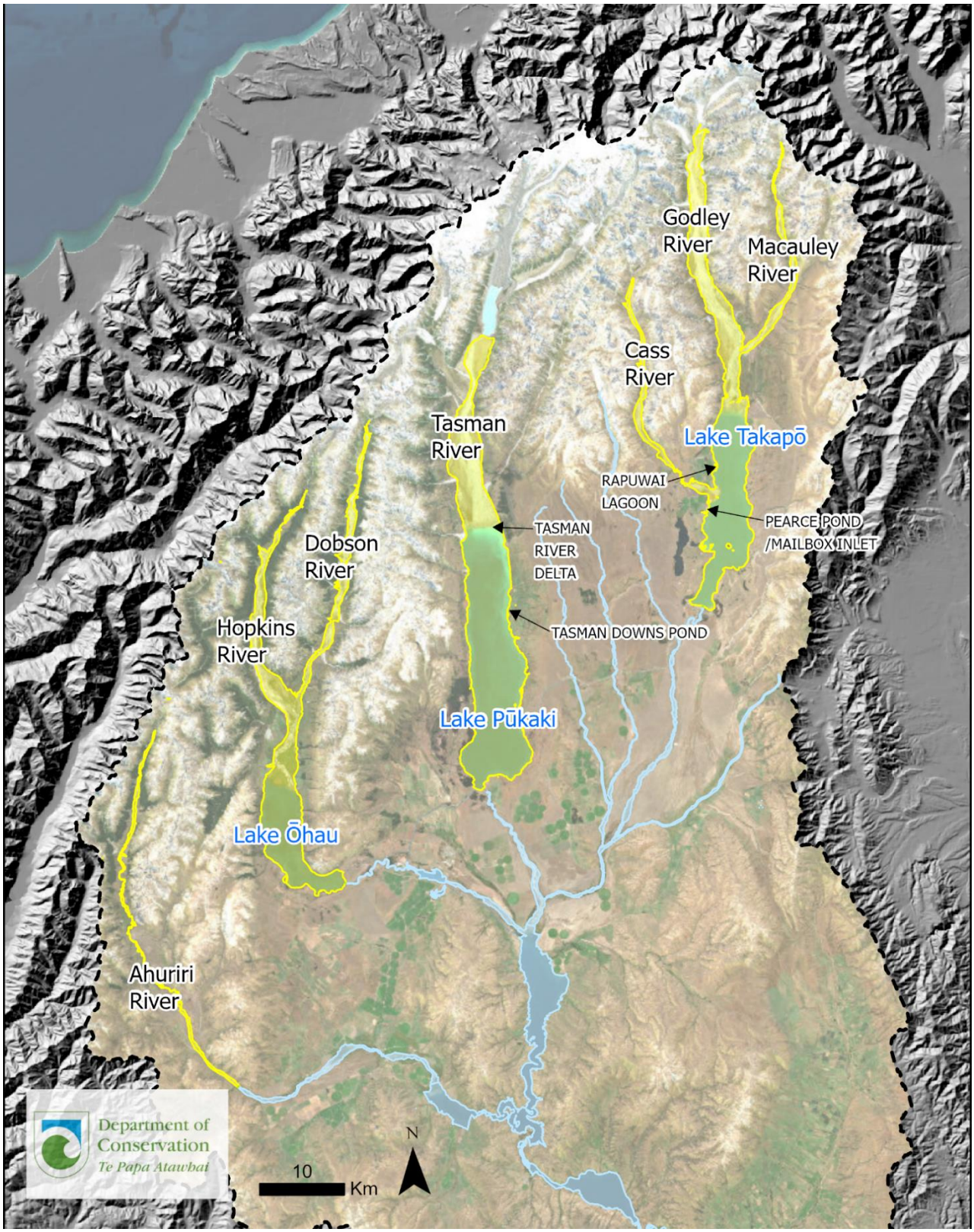

Figure 13. The upper catchment braided rivers and lakes and associated wetlands (yellow highlight) form zone 1 of the Waitaki catchment.

3.1.4 Outcome monitoring of actions in Zone 1

To record the benefits that Kahu Ora has delivered to indigenous biodiversity and cultural values throughout Zone 1, the following outcome monitoring will be delivered as a minimum:

Values protected (benefits)

- **Bird nesting success** (and causes of nest failure) in one river to measure the benefits of direct mammalian predator control and interpretation signage
- **Lizard and invertebrate populations trends** in one river to measure the benefits of direct mammalian predator control, and in two rivers to measure indirect predator control by maintaining low densities of rabbits
- **Bird population trends** across upper catchment rivers to measure benefits of weed and karoro management
- **Threatened fish population trends** at sites with upland long-jaw galaxias present
- **Threatened plant population trends** in lake shore and bay areas to measure the benefits of weed management.

Impacts on pressures

- The number and size of **karoro colonies** in target rivers to inform the intensity of ongoing management actions
- **Rabbit density trends** in target rivers to inform the intensity of ongoing management actions
- **Survey public** to understand the impacts of interpretation signage on behaviours in wetlands and braided rivers.

Intensity of actions

- Extent of **weed control** and surveillance as ha per type per annum.
- **Mammalian predator control** as 1) number of trap (and/or toxin) nights, 2) number and type of predators removed by trapping networks, and 3) extent of trapping network as ha per annum
- The intensity of **karoro control** as 1) the control tool used, 2) the number of individuals targeted by the control action, and 3) the number of individuals removed during control operations
- Extent of **grazer and browser control** and surveillance as 1) ha per annum, 2) intensity of control per river per annum (e.g., nights of shooting), and 3) number of individuals removed per river per annum.

3.2 Zone 2. The mid catchment braided rivers, tributaries and associated wetlands

Zone 2 is comprised of the braided rivers that occur between the hydro lakes, and their tributaries and their adjacent wetlands (Figure 14). The primary rivers are the Lower Ahuriri, Pūkaki and the Upper and Lower Ōhau and the Takapō which is fed by tributaries including Fork Stream, Mary Burn and Irishman Creek. Important wetlands within this zone include Ruataniwha Wetlands and Grays River Wetland. Historically, settlements utilised by Ngāi Tahu lined all the major tributaries of this zone. Waterways including wetlands were heavily used by whānau who followed many trails inland to converge on this zone.

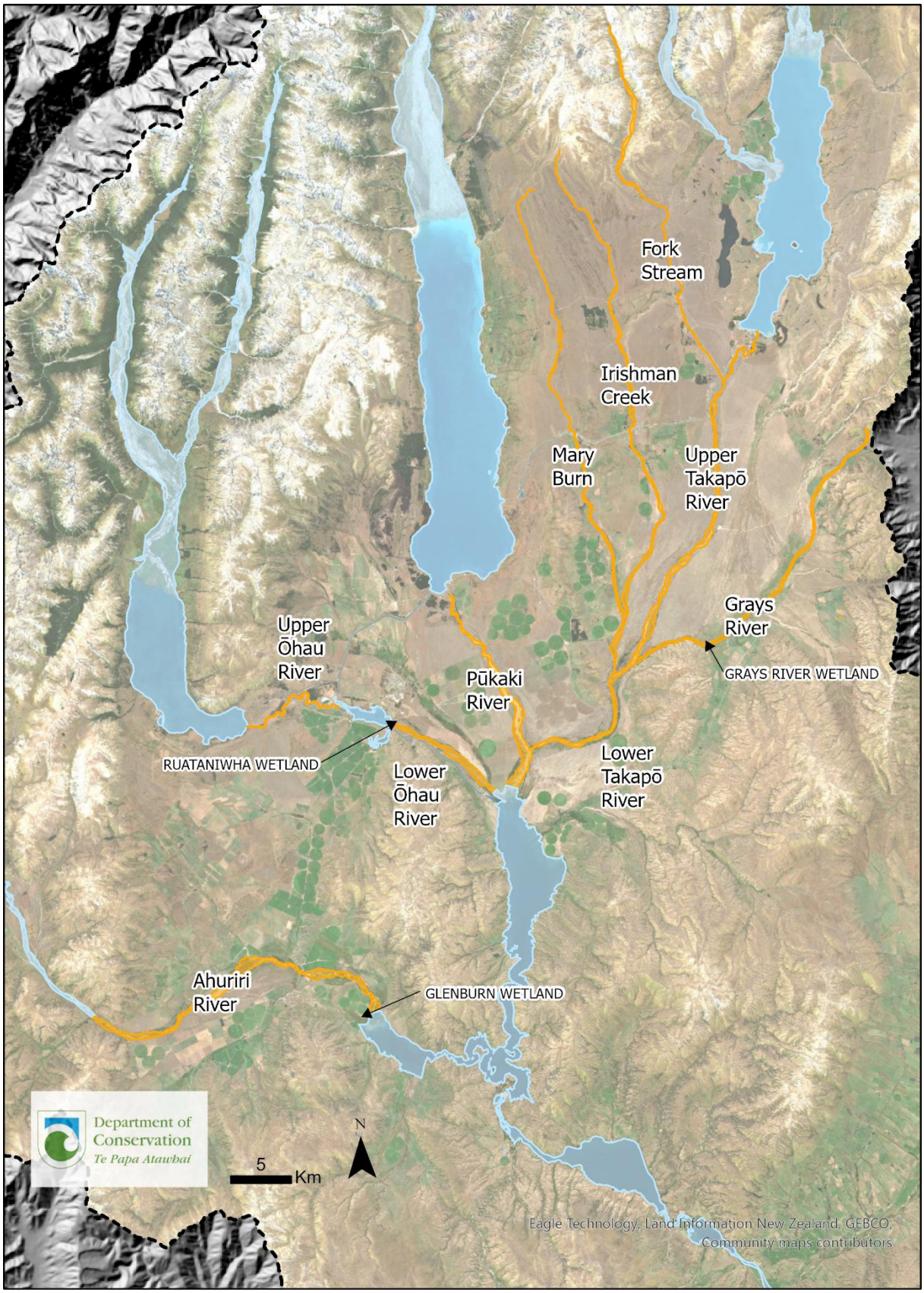

Figure 14. The mid catchment braided rivers, tributaries and associated wetlands (pale orange highlight) form Zone 2 of the Waitaki catchment.

3.2.1 Values, pressures and past investments in Zone 2

In this zone, the braided rivers have altered flow regimes because most natural flows are diverted through the hydro canals. There are moderate to high levels of weed and pest invasion, but indigenous biodiversity values persist throughout, including, for example, populations of lakes skinks, robust and minute grasshoppers, and a nationally important population of black-fronted terns. Large tracts of the Pūkaki and Takapō riverbeds are connected to rare and valuable outwash plain habitat which is protected as Public Conservation Land. Grays River Wetland forms the largest wetland complex in the Mackenzie Basin.

There are some impacts from recreational activities through this zone, for example, fishing, dog walking, motorbiking and four-wheel driving. Access to the rivers throughout the zone is along rough and poorly maintained roads that are suitable only for four-wheel drive vehicles which reduces the attractiveness of these sites for recreation. The intensity of agriculture in adjacent properties is increasing and the impacts for native species are not yet understood; however, they are likely to support increasing densities of karoro throughout the zone. Some plantings through the Takapō River have introduced invasive species (e.g., crack willow) to the system.

Project River Recovery has established and maintained an intensive predator trapping network in the Upper Ōhau River to protect an important colony of black-fronted tern and secure a minute grasshopper and lakes skink population. Previous work in the Lower Ahuriri River included willow removal from the mainstem of the river below Longslip Creek. Several fish barriers throughout this zone protect populations of bignose and lowland longjaw galaxiids from salmonids. Environment Canterbury has done some alder removal and enhancement planting along the Mary Burn and its confluence with the Takapō River, and in collaboration with the landowner has removed a large number of willows from Grays River Wetland. Environment Canterbury also deliver weed management in the fairways of the Ōhau, Pūkaki and Takapō Rivers, the later of which is joint funded by Environment Canterbury, PRR and Land Information New Zealand (LINZ).

3.2.2 A 35-year vision for Kahu Ora in Zone 2

Values through Zone 2 have been compromised by the impacts from the Combined Waitaki Power Schemes, particularly the reduced flows through the major braided rivers. Therefore, the focus of work in Zone 2 is to enhance values where they persist by protecting habitat and reducing impacts from other pressures within the zone. Over the next 35 years, Kahu Ora aims to:

- Increase extent of habitat available for indigenous flora and fauna by reducing impacts of weeds, and creating river islands
- Support stable and growing populations of some threatened species of indigenous flora and fauna by suppressing predators and browsers at high value sites
- Understand and implement opportunities to improve cultural values including taonga species.

3.2.3 Priority actions for the first 10 years of Kahu Ora in Zone 2

The focus of work in Zone 2 is to protect values where they continue to persist by delivering weed and predator management, to increase the extent of available habitat at selected sites, and to protect populations of key Threatened and At Risk species. Most resources will be invested in three of the key sites in the Zone: (1) the upper reach of the Takapō River which has relatively low infestations of woody weeds and moderate levels of residual populations of key threatened species. As a key action this site will include work in its uppermost tributary, Fork Stream which provides a substantial source of weeds to the Takapō River; (2) the Upper Ōhau River at Tern Island where a key population of lakes skinks and a nationally important population of black-fronted terns persists; and (3) to protect lizards in the Pūkaki River

(Table 3). These sites represent the highest priority sites that hold the most biodiversity and offer the most restoration potential.

Table 3. The proportional split of investment (rounded to the nearest whole number) into sites and actions within Zone 2 in the first 10 years of Kahu Ora.

Action	Takapō River	Takapō River wetlands	Pūkaki River	Upper Ōhau River	Lower Ōhau River	Fork Stream	Mary Burn	Glenburn Wetlands	Grays River Wetland	Ruataniwha Wetlands	Share of action investment (%)
Weed control	✓		✓	✓		✓			✓	✓	**59.2**
Predator control											**28.2**
Mammals	✓			✓							
Karoro	✓		✓	✓	✓						
Trout						✓					
Grazer and browser control	✓									✓	**5.5**
Education and advocacy	✓		✓	✓	✓	✓	✓	✓	✓	✓	**0.9**
Habitat Enhancement (non-vegetative island creation; restoration planting)	✓	✓		✓						✓	**5.6**
Fill knowledge gaps and support research	Throughout zone										**0.6**
Share of site investment (%)	**53.2**	**2.0**	**1.6**	**10.6**	**0.4**	**15.1**	**0.1**	**0.1**	**11.4**	**5.4**	**100**

Kahu Ora will achieve the following outcomes within the first 10 years:

- **Increased extent of habitat for indigenous flora and fauna** by removing tree weeds and controlling herbaceous weeds in Fork Stream, Upper Takapō River, Gray River Wetland and Pūkaki River terrace habitat, and 8 wetlands in the Upper Takapō River
- **Indigenous flora values protected** by maintaining low densities of rabbits in 1 river and 1 wetland
- **Indigenous river bird values protected** by maintaining low densities of karoro across 3 rivers, and maintaining 1 and establishing 8 islands to support bird nesting through the Upper Ōhau and Takapō Rivers respectively
- **Indigenous invertebrate, lizard and bird values protected** by supressing mammalian predators at 1 indigenous biodiversity hot-spot in each of the Upper Ōhau and Takapō rivers
- **Indigenous fish values protected** by eliminating trout from upstream of the trout barriers in the Fork Stream
- **Users informed of ecological and cultural values** by interpretation signage installed at 4 braided rivers, 3 wetlands, and 2 important tributaries of the Takapō River

3.2.4 Outcome monitoring of actions in Zone 2

To record the benefits that Kahu Ora has delivered to indigenous biodiversity and cultural values throughout Zone 2, we will deliver, as a minimum, the following monitoring:

Values protected (benefits)

- **Bird nesting success** (and causes of nest failure) on river islands to understand the benefits of island building and predator control, and the impacts of interpretation signage
- **Lizard and invertebrate populations trends** in two rivers to measure the benefits of direct mammalian predator control, and of woody weed control at Pūkaki
- **Bird population trends** across mid catchment rivers to measure benefits of weed and karoro management
- **Threatened plant population trends** to measure the benefits of weed and rabbit management
- **Indigenous freshwater fish population trends** to measure the benefits of trout removal
- **Survey public** to understand the impacts of interpretation signage on behaviours in wetlands and braided rivers.

Impacts on pressures

- The number and size of **karoro colonies** in target rivers to inform the intensity of ongoing management actions
- **Rabbit population trends** in target rivers to inform the intensity of ongoing management actions
- **Trout population trends** upstream of the Forks Stream barrier to understand progress towards eradication
- **Mammalian predator density trends** to inform the intensity of ongoing predator control
- **Survey public** to understand the impacts of interpretation signage on behaviours in wetlands and braided rivers.

Intensity of actions

- Extent of **weed control** and surveillance as ha per type per annum.
- **Mammalian predator control** as 1) number of trap (and/or toxin) nights, 2) number and type of predators removed by trapping networks, and 3) extent of trapping network as ha per annum
- The intensity of **karoro control** as 1) the control tool used, 2) the number of individuals targeted by the control action and 3) the number of individuals removed during control operations
- Extent of **grazer and browser control** and surveillance as 1) ha per annum, 2) intensity of control per river per annum (e.g., nights of shooting), and 3) number of individuals removed per river per annum
- The size and location of **bird islands** created
- The intensity of **trout eradication** as 1) hours spent electric fishing, and 2) the number of trout removed from upstream of the barrier.

3.3 Zone 3: Lakes Ruataniwha, Benmore, Aviemore and Waitaki, and associated wetlands

Zone 3 encompasses the lakes developed as part of the Waitaki Power Scheme, and their associated river delta and lake-edge wetlands. Lake Waitaki was the first to be established in the 1930s, followed by Lakes

Benmore (including the Takapō, Lower Ōhau and Ahuriri River deltas) and Aviemore in the 1960s, and finally Lake Ruataniwha (including Kelland Pond and Wairepo Arm) in the 1970s.

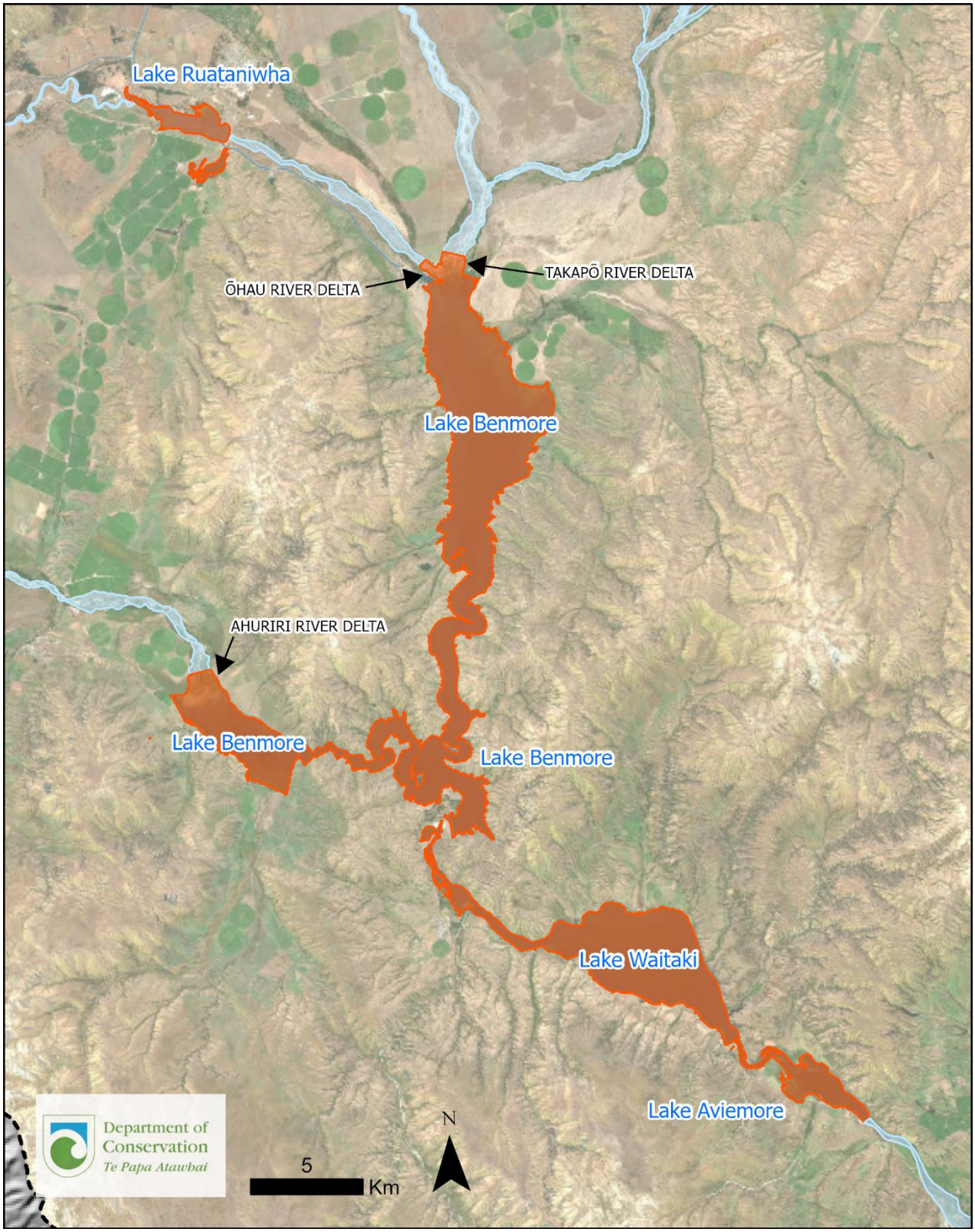

Figure 15. Lakes Ruataniwha, Benmore, Aviemore, Waitaki, and associated wetlands and river deltas form Zone 3 of the Waitaki catchment.

3.3.1 Values, pressures and past investments in Zone 3

The lakes and many of the associated wetlands throughout Zone 3 were formed during the installation of Waitaki Power Scheme dams, meaning that these ecosystems are young on an ecological time scale. However, the zone still supports some important indigenous values. For Ngāi Tahu, their history is still alive in the landscape, even if it is modified. For example, the Ahuriri Delta is hugely important because of historical events.

The lake edges provide important nesting and foraging habitats for Threatened and At Risk species of wetland birds such as Australasian crested grebe / kāmana (*Podiceps cristatus*; Nationally Vulnerable), Australian coot (*Fulica atra australis;* Naturally Uncommon), Australasian bittern/ matuku-hūrepo (*Botaurus poiciloptilus*; Nationally Critical) and marsh crake/ kotoreke (*Porzana pusilla affinis*: Declining). Indigenous wetland vegetation communities, including raupō reedland and tī kōuka / pūrei tussocklands, have established and persist at several lake-edge wetlands. The lake deltas also provide important habitats. They are important nesting and foraging habitats for braided river birds, and a recent study has shown that they are also important roosting sites for large congregations of black-fronted terns (Gray 2024). Turflands and Buchanan's sedge and *Carex kaloides* also occur on the river deltas.

There is a high level of human disturbance through this zone, because it is exceptionally well-utilized for recreation. The lake edges offer popular camping sites that are heavily used during the summer months. Lakes Benmore and Ruataniwha are extensively used for boating, with Lake Ruataniwha being a nationally recognized competition site for rowing. Fishing access is available along sections of the lakes' edges and some river deltas.

Exotic tree weeds, including crack and grey willows and alder, dominate and continue to invade many ecologically important areas throughout the zone. Their presence threatens indigenous vegetation values and reduces habitat quality and availability for indigenous birds. They also provide cover for predatory mammals that threaten indigenous birds in the zone. Adjacent and upstream land uses including intensive agriculture are degrading water quality in specific habitats and the wider wetland and lake environments.

The Takapō River delta was cleared of willows in the early 1990s. Recent investments in weed control at the delta have cleared and maintained large areas, keeping it free of willows. Current investment into biodiversity management in Zone 3 includes wetland enhancement at the Otematata Wetlands by a local community group supported by ECan funding, and annual *Lagarosiphon* control in Lake Benmore by LINZ.

3.3.2 A 35-year vision for Kahu Ora in Zone 3

Zone 3 has been compromised by the Combined Waitaki Power Schemes and other pressures; however, important ecological values continue to be present including in habitats that have been created by the schemes. The focus of work in Zone 3 is to protect and enhance biodiversity and cultural values at selected sites. Over the next 35 years, Kahu Ora aims to:

- Reduce the impacts of weeds on some wetland, delta and lake edge habitats
- Improve quality of some wetland and lake edge habitat with indigenous plantings
- Suppress predators and browsers at high value sites
- Understand opportunities to improve cultural values including provisions for mahinga kai investigations.

3.3.3 Priority actions for the first 10 years of Kahu Ora in Zone 3

The focus of the first 10 years in Zone 3 is on education and advocacy and weed control in several lake edge areas (Table 4). Kahu Ora will invest 3% of its resources into this zone in the first 10 years.

Table 4. The proportional split of investment (rounded to the nearest whole number) into sites and actions within Zone 3 in the first 10 years of Kahu Ora.

Action	Lake Aviemore	Lake Benmore	Lake Waitaki	Lake Ruataniwha	Ahuriri River delta	Takapō River delta	Otematata Wetlands	Lake Waitaki wetlands	Share of action investment (%)
Weed control				✓	✓	✓			**80.1**
Education and advocacy	✓	✓	✓	✓			✓	✓	**8.7**
Fill knowledge gaps and support research	Throughout zone								**11.2**
Share of site investment (%)	**2.9**	**2.9**	**2.9**	**8.3**	**36.9**	**40.5**	**2.9**	**2.9**	**100**

Kahu Ora will achieve the following outcomes within the first 10 years:

- **Habitat quality and extent** is improved through **weed control** at **1 delta** and **1 bay area**
- **Users informed** of ecological and cultural values through interpretation signage installed at **4 lakes** and **2 wetlands**

3.3.4 Outcome monitoring of actions in Zone 3

To record the benefits that Kahu Ora has delivered to indigenous biodiversity and cultural values throughout Zone 3, we will deliver, as a minimum, the following monitoring:

<u>Values protected (benefits)</u>

- **Indigenous plant values** to measure the benefits of weed management in 1 delta and at 1 bay area

<u>Impacts on pressures</u>

- The **extent and type of weeds** present at target sites
- **Survey public** to understand the impacts of interpretation signage on behaviours in wetlands and braided rivers

<u>Intensity of actions</u>

- Extent of **weed control** as ha per weed type per annum

3.4 Zone 4: The Lower Waitaki River and associated wetlands

Zone 4 extends from the Waitaki Dam to the ocean and incorporates the Lower Waitaki River, the riparian and wider braid plain wetlands and associated side streams (Figure 16).

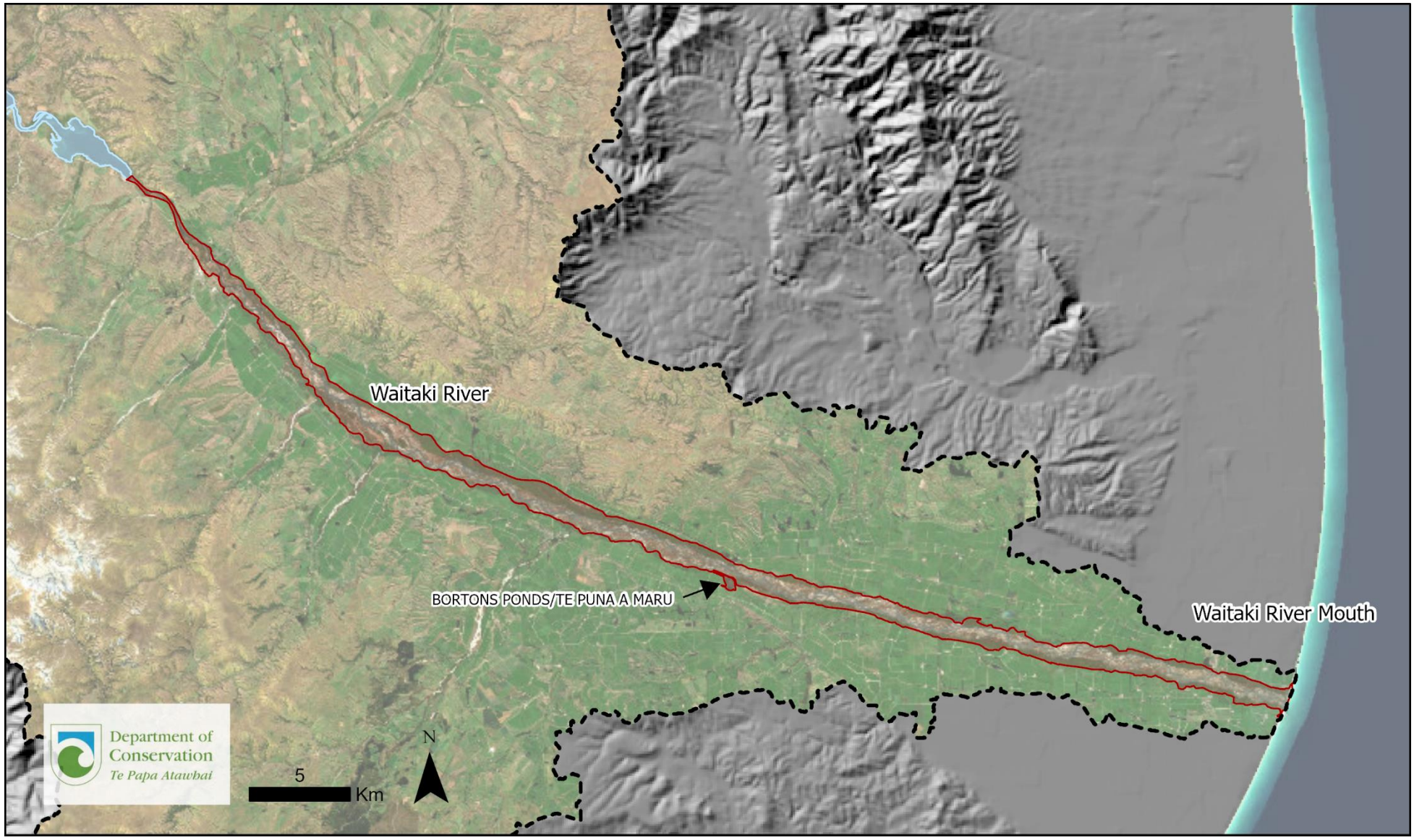

Figure 16. The Lower Waitaki River and associated wetlands and river mouth that form Zone 4.

3.4.1 Values, pressures and past investments in Zone 4

Repeated reference has been made in Iwi Management Plans to the importance of the Lower Waitaki River to Ngāi Tahu whānui, particularly side braids, riparian wetlands, springs and backwaters for their biodiversity values. They remain important to whānau and hapu for their mahinga kai and as such may be targeted for either passive or active restoration.

Although the Waitaki River has been heavily modified by flood protection works, weed infestation and agricultural encroachment, and the upstream Combined Waitaki Power Schemes, indigenous biodiversity values (fish, plants, lizards, birds, invertebrates) persist throughout the system, especially in some of the wetlands that occur in the riparian edges and across the wider abandoned floodplains. On the river itself, a range of braided river bird species, including black-fronted terns, black-billed gulls, wrybills and banded dotterels, continue to persist. The river mouth provides important winter foraging habitat for some river birds and nesting habitat for species such as the white-fronted tern/tara.

Wetlands within the riparian zone are generally modified and dominated by exotic species, but some areas retain diverse and representative indigenous wetland communities. On the wider floodplains there are 46 terrace wetlands that are influenced to some extent by the river. The wetlands have representative vegetation communities of bog rush and *Carex* sedgelands, turflands, pūrei tussockland, harakeke flaxland, and raupō reedland. The wetlands support several Threatened and At-Risk species, including swamp nettle, Buchanan's sedge and Lady's tresses orchid, and locally uncommon species of mud buttercup and *Gunnera dentata*; lamprey/kanakana, longfin eel/tuna, inanga, and Canterbury mudfish/kōwaro. The wetlands provide feeding habitat for braided river bird species, and reports of Australasian bittern and marsh crake in at least two wetlands indicate their value as habitat for indigenous wetland birds.

The Combined Waitaki Power Schemes have altered flows and flooding dynamics that would have naturally occurred through the Lower Waitaki River. The wider riverbed has been gradually encroached upon by flood protection works and agricultural practices such that the river now occupies only a portion of its historic bed. Consequently, river channels have become deeper and more embedded, altering the braiding pattern through the system.

Vegetation of the braided river in Zone 4 is dominated by exotic grasses, herbs, shrubs and trees which compromise the habitat availability and quality for braided river fauna and provide refugia for mammalian predators. Weedy species occur throughout the associated wetlands and have reduced wetland quality and extent.

The Lower Waitaki Valley is highly modified through intensive agricultural development. Irrigation infrastructure and methods, ongoing agricultural development, nutrient enrichment, and stock access have been detrimental to wetlands in Zone 4. Increased agricultural intensity has also facilitated the rapid expansion of karoro populations, which places excessive predation pressure on populations of other braided river bird species. Recreation tends to have localised impacts throughout this zone. Much of the river itself is inaccessible because of dense stands of willow and poplar planted for flood protection. However, jetboats provide some access to river islands and channels. Disturbance at the river mouth, especially from four-wheel drive vehicles, disturbs habitat for roosting and nesting river birds and compromises their nesting success. Widespread channel and gravel bulldozing, and willow removal for flood risk reduction also disturbs habitat throughout the river.

Project River Recovery supported the experimental establishment of several modified river islands in the 2010s to benefit braided river birds. There were low to zero detections of mammalian predators on those

islands, but despite high use for nesting and hatching success by mostly black-fronted terns, fledgling success was very low because of depredation by karoro. The absence of ongoing management has meant that the islands have been degraded by subsequent floods and vegetation encroachment. Several wetlands are under active or recent management including weed control and/or planting, with a range of funding and resourcing including landowners, community groups, Meridian, ECan, QE II Trust and Ngāi Tahu. The managed wetlands include Kurow Wetland and Kurow Island, Station Peak Raupō Wetland, Riverside Flats, Takiroa, Duntroon Wetland and Borton's Pond (which is managed for its wildlife values and a large area adjacent and downstream of the pond, Te Puna a Maru, is being enhanced by Te Rūnanga o Moeraki through Whiria te Waitaki). Environment Canterbury manages river fairway vegetation control, through a targeted rate, for woody trees and shrubs, mainly willow, gorse and broom, along the length of the Lower Waitaki River on at least a three-yearly cycle.

3.4.2 A 35-year vision for Kahu Ora in Zone 4

The modified nature of the Lower Waitaki River and adjacent wetlands has reduced biodiversity and associated cultural values over many decades. The vision for Zone 4 is therefore one of protecting, enhancing and restoring values. Over the next 35 years, Kahu Ora aims to:

- Restore wetlands of different types to benefit a range of values including, but not limited to, indigenous flora and fauna, ecological function, and cultural including mahinga kai
- Understand opportunities to improve cultural values including provisions for mahinga kai investigations
- Support indigenous river bird values through predator control and increasing availability of high-quality river islands
- Understand and consider implementation of some protection for indigenous invertebrate, bird, lizard, vegetation, and fish values
- Ensure flood protection works align with ecological and cultural values where possible

3.4.3 Priority actions for the first 10 years of Kahu Ora in Zone 4

The first 10 years of Kahu Ora in Zone 4 focuses on delivering weed control in selected wetlands, supporting Waitaki Rūnanga restoration of impacted Lower Waitaki wetlands for biodiversity and mahinga kai, and benefiting river bird values by building and maintaining bird islands and managing populations of karoro (Table 5). Kahu Ora will invest 31% of its resources into this zone in the first 10 years.

Table 5. The proportional split of investment (rounded to the nearest whole number) into sites and actions within Zone 4 in the first 10 years of Kahu Ora.

Action	Lower Waitaki River	Te Puna a Maru	Rūnanga Restoration Site 2	Wetlands	River mouth	Share of action investment (%)
Weed control only				✓		**17.6**
Predator control (karoro)	✓					**15.1**
Habitat enhancement						**59.6**
Waitaki Rūnanga restoration sites (includes weed control)		✓	✓			
Bird islands	✓					
Education and advocacy	✓	✓	✓	✓	✓	**0.6**
Fill knowledge gaps and support research	Throughout zone					**7.1**
Share of site investment (%)	**20.7**	**27.9**	**29.7**	**19.2**	**2.5**	**100**

Kahu Ora will achieve the following outcomes within the first 10 years:

- **Wetland values enhanced** through weed control at 5 sites
- Indigenous **river bird values supported** through karoro control and the creation and maintenance of 8 river islands, and seasonal vehicle restrictions at the river mouth
- **Cultural wetland restoration** and **mahinga kai values** are supported across 62 ha of wetland at Te Puna a Maru and 1 other site, and via access on public conservation land
- **Indigenous invertebrate, lizard, bird, plant, fish and wetland values are understood** throughout the zone
- **Ecological and cultural values benefit** from flood protection works where possible
- **Users informed of ecological and cultural values** through interpretation signage installed at 1 river site, 2 wetlands, and 2 Waitaki Rūnanga wetland restoration sites.

3.4.4 Outcome monitoring of actions in Zone 4

To record the benefits that Kahu Ora has delivered to indigenous biodiversity and cultural values throughout Zone 4, we will deliver, as a minimum, the following monitoring:

Values protected (benefits)

- **Bird nesting success** (and causes of nesting failure) on river islands to understand the benefits of island building, karoro management, and interpretation signage
- **Bird population trends** in the Lower Waitaki River to measure benefits of karoro management
- **Survival rates of native plantings** to understand the success of those plantings
- **Extent and locations of wetlands created** to measure the benefits of hydrology manipulations or mechanical works

- **Percentage of indigenous vegetation cover**, and/or indigenous-dominated vegetation communities as compared with baseline, to understand the benefits of weed control and plantings in and around wetlands
- The **number of new access points** through public conservation land that enable whānau and communities to access habitats and enjoy experiences with biodiversity
- The **length of riverbank that is opened up** for whānau and communities to access.

Impacts on pressures

- The number and size of **karoro colonies** in target rivers to inform the intensity of ongoing management actions
- **Survey public** to understand the impacts of interpretation signage on behaviours in wetlands and braided rivers.

Intensity of actions

- Extent and location of **weed control** as ha per type per annum.
- The intensity of **karoro control** as 1) the control tool used, 2) the number of individuals targeted by the control action and 3) the number of individuals removed during control operations
- The size and locations of **bird islands** created
- The extent of **native planting** as 1) number of each species planted, and 2) total ha planted, per annum
- The extent of mechanical and hydrology **wetland manipulations** as ha per annum.

4 Delivery of the strategic action plan

4.1 Priority knowledge gaps

Management of ecological and cultural values within the Waitaki catchment is complex and knowledge gaps related to pressures, actions, species, ecosystems, monitoring and management tools remain. Resolving these will both allow work to proceed, where knowledge has been limiting delivery; or allow current activities to be delivered more efficiently. Most knowledge gaps will require coordinated effort over many decades to fully resolve, and this task is much bigger than the role and budget proposed for Kahu Ora.

Therefore, we have not listed individual recommendations for addressing knowledge gaps here, but instead are recommending that the first steps in the work planning for understanding knowledge gaps for Kahu Ora are to:

1. List and review existing research / knowledge gap needs relevant to the catchment
2. Set up a workshop with Waitaki Rūnanga and key biodiversity experts in the ecosystems, species, activities and pressures to identify additional gaps and to set priorities for the potential projects. Projects would include key cultural research gap needs as well as biodiversity ones. Projects should be ranked using a combination of:
    a. relevance (what is the greatest benefit),
    b. feasibility (what research will likely result in new learning that can be applied),
    c. efficiency gains (what research will result in significant reductions in future budgets), and

d. effectiveness gains (what research is preventing key actions being delivered well).

3. Understand and align the proposed research list and priorities with DOC's knowledge gap programmes, to other research being delivered nationally, and to the objectives for the Aotearoa New Zealand Biodiversity Strategy.
4. Set up a delivery model that maximises collaborative effort to deliver work, considering options such as working with universities to provide a succession of future scientists. Kahu Ora will continue to work with DOC, Waitaki Rūnanga and other experts to understand what other knowledge gaps there are, and their relative priority in order to achieve the best biodiversity and cultural gains.

4.2 Action milestones

The delivery of Kahu Ora over the first 10 years is guided by 17 milestones. These milestones are scheduled at the end of the financial years of the 5th and 10th years of project delivery (see Figure 17). Reporting on milestones is required at the completion of the first strategic period (2025-2035) as per the conditions in Appendix I.

Zone 1

1) Willows have been removed from c. 5 ha of bay habitat in Lake Takapō. Lupins are controlled across 35 ha of bay habitat in Lake Pūkaki and c. 65 ha in Lake Takapō
2) Interpretation signage has been installed at 5 braided rivers, 3 lake shore areas and 3 wetland habitats

Zone 2

3) Tree weeds have been removed from c. 155 ha of the Upper Takapō River
4) Tree weeds have been removed from c. 80 ha of the Fork Stream
5) Tree weeds have been removed from c. 100 ha of the Gray River Wetland
6) Tree weeds have been removed from c. 9 ha of terrace habitat in the Pūkaki River
7) Eight wetlands in the Upper Takapō River have been enhanced
8) Interpretation signage has been installed at 4 braided rivers, 3 wetlands, and 2 key tributaries of the Takapō River
9) Eight islands have been established and are available for nesting birds in the Takapō River

Zone 3

10) Tree weeds have been removed from c. 130 ha of the Ahuriri River delta
11) Tree weeds have been removed from c. 1 Ha of bay habitat in Lake Ruataniwha
12) Interpretation signage has been installed at 4 lakes and 2 wetlands

Zone 4

13) Tree weeds have been removed from c. 50 ha of wetland habitat across at least 5 wetlands
14) Approximately 30 ha of wetland habitat has been restored for biodiversity and mahinga kai at Te Puna a Maru
15) Approximately 30 ha of wetland habitat has been restored for biodiversity and mahinga kai at one other site

16) Eight islands have been established and are available for nesting birds in the Lower Waitaki River
17) Interpretation signage has been installed at 1 river site, 2 wetlands, 2 Waitaki Rūnanga wetland restoration sites and the river mouth

Project Phase

- Planning
- Delivery
- Maintenance
- ◆ Milestone

Zone	Action	Milestone
1	Control weeds in 6 rivers	
1	Control weeds on lake bays	1
1	Control predatory mammals in 1 river	
1	Seasonally control cats in 3 rivers	
1	Maintain low densities of karoro in 6 rivers	
1	Control rabbit denisties in 3 rivers	
1	Install interpretation signage	2
2	Remove tree weeds in the Upper Takapō River	3
2	Control lupin, gorse, broom in the Upper Takapō River	
2	Remove tree weeds from the Fork Stream	4
2	Control lupin, gorse, broom in the Fork Stream	
2	Remove tree weeds from the Gray River Wetland	5
2	Enhance 8 wetlands in the upper Takapō River	6
2	Maintain low densities of karoro across 4 rivers	
2	Control mammalian predators at 1 diversity hot-spot in the Upper Ōhau River	
2	Control mammalian predators at 1 diversity hot-spot in the Takapō River	
2	Remove trout from upstream of the trout barriers in the Fork Stream	7
2	Control rabbits in 1 river and 1 wetland	
2	Install interpretation signage	8
2	Maintain 1 island in the Upper Ōhau River	
2	Establish and maintain 8 islands in the Takapō River	9
3	Control weeds at the Ahuriri River delta	10
3	Control weeds at 1 Ruataniwha bay	11
3	Install interpretation signage	12
4	Weed Control at 5 wetlands	13
4	Control karoro populations managed	
4	Enhance habitat at Te Puna a Maru	14
4	Habitat Enhancement (rūnaka restoration site 2)	15
4	Establish and maintain 8 islands in the Waitaki River	16
4	Seasonally restrict vehicle access at river mouth	
4	Install interpreative signage at 1 river site, 2 wetlands, and 2 rūnaka wetland restoration sites	17

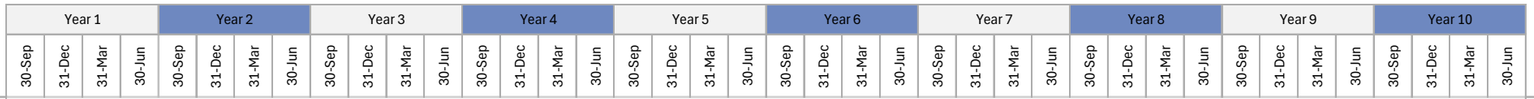

Figure 17. A proposed timeline for delivery of actions (pale blue = planning phase, dark blue = delivery phase, medium blue = maintenance phase) to meet milestones (black diamonds) over the first ten years of Kahu Ora.

4.3 Principles for delivering strategic priorities

Kahu Ora aims to enhance indigenous biodiversity and cultural values across braided river, wetland, and lake ecosystems within Aotearoa New Zealand's third-largest catchment. To achieve these ambitious goals and ensure the highest quality outcomes, Kahu Ora's delivery is guided by several key principles.

1. **Integrated management.** Kahu Ora takes an ecosystem approach to management, considering ecological communities and the relationships among them, and ecosystem function and connectivity. An ecosystem approach means that Kahu Ora's actions will deliver benefits that support a range of values throughout the catchment including Threatened and At Risk indigenous species, taonga species, and species that are important for mahinga kai.
2. **Research and monitoring to improve understanding and delivery.** Ecological management is complex. If actions are not applied with the correct intensity or duration, if unrecognised pressures exist within the system, or if there are knowledge gaps in best-practice delivery, or if management have unintended ecological outcomes, the intended benefits may be compromised. Kahu Ora will monitor all its actions to ensure they achieve, with best endeavour, the desired benefits and collaborate with researchers, postgraduate students and other agencies to fill knowledge gaps. This approach enables Kahu Ora to adapt its management approach flexibly; develop and test new methods; improve understanding of the catchment, its values and pressures; and ensure that ecological and cultural benefits are embedded into its actions.
3. **Make knowledge available**. Kahu Ora is the largest braided river, wetland and lake enhancement project in Aotearoa New Zealand, and will make important advances to current understanding of the values, pressures and pressure management in these rare and important ecosystems. Kahu Ora will share these advances widely for the benefit of other land and water managers, contributing to the better protection and conservation of indigenous values in these ecosystems across the country.
4. **Engagement with Waitaki Rūnanga.** Kahu Ora will regularly engage with Waitaki Rūnanga to stay abreast of cultural priorities and understand the benefits of Kahu Ora's delivery to cultural values. Kahu Ora will work with Waitaki Rūnanga to build capacity through sharing of skills and knowledge. Opportunities to collaborate and to share knowledge and learning via the delivery of specific projects will be sought and explored.
5. **Collaboration.** Kahu Ora will regularly liaise with agencies delivering similar work within the catchment for the purpose of aligning actions and delivering them efficiently. Kahu Ora will regularly monitor and integrate the latest advancements in tools, technologies, and techniques developed by others, and adopt and adapt these advancements to enhance the delivery of its actions to ensure it achieves optimal outcomes and value for money. Kahu Ora will keep local communities informed about work plans and progress, consult with them when appropriate, and actively strive to involve the community in its initiatives.
6. **Be a champion of braided rivers and wetlands.** Kahu Ora will champion the conservation and restoration of braided rivers, wetlands, and lakes by delivering exemplary outcomes in these ecosystems. Kahu Ora will educate communities, especially those that spend time in these ecosystems, about the unique and rare values that are present, and of actions they can take to ensure those ecosystems, and their values thrive.

4.4 Delivery in the context of other work in the catchment

Kahu Ora takes an ecosystem approach, seeking to benefit the indigenous biodiversity and cultural values of braided rivers, lakes, and associated wetlands within the Waitaki catchment. Kahu Ora is led by DOC and will use DOC systems to plan, hold and report on projects. This will include alignment with the DOC's biodiversity programmes embedded in BioInvest (BioInvest: biodiversity investment approach), providing clear visibility on the outcomes of the work in relation to other work around the motu. The BioInvest approach includes showing how work delivered on the ground aligns to collective biodiversity strategic expectations: Te Manu o te Taiao (Aotearoa New Zealand Biodiversity Strategy) and DOC's 10-year strategic goals and its outcome investment programmes.

Many of the riverbeds and lakes within the Waitaki Catchment are administered by LINZ. However, other agencies have regulatory or management interest in riverbed activities. For example, Environment Canterbury River manages flood risk and delivers fairway clearance works through the Takapō, Ōhau, Pūkaki, and Waitaki Rivers. They also deliver biodiversity enhancement work through the catchment by clearing invasive trees and establishing native plantings and delivering wetland surveys and monitoring. Kahu Ora will take note of other parties that are delivering conservation, enhancement and management within the catchment to consider alignment across complementary work programmes. Kahu Ora project work will occur in addition to, not in replacement of, that work.

4.5 Determining future priorities for actions under a changing environment

This strategic document was prepared under the current environmental state of the catchment, which includes the current tools and technologies available, and the balance of values and pressures present in 2025. It is likely that the environmental state of the catchment will shift over the duration of this 10-year strategic action plan, and over the 35-year duration of Kahu Ora. For example, the Predator Free 2050 (PF2050) movement is working towards eliminating possums, rats and mustelids from across the entire country by 2050, which would shift the balance of pressures within the catchment within in the next 25 years. Other less foreseeable change may include extreme weather events, wildfire, earthquakes, human disturbance, new infrastructure or land use impacts, water abstraction, climate change, new pest animal or plant invasions, and disease. Therefore, a 5 yearly re-evaluation of action priorities and of the timing of their delivery during the project will be required. As part of those review periods, it is recommended that Kahu Ora consider the following:

- **The principles for delivery**. Ensure that any changes in allocation of resources within the catchment, and the process of reallocation, aligns strongly with the project's Principles for delivering strategic action priorities (see p.49).
- **The balance of risk across the catchment**. Secure values across the catchment to maximise those values that are nationally important and ensure adequate buffering within the catchment to avoid risk of loss.
- **Past investment**. Ensure past investment is considered where that investment has produced high quality outcomes. Much of the work of Kahu Ora is investing in incremental improvement by reducing pressures such as weeds to retain and enhance values. Therefore, the investment in these activities will be undone if priorities shift before resilience of sites is secured (i.e. all of that cumulative effort will be wasted).

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7 Appendix I

Screen shots of the two relevant sections of the Indigenous Biodiversity Enhancement Programme related to the strategic plan. This document was signed by DOC, Meridian and Genesis CEO's on 23rd June 2023. The sections below set out the specific parameters (Section 8, fully copied) and the Biodiversity Programme Administration (Section 9, partially copied) for the development of this strategy document (now termed the "strategic action plan" to better match the intent of the parameters in Section 8). These are conditions agreed at this point in time (23 June 2023) and have been modified through agreement with Waitaki Rūnanga, DOC and the generators (see Appendix II).

8. PARAMETERS FOR THE BIODIVERSITY PROGRAMME

8.1 The objective of the Biodiversity Programme is to improve the condition, resilience, indigenous biodiversity, ecological processes and other values of the braided rivers and associated environments, including the wetlands, within the Waitaki catchment.

8.2 The Director-General will manage and deliver the Biodiversity Programme in accordance with the Strategic Plan under clause 9.4 and the Annual Plan under clauses 9.7 and 9.9.

8.3 A Biodiversity Programme will be developed by the Director-General, but must:

(a) align with the Strategic Plan under clause 9.4 and the Annual Plan under clause 9.9;

(b) be focused on improving the condition, resilience, biodiversity, and ecological processes of conservation values (except tuna, if dealt with in a separate agreement with the Waitaki Rūnanga) within the Waitaki catchment that are representative of those influenced by the Schemes being:

(i) lake margins and deltas;

(ii) wetland areas and springs associated with lakes and braided rivers;

(iii) braided rivers (both aquatic, within the braid plain) and their margins; and

(iv) areas of connection between these elements; and

(c) in achieving (a):

(i) work primarily, but not exclusively, focused on those waterbodies affected by the Generators' activities;

(ii) provide for the values, interests and aspirations as expressed by the Waitaki Rūnanga as mana whenua, including in relation to taonga species and mahika kai values (except tuna, to the extent dealt with in a separate agreement with the Waitaki Rūnanga); and

(iii) foster increased understanding of the listed areas and their biodiversity through research and development.

8.4 The initial focus of the Biodiversity Programme will include, but need not exclusively be:

(a) **Takapō Catchment**: Focussed restoration in key exemplar sites on river with associated weed and predator management, wetland enhancement in catchment, island creation, wider river targeted weed and predator control, knowledge gaps filled, restoration of two bay areas on lake;

(b) **Pūkaki, Upper and Lower Ōhau River catchments**: Exemplar sites with predator and weed management in lower river reaches focused on threatened species hotspots, and areas of terrestrial braid plain weeds managed, knowledge gaps filled; and

(c) **Lower Waitaki River Catchment**: Restoration of braid plains and side streams, wetland enhancement in catchment, island creation, weed control and targeted predator control, knowledge gaps filled.

9.4 The Director-General shall develop, and the Governance Group shall agree, a Strategic Plan that:

(a) sets out how the purpose of this Agreement and the objective of the Biodiversity Programme will be achieved over the upcoming 10-year period;

(b) shapes the direction of the Annual Plans by identifying priorities for investment of the Biodiversity Fund in achieving the objective of the Biodiversity Programme, including those matters listed in clause 8.3(b);

(c) ensures the efficient and effective implementation of the Biodiversity Programme and expenditure of the Biodiversity Fund, including opportunities to integrate and co-ordinate the Biodiversity Programme with other indigenous biodiversity management activities and parties within the Waitaki catchment, including pursuing additional alternative funding options;

(d) provides a framework for the involvement of the Waitaki Rūnanga as mana whenua, if they desire, while achieving the purpose of this Agreement, including the development of relevant capabilities and mātauranga Māori;

(e) identifies monitoring and other opportunities within Annual Plans to enable an adaptive learning context to enhance indigenous biodiversity gain from the use of the Biodiversity Fund; and

(f) the first Strategic plan must also identify a framework for how the matters in clause 8.4 will be delivered through the Annual Plans.

9.5 The Parties will use reasonable endeavours to have the first Strategic Plan prepared and, subject to any amendments required by conditions in the Replacement Consents, agreed before the commencement of the Replacement Consents. The process for preparing the first Strategic Plan is:

(a) a draft Strategic Plan in accordance with this Agreement shall be prepared by the Director-General in consultation with the Governance Group representatives, before 1 May 2025;

(b) any amendments to accommodate consent condition requirements shall be added by the Director-General in consultation with the Governance Group representatives; and

(c) once finalised by the Director-General the draft Strategic Plan shall be provided to the Governance Group representatives, along with an agenda for a Governance Group meeting, at

least 4 weeks prior to a special meeting of the Governance Group to agree the new Strategic Plan.

9.6 The Strategic Plan shall be reviewed every 10 years by the Governance Group. The review process shall be led by the Director-General and commence 1 year prior to the end of the 10-year period of the last Strategic Plan. The review shall follow the same process as set out in clause 9.5, with any amendments as relevant. The Director-General, at the start of consultation (to commence no later than 9 months prior to the end of the 10-year period), shall provide a report to the Governance Group representatives as to the lessons learnt from the preceding Annual Plans that will improve efficient and effective implementation of the Biodiversity Programme and enhance indigenous biodiversity gain from the use of the Biodiversity Fund. For the avoidance of doubt, every review must achieve the purpose of this Agreement and the objective of the Biodiversity Programme.

8 Appendix II

Final draft of the reworked version of the original Indigenous Biodiversity Enhancement Programme Conditions (Appendix I) as modified through agreement with Waitaki Rūnanga, DOC and the Generators. This draft includes feedback from these Waitaki Rūnanga. Note that because it has not yet been signed as an update to the original agreement, it is provided here as draft only at this point in time. The strategy action team have used this version to map the proposed work across the zones against these requirements in Appendix III.

Version dated: 11 October 2023

The Indigenous Biodiversity Enhancement Programme (IBEP) is to be proffered as conditions of consent in both of the Generators replacement consent application processes. Feedback from Waitaki Rūnaka identifies improvements that can be made to those conditions to be proffered.

The conditions below are agreed by the Department and the Generators in response to the Waitaki Rūnaka feedback. The Generators undertake to amend the IBEP conditions proffered to be those below at an appropriate time on their respective consent processes. The Department undertakes to support the proffered conditions below.

Indigenous Biodiversity

Requirement for an Indigenous Biodiversity Enhancement Programme

1. The consent holder must ensure an integrated Indigenous Biodiversity Enhancement Programme (IBEP) is undertaken in conjunction with Genesis Energy to improve the condition, resilience, indigenous biodiversity, ecological processes and other related values of taonga species, the braided rivers and associated freshwater environments including the wetlands within the Waitaki Catchment.

2. The consent holder's contribution to the IBEP must have a minimum annual value of $[Generator's contribution], CPI (all groups) adjusted from 1 July 2025.

3. The objective of the IBEP required by condition 1 is to improve the condition, resilience, indigenous biodiversity, ecological processes and other values of representative examples of the following features within the Waitaki Catchment:
   a. Lake margins and deltas
   b. Wetlands and springs associated with lakes and braided rivers
   c. Braided rivers (both aquatic, within the braid plain) and their margins
   d. Areas of functional connection between these features

4. In achieving the objective in condition 3 the IBEP will:
   a. focus work primarily, but not exclusively, on those waterbodies directly affected by the Waitaki or Tekapō power schemes;
   b. incorporate the values, interests and aspirations as expressed by the Waitaki Rūnanga, including in relation to taonga species and mahika kai (except for tuna) values; and
   c. foster increased understanding of such areas and their biodiversity through research and development.

Implementation of the Indigenous Biodiversity Enhancement Programme

5. At all times there must be a strategic plan that sets out how conditions 1, 3 and 4 are to be achieved ("Strategic Plan") over a 10-year planning horizon ("Strategic Plan Period"). The initial Strategic Plan will cover intended actions to implement the IBEP over the first 10-year period of this consent and must be prepared and a copy supplied to the Canterbury Regional Council no later than 6 months of the commencement date of this consent.
6. The Strategic Plan must be reviewed and confirmed or replaced, and a copy provided to the Canterbury Regional Council not more than ten years following preparation of the initial Strategic Plan and not more than every ten years thereafter. All reviews of the Strategic Plan must be provided to the Canterbury Regional Council prior to the commencement of the period to which the Strategic Plan relates.

7. The Strategic Plan must:
    a. Be prepared by a suitably experienced person; and
    b. Be prepared with the Department of Conservation alongside Te Rūnanga o Arowhenua, Te Rūnanga o Moeraki, Te Rūnanga o Waihao, if they individually or collectively elect to be involved; and
    c. Identify the priorities for achieving the objective of the IBEP over the Strategic Plan Period; and
    d. Identify the key implementation milestones to be achieved over the Strategic Plan Period in accordance with the priorities; and
    e. Identify the monitoring that will be used to demonstrate the achievement of the milestones that are set out in the Strategic Plan over the Strategic Plan Period; and
    f. Identify the governance, management, and delivery arrangements for the IBEP over the Strategic Plan Period.

    A report must be provided to the Canterbury Regional Council within six months of the completion of each Strategic Plan implementation period. The report must:

    g. Be prepared by a suitably experienced person; and
    h. Be prepared with the Department of Conservation alongside Te Rūnanga o Arowhenua, Te Rūnanga o Moeraki, Te Rūnanga o Waihao, if they individually or collectively elect to be involved; and
    i. Identify whether the key milestones set out in the Strategic Plan were achieved; and
    j. Identify whether the monitoring undertaken was appropriate for demonstrating whether the milestones in the Strategic Plan were achieved; and
    k. Identify if any milestones were not achieved, and if so, the causes of non-achievement and any matters that should be revised in the next Strategic Plan.
8. The initial Strategic Plan must include (without limitation) a focus on the following:
    a. Takapō Catchment:
        i. Restoration of key representative sites on the river, other waterbodies and immediate riparian environs with associated pressure management (e.g., weeds and pests);
        ii. Wetland enhancement;
        iii. Island creation;
        iv. Pressure management (e.g., weeds and pests); and
        v. Restoration of two bay areas on Lake Takapō;
    b. Pūkaki, Upper and Lower Ōhau River catchments: Representative sites with predator and weed management in lower river reaches focused on threatened species hotspots and areas of terrestrial braid plain; and
    c. Lower Waitaki River Catchment: Restoration of braid plains and side streams, wetland enhancement, island creation, pressure management (e.g., weeds and pests); and
    d. Identification and prioritisation of research to address identified knowledge gaps.

9. To implement the Strategic Plan an Annual Plan must be developed and implemented. The Annual Plan is to:
    a. Be prepared by a suitably experienced person; and
    b. Identify the specific actions and outputs that are to be the focus for the forthcoming year covered by the Plan, consistent with the strategic plan.
10. A copy of each Annual Plan must be provided to the Canterbury Regional Council prior to the implementation period for that Annual Plan.
11. A report must be provided to the Canterbury Regional Council within 3 months of the end of each Annual Plan implementation period. The report must:
    a. Be prepared by a suitably qualified expert; and
    b. Identify the actions and outcomes that were undertaken over the previous Annual Plan period; and
        i. If any actions and outcomes were not achieved identify the causes of non-achievement and
        ii. If similar actions and outcomes are to be undertaken in future, identify what matters should be revised; and
    c. Identify progress towards achievement of the Strategic Plan.
12. A copy of each Strategic Plan (condition 5), report on each Strategic Plan (condition 8), Annual Plan (condition 10) and report on the Annual Plan (condition 12) must be provided to Te Rūnanga o Arowhenua, Te Rūnanga o Moeraki, Te Rūnanga o Waihao and the Department of Conservation.
13. The Canterbury Regional Council may review conditions 1 - 13 of this consent by giving notice of its intention to do so in accordance with section 128 of the RMA, at any time within six months of the delivery to the Canterbury Regional Council of each strategic plan review report as required by condition 8. The review shall enable the Canterbury Regional Council to amend or add conditions to ensure that the IBEP remains effective and appropriate to achieve its objective over the duration of the consent.

9 Appendix III

Evidence of adherence of the strategic action plan to the agreement (Appendix II).

	Clause		Reference
	7.c.	Identify the priorities for achieving the objective of the IBEP over the Strategic Plan Period	Priority actions for the first 10 years of Kahu Ora in Zone 1 (p.29), Zone 2 (p.34); Zone 3 (p.39) and Zone 4 (p. 43)
	7.d.	Identify the key implementation milestones to be achieved over the Strategic Plan Period in accordance with the priorities	Action milestones; p.46
	7.e.	Identify the monitoring that will be used to demonstrate the achievement of the milestones that are set out in the Strategic Plan over the Strategic Plan Period	Monitoring the delivery and benefits of actions within the zone (p.27) Outcome monitoring of actions in Zone 1 (p.32); Zone 2 (p.36); Zone 3 (p.39); and Zone 4 (p. 44)
	7.f.	Identify the governance, management, and delivery arrangements for the IBEP over the Strategic Plan Period	The delivery of Kahu Ora in the Waitaki catchment in the first 10 years; p.22
	8.a.i.	Takapō Catchment: Restoration of key representative sites on the river, other waterbodies and immediate riparian environs with associated pressure management (e.g., weeds and pests)	Priority actions for the first 10 years of Kahu Ora in Zone 2; p.34
	8.a.ii.	Takapō Catchment: Wetland enhancement	Priority actions for the first 10 years of Kahu Ora in Zone 2; p.34
	8.a.iii.	Takapō Catchment: Island creation	Priority actions for the first 10 years of Kahu Ora in Zone 2; p.34
	8.a.iv.	Takapō Catchment: Pressure management (e.g., weeds and pests)	Priority actions for the first 10 years of Kahu Ora in Zone 2; p.34
	8.a.v.	Takapō Catchment: Restoration of two bay areas on Lake Takapō	Priority actions for the first 10 years of Kahu Ora in Zone 1; p.29
	8.b.	Pūkaki, Upper and Lower Ōhau River catchments: Representative sites with predator and weed management in lower river reaches focused on threatened species hotspots and areas of terrestrial braid plain	Priority actions for the first 10 years of Kahu Ora in Zone 2; p.34
	8.c.	Lower Waitaki River Catchment: Restoration of braid plains and side streams, wetland enhancement, island creation, pressure management (e.g., weeds and pests);	Priority actions for the first 10 years of Kahu Ora in Zone 4; p.43
	8.d.	Identification and prioritisation of research to address identified knowledge gaps	Priority knowledge gaps; p.45

10 Appendix IV

Some of the key Threatened and At-Risk species and habitat types that occur within the Waitaki catchment, and the zones in which actions will protect them. Note that not all species and habitat types occur across all zones within the catchment. *TS = Threat Status (from the New Zealand Threat Classification System): *Threatened*, inclusive of Nationally Critical (NC), Nationally Endangered (NE) and Nationally Vulnerable (NV); *At Risk*, inclusive of Declining (D) and Naturally Uncommon (NU); Not Threatened (NT); Introduced and Naturalised (I/N).

Species/Ecosystem			Zone 1	Zone 2	Zone 3	Zone 4
***TS**	**BIRDS**					
NE	Black-fronted tern/tarapirohe	*Chlidonias albostriatus*	✓	✓		✓
NV	Wrybill/ngutu parore	*Anarhynchus frontalis*	✓	✓		✓
NC	Black stilt/kakī	*Himantopus novaezelandiae*	✓	✓		
D	Banded dotterel/tūturiwhatu	*Charadrius bicinctus*	✓			
D	South Island pied oyster catcher/tōrea	*Haematopus finschi*	✓			
D	Black-billed gill/tarāpuka	*Larus bulleri*	✓	✓		✓
NV	Caspian tern/taranui	*Hydroprogne caspia*	✓	✓		
NC	Australasian bittern/matuku-hūrepo	*Botaurus poiciloptilus*	✓	✓		✓
NV	Australasian crested grebe/pūteketeke	*Podiceps cristatus australis*		✓		
D	Marsh crake/ kotoreke	*Porzana pusilla*		✓		✓
D	White-fronted terns/tara	*Sterna striata*				✓
NU	Australian coot	*Fulica atra australis*		✓		
	LIZARDS					
NV	Lakes skink	*Oligosoma* aff. *chloronoton* “West Otago”		✓		
NV	Mackenzie skink	*Oligosoma prasinum*		✓		
NV	Scree skink	*Oligosoma waimatense*		✓		
D	Roamatimati	*Oligosoma aff. longipes* “southern”				
D	Southern grass skink	*Oligosoma* aff. *polychroma* Clade 5				
D	Jewelled gecko	*Naultinus gemmeus*				
D	Southern Alps gecko*	*Woodworthia* “Southern Alps”	✓			
	INVERTEBRATES					
NE	Robust grasshopper			✓		
NV	Minute grasshopper			✓		

	PLANTS				
NC	New Zealand fish-guts plant	*Chenopodium detestans*	✓		
NE	Pygmy goosefoot	*Dysphania pusilla*			
NE	Curly sedge	*Carex cirrhosa*	✓		
D	Buchanan's sedge	*Carex buchananii*			
D	Sedge	*Carex kaloides*			
NE	Sneezeweed	*Centipeda minima* subsp. *minima*			
NU	Pygmy clubrush	*Isolepis basilaris*	✓		
NU	Swamp nettle	*Urtica perconfusa*			
NV	Lady's tresses orchid	*Spiranthes australis*			
D	Berggren's sedge	*Carex berggrenii*	✓		
D	Sedge	*Carex decurtata*	✓		
NU	Sedge	*Carex lachenalii* subsp. *parkeri*	✓		
D	Mueller's sedge	*Carex muelleri*	✓		
D	Trailing bindweed	*Convolvulus verecundus* f. *verecundus*		✓	
NU	n/a	*Pentapogon youngii*	✓		
D	n/a	*Muehlenbeckia ephedroides*		✓	
NU	n/a	*Ranunculus maculatus*	✓		
D	Tufted hair-grass	*Deschampsia cespitosa*	✓		
D	Marsh willowherb	*Epilobium chionanthum*	✓		
D	Dryland button daisy	*Leptinella serrulata*	✓		
NV	Dwarf woodrush	*Luzula celata*	✓		
D	Pin cushion	*Colobanthus brevisepalus*		✓	
NV	Riverbed forget-me-not	*Myosotis uniflora*	✓		
	FISH				
NV	Bignose galaxias	*Galaxias macronasus*		✓	
NE	Lowland longjaw galaxias (Waitaki River)	*Galaxias aff. cobitinis "Waitaki"*		✓	
NV	Upland longjaw galaxias (Waitaki River)	*Galaxias aff. prognathus "Waitaki"*			
NC	Canterbury mudfish/kōwaro	*Neochanna burrowsius*			
NV	lamprey/kanakana	*Geotria australis*			
D	Longfin eel/tuna	*Anguilla dieffenbachii*			
D	kōaro	*Galaxias brevipinnis*			
	HABITAT TYPE				
	Braided riverbed		✓	✓	✓
	Wetlands			✓	✓

Shallow ephemeral lake bays	✓			
River delta	✓		✓	
River mouth				✓
River margins	✓	✓		✓