Waitākere Dam and Pipeline
2024-2025 Annual Report

Final - November 2025

Watercare

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CONSENT CHANGE AND MONITORING HISTORY

Change type	Description	Effective date	Reference / condition	Reporting / monitoring implications
Reduced compensation flow	Watercare exercised emergency powers to reduce compensation flow discharges as a result of drought conditions.	9/04/2020	4(i)-(iv) of baseline consents.	Requirements of 4(i)-(iv) not applicable.
Reduced compensation flow	Short-term resource consents authorising a reduction in compensation flow from the Dam.	24/07/2020	4(i)-(iv) of baseline consents replaced by consent DIS60357054.	Requirements for compensation flow, monitoring and reporting authorised by DIS60357054. No annual reporting required, but increased monitoring and notification of issues throughout critical spring-summer period.
Reduced compensation flow	DIS60382532 continued reduced compensation flow requirements following the expiry of consent DIS60357054.	22/07/2022	4(i)-(iv) of baseline consents replaced by consent DIS60382532	As above.
Increased compensation flow	DIS60382532 required reduced compensation flows to cease on 30 April 2025, returning to a compensation flow regime determined by total system storage.	1/05/2025	4(i)-(iv) of the baseline consents.	Management and reporting of compensation flow compliance is in accordance with total system storage and the baseline consents from 1 May 2025.
Annual report due date	Watercare requested all dam annual reports to be extended from 30 September to 31 October	19/05/2025	7	All reports to be submitted by 31 October of each year.

EXECUTIVE SUMMARY

The 2024-2025 Annual Report for the Waitākere Dam and Pipeline provide an overview of compliance and monitoring activities conducted over the reporting period from 1 July 2024 to 30 June 2025. The report covers various aspects, including water abstraction, reservoir levels, spillway discharges, compensation flows, environmental monitoring, and pipeline operations, as required under the respective resource consents.

Key findings and highlights from the monitoring activities include:

- Water usage: The total volume of water abstracted during the reporting period was 5,499,682 m^3, measured accurately with Magflow meters
- Reservoir levels: The reservoir was continuously monitored, showing average daily reservoir levels between 15.2 and 19.9 meters
- System storage: The total system storage for raw water reservoirs ranged from 60% to 88% over the year, ensuring a stable water supply. No significant storage deficits were recorded during this period
- Spillway and compensation flows: Spillway discharges occurred consistently in winter and spring. The compensation flow regime was above minimum flows throughout the period
- Environmental stream monitoring: Monitoring downstream of the dams highlighted stable water quality, nutrient levels and macroinvertebrate communities. No trigger levels for the adaptive management plan were reached.
- Fisheries management: Large quantities of elvers and some *galaxiids* were transported over the dam, however no migrating eels were caught for downstream migration
- Pipeline and discharge valve operations: Regular free discharge valve operations and maintenance were performed at the dam, with turbidity levels monitored before and after discharges to ensure compliance with environmental standards. No scour valve operations occurred along the Waitakere pipeline during this period
- Network efficiency and conservation: Watercare continues its water efficiency efforts, identifying and repairing leaks across the region, reducing non-revenue water, and promoting residential and commercial water conservation initiatives

In conclusion, Waitākere Dam has remained fully compliant throughout the 2023-2024 monitoring period, and no equipment failures or maintenance activities resulted in adverse environmental effects.

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1 INTRODUCTION

This report contains the monitoring results required annually by the following resource consents for the Waitākere Dam: 36631 (WAT60274700), 36632 (LUS60273611), 36633 (DIS60263491), 36634 (DIS60263505), and 36527 (WAT60274684). In addition, this report covers the short-term compensation flow reduction consent DIS60382532.

This report also covers the annual reporting requirements of Waitākere Dam treatment plant pipelines consents 25336 (DIS60264264) and 25337 (LUS60273107). The conditions of the consents are listed below in Table 1-1. The conditions across each of the dam's consents are identical.

Table 1-1: Resource consent conditions requiring annual reports.

Reporting information	Consent conditions
Water use	Condition 1 Condition 7 (iii)
Reservoir level	Condition 2 (ii) Condition 7 (iii)
Environmental monitoring	Condition 5 Condition 7 (iii)
Free discharge valve monitoring	Condition 6 Condition 7 (iii)
Network efficiency and conservation	Condition 9 Condition 7 (iii)
Pipeline scour valve operations	Condition 2 (iii – iv) Condition 3

2 WATER USAGE

The daily quantity of water being taken from the Waitākere Dam is measured by Magflow meters. This meter is on the pipeline below the dam adjacent to Kelly's pipeline. The meter measures to an accuracy of at least ± 5%, is appropriately verified, and maintained in working condition at all times.

Daily abstraction for the reporting period is shown in Figure 2-1. The full dataset is in Appendix A. Over the 12 months, 5,499,682 m3 was abstracted, with an average of 15,068 m^3 per day.

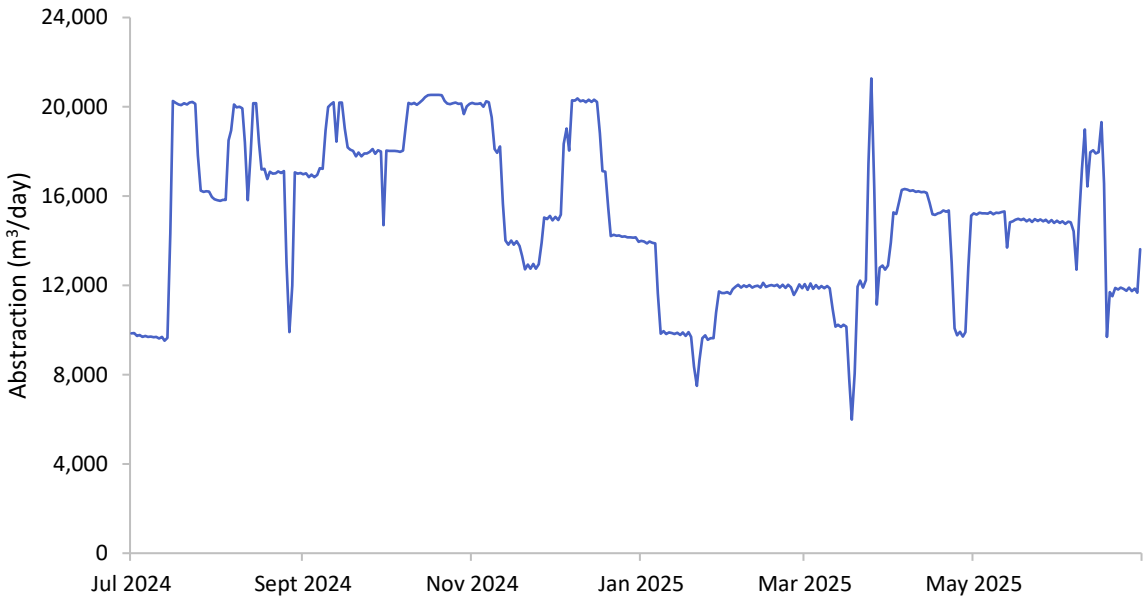

Figure 2-1: Total daily abstraction from Waitākere Dam for the reporting period 2024-2025.

3 RESERVOIR LEVEL

The reservoir levels are monitored continuously on SCADA by level transmitters located in the tower of the Waitākere Dam.

The daily average reservoir levels for the reporting period are shown in Figure 3-1. The full dataset is in Appendix B. The average level for Waitākere Dam ranged between 15.2 – 19.9 m.

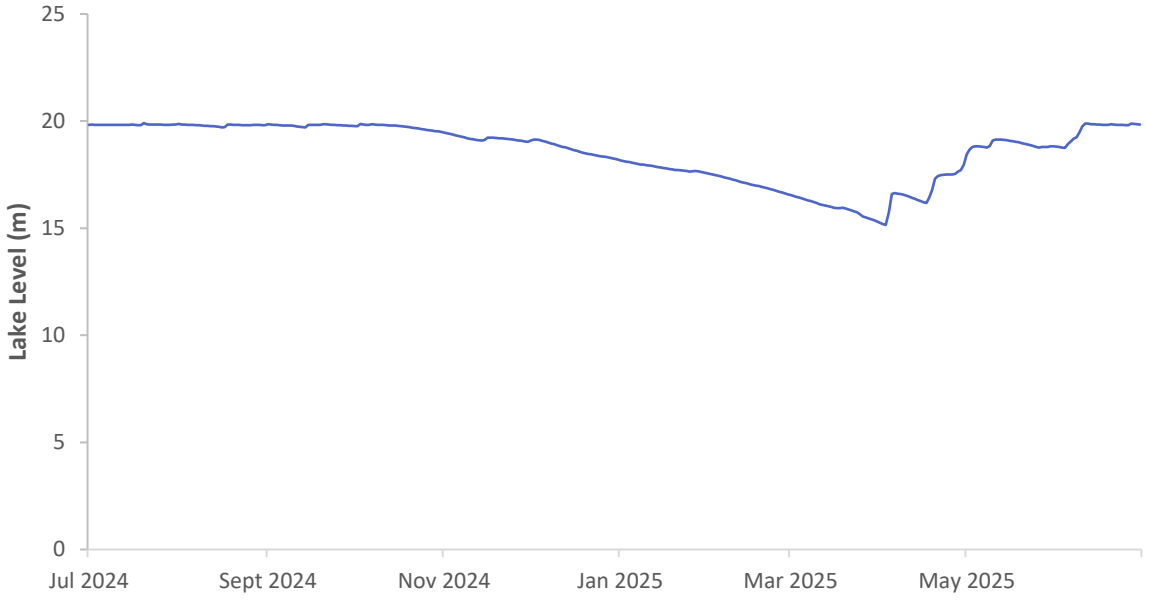

Figure 3-1: Reservoir daily average level for Waitākere Dam for the reporting period 2024-2025.

4 TOTAL SYSTEM STORAGE

The resource consents require monitoring of the total system storage, defined by the following formula:

$$\frac{\text{Total system live storage volume}}{\text{Total system live storage volume capacity}} \times 100$$

Where:

- *Total system live storage volume* is the sum of water stored at any one time in all of the Watercare raw water reservoirs (whether within or outside the Auckland Region) above the level of the lowest supply intake in each respective reservoir
- *Total system live storage volume capacity* is the sum of the volume of water that can be stored at any one time in all of the Watercare raw water reservoirs (whether within or outside the Auckland Region) between the level of the lowest supply intake and the level of the spillway in each respective reservoir.

For the 2024-2025 monitoring period, total system storage for the dams ranged between 60% and 88%. The data is displayed in Figure 4-1 and the full dataset in Appendix C.

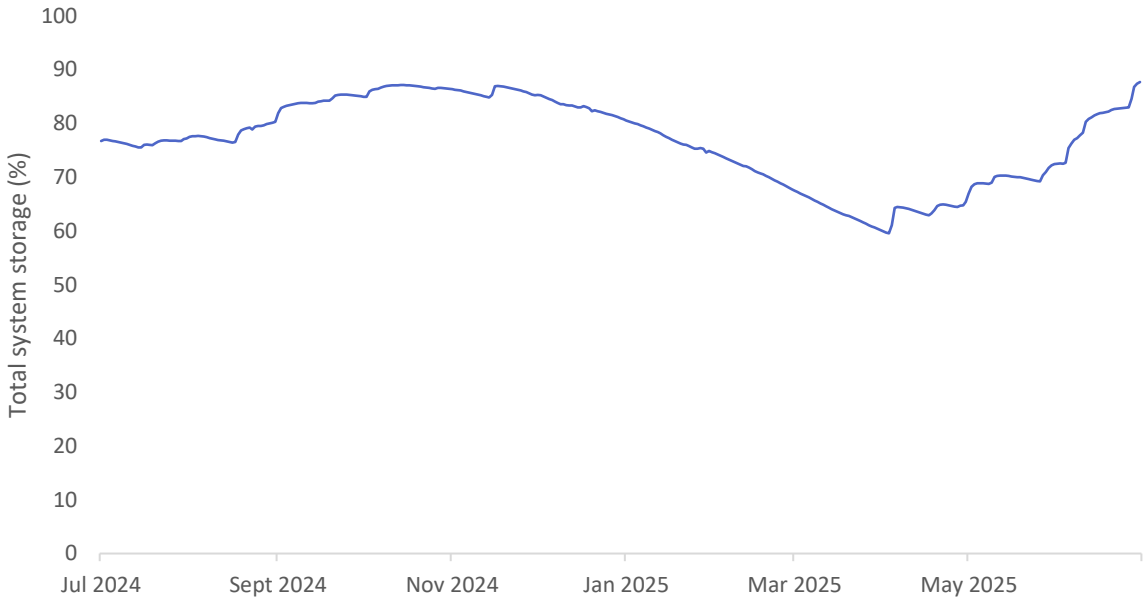

Figure 4-1: Total system storage for 2024-2025.

5 SPILLWAY DISCHARGE

The spillway flow is calculated by considering the water level over the spillway and the size and shape of the spillway, calculated at 1 mm levels. The spillway flow is presented in Figure 5-1. The full dataset is in Appendix C. Throughout the summer period, the dam did not spill due to reduced reservoir levels, however, was spilling throughout much of the winter and spring periods.

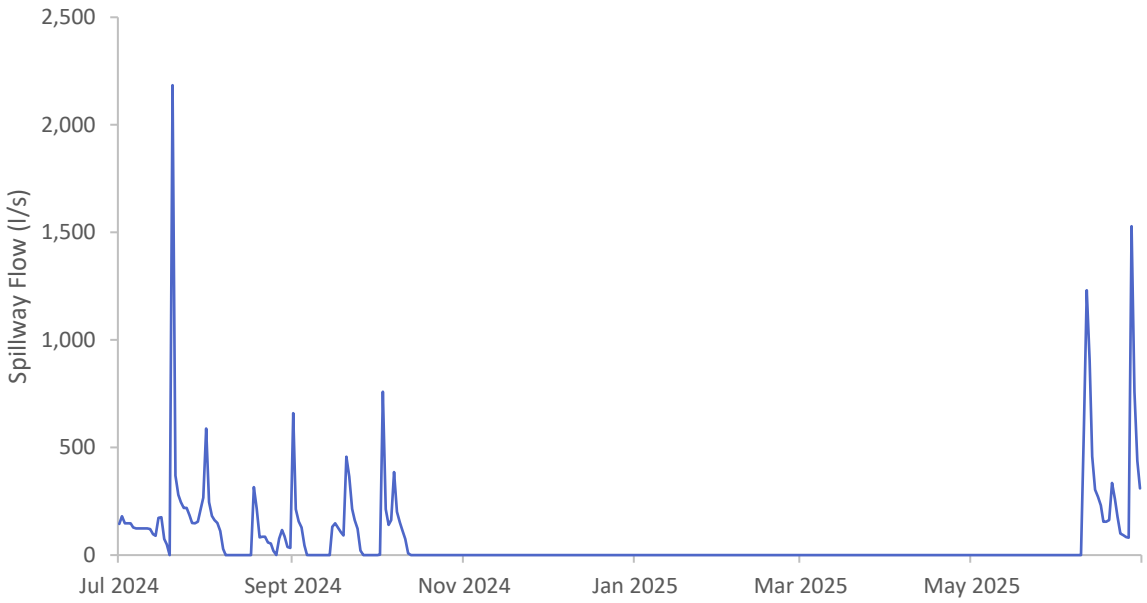

Figure 5-1: Spillway Flows from Waitākere Dam for the reporting period 2024-2025.

6 COMPENSATION FLOW

Waitākere Dam resource consents require a compensation flow to be maintained at the toe of the Waitākere Dam. For 1 July 2024 to 30 April 2025, consent DIS60382532 authorised a reduced compensation flow: a minimum flow rate of 11.6 L/s, superseding compensation flow requirements in the baseline resource consents. From 1 May 2025 for the remainder of the monitoring period, conditions 4(i) to 4(iv) of the baseline consents were in effect due to the expiry of DIS60382532, requiring a return to a variable compensation flow regime, for which the minimum flows are dependent on the total system storage levels.

Compensation flow requirements are met by a combination of compensation flow releases and spillway flows and are shown in Figure 6-1 and the full dataset is in Appendix C. The measuring devices are Magflow meters located on the downstream face of the dam. The meter measures to an accuracy of at least ± 5%, are appropriately calibrated, and always maintained in working condition.

Throughout the reporting period, compensation flow was fully compliant.

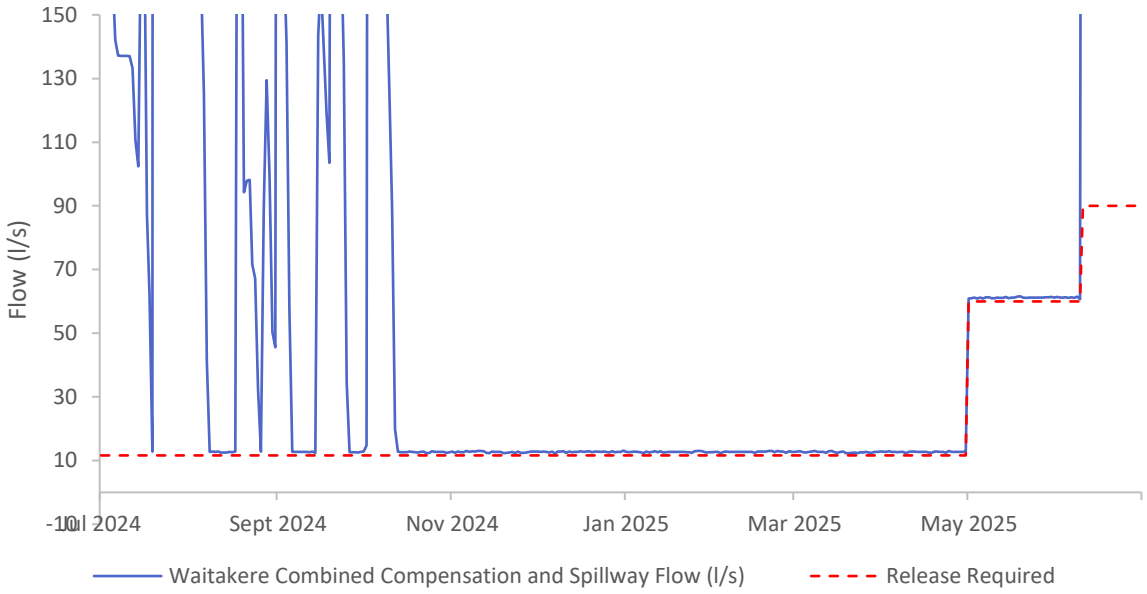

Figure 6-1: Waitākere Dam combined compensation and spillway flows for 2024-2025.
Note: Y-axis is reduced to present flows close to the compensation limit. Flows from the dam exceed the Y-axis on many days.

7 FISHERIES MANAGEMENT

Fisheries management for upstream and downstream transfer of native fish is ongoing at Waitākere Dam. Ministry of Primary Industries approval has been granted for this work under Special Permit 737, which will expired on 1 October 2025. The records from the 2024-2025 trap and haul season are detailed in the annual report to the Ministry of Primary Industries, which is included in appendix D.

Throughout the 2024-2025 trap and haul season, approximately 2,330 elvers and 28 *galaxiids* were transferred upstream into the Waitākere Dam. One eel was caught in the dam, but did not display signs of migration, so it was not transferred downstream.

8 FREE DISCHARGE VALVE OPERATIONS

The consent requires flushing flows to occur every month for Waitākere Dam from December to March to maintain the health of aquatic ecosystems and aesthetic values. As per the conditions of the consent, turbidity was measured downstream of the discharge point approximately 30 minutes before discharge commenced and between 60 and 120 minutes after the discharge valve has been opened.

Short discharges are undertaken at the dam each year to open the discharge valve as part of routine maintenance. Discharges undertaken for maintenance are also sampled according to the flushing flow requirements.

The 2024-2025 discharges are detailed in Table 8-1. Auckland Council was notified more than 24 hours in advance for each release of flushing flows and maintenance discharge.

Table 8-1: Free discharge valve monitoring for Waitākere Dam.

Date	Duration of discharge	Turbidity before (NTU)	Turbidity during/after (NTU)
18 September 2024	12 minutes	2.95	13.30
10 December 2024	3 hours	1.89	5.35
15 January 2025	3 hours	1.48	2.56
11 February 2025	3 hours	2.85	2.54
11 March 2025	3 hours	2.61	2.42

9 NETWORK EFFICIENCY AND CONSERVATION

Watercare has published the Auckland Water Efficiency Plan 2021 to 2025[1], which includes a section detailing its water efficiency programmes and achievements. In summary, Watercare's water efficiency strategy has four main pillars:

- **Municipal water efficiency programme**: related to reducing water use by Watercare itself, mainly through reuse at its treatment plants, and by Auckland Council, through initiatives targeted at saving 30% of water use.
- **Residential water efficiency programme**: includes working with schools and sports clubs to raise awareness and water-saving campaigns, and a partnership with EcoMatters to give households the opportunity to have their water use audited and receive a report on the water and dollar savings they can achieve through simple changes.
- **Commercial water efficiency programme:** involves working with key costumers to reduce demand from our largest users, through initiatives such as the digital meter roll-out project across high-use industrial users, schools and sports clubs.
- **Non-revenue water reduction programme**: related to initiatives focused on reducing three aspects of non-revenue water: leakage, under-reading of meters, and unauthorised use.

Watercare continues with its proactive leakage detection programme, which is effectively targeting areas for leakage surveying using its district meter areas and its Leakage Management System. We continue to optimise our water networks performance through our pressure management programme, which is reducing the number of leaks and their recurrence of them.

The average consumption of Aucklanders is 257 l/p/d which is within our target for water consumption.

More details on water efficiency initiatives, performance, challenges, targets, and strategies for the future are available directly in the Auckland Water Efficiency Plan 2021 to 2025.

10 PIPELINE SCOUR VALVE OPERATIONS

Condition 2 iii of consent 25336 (DIS60264264) and consent 25337 (LUS60273107) states that if a scour valve discharge occurs along the Waitākere Dam Treatment Plant Pipeline then photos must be taken. Condition iv states that these must be sent to Auckland Council annually.

For the 2024-2025 reporting period, no discharges from the Waitākere Pipeline occurred.

[1] https://waterefficiencyplan.watercare.co.nz/

11 ENVIRONMENTAL MONITORING

11.1 Overview

Condition 5 requires water quality, macroinvertebrate and habitat monitoring of five established sites in the Waitākere catchment, four located downstream of the Waitākere Dam and one control site. Consent DIS60382532 has additional monitoring required by the adaptive management plan.

Watercare contracts Watercare Laboratory Services to undertake the environmental monitoring and reporting for the conditions required under the original consents. Auckland Council has been engaged to operate and maintain continuous temperature sensors required by the adaptive management plan, and Wildlands Consultants Ltd undertake the required fish and Hochstetter frog surveys. The additional survey reports are in Appendix E.

11.2 Monitoring sites

The location of the monitoring sites is shown in Figure 11-6. All monitoring sites are in riffle habitat.

11.2.1 Site A (control)

36°53'18.8"S 174°31'17.8"E

Control Site A is located on Cascades Stream, just above confluence with the Waitākere River. The site is shown in Figure 11-1.

Figure 11-1: Site A, looking downstream (February 2025).

11.2.2 Site B

36°53'26.0"S 174°31'47.0"E

Site B is the closest monitoring site to the Waitākere Dam, located above the confluence with Anderson Stream. The site is approximately 1.9 km downstream of the Dam and shown in Figure 11-2.

Figure 11-2: Site B, looking upstream (August 2025).

11.2.3 Site C

36°53'17.9"S 174°31'19.5"E

Above confluence with Cascades Stream, 0.9 km downstream of Site B and 2.8 km downstream of the Waitākere Dam. The site is shown in Figure 11-3.

Figure 11-3: Site C, looking upstream (February 2025).

11.2.4 Site D

36°52'31.8"S 174°30'32.3"E

Shown in Figure 11-4, Site D is located near the end of Airo Wira Rd. There is approximately 2.2 km between Sites D and C, and 5 km from the Waitākere Dam.

Figure 11-4: Site D, looking upstream (August 2025).

11.2.5 Site E

36°52'04.7"S 174°30'25.6"E

Site E is located at the Bethells Rd bridge, as shown in Figure 11-5. The location is 1.4 km downstream of Site D and 6.5 km downstream of the Dam. This site is the only location without native forestry along the riparian zone, and has more minimal shading compared to the other sites.

Figure 11-5: Site E, looking upstream (February 2025).

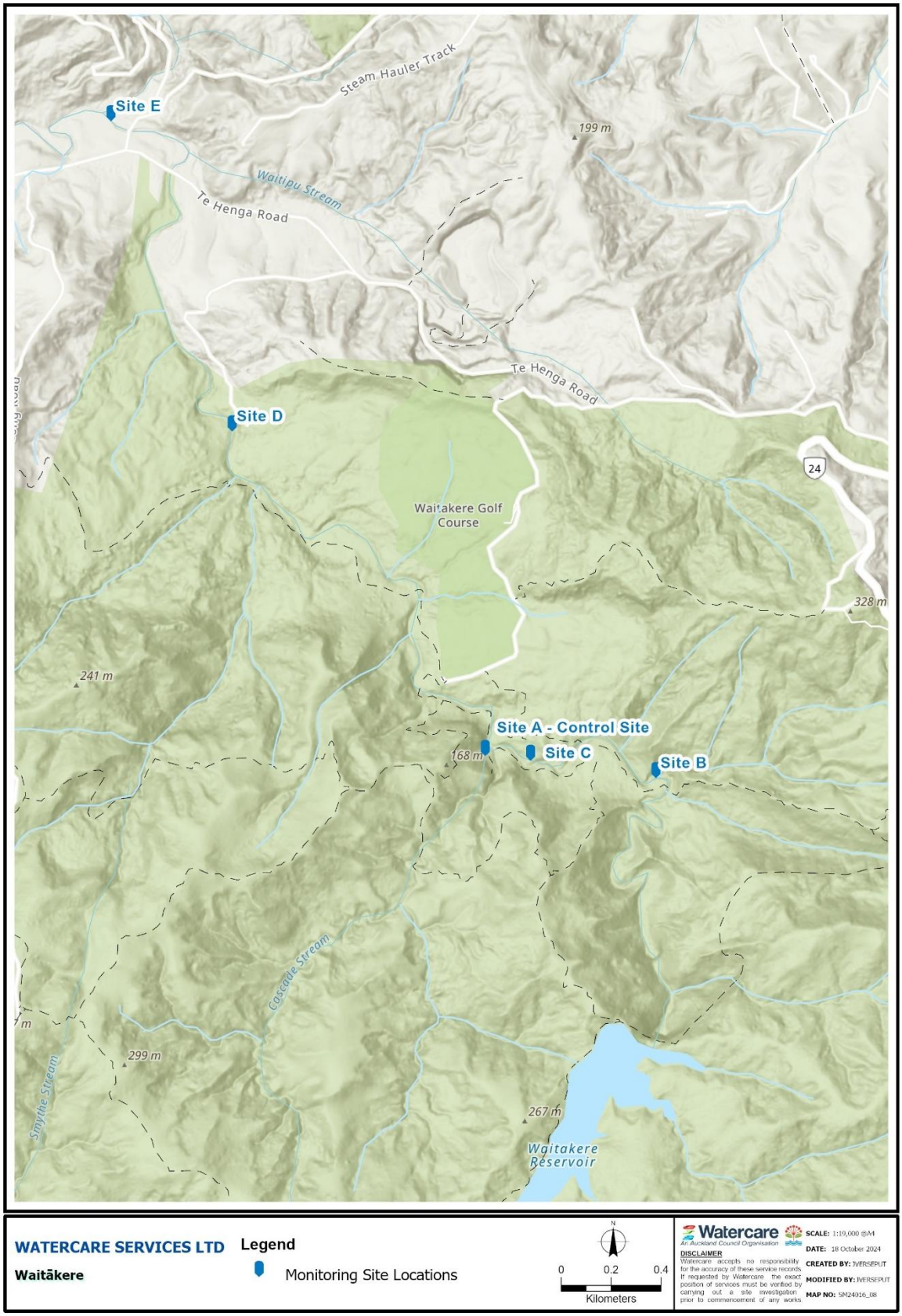

Figure 11-6: Waitākere catchment monitoring locations.

11.3 Methods

11.3.1 Water quality – discrete monitoring

Discrete water quality samples are collected monthly over summer, between December and May of each year. The parameters analysed at these sites are listed in Table 11-1. Sampling methodology and analysis techniques were carried out in accordance with APHA Standard Methods for the Examination of Water and Wastewater (2011), as per condition 5(vi).

Temperature and dissolved oxygen measurements are taken in situ using a calibrated YSI ProDSS meter. Periphyton composite samples are collected by scraping periphyton from 10 randomly selected rock surfaces[2].

Table 11-1: Monthly water quality parameters.

Parameter	Units
Temperature*	˚C
Suspended solids	g/m³
pH	pH Unit
Conductivity (at 25 °C)*	µS/cm[1]
Turbidity	NTU
Black disc transparency (visual clarity)*	m
Dissolved oxygen (DO)*	g/m³
Dissolved reactive phosphorus (DRP)	gP/m³
Total phosphorous	gP/m³
Ammonia nitrogen (NH4–N)	gN/m³
Nitrate nitrogen (NO3–N)	gN/m³
Periphyton (*Chlorophyll a, b, & c*)**	mg/m²

*Parameters recorded in the field (all others analysed at the laboratory)

**Chlorophyll d is not tested

Best endeavours are made to conduct sampling during periods of flow recession and when there had been rainfall of no greater than 2 mm over the previous 24 hours. When these conditions are unable to be met, sampling is completed before the end of the respective month. For the 2024-2025 monitoring period, the sampling dates and preceding rainfall totals are presented in Table 11-2.

Table 11-2: Discrete water quality sampling dates and rainfall for 2024-2025.

Date	Rainfall 24 hours prior (mm)
4 December 2024	0
9 January 2025	3.5

[2] Biggs BJF, Kilroy C, 2000: Stream Periphyton Monitoring Manual. Prepared for Ministry for the Environment, Wellington, New Zealand.

Date	Rainfall 24 hours prior (mm)
18 February 2025	10.5
20 March 2025	17.5
3 April 2025	16.0
1 May 2025	50.5

11.3.2 Water quality – continuous monitoring

Condition 5(v) requires that water temperature is continuously monitored at Site A (control) and Site B between December and May (inclusive) at 5-yearly intervals. Condition 5(iv) requires continuous measurement of dissolved oxygen, pH, temperature and conductivity over a 14-day period between 1 February and 15 April at 5-yearly intervals. Data logs at 10-minute intervals and is manually uploaded once monthly. The most recent continuous monitoring was completed in 2024-2025. The next monitoring is required in 2029-2030.

Continuous temperature monitoring sensors for the adaptive management plan are located at Site A and Site B, for monitoring during the critical spring and summer period (1 November to 30 April). The data is telemetered to an online platform, where it is checked a maximum of every 14 days to determine any days when trigger levels were met.

11.4 Periphyton community composition

Percentage cover of periphyton was monitored in accordance with the rapid bioassessment protocols (RAM-2) method monthly during December 2024 to April 2025, excluding March. Five stones from four transects were examined to define the periphyton community composition or category (colour, length) on the stone.

11.4.1 Macroinvertebrate and habitat monitoring

Macroinvertebrate samples were collected once in winter (Jun-Jul) and in summer (Jan-Feb) each monitoring period. Five replicate samples were collected using kick-net sampling techniques[3]. Visual observations of substrate composition and embeddedness were recorded during each macroinvertebrate sampling event. Embeddedness measurements were based on a 50-100 m reach that includes the sampling site. Substrate composition was based on percentage coverage of different substrate sizes, as shown in Table 11-3. Embeddedness scoring criteria is in accordance with Barbour *et al.* (1999), shown in Table 11-4.

In the 2024-2025 reporting period, macroinvertebrate and habitat monitoring occurred on 27 June 2024 and 22 February 2025.

Table 11-3: Substrate size classes.

Substratum Type	Size
Clay	<0.004 mm
Silt	0.004-0.06 mm
Sand	>0.06-2 mm

[3] Stark et al. (2001). Protocols for sampling macroinvertebrates in wadeable streams

Substratum Type	Size
Gravel	>2-64 mm
Cobble	>64-256 mm
Boulder	>256 mm
Bedrock	-

Table 11-4: Embeddedness Scoring Criteria (Barbour et al., 1999)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
Embeddedness	Gravel, cobble, and boulder particles are 0–25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25–50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50–75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

11.4.2 Fish survey

Surveys are carried out by Wildlands Consultants Ltd at one control site and one impact site in the Waitākere River catchment. At each site, electric fishing is undertaken along a 150 m stretch. The methods are further detailed in the report, attached in Appendix E.

11.4.3 Hochstetter's frog surveys

Surveys are carried out by Wildlands Consultants Ltd along 50 m long transects at one control site and four impact sites in the Waitākere River catchment. The methods used to survey for Hochstetter's frogs followed the protocol recommended by Bell (1996) and are further detailed in the report, attached in Appendix E.

11.5 Results

11.5.1 Water quality – discrete monitoring

General water quality remains very high as presented in Table 11-5, with no deterioration downstream of the dam or pipeline. Mean temperatures ranged from 16.4 °C (Site A) to 17.6 °C (Site C), consistent with natural seasonal variation and expected downstream warming. Dissolved oxygen was high at all sites, reflecting excellent oxygenation and low organic demand. pH: Uniformly neutral (7.2–7.5 pH units) across all sites, indicating stable chemical conditions, and turbidity and suspended solids were low overall. Slightly higher variance of suspended solids at Site A reflects natural variability at the control location.

Nutrients were low across all sites ammoniacal nitrogen, nitrate, and dissolved reactive phosphorus are all well within A-band limits for ecosystem health (NPS-FM (2020)). Total Phosphorus (0.012–0.017 mg/L) also remains low and stable across sites.

Chlorophyll *a* was highest at Site D on average, but all sites generally below the recommended maximum chlorophyll *a* value (50 mg/m^2) for the protection of benthic biodiversity[4]. Chlorophyll *b* and *c* remained near detection limits at most sites. Overall, periphyton biomass is low, showing no signs of nutrient-driven growth. Local peaks likely reflect seasonal or light-related variability.

Table 11-5: Summary results (mean ± 95% confidence interval) for water quality parameters for the Waitākere monitoring sites 2024-2025.

Parameter	Unit	Site A	Site B	Site C	Site D	Site E
Ammoniacal Nitrogen	mg/L	0.006 ± 0.002	0.006 ± 0.001	0.008 ± 0.005	0.006 ± 0.001	0.006 ± 0.001
Chlorophyll a	mg/L	0.5 ± 0.6	0.5 ± 0.7	0.3 ± 0.2	21.8 ± 54.3	0.4 ± 0.8
Chlorophyll b	mg/L	0 ± 0	0 ± 0.1	0 ± 0	0.2 ± 0.6	0 ± 0.1
Chlorophyll c	mg/L	0.1 ± 0.1	0 ± 0.1	0 ± 0.1	0 ± 0	0.1 ± 0.1
Conductivity	µS/cm	163.3 ± 28.7	144 ± 26.2	158.3 ± 21.4	166 ± 27.4	176.7 ± 29.4
DO	mg/L	9.8 ± 0.3	9.2 ± 0.4	9.7 ± 0.4	9.3 ± 0.5	9.2 ± 0.5
DRP	mg/L	0.012 ± 0.006	0.005 ± 0.002	0.007 ± 0.003	0.009 ± 0.002	0.007 ± 0.002
Nitrate	mg/L	0.009 ± 0.009	0.006 ± 0.002	0.003 ± 0.001	0.003 ± 0.003	0.006 ± 0.007
Suspended Solids	mg/L	7.7 ± 10	3.5 ± 3.2	4.3 ± 4.1	3.8 ± 4.3	3.1 ± 4.1
Temperature	°C	16.4 ± 1	17.3 ± 1.6	17.6 ± 2.1	16.8 ± 1.7	17 ± 1.9
Total Phosphorus	mg/L	0.017 ± 0.006	0.012 ± 0.011	0.012 ± 0.007	0.016 ± 0.008	0.017 ± 0.009
Turbidity	NTU	7.2 ± 9.9	6 ± 8.1	4.1 ± 6.7	6.6 ± 10.7	5.7 ± 9.5
Visual Clarity	m	1.3 ± 0.6	1.4 ± 0.8	1.2 ± 0.5	1.4 ± 0.2	1.4 ± 0.5
pH	pH unit	7.5 ± 0.2	7.2 ± 0.2	7.4 ± 0.2	7.3 ± 0.2	7.2 ± 0.2

11.5.2 Water quality - continuous monitoring

The results for the continuous temperature monitoring are displayed in Figure 11-7 for the adaptive management plan. During the monitoring period, some small data gaps occur when batteries required replacing.

On 27 February 2025, the maximum temperature reached 31°C, however this was due to a sensor malfunction which was rectified. Several other days in the period reached elevated temperatures at Site B, however these did not occur with sufficient frequency to meet the threshold. As such, the level 1 trigger for temperature downstream of the dam was not met in the 2024-2025 period; therefore, no additional monitoring responses related to this threshold were required:

"Daily maximum as Site B >20°C >7 occasions in critical spring and summer period, when daily maximum at Size A (control site) <20°C on the same 7 occasions; within any 28-day period "*

The highest temperature was at Site B on 21 February 2025, with a maximum of 20.6°C.

[4] https://environment.govt.nz/assets/Publications/Files/nz-periphyton-guide-jun00.pdf

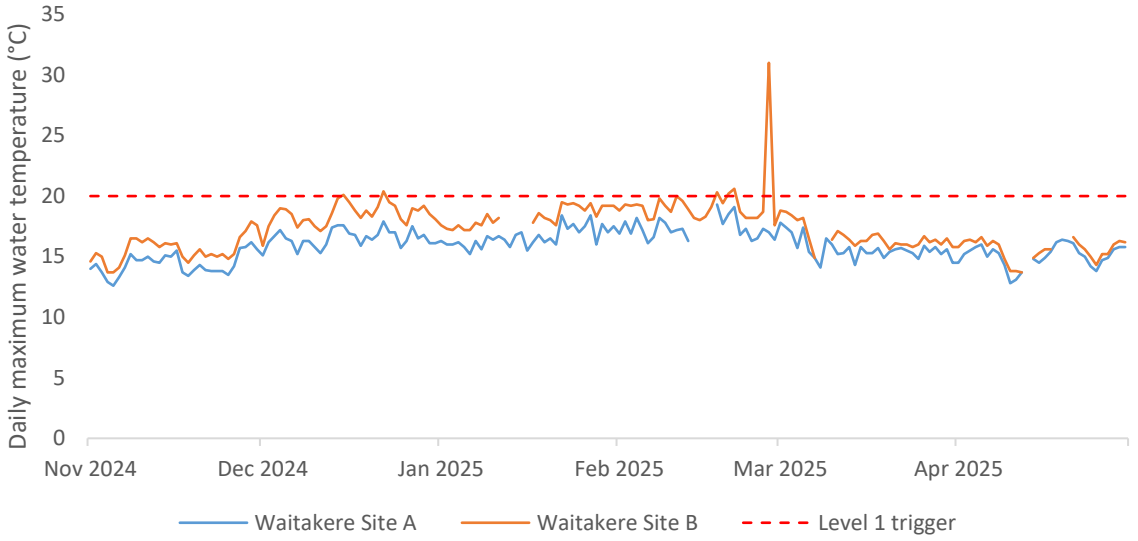

Figure 11-7: Daily maximum temperature monitoring in the Waitākere River and tributaries for the critical spring-summer period in 2024-2025.

Concurrently, monitoring requirements for the baseline resource consents were continued. The results for these are presented in Figure 11-8 to Figure 11-11.

Temperature was relatively consistent across the monitoring period, slightly higher at Site B compared to Site A. On average, Site A had a water temperature of 15.65°C, and Site B had a water temperature of 17.63°C. pH was lower at Site B, within a tight range of 6.90 to 6.96, whereas Site A was more neutral, between 7.72 and 8.04.

Dissolved oxygen was high at both sites, with the lowest result at Site B of 9.81 mg/L, still within a very high range for good ecological health. At Site A, conductivity ranged between 94.9 µS/cm and 134 µS/cm, and at Site B, conductivity ranged between 83.8 µS/cm and 102 µS/cm.

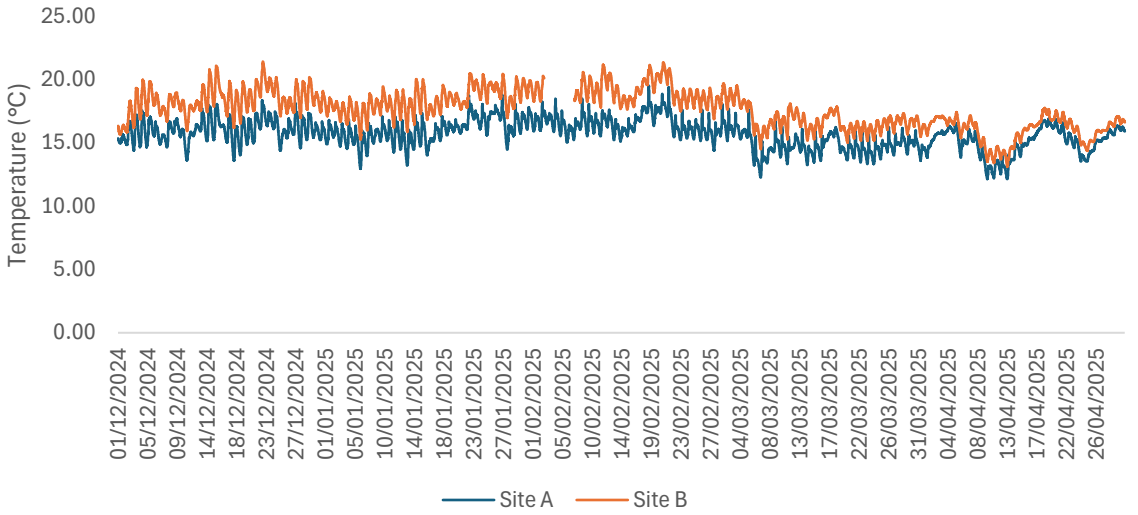

Figure 11-8: Continuous temperature monitoring for the Waitākere catchment in 2024-2025.

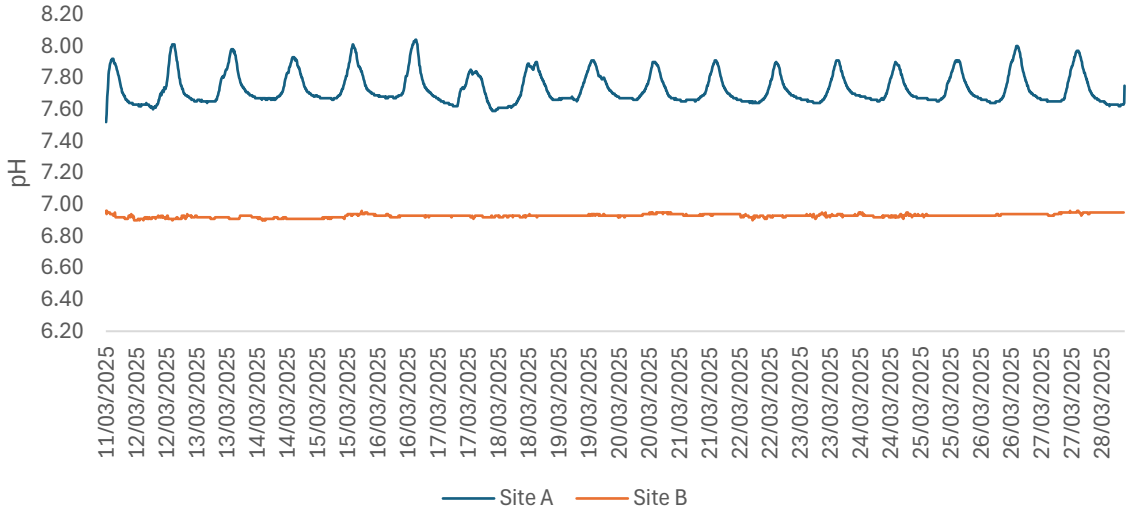

Figure 11-9: Continuous pH monitoring for the Waitākere catchment in 2024-2025.

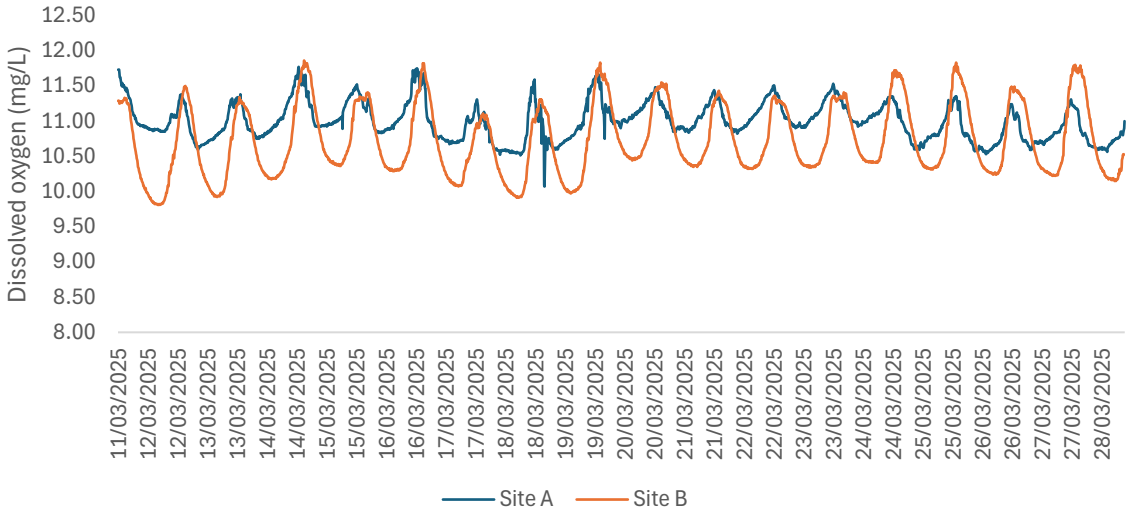

Figure 11-10: Continuous dissolved oxygen monitoring for the Waitākere catchment in 2024-2025.

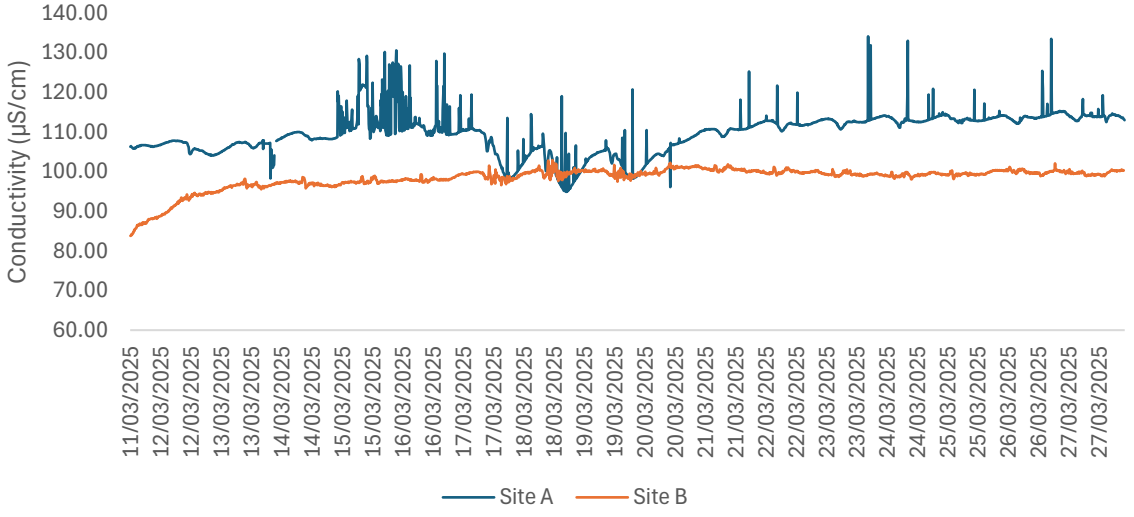

Figure 11-11: Continuous conductivity monitoring for the Waitākere catchment in 2024-2025.

11.6 Periphyton community composition

Filamentous algae were monitored as part of the adaptive management plan in 2024-2025, presented in Table 11-6. Throughout the period, the levels remained below the level 1 trigger and as such, no additional monitoring or management responses were required:

"Monthly periphyton filamentous algae (>2 cm long) >30% substrate cover when control site is periphyton filamentous algae (>2 cm long) <30% substrate cover during critical spring and summer period."

Periphyton peaked at Site A in December 2024, with filamentous algae covering 20% of the river substrate.

Table 11-6: Mean filamentous algae (>2 cm) substrate cover (%).

Date	Site A (control)	Site B	Site C	Site D	Site E
4/12/2024	20.25	2.8	0	5.75	11.25
9/01/2025	3.75	10	0.25	3	9.75
18/02/2025	6.5	0	0	5	0
3/04/2025	3.25	11	0	3.75	0

11.6.1 Macroinvertebrate monitoring

All sites fall within the "Good" (100–119) range in winter and the "Fair–Good" range in summer for MCI values, with the highest at Site B (winter) and lowest at the control Site A (summer) (Stark & Maxted, 2007). QMCI were generally ≥ 4.0, consistent with healthy, oxygenated conditions and moderate enrichment tolerance.

EPT taxa were highest in winter at Site A and Site E, suggesting good habitat diversity in riffle zones. Macroinvertebrate results confirm sustained ecological integrity, with strong EPT representation and stable seasonal patterns. The overall macroinvertebrate community is stable and healthy, showing no downstream deterioration.

Table 11-7: Summary results (mean ± 95% confidence interval) of macroinvertebrate community metrics for the Waitākere monitoring sites 2024-2025.

Season	Metric	Site A	Site B	Site C	Site D	Site E
Winter	EPT taxa	10.2 ± 4.1	6.2 ± 3.3	5.8 ± 1.8	4.8 ± 6.1	7.2 ± 2.7
Summer	EPT taxa	5.8 ± 3	9.6 ± 4	2.8 ± 1.6	4 ± 3.4	4.8 ± 1.6
Winter	Individuals	112.2 ± 50.2	56.2 ± 55.1	19.4 ± 11.6	35.5 ± 50.4	59.2 ± 67
Summer	Individuals	105.6 ± 59.8	173 ± 102.7	42.4 ± 34.7	120 ± 134.8	99 ± 41.3
Winter	MCI	103.8 ± 5.4	118.2 ± 8.6	112.4 ± 14.7	102.8 ± 25	103.5 ± 8.3
Summer	MCI	82 ± 17.3	92.2 ± 11.7	101 ± 11.7	103 ± 19	86.2 ± 6.1
Winter	QMCI	4.2 ± 0.6	6.6 ± 0.7	5.2 ± 1	4.8 ± 0.8	5 ± 0
Summer	QMCI	3 ± 0	3.6 ± 0.7	4.4 ± 0.7	4 ± 0	4.6 ± 0.7
Winter	Taxa richness	16 ± 6	10 ± 5.3	7.6 ± 2.7	8.8 ± 6.9	11.2 ± 4.8
Summer	Taxa richness	11 ± 4.6	17.4 ± 3.6	5.2 ± 0.6	7.8 ± 4.5	11 ± 1.2

11.6.2 Trend analysis (2013-2025)

Chlorophyll a, b & c are decreasing across all sites, showing long-term reduction in periphyton productivity and stable trophic control. Nutrients (DRP, Total P) show significant declines, reflecting reduced nutrient availability and likely account for the decrease in periphyton.

pH: shows a gradual decrease at all sites, possibly due to natural organic inputs, but still within neutral range. Visual clarity is slightly decreasing at Sites A–B, though clarity remains within high ecological standards. Suspended solids & turbidity show minor increases at Site A, but not at the sites downstream of the Dam.

Overall, water quality continues to improve or remain stable, with strong downward trends in nutrients and periphyton, stable oxygenation, and no systemic degradation.

MCI and QMCI show decreasing trends at Sites A and E, indicating a slight reduction in sensitive taxa but still within the "*Good*" classification band (Stark & Maxted, 2007). EPT taxa and total richness are stable over the monitoring period, showing no decline in biodiversity or habitat quality. Individuals (abundance) are an increasing trend at Site A.

Overall, the macroinvertebrate assemblage remains stable and resilient, with no significant loss of sensitive species and no evidence of downstream ecological decline.

Table 11-8: Summary results (mean ± 95% confidence interval) and Mann-Kendall trend analysis results of water quality parameters for the Waitākere monitoring sites (2013-2025).

Monitoring site	Metric	Unit	Mean ± 95% CI	Tau	p-value	Trend
Site A	Ammoniacal Nitrogen	mg/L	0.007 ± 0.001	-0.1	0.27	No significant trend
Site B	Ammoniacal Nitrogen	mg/L	0.006 ± 0.000	-0.13	0.17	No significant trend
Site C	Ammoniacal Nitrogen	mg/L	0.006 ± 0.001	0.06	0.51	No significant trend
Site D	Ammoniacal Nitrogen	mg/L	0.006 ± 0.001	-0.03	0.72	No significant trend
Site E	Ammoniacal Nitrogen	mg/L	0.006 ± 0.001	-0.12	0.2	No significant trend
Site A	Chlorophyll A	mg/L	3.8 ± 1.2	-0.22	0.01	Decreasing
Site B	Chlorophyll A	mg/L	8.7 ± 11.6	-0.26	0	Decreasing
Site C	Chlorophyll A	mg/L	2.8 ± 1.3	-0.4	0	Decreasing
Site D	Chlorophyll A	mg/L	10.4 ± 5.5	-0.27	0	Decreasing
Site E	Chlorophyll A	mg/L	8.5 ± 2.3	-0.5	0	Decreasing
Site A	Chlorophyll B	mg/L	0.4 ± 0.2	-0.28	0	Decreasing
Site B	Chlorophyll B	mg/L	0.8 ± 0.9	-0.28	0	Decreasing

Monitoring site	Metric	Unit	Mean ± 95% CI	Tau	p-value	Trend
Site C	Chlorophyll B	mg/L	0.6 ± 0.4	-0.4	0	Decreasing
Site D	Chlorophyll B	mg/L	2.0 ± 1.7	-0.32	0	Decreasing
Site E	Chlorophyll B	mg/L	1.5 ± 0.4	-0.45	0	Decreasing
Site A	Chlorophyll C	mg/L	0.3 ± 0.1	-0.24	0	Decreasing
Site B	Chlorophyll C	mg/L	1.0 ± 1.5	-0.15	0.07	No significant trend
Site C	Chlorophyll C	mg/L	0.2 ± 0.1	-0.31	0	Decreasing
Site D	Chlorophyll C	mg/L	0.7 ± 0.4	-0.37	0	Decreasing
Site E	Chlorophyll C	mg/L	0.8 ± 0.3	-0.32	0	Decreasing
Site A	Conductivity	µS/cm	170.7 ± 3.9	0.08	0.24	No significant trend
Site B	Conductivity	µS/cm	130.1 ± 4.3	0.3	0	Increasing
Site C	Conductivity	µS/cm	140.9 ± 4.7	0.29	0	Increasing
Site D	Conductivity	µS/cm	155.4 ± 4.3	0.37	0	Increasing
Site E	Conductivity	µS/cm	160.6 ± 4.4	0.37	0	Increasing
Site A	DO	mg/L	10.2 ± 0.3	0.01	0.84	No significant trend
Site B	DO	mg/L	9.6 ± 0.2	-0.02	0.71	No significant trend
Site C	DO	mg/L	9.8 ± 0.2	0.06	0.33	No significant trend
Site D	DO	mg/L	9.8 ± 0.2	-0.03	0.66	No significant trend
Site E	DO	mg/L	9.8 ± 0.2	-0.06	0.34	No significant trend
Site A	DRP	mg/L	0.018 ± 0.002	-0.4	0	Decreasing
Site B	DRP	mg/L	0.006 ± 0.001	-0.2	0.02	Decreasing
Site C	DRP	mg/L	0.007 ± 0.001	-0.21	0.01	Decreasing
Site D	DRP	mg/L	0.010 ± 0.001	-0.29	0	Decreasing
Site E	DRP	mg/L	0.010 ± 0.001	-0.39	0	Decreasing
Site A	Nitrate	mg/L	0.009 ± 0.002	0.14	0.08	No significant trend
Site B	Nitrate	mg/L	0.011 ± 0.002	-0.03	0.74	No significant trend
Site C	Nitrate	mg/L	0.008 ± 0.002	-0.06	0.48	No significant trend
Site D	Nitrate	mg/L	0.006 ± 0.001	0.03	0.75	No significant trend
Site E	Nitrate	mg/L	0.007 ± 0.002	0.08	0.31	No significant trend
Site A	pH	pH unit	7.6 ± 0.1	-0.25	0	Decreasing
Site B	pH	pH unit	7.3 ± 0.1	-0.33	0	Decreasing
Site C	pH	pH unit	54.0 ± 92.0	-0.31	0	Decreasing
Site D	pH	pH unit	7.4 ± 0.1	-0.25	0	Decreasing

Monitoring site	Metric	Unit	Mean ± 95% CI	Tau	p-value	Trend
Site E	pH	pH unit	7.3 ± 0.1	-0.23	0	Decreasing
Site A	Suspended Solids	mg/L	3.1 ± 1.0	0.29	0	Increasing
Site B	Suspended Solids	mg/L	2.3 ± 0.7	0.14	0.09	No significant trend
Site C	Suspended Solids	mg/L	2.6 ± 0.7	0.01	0.87	No significant trend
Site D	Suspended Solids	mg/L	3.0 ± 0.9	0.1	0.23	No significant trend
Site E	Suspended Solids	mg/L	2.5 ± 0.6	0.01	0.92	No significant trend
Site A	Temperature	°C	15.0 ± 0.4	0.07	0.31	No significant trend
Site B	Temperature	°C	16.0 ± 0.5	0.04	0.49	No significant trend
Site C	Temperature	°C	16.1 ± 0.5	0.01	0.91	No significant trend
Site D	Temperature	°C	15.6 ± 0.5	0.02	0.77	No significant trend
Site E	Temperature	°C	15.8 ± 0.5	0.01	0.86	No significant trend
Site A	Total Phosphorus	mg/L	0.023 ± 0.002	-0.34	0	Decreasing
Site B	Total Phosphorus	mg/L	0.011 ± 0.002	-0.17	0.04	Decreasing
Site C	Total Phosphorus	mg/L	0.013 ± 0.002	-0.12	0.14	No significant trend
Site D	Total Phosphorus	mg/L	0.017 ± 0.002	-0.12	0.15	No significant trend
Site E	Total Phosphorus	mg/L	0.017 ± 0.002	-0.2	0.02	Decreasing
Site A	Turbidity	NTU	3.9 ± 1.2	0.36	0	Increasing
Site B	Turbidity	NTU	3.9 ± 1.3	0.11	0.18	No significant trend
Site C	Turbidity	NTU	3.9 ± 1.3	0.04	0.64	No significant trend
Site D	Turbidity	NTU	4.1 ± 1.3	0.12	0.17	No significant trend
Site E	Turbidity	NTU	4.1 ± 1.3	0.07	0.4	No significant trend
Site A	Visual Clarity	m	17.8 ± 31.7	-0.13	0.05	Decreasing
Site B	Visual Clarity	m	12.8 ± 21.6	-0.21	0	Decreasing
Site C	Visual Clarity	m	14.4 ± 24.8	-0.08	0.24	No significant trend
Site D	Visual Clarity	m	17.9 ± 31.6	-0.11	0.09	No significant trend
Site E	Visual Clarity	m	15.8 ± 27.8	-0.09	0.18	No significant trend

Table 11-9: Summary results (mean ± 95% confidence interval) and Mann-Kendall trend analysis results of macroinvertebrate community metrics for the Waitakere monitoring sites (2013-2025).

Monitoring site	Metric	Mean ± 95% CI	Tau	p-value	Trend
Site A	EPT taxa	8.5 (± 0.6)	0.06	0.29	No significant trend
Site B	EPT taxa	8.6 (± 0.6)	0.02	0.77	No significant trend

Site C	EPT taxa	8.3 (± 0.6)	-0.03	0.62	No significant trend
Site D	EPT taxa	9.3 (± 0.7)	0.07	0.29	No significant trend
Site E	EPT taxa	8.4 (± 0.5)	0.061	0.35	No significant trend
Site A	Individuals	160.8 (±21.4)	0.12	0.04	Increasing
Site B	Individuals	128.9 (±17.2)	-0.02	0.68	No significant trend
Site C	Individuals	153.6 (±23.0)	-0.05	0.38	No significant trend
Site D	Individuals	206.5 (±29.6)	0.05	0.39	No significant trend
Site E	Individuals	166.4 (±19.1)	-0.07	0.24	No significant trend
Site A	MCI	115.3 (± 2.5)	-0.20	0.00	Decreasing
Site B	MCI	114.0 (± 1.9)	-0.06	0.30	No significant trend
Site C	MCI	117.3 (± 2.0)	-0.09	0.14	No significant trend
Site D	MCI	115.5 (± 2.6)	-0.08	0.22	No significant trend
Site E	MCI	113.6 (± 2.4)	-0.17	0.01	Decreasing
Site A	QMCI	5.4 (± 0.2)	-0.29	0.00	Decreasing
Site B	QMCI	5.1 (± 0.1)	-0.06	0.31	No significant trend
Site C	QMCI	5.2 (± 0.2)	-0.20	0.00	Decreasing
Site D	QMCI	5.5 (± 0.2)	-0.17	0.01	Decreasing
Site E	QMCI	5.5 (± 0.2)	-0.14	0.05	No significant trend
Site A	Taxa richness	13.5 (± 0.9)	0.06	0.33	No significant trend
Site B	Taxa richness	13.4 (± 0.8)	0.00	0.94	No significant trend
Site C	Taxa richness	13.1 (± 0.9)	-0.11	0.078	No significant trend
Site D	Taxa richness	14.8 (± 0.9)	0.00	0.99	No significant trend
Site E	Taxa richness	13.7 (± 0.6)	-0.08	0.23	No significant trend

11.6.3 Fish survey

The full results of the monitoring are in the report (Appendix E). The key findings were:

- Total number of individual fish and densities were greater at the downstream site compared to the control site
- Fish index of biotic integrity scores indicated excellent health categories at both the control and impact sites in the Waitākere River, consistent with previous monitoring periods
- Compared to the previous surveys the fish index of biotic integrity scores and species richness are similar, however overall fish density has decreased. Perch was detected for the first time
- No apparent adverse effects on fish communities are detected, and the fish communities have persisted despite reduced compensation flows and extreme weather events

11.6.4 Hochstetter's frog surveys

The full results of the monitoring are in the report (Appendix E). The key findings were:

- No frogs were detected during the 2024-2025 monitoring. Lack of detection across sites is consistent with previous surveys
- A number of variables may explain the reduction in detection at the impact sites. These variables include normal variability of detection given the cryptic nature of the species, impacts of the cyclones and flooding in 2023, or adverse impacts associated with low flow conditions.

12 CONCLUSION

This report presents the required data for the period of 1 July 2024 to 30 June 2025 for the Waitākere Dam and the associated raw water pipeline. All consent conditions were fully compliant throughout the monitoring period.

There were no equipment failures or maintenance activities undertaken in the reporting period that resulted in a discharge that had an observed adverse environmental effect.

The environmental stream monitoring indicates some variability in water quality and macroinvertebrate communities, although this attributed to localised differences in the structure of substrate and cover rather than flow or water quality related changes, with macroinvertebrates communities highest at the sites downstream of the dam, compared to the control.

Appendix A. Daily water abstraction volumes

Date	Abstraction (m^3/day)	Date (continued)	Abstraction (m^3/day)
1/07/2024	9,850	1/01/2025	13,997
2/07/2024	9,864	2/01/2025	13,970
3/07/2024	9,730	3/01/2025	13,879
4/07/2024	9,782	4/01/2025	13,961
5/07/2024	9,695	5/01/2025	13,908
6/07/2024	9,735	6/01/2025	13,874
7/07/2024	9,698	7/01/2025	11,642
8/07/2024	9,704	8/01/2025	9,834
9/07/2024	9,675	9/01/2025	9,948
10/07/2024	9,691	10/01/2025	9,814
11/07/2024	9,619	11/01/2025	9,897
12/07/2024	9,690	12/01/2025	9,857
13/07/2024	9,524	13/01/2025	9,824
14/07/2024	9,641	14/01/2025	9,879
15/07/2024	14,337	15/01/2025	9,778
16/07/2024	20,268	16/01/2025	9,885
17/07/2024	20,178	17/01/2025	9,728
18/07/2024	20,104	18/01/2025	9,900
19/07/2024	20,074	19/01/2025	9,685
20/07/2024	20,166	20/01/2025	8,362
21/07/2024	20,107	21/01/2025	7,498
22/07/2024	20,191	22/01/2025	8,637
23/07/2024	20,216	23/01/2025	9,633
24/07/2024	20,136	24/01/2025	9,765
25/07/2024	17,834	25/01/2025	9,568
26/07/2024	16,246	26/01/2025	9,640
27/07/2024	16,185	27/01/2025	9,634
28/07/2024	16,212	28/01/2025	10,780
29/07/2024	16,197	29/01/2025	11,727
30/07/2024	15,960	30/01/2025	11,657
31/07/2024	15,865	31/01/2025	11,652
1/08/2024	15,810	1/02/2025	11,693
2/08/2024	15,782	2/02/2025	11,614
3/08/2024	15,823	3/02/2025	11,826
4/08/2024	15,824	4/02/2025	11,943

Date	Abstraction (m^3/day)	Date (continued)	Abstraction (m^3/day)
5/08/2024	18,492	5/02/2025	12,022
6/08/2024	18,938	6/02/2025	11,903
7/08/2024	20,097	7/02/2025	12,004
8/08/2024	19,969	8/02/2025	11,929
9/08/2024	20,006	9/02/2025	12,016
10/08/2024	19,938	10/02/2025	11,902
11/08/2024	18,396	11/02/2025	11,957
12/08/2024	15,820	12/02/2025	11,988
13/08/2024	17,890	13/02/2025	11,900
14/08/2024	20,168	14/02/2025	12,109
15/08/2024	20,157	15/02/2025	11,924
16/08/2024	18,377	16/02/2025	11,990
17/08/2024	17,192	17/02/2025	12,010
18/08/2024	17,224	18/02/2025	11,969
19/08/2024	16,763	19/02/2025	12,029
20/08/2024	17,095	20/02/2025	11,904
21/08/2024	17,007	21/02/2025	12,023
22/08/2024	17,023	22/02/2025	11,879
23/08/2024	17,102	23/02/2025	12,031
24/08/2024	17,035	24/02/2025	11,913
25/08/2024	17,114	25/02/2025	11,564
26/08/2024	13,002	26/02/2025	11,765
27/08/2024	9,900	27/02/2025	12,040
28/08/2024	11,980	28/02/2025	11,865
29/08/2024	17,066	1/03/2025	12,064
30/08/2024	17,011	2/03/2025	11,801
31/08/2024	17,038	3/03/2025	12,087
1/09/2024	16,977	4/03/2025	11,847
2/09/2024	17,021	5/03/2025	12,021
3/09/2024	16,849	6/03/2025	11,850
4/09/2024	16,957	7/03/2025	11,974
5/09/2024	16,852	8/03/2025	11,872
6/09/2024	16,954	9/03/2025	11,973
7/09/2024	17,255	10/03/2025	11,875
8/09/2024	17,217	11/03/2025	10,959

Date	Abstraction (m^3/day)	Date (continued)	Abstraction (m^3/day)
9/09/2024	18,944	12/03/2025	10,147
10/09/2024	19,987	13/03/2025	10,240
11/09/2024	20,122	14/03/2025	10,130
12/09/2024	20,197	15/03/2025	10,239
13/09/2024	18,442	16/03/2025	10,147
14/09/2024	20,187	17/03/2025	7,785
15/09/2024	20,185	18/03/2025	5,985
16/09/2024	19,030	19/03/2025	8,057
17/09/2024	18,189	20/03/2025	11,940
18/09/2024	18,080	21/03/2025	12,214
19/09/2024	18,018	22/03/2025	11,899
20/09/2024	17,782	23/03/2025	12,231
21/09/2024	17,950	24/03/2025	17,430
22/09/2024	17,781	25/03/2025	21,270
23/09/2024	17,909	26/03/2025	16,441
24/09/2024	17,907	27/03/2025	11,139
25/09/2024	17,977	28/03/2025	12,788
26/09/2024	18,110	29/03/2025	12,890
27/09/2024	17,901	30/03/2025	12,704
28/09/2024	18,049	31/03/2025	12,892
29/09/2024	18,002	1/04/2025	13,929
30/09/2024	14,691	2/04/2025	15,263
1/10/2024	18,033	3/04/2025	15,192
2/10/2024	18,028	4/04/2025	15,755
3/10/2024	18,018	5/04/2025	16,273
4/10/2024	18,017	6/04/2025	16,314
5/10/2024	18,009	7/04/2025	16,289
6/10/2024	17,984	8/04/2025	16,231
7/10/2024	18,035	9/04/2025	16,258
8/10/2024	19,200	10/04/2025	16,195
9/10/2024	20,177	11/04/2025	16,221
10/10/2024	20,121	12/04/2025	16,174
11/10/2024	20,182	13/04/2025	16,183
12/10/2024	20,093	14/04/2025	16,144
13/10/2024	20,194	15/04/2025	15,700

Date	Abstraction (m^3/day)	Date (continued)	Abstraction (m^3/day)
14/10/2024	20,309	16/04/2025	15,185
15/10/2024	20,428	17/04/2025	15,162
16/10/2024	20,526	18/04/2025	15,229
17/10/2024	20,529	19/04/2025	15,258
18/10/2024	20,528	20/04/2025	15,359
19/10/2024	20,530	21/04/2025	15,298
20/10/2024	20,534	22/04/2025	15,356
21/10/2024	20,522	23/04/2025	13,025
22/10/2024	20,256	24/04/2025	10,084
23/10/2024	20,148	25/04/2025	9,760
24/10/2024	20,118	26/04/2025	9,916
25/10/2024	20,168	27/04/2025	9,710
26/10/2024	20,183	28/04/2025	9,902
27/10/2024	20,133	29/04/2025	12,809
28/10/2024	20,143	30/04/2025	15,125
29/10/2024	19,670	1/05/2025	15,220
30/10/2024	20,016	2/05/2025	15,172
31/10/2024	20,137	3/05/2025	15,259
1/11/2024	20,182	4/05/2025	15,230
2/11/2024	20,133	5/05/2025	15,229
3/11/2024	20,138	6/05/2025	15,209
4/11/2024	20,165	7/05/2025	15,284
5/11/2024	20,007	8/05/2025	15,183
6/11/2024	20,253	9/05/2025	15,259
7/11/2024	20,205	10/05/2025	15,240
8/11/2024	19,529	11/05/2025	15,287
9/11/2024	18,115	12/05/2025	15,316
10/11/2024	17,931	13/05/2025	13,688
11/11/2024	18,219	14/05/2025	14,824
12/11/2024	15,664	15/05/2025	14,863
13/11/2024	14,013	16/05/2025	14,938
14/11/2024	13,817	17/05/2025	14,985
15/11/2024	14,003	18/05/2025	14,926
16/11/2024	13,817	19/05/2025	14,985
17/11/2024	13,982	20/05/2025	14,862

Date	Abstraction (m^3/day)	Date (continued)	Abstraction (m^3/day)
18/11/2024	13,765	21/05/2025	14,950
19/11/2024	13,319	22/05/2025	14,839
20/11/2024	12,714	23/05/2025	14,967
21/11/2024	12,935	24/05/2025	14,876
22/11/2024	12,746	25/05/2025	14,953
23/11/2024	12,954	26/05/2025	14,863
24/11/2024	12,748	27/05/2025	14,937
25/11/2024	12,949	28/05/2025	14,815
26/11/2024	13,914	29/05/2025	14,919
27/11/2024	15,044	30/05/2025	14,794
28/11/2024	14,972	31/05/2025	14,902
29/11/2024	15,108	1/06/2025	14,792
30/11/2024	14,906	2/06/2025	14,868
1/12/2024	15,069	3/06/2025	14,760
2/12/2024	14,926	4/06/2025	14,848
3/12/2024	15,174	5/06/2025	14,822
4/12/2024	18,342	6/06/2025	14,420
5/12/2024	19,034	7/06/2025	12,705
6/12/2024	18,044	8/06/2025	14,977
7/12/2024	20,294	9/06/2025	17,204
8/12/2024	20,282	10/06/2025	18,984
9/12/2024	20,373	11/06/2025	16,434
10/12/2024	20,250	12/06/2025	17,973
11/12/2024	20,292	13/06/2025	18,060
12/12/2024	20,208	14/06/2025	17,913
13/12/2024	20,323	15/06/2025	17,965
14/12/2024	20,213	16/06/2025	19,314
15/12/2024	20,323	17/06/2025	16,555
16/12/2024	20,215	18/06/2025	9,693
17/12/2024	18,816	19/06/2025	11,702
18/12/2024	17,116	20/06/2025	11,515
19/12/2024	17,092	21/06/2025	11,890
20/12/2024	15,479	22/06/2025	11,816
21/12/2024	14,214	23/06/2025	11,906
22/12/2024	14,270	24/06/2025	11,838

Date	Abstraction (m^3/day)	Date (continued)	Abstraction (m^3/day)
23/12/2024	14,228	25/06/2025	11,759
24/12/2024	14,242	26/06/2025	11,902
25/12/2024	14,178	27/06/2025	11,735
26/12/2024	14,201	28/06/2025	11,858
27/12/2024	14,155	29/06/2025	11,671
28/12/2024	14,155	30/06/2025	13,619
29/12/2024	14,132		
30/12/2024	14,153		
31/12/2024	13,949		

Appendix B. Daily average reservoir level

Date	Reservoir level (m)	Date (continued)	Reservoir level (m)
1/07/2024	19.828	1/01/2025	18.170
2/07/2024	19.832	2/01/2025	18.139
3/07/2024	19.828	3/01/2025	18.108
4/07/2024	19.828	4/01/2025	18.091
5/07/2024	19.828	5/01/2025	18.063
6/07/2024	19.826	6/01/2025	18.029
7/07/2024	19.825	7/01/2025	17.997
8/07/2024	19.825	8/01/2025	17.977
9/07/2024	19.825	9/01/2025	17.965
10/07/2024	19.825	10/01/2025	17.946
11/07/2024	19.825	11/01/2025	17.926
12/07/2024	19.824	12/01/2025	17.906
13/07/2024	19.822	13/01/2025	17.884
14/07/2024	19.820	14/01/2025	17.854
15/07/2024	19.831	15/01/2025	17.829
16/07/2024	19.832	16/01/2025	17.808
17/07/2024	19.819	17/01/2025	17.788
18/07/2024	19.815	18/01/2025	17.768
19/07/2024	19.804	19/01/2025	17.743
20/07/2024	19.909	20/01/2025	17.723
21/07/2024	19.852	21/01/2025	17.714
22/07/2024	19.845	22/01/2025	17.709
23/07/2024	19.841	23/01/2025	17.689
24/07/2024	19.837	24/01/2025	17.668
25/07/2024	19.837	25/01/2025	17.649
26/07/2024	19.833	26/01/2025	17.658
27/07/2024	19.828	27/01/2025	17.669
28/07/2024	19.828	28/01/2025	17.653
29/07/2024	19.829	29/01/2025	17.624
30/07/2024	19.837	30/01/2025	17.595
31/07/2024	19.841	31/01/2025	17.567
1/08/2024	19.862	1/02/2025	17.537
2/08/2024	19.841	2/02/2025	17.507
3/08/2024	19.832	3/02/2025	17.476
4/08/2024	19.830	4/02/2025	17.444

Date	Reservoir level (m)	Date (continued)	Reservoir level (m)
5/08/2024	19.828	5/02/2025	17.411
6/08/2024	19.823	6/02/2025	17.379
7/08/2024	19.812	7/02/2025	17.343
8/08/2024	19.802	8/02/2025	17.309
9/08/2024	19.797	9/02/2025	17.275
10/08/2024	19.786	10/02/2025	17.240
11/08/2024	19.773	11/02/2025	17.195
12/08/2024	19.769	12/02/2025	17.154
13/08/2024	19.763	13/02/2025	17.118
14/08/2024	19.745	14/02/2025	17.082
15/08/2024	19.728	15/02/2025	17.045
16/08/2024	19.708	16/02/2025	17.015
17/08/2024	19.719	17/02/2025	16.984
18/08/2024	19.840	18/02/2025	16.963
19/08/2024	19.836	19/02/2025	16.929
20/08/2024	19.819	20/02/2025	16.894
21/08/2024	19.820	21/02/2025	16.859
22/08/2024	19.820	22/02/2025	16.822
23/08/2024	19.816	23/02/2025	16.783
24/08/2024	19.815	24/02/2025	16.744
25/08/2024	19.811	25/02/2025	16.707
26/08/2024	19.805	26/02/2025	16.669
27/08/2024	19.817	27/02/2025	16.628
28/08/2024	19.822	28/02/2025	16.588
29/08/2024	19.818	1/03/2025	16.547
30/08/2024	19.812	2/03/2025	16.509
31/08/2024	19.810	3/03/2025	16.467
1/09/2024	19.859	4/03/2025	16.427
2/09/2024	19.833	5/03/2025	16.391
3/09/2024	19.826	6/03/2025	16.347
4/09/2024	19.823	7/03/2025	16.303
5/09/2024	19.811	8/03/2025	16.260
6/09/2024	19.800	9/03/2025	16.219
7/09/2024	19.790	10/03/2025	16.174
8/09/2024	19.794	11/03/2025	16.124

Date	Reservoir level (m)	Date (continued)	Reservoir level (m)
9/09/2024	19.790	12/03/2025	16.090
10/09/2024	19.773	13/03/2025	16.064
11/09/2024	19.752	14/03/2025	16.030
12/09/2024	19.730	15/03/2025	15.995
13/09/2024	19.714	16/03/2025	15.960
14/09/2024	19.708	17/03/2025	15.935
15/09/2024	19.823	18/03/2025	15.943
16/09/2024	19.828	19/03/2025	15.948
17/09/2024	19.825	20/03/2025	15.927
18/09/2024	19.823	21/03/2025	15.885
19/09/2024	19.821	22/03/2025	15.841
20/09/2024	19.846	23/03/2025	15.795
21/09/2024	19.850	24/03/2025	15.739
22/09/2024	19.837	25/03/2025	15.647
23/09/2024	19.830	26/03/2025	15.557
24/09/2024	19.825	27/03/2025	15.511
25/09/2024	19.810	28/03/2025	15.466
26/09/2024	19.804	29/03/2025	15.415
27/09/2024	19.800	30/03/2025	15.365
28/09/2024	19.792	31/03/2025	15.310
29/09/2024	19.781	1/04/2025	15.255
30/09/2024	19.773	2/04/2025	15.190
1/10/2024	19.770	3/04/2025	15.151
2/10/2024	19.770	4/04/2025	15.766
3/10/2024	19.869	5/04/2025	16.590
4/10/2024	19.836	6/04/2025	16.634
5/10/2024	19.827	7/04/2025	16.617
6/10/2024	19.830	8/04/2025	16.592
7/10/2024	19.852	9/04/2025	16.569
8/10/2024	19.834	10/04/2025	16.527
9/10/2024	19.828	11/04/2025	16.474
10/10/2024	19.824	12/04/2025	16.423
11/10/2024	19.818	13/04/2025	16.369
12/10/2024	19.802	14/04/2025	16.314
13/10/2024	19.789	15/04/2025	16.260

Date	Reservoir level (m)	Date (continued)	Reservoir level (m)
14/10/2024	19.789	16/04/2025	16.208
15/10/2024	19.792	17/04/2025	16.184
16/10/2024	19.781	18/04/2025	16.424
17/10/2024	19.769	19/04/2025	16.794
18/10/2024	19.752	20/04/2025	17.314
19/10/2024	19.736	21/04/2025	17.440
20/10/2024	19.718	22/04/2025	17.479
21/10/2024	19.696	23/04/2025	17.492
22/10/2024	19.673	24/04/2025	17.502
23/10/2024	19.654	25/04/2025	17.505
24/10/2024	19.633	26/04/2025	17.508
25/10/2024	19.607	27/04/2025	17.531
26/10/2024	19.584	28/04/2025	17.647
27/10/2024	19.574	29/04/2025	17.723
28/10/2024	19.555	30/04/2025	17.969
29/10/2024	19.531	1/05/2025	18.445
30/10/2024	19.518	2/05/2025	18.674
31/10/2024	19.493	3/05/2025	18.799
1/11/2024	19.465	4/05/2025	18.822
2/11/2024	19.435	5/05/2025	18.823
3/11/2024	19.404	6/05/2025	18.812
4/11/2024	19.370	7/05/2025	18.792
5/11/2024	19.335	8/05/2025	18.768
6/11/2024	19.300	9/05/2025	18.835
7/11/2024	19.267	10/05/2025	19.091
8/11/2024	19.234	11/05/2025	19.134
9/11/2024	19.201	12/05/2025	19.138
10/11/2024	19.173	13/05/2025	19.134
11/11/2024	19.149	14/05/2025	19.121
12/11/2024	19.122	15/05/2025	19.102
13/11/2024	19.101	16/05/2025	19.083
14/11/2024	19.087	17/05/2025	19.059
15/11/2024	19.126	18/05/2025	19.031
16/11/2024	19.223	19/05/2025	19.010
17/11/2024	19.229	20/05/2025	18.979

Date	Reservoir level (m)	Date (continued)	Reservoir level (m)
18/11/2024	19.221	21/05/2025	18.946
19/11/2024	19.208	22/05/2025	18.911
20/11/2024	19.198	23/05/2025	18.876
21/11/2024	19.189	24/05/2025	18.838
22/11/2024	19.176	25/05/2025	18.798
23/11/2024	19.160	26/05/2025	18.767
24/11/2024	19.145	27/05/2025	18.787
25/11/2024	19.130	28/05/2025	18.791
26/11/2024	19.112	29/05/2025	18.793
27/11/2024	19.092	30/05/2025	18.827
28/11/2024	19.069	31/05/2025	18.828
29/11/2024	19.044	1/06/2025	18.812
30/11/2024	19.033	2/06/2025	18.792
1/12/2024	19.098	3/06/2025	18.765
2/12/2024	19.137	4/06/2025	18.755
3/12/2024	19.132	5/06/2025	18.930
4/12/2024	19.114	6/06/2025	19.041
5/12/2024	19.076	7/06/2025	19.182
6/12/2024	19.048	8/06/2025	19.239
7/12/2024	19.008	9/06/2025	19.469
8/12/2024	18.964	10/06/2025	19.755
9/12/2024	18.924	11/06/2025	19.889
10/12/2024	18.887	12/06/2025	19.876
11/12/2024	18.838	13/06/2025	19.856
12/12/2024	18.798	14/06/2025	19.847
13/12/2024	18.772	15/06/2025	19.843
14/12/2024	18.731	16/06/2025	19.838
15/12/2024	18.685	17/06/2025	19.827
16/12/2024	18.644	18/06/2025	19.827
17/12/2024	18.606	19/06/2025	19.828
18/12/2024	18.566	20/06/2025	19.848
19/12/2024	18.528	21/06/2025	19.840
20/12/2024	18.490	22/06/2025	19.829
21/12/2024	18.466	23/06/2025	19.819
22/12/2024	18.442	24/06/2025	19.818

Date	Reservoir level (m)	Date (continued)	Reservoir level (m)
23/12/2024	18.418	25/06/2025	19.816
24/12/2024	18.394	26/06/2025	19.815
25/12/2024	18.363	27/06/2025	19.883
26/12/2024	18.350	28/06/2025	19.867
27/12/2024	18.332	29/06/2025	19.851
28/12/2024	18.297	30/06/2025	19.843
29/12/2024	18.266		
30/12/2024	18.233		
31/12/2024	18.203		

Appendix C. Total system storage, spillway flows and compensation flows

Date	Compensation release (l/s)	Spillway flows (l/s)	Combined compensation and spillway flow (l/s)	Release required (l/s)	Total system storage (%)
1/07/2024	12.7	144.2	156.9	11.6	76.73
2/07/2024	12.7	181.2	193.9	11.6	76.91
3/07/2024	12.5	147.8	160.3	11.6	76.93
4/07/2024	12.8	147.8	160.5	11.6	76.83
5/07/2024	13.8	147.8	161.6	11.6	76.72
6/07/2024	13.0	129.1	142.2	11.6	76.62
7/07/2024	12.8	124.4	137.2	11.6	76.53
8/07/2024	12.7	124.4	137.1	11.6	76.42
9/07/2024	12.7	124.4	137.1	11.6	76.29
10/07/2024	12.7	124.4	137.1	11.6	76.15
11/07/2024	12.6	124.4	137.0	11.6	75.99
12/07/2024	12.7	120.5	133.2	11.6	75.83
13/07/2024	12.7	97.9	110.6	11.6	75.67
14/07/2024	13.0	89.4	102.5	11.6	75.52
15/07/2024	12.6	173.5	186.0	11.6	75.53
16/07/2024	12.5	176.7	189.2	11.6	76.00
17/07/2024	12.9	74.4	87.3	11.6	76.02
18/07/2024	12.6	49.5	62.1	11.6	75.98
19/07/2024	12.8	0.0	12.8	11.6	75.94
20/07/2024	12.5	2184.4	2196.9	11.6	76.25
21/07/2024	12.8	369.7	382.5	11.6	76.60
22/07/2024	12.8	280.4	293.1	11.6	76.75
23/07/2024	12.9	246.1	258.9	11.6	76.79
24/07/2024	12.5	219.6	232.1	11.6	76.81
25/07/2024	12.5	219.0	231.5	11.6	76.78
26/07/2024	12.7	184.8	197.5	11.6	76.77
27/07/2024	12.7	149.9	162.6	11.6	76.73
28/07/2024	12.7	147.8	160.5	11.6	76.71
29/07/2024	12.6	155.4	168.0	11.6	76.72
30/07/2024	12.8	215.5	228.2	11.6	77.05
31/07/2024	12.7	266.2	279.0	11.6	77.20
1/08/2024	12.6	587.9	600.5	11.6	77.45
2/08/2024	12.8	246.6	259.4	11.6	77.58
3/08/2024	12.7	182.7	195.4	11.6	77.60
4/08/2024	12.7	163.3	175.9	11.6	77.63
5/08/2024	12.7	149.3	162.0	11.6	77.62
6/08/2024	12.7	112.2	124.9	11.6	77.51
7/08/2024	12.7	28.9	41.6	11.6	77.39
8/08/2024	12.7	0.0	12.7	11.6	77.24
9/08/2024	12.8	0.0	12.8	11.6	77.14
10/08/2024	12.7	0.0	12.7	11.6	77.02
11/08/2024	12.8	0.0	12.8	11.6	76.88

Date	Compensation release (l/s)	Spillway flows (l/s)	Combined compensation and spillway flow (l/s)	Release required (l/s)	Total system storage (%)
12/08/2024	12.5	0.0	12.5	11.6	76.80
13/08/2024	12.5	0.0	12.5	11.6	76.74
14/08/2024	12.5	0.0	12.5	11.6	76.61
15/08/2024	12.7	0.0	12.7	11.6	76.50
16/08/2024	12.6	0.0	12.6	11.6	76.39
17/08/2024	12.8	0.0	12.8	11.6	76.51
18/08/2024	12.5	315.6	328.2	11.6	77.92
19/08/2024	12.8	215.5	228.3	11.6	78.66
20/08/2024	12.7	81.6	94.3	11.6	78.93
21/08/2024	12.3	85.6	97.9	11.6	79.09
22/08/2024	12.6	85.6	98.2	11.6	79.19
23/08/2024	12.8	58.9	71.7	11.6	78.84
24/08/2024	12.7	54.5	67.2	11.6	79.38
25/08/2024	12.7	19.8	32.5	11.6	79.49
26/08/2024	12.7	0.0	12.8	11.6	79.52
27/08/2024	12.7	77.1	89.7	11.6	79.63
28/08/2024	12.8	116.7	129.4	11.6	79.85
29/08/2024	12.7	86.4	99.1	11.6	79.96
30/08/2024	12.7	37.6	50.3	11.6	80.08
31/08/2024	12.7	32.8	45.6	11.6	80.27
1/09/2024	12.7	659.8	672.5	11.6	81.88
2/09/2024	12.6	212.8	225.4	11.6	82.82
3/09/2024	12.7	156.2	168.9	11.6	83.06
4/09/2024	12.7	128.6	141.3	11.6	83.24
5/09/2024	12.7	44.9	57.6	11.6	83.37
6/09/2024	12.7	0.1	12.7	11.6	83.48
7/09/2024	12.7	0.0	12.7	11.6	83.58
8/09/2024	12.7	0.0	12.7	11.6	83.72
9/09/2024	12.7	0.0	12.7	11.6	83.80
10/09/2024	12.7	0.0	12.7	11.6	83.81
11/09/2024	12.7	0.0	12.7	11.6	83.80
12/09/2024	12.6	0.0	12.6	11.6	83.75
13/09/2024	12.8	0.0	12.8	11.6	83.73
14/09/2024	12.4	0.0	12.4	11.6	83.76
15/09/2024	12.5	130.9	143.4	11.6	84.03
16/09/2024	12.5	148.5	161.0	11.6	84.10
17/09/2024	12.8	127.4	140.2	11.6	84.18
18/09/2024	12.7	106.6	119.3	11.6	84.21
19/09/2024	12.8	90.7	103.5	11.6	84.22
20/09/2024	12.9	456.8	469.7	11.6	84.60
21/09/2024	12.8	365.3	378.1	11.6	85.13
22/09/2024	12.8	214.7	227.5	11.6	85.25

Date	Compensation release (l/s)	Spillway flows (l/s)	Combined compensation and spillway flow (l/s)	Release required (l/s)	Total system storage (%)
23/09/2024	12.7	163.1	175.8	11.6	85.31
24/09/2024	12.7	122.4	135.1	11.6	85.34
25/09/2024	12.9	21.6	34.5	11.6	85.35
26/09/2024	12.6	0.0	12.6	11.6	85.29
27/09/2024	12.6	0.0	12.6	11.6	85.24
28/09/2024	12.6	0.0	12.6	11.6	85.18
29/09/2024	12.6	0.0	12.6	11.6	85.11
30/09/2024	12.7	0.0	12.7	11.6	85.03
1/10/2024	12.8	0.0	12.8	11.6	84.93
2/10/2024	12.6	2.1	14.7	11.6	84.89
3/10/2024	12.7	759.6	772.4	11.6	85.91
4/10/2024	12.5	213.4	225.9	11.6	86.24
5/10/2024	12.7	140.5	153.2	11.6	86.32
6/10/2024	12.8	162.4	175.2	11.6	86.38
7/10/2024	12.8	386.5	399.2	11.6	86.67
8/10/2024	12.5	201.4	214.0	11.6	86.83
9/10/2024	12.7	151.7	164.4	11.6	86.93
10/10/2024	12.6	114.6	127.3	11.6	86.98
11/10/2024	12.9	75.6	88.5	11.6	87.05
12/10/2024	12.2	7.6	19.8	11.6	87.08
13/10/2024	12.8	0.0	12.8	11.6	87.05
14/10/2024	12.6	0.0	12.6	11.6	87.11
15/10/2024	12.6	0.0	12.6	11.6	87.11
16/10/2024	12.6	0.0	12.6	11.6	87.08
17/10/2024	12.8	0.0	12.8	11.6	87.04
18/10/2024	12.7	0.0	12.7	11.6	86.99
19/10/2024	12.7	0.0	12.7	11.6	86.92
20/10/2024	12.5	0.0	12.5	11.6	86.86
21/10/2024	12.7	0.0	12.7	11.6	86.80
22/10/2024	12.8	0.0	12.8	11.6	86.72
23/10/2024	12.3	0.0	12.3	11.6	86.65
24/10/2024	12.4	0.0	12.4	11.6	86.57
25/10/2024	12.9	0.0	12.9	11.6	86.46
26/10/2024	12.7	0.0	12.7	11.6	86.40
27/10/2024	12.8	0.0	12.8	11.6	86.59
28/10/2024	12.7	0.0	12.7	11.6	86.57
29/10/2024	12.7	0.0	12.7	11.6	86.50
30/10/2024	12.4	0.0	12.4	11.6	86.49
31/10/2024	12.6	0.0	12.6	11.6	86.41
1/11/2024	12.8	0.0	12.8	11.6	86.32
2/11/2024	12.4	0.0	12.4	11.6	86.21
3/11/2024	12.8	0.0	12.8	11.6	86.19

Date	Compensation release (l/s)	Spillway flows (l/s)	Combined compensation and spillway flow (l/s)	Release required (l/s)	Total system storage (%)
4/11/2024	12.6	0.0	12.6	11.6	86.09
5/11/2024	12.6	0.0	12.6	11.6	85.95
6/11/2024	13.0	0.0	13.0	11.6	85.83
7/11/2024	12.7	0.0	12.7	11.6	85.71
8/11/2024	12.9	0.0	12.9	11.6	85.58
9/11/2024	12.8	0.0	12.8	11.6	85.44
10/11/2024	13.1	0.0	13.1	11.6	85.30
11/11/2024	13.1	0.0	13.1	11.6	85.20
12/11/2024	12.9	0.0	12.9	11.6	85.05
13/11/2024	12.4	0.0	12.4	11.6	84.90
14/11/2024	12.3	0.0	12.3	11.6	84.77
15/11/2024	12.8	0.0	12.8	11.6	85.26
16/11/2024	12.7	0.0	12.7	11.6	86.85
17/11/2024	12.7	0.0	12.7	11.6	86.92
18/11/2024	12.7	0.0	12.7	11.6	86.88
19/11/2024	12.3	0.0	12.3	11.6	86.80
20/11/2024	12.4	0.0	12.4	11.6	86.68
21/11/2024	12.5	0.0	12.5	11.6	86.58
22/11/2024	12.7	0.0	12.7	11.6	86.49
23/11/2024	12.3	0.0	12.3	11.6	86.36
24/11/2024	12.8	0.0	12.8	11.6	86.23
25/11/2024	12.4	0.0	12.4	11.6	86.11
26/11/2024	12.4	0.0	12.4	11.6	85.96
27/11/2024	12.5	0.0	12.5	11.6	85.78
28/11/2024	12.7	0.0	12.7	11.6	85.58
29/11/2024	12.8	0.0	12.8	11.6	85.36
30/11/2024	12.8	0.0	12.8	11.6	85.20
1/12/2024	12.8	0.0	12.8	11.6	85.25
2/12/2024	12.8	0.0	12.8	11.6	85.19
3/12/2024	12.9	0.0	12.9	11.6	85.00
4/12/2024	12.7	0.0	12.7	11.6	84.76
5/12/2024	12.5	0.0	12.5	11.6	84.51
6/12/2024	12.8	0.0	12.8	11.6	84.29
7/12/2024	12.2	0.0	12.2	11.6	84.04
8/12/2024	12.8	0.0	12.8	11.6	83.79
9/12/2024	12.8	0.0	12.8	11.6	83.57
10/12/2024	13.0	0.0	13.0	11.6	83.53
11/12/2024	12.4	0.0	12.4	11.6	83.34
12/12/2024	12.8	0.0	12.8	11.6	83.30
13/12/2024	12.6	0.0	12.6	11.6	83.28
14/12/2024	12.7	0.0	12.7	11.6	83.14
15/12/2024	12.7	0.0	12.7	11.6	82.96

Date	Compensation release (l/s)	Spillway flows (l/s)	Combined compensation and spillway flow (l/s)	Release required (l/s)	Total system storage (%)
16/12/2024	12.9	0.0	12.9	11.6	82.96
17/12/2024	12.7	0.0	12.7	11.6	83.19
18/12/2024	12.8	0.0	12.8	11.6	83.03
19/12/2024	12.9	0.0	12.9	11.6	82.80
20/12/2024	12.6	0.0	12.6	11.6	82.22
21/12/2024	12.8	0.0	12.8	11.6	82.41
22/12/2024	12.8	0.0	12.8	11.6	82.25
23/12/2024	12.7	0.0	12.7	11.6	82.10
24/12/2024	12.8	0.0	12.8	11.6	81.95
25/12/2024	12.7	0.0	12.7	11.6	81.73
26/12/2024	12.5	0.0	12.5	11.6	81.65
27/12/2024	12.9	0.0	12.9	11.6	81.55
28/12/2024	12.6	0.0	12.6	11.6	81.33
29/12/2024	12.7	0.0	12.7	11.6	81.14
30/12/2024	12.7	0.0	12.7	11.6	80.94
31/12/2024	13.1	0.0	13.1	11.6	80.73
1/01/2025	12.7	0.0	12.7	11.6	80.53
2/01/2025	12.6	0.0	12.6	11.6	80.33
3/01/2025	12.7	0.0	12.7	11.6	80.13
4/01/2025	12.8	0.0	12.8	11.6	79.99
5/01/2025	12.7	0.0	12.7	11.6	79.83
6/01/2025	12.6	0.0	12.6	11.6	79.63
7/01/2025	12.3	0.0	12.3	11.6	79.41
8/01/2025	12.8	0.0	12.8	11.6	79.18
9/01/2025	12.5	0.0	12.5	11.6	79.00
10/01/2025	12.7	0.0	12.7	11.6	78.79
11/01/2025	12.9	0.0	12.9	11.6	78.57
12/01/2025	12.7	0.0	12.7	11.6	78.37
13/01/2025	12.9	0.0	12.9	11.6	78.11
14/01/2025	12.5	0.0	12.5	11.6	77.77
15/01/2025	12.7	0.0	12.7	11.6	77.50
16/01/2025	12.7	0.0	12.7	11.6	77.24
17/01/2025	12.7	0.0	12.7	11.6	76.97
18/01/2025	12.7	0.0	12.7	11.6	76.72
19/01/2025	12.7	0.0	12.7	11.6	76.46
20/01/2025	12.7	0.0	12.7	11.6	76.23
21/01/2025	12.7	0.0	12.7	11.6	76.06
22/01/2025	12.6	0.0	12.6	11.6	75.96
23/01/2025	12.6	0.0	12.6	11.6	75.74
24/01/2025	12.4	0.0	12.4	11.6	75.50
25/01/2025	12.9	0.0	12.9	11.6	75.27
26/01/2025	13.0	0.0	13.0	11.6	75.29

Date	Compensation release (l/s)	Spillway flows (l/s)	Combined compensation and spillway flow (l/s)	Release required (l/s)	Total system storage (%)
27/01/2025	13.0	0.0	13.0	11.6	75.41
28/01/2025	12.9	0.0	12.9	11.6	75.26
29/01/2025	12.5	0.0	12.5	11.6	74.54
30/01/2025	12.6	0.0	12.6	11.6	74.84
31/01/2025	12.6	0.0	12.6	11.6	74.63
1/02/2025	12.7	0.0	12.7	11.6	74.43
2/02/2025	12.7	0.0	12.7	11.6	74.19
3/02/2025	12.3	0.0	12.3	11.6	73.96
4/02/2025	12.7	0.0	12.7	11.6	73.73
5/02/2025	12.8	0.0	12.8	11.6	73.46
6/02/2025	12.7	0.0	12.7	11.6	73.24
7/02/2025	12.7	0.0	12.7	11.6	72.99
8/02/2025	12.7	0.0	12.7	11.6	72.76
9/02/2025	12.7	0.0	12.7	11.6	72.55
10/02/2025	12.7	0.0	12.7	11.6	72.31
11/02/2025	12.7	0.0	12.7	11.6	72.07
12/02/2025	12.7	0.0	12.7	11.6	71.98
13/02/2025	12.7	0.0	12.7	11.6	71.75
14/02/2025	12.7	0.0	12.7	11.6	71.45
15/02/2025	12.4	0.0	12.4	11.6	71.10
16/02/2025	12.8	0.0	12.8	11.6	70.88
17/02/2025	12.8	0.0	12.8	11.6	70.67
18/02/2025	12.8	0.0	12.8	11.6	70.48
19/02/2025	12.8	0.0	12.8	11.6	70.23
20/02/2025	13.0	0.0	13.0	11.6	69.95
21/02/2025	13.0	0.0	13.0	11.6	69.68
22/02/2025	12.6	0.0	12.6	11.6	69.40
23/02/2025	13.0	0.0	13.0	11.6	69.13
24/02/2025	12.8	0.0	12.8	11.6	68.87
25/02/2025	12.8	0.0	12.8	11.6	68.59
26/02/2025	12.5	0.0	12.5	11.6	68.30
27/02/2025	12.9	0.0	12.9	11.6	68.01
28/02/2025	12.7	0.0	12.7	11.6	67.74
1/03/2025	12.7	0.0	12.7	11.6	67.47
2/03/2025	12.8	0.0	12.8	11.6	67.23
3/03/2025	12.9	0.0	12.9	11.6	66.96
4/03/2025	12.6	0.0	12.6	11.6	66.70
5/03/2025	12.5	0.0	12.5	11.6	66.49
6/03/2025	12.7	0.0	12.7	11.6	66.21
7/03/2025	12.8	0.0	12.8	11.6	65.92
8/03/2025	13.0	0.0	13.0	11.6	65.66
9/03/2025	12.7	0.0	12.7	11.6	65.41

Date	Compensation release (l/s)	Spillway flows (l/s)	Combined compensation and spillway flow (l/s)	Release required (l/s)	Total system storage (%)
10/03/2025	12.7	0.0	12.7	11.6	65.12
11/03/2025	12.7	0.0	12.7	11.6	64.83
12/03/2025	12.4	0.0	12.4	11.6	64.57
13/03/2025	12.9	0.0	12.9	11.6	64.32
14/03/2025	13.0	0.0	13.0	11.6	64.05
15/03/2025	12.6	0.0	12.6	11.6	63.78
16/03/2025	12.4	0.0	12.4	11.6	63.52
17/03/2025	12.7	0.0	12.7	11.6	63.28
18/03/2025	12.8	0.0	12.8	11.6	63.08
19/03/2025	12.3	0.0	12.3	11.6	62.90
20/03/2025	12.3	0.0	12.3	11.6	62.77
21/03/2025	12.4	0.0	12.4	11.6	62.55
22/03/2025	12.5	0.0	12.5	11.6	62.31
23/03/2025	12.3	0.0	12.3	11.6	62.08
24/03/2025	12.6	0.0	12.6	11.6	61.84
25/03/2025	12.5	0.0	12.5	11.6	61.57
26/03/2025	12.7	0.0	12.7	11.6	61.33
27/03/2025	12.5	0.0	12.5	11.6	61.06
28/03/2025	12.4	0.0	12.4	11.6	60.83
29/03/2025	12.7	0.0	12.7	11.6	60.62
30/03/2025	12.7	0.0	12.7	11.6	60.39
31/03/2025	12.8	0.0	12.8	11.6	60.15
1/04/2025	12.8	0.0	12.8	11.6	59.89
2/04/2025	12.7	0.0	12.7	11.6	59.69
3/04/2025	12.9	0.0	12.9	11.6	59.54
4/04/2025	12.7	0.0	12.7	11.6	61.06
5/04/2025	12.7	0.0	12.7	11.6	64.28
6/04/2025	12.7	0.0	12.7	11.6	64.41
7/04/2025	12.7	0.0	12.7	11.6	64.35
8/04/2025	12.7	0.0	12.7	11.6	64.29
9/04/2025	12.3	0.0	12.3	11.6	64.21
10/04/2025	12.7	0.0	12.7	11.6	64.06
11/04/2025	12.8	0.0	12.8	11.6	63.90
12/04/2025	12.8	0.0	12.8	11.6	63.73
13/04/2025	12.7	0.0	12.7	11.6	63.54
14/04/2025	12.7	0.0	12.7	11.6	63.37
15/04/2025	12.7	0.0	12.7	11.6	63.17
16/04/2025	12.7	0.0	12.7	11.6	62.99
17/04/2025	12.5	0.0	12.5	11.6	62.90
18/04/2025	12.4	0.0	12.4	11.6	63.24
19/04/2025	12.8	0.0	12.8	11.6	63.87
20/04/2025	12.8	0.0	12.8	11.6	64.61

Date	Compensation release (l/s)	Spillway flows (l/s)	Combined compensation and spillway flow (l/s)	Release required (l/s)	Total system storage (%)
21/04/2025	12.7	0.0	12.7	11.6	64.87
22/04/2025	12.8	0.0	12.8	11.6	64.89
23/04/2025	12.4	0.0	12.4	11.6	64.83
24/04/2025	13.0	0.0	13.0	11.6	64.73
25/04/2025	12.7	0.0	12.7	11.6	64.61
26/04/2025	12.7	0.0	12.7	11.6	64.49
27/04/2025	12.7	0.0	12.7	11.6	64.46
28/04/2025	12.7	0.0	12.7	11.6	64.67
29/04/2025	12.7	0.0	12.7	11.6	64.73
30/04/2025	12.7	0.0	12.7	11.6	65.37
1/05/2025	60.9	0.0	60.9	60	66.94
2/05/2025	61.0	0.0	61.0	60	68.21
3/05/2025	61.2	0.0	61.2	60	68.69
4/05/2025	60.9	0.0	60.9	60	68.82
5/05/2025	61.1	0.0	61.1	60	68.85
6/05/2025	60.8	0.0	60.8	60	68.82
7/05/2025	61.3	0.0	61.3	60	68.77
8/05/2025	61.3	0.0	61.3	60	68.72
9/05/2025	61.0	0.0	61.0	60	68.98
10/05/2025	61.0	0.0	61.0	60	70.03
11/05/2025	61.2	0.0	61.2	60	70.24
12/05/2025	61.1	0.0	61.1	60	70.28
13/05/2025	61.1	0.0	61.1	60	70.27
14/05/2025	61.4	0.0	61.4	60	70.24
15/05/2025	61.0	0.0	61.0	60	70.19
16/05/2025	61.2	0.0	61.2	60	70.12
17/05/2025	61.2	0.0	61.2	60	70.04
18/05/2025	61.5	0.0	61.5	60	69.98
19/05/2025	61.6	0.0	61.6	60	69.96
20/05/2025	61.2	0.0	61.2	60	69.87
21/05/2025	61.1	0.0	61.1	60	69.76
22/05/2025	61.2	0.0	61.2	60	69.64
23/05/2025	61.1	0.0	61.1	60	69.51
24/05/2025	61.2	0.0	61.2	60	69.39
25/05/2025	61.2	0.0	61.2	60	69.27
26/05/2025	61.2	0.0	61.2	60	69.22
27/05/2025	61.1	0.0	61.1	60	70.35
28/05/2025	61.3	0.0	61.3	60	70.91
29/05/2025	61.3	0.0	61.3	60	71.71
30/05/2025	61.4	0.0	61.4	60	72.20
31/05/2025	61.2	0.0	61.2	60	72.42
1/06/2025	61.4	0.0	61.4	60	72.49

Date	Compensation release (l/s)	Spillway flows (l/s)	Combined compensation and spillway flow (l/s)	Release required (l/s)	Total system storage (%)
2/06/2025	61.2	0.0	61.2	60	72.51
3/06/2025	61.2	0.0	61.2	60	72.48
4/06/2025	61.3	0.0	61.3	60	72.66
5/06/2025	61.1	0.0	61.1	60	75.39
6/06/2025	61.3	0.0	61.3	60	76.23
7/06/2025	61.1	0.0	61.1	60	76.91
8/06/2025	61.5	0.0	61.5	60	77.23
9/06/2025	60.6	0.0	60.6	60	77.79
10/06/2025	61.2	583.4	644.6	90	78.23
11/06/2025	61.6	1231.4	1293.0	90	80.25
12/06/2025	86.8	904.9	991.6	90	80.78
13/06/2025	91.9	458.7	550.6	90	81.12
14/06/2025	91.9	304.1	395.9	90	81.47
15/06/2025	92.0	271.4	363.4	90	81.73
16/06/2025	91.7	230.8	322.5	90	81.89
17/06/2025	91.8	154.6	246.4	90	81.96
18/06/2025	91.7	155.5	247.3	90	82.06
19/06/2025	91.9	163.3	255.2	90	82.16
20/06/2025	91.8	335.0	426.8	90	82.49
21/06/2025	91.8	260.3	352.1	90	82.65
22/06/2025	91.7	179.5	271.3	90	82.72
23/06/2025	92.0	100.0	192.0	90	82.77
24/06/2025	91.8	93.3	185.2	90	82.84
25/06/2025	91.9	84.0	176.0	90	82.91
26/06/2025	92.1	81.1	173.2	90	82.96
27/06/2025	91.8	1529.3	1621.1	90	84.57
28/06/2025	91.8	759.7	851.5	90	86.79
29/06/2025	91.7	437.7	529.5	90	87.33
30/06/2025	91.6	309.6	401.1	90	87.67

Appendix D. Native Fisheries Annual MPI Report

Auckland Water Supply Dams
2024-2025 Native Fisheries Annual Report

Final - August 2025

Watercare

QUALITY INFORMATION

Document	Annual Report
Date	8 August 2025
Name and position of originator	Emma Baker, Environmental Scientist
Report directory	\\water.internal\ORG\Ops\Water Supply\Headworks\SDGEN\00 - Site General\Compliance\Trap and Haul\Ministry of Fisheries Reports

REVISION HISTORY

Rev	Revision Date	Name	Position	Signature
1	24/07/2025	Michiel Jonker	Environmental Care Manager	
2	05/08/2025	AJ Grobler	Operations Controller	
3	08/08/2025	Brendon Dockary	Operations Controller	

APPROVED

Date	Name	Position	Signature
08/08/2025	Michiel Jonker	Environmental Care Manager	

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1 INTRODUCTION

Watercare Services Limited (Watercare) currently undertakes a Native Fisheries Management Programme utilising 'trap and haul' methods at eight of the water supply dams. Ministry of Primary Industries approval has been granted for this work under Special Permit 737 (expires on 1 October 2025; Appendix A) and Fish Transfer Authorisation NFT325. The permit covers the upstream and downstream trap and haul activities for dams in the Auckland and Waikato regions:

- Hunua Ranges:
  - Hays Creek Dam
  - Cosseys Dam
  - Wairoa Dam
  - Upper Mangatawhiri Dam
  - Mangatangi Weir
- Waitākere Ranges:
  - Lower Nihotupu Dam
  - Lower Huia Dam
  - Waitākere Dam

New permits will be applied for to continue trap and haul from the 2025-2026 season onwards.

This report provides details of the programme for the period 1 July 2024 to 30 June 2025, in fulfilment of conditions 27, 28 and 29 of Special Permit 737.

2 UPSTREAM TRANSFER

Trapping for elver and other freshwater fish was conducted at the following sites for the purpose of upstream transfer:

- Lower Nihotupu Dam
- Waitākere Dam
- Hays Creek Dam
- Cosseys Dam
- Mangatangi weir

Trapping (upstream transfer) at Lower Huia Dam has proven unsuccessful in the past and is no longer undertaken.

2.1 Collection methods

During the 2024-2025 trap and haul season, two traps were deployed in the Waitākere Ranges and three in the Hunua Ranges. The design and methodology of each trap followed those outlined in Watercare's Native Fisheries Program – Operations Manual for Undertaking Trap and Haul.

During rainfall events, traps were taken out of service as part of standard operations. Additionally, over the Christmas holiday period, the Hunua dams' traps were not in service due to low staff availability.

2.2 Fish species, elvers and approximate total weight

The estimated weight of each catch is based on the number of individuals caught, the expected weight for each species (1 g per elver and 0.5 g per juvenile galaxiid) and the measured size of the individuals. The data provided in Table 2-1 to Table 2-5 fulfil conditions 28a, 28b and 28f.

All elvers and galaxiids were released directly into the respective dams upstream of the trapping sites or above the Mangatangi weir.

Table 2-1: Approximate total weight of each species collected at Lower Nihotupu Dam during the 2024-2025 upstream trap and haul season.

Date	Elver (g)	Galaxiids (g)
20/10/2024	5	100.0
24/10/2024	-	10.0
30/10/2024	6	3.5
3/11/2024	40	1.0
7/11/2024	38	-
13/11/2024	12	-
18/11/2024	14	9.0
25/11/2024	80	30.0
28/11/2024	50	2.0
3/12/2024	200	-
6/12/2024	250	6.0
9/12/2024	300	2.5
10/12/2024	50	0.5

Date	Elver (g)	Galaxiids (g)
15/12/2024	40	1.5
22/12/2024	100	-
22/12/2024	50	-
2/01/2025	480	-
5/01/2025	107	3.0
9/01/2025	100	-
14/01/2025	60	-
16/01/2025	100	0.5
23/01/2025	120	2.0
28/01/2025	230	-
3/02/2025	200	16.0
6/02/2025	85	-
11/02/2025	48	-
17/02/2025	30	-
7/03/2025	28	-
10/04/2025	14	-
Total	**2,837**	**178.0**

Table 2-2: Approximate total weight of each species collected at Waitākere Dam during the 2024-2025 upstream trap and haul season.

Date	Elver (g)	Galaxiids (g)
10/11/2024	5	-
18/11/2024	7	-
2/12/2024	23	1.0
11/12/2024	22	2.0
19/12/2024	12	1.0
27/12/2024	3	1.5
29/12/2024	3	1.0
29/12/2024	35	-
3/01/2025	170	-
6/01/2025	12	-
7/01/2025	100	-
9/01/2025	50	-
13/01/2025	110	-
14/01/2025	5	7.5
16/01/2025	200	-
20/01/2025	24	-
21/01/2025	104	-

Date	Elver (g)	Galaxiids (g)
2/02/2025	35	-
7/02/2025	300	-
10/02/2025	140	-
17/02/2025	350	-
27/02/2025	200	-
4/03/2025	64	-
10/03/2025	184	-
12/03/2025	11	-
18/03/2025	64	-
26/03/2025	38	-
30/03/2025	44	-
16/04/2025	15	-
Total	**2,330**	**14.0**

Table 2-3: Approximate total weight of each species collected at Hays Creek Dam during the 2024-2025 upstream trap and haul season.

Date	Elver (g)	Galaxiids (g)
21/10/2024	-	1.0
28/10/2024	-	1.5
31/10/2024	-	0.5
1/11/2024	-	1.0
2/11/2024	-	2.0
4/11/2024	-	1.0
4/11/2024	-	0.5
5/11/2024	-	2
22/12/2024	52	-
27/12/2024	49	-
30/12/2024	69	-
31/12/2024	16	-
7/01/2025	17	-
13/01/2025	15	-
13/01/2025	200	0.5
15/01/2025	14	-
6/02/2025	84	-
19/02/2025	46	-
20/02/2025	25	-
24/02/2025	12	-
3/03/2025	3	-

Date	Elver (g)	Galaxiids (g)
4/03/2025	6	-
9/03/2025	6	-
Total	**614**	**10.0**

Table 2-4: Approximate total weight of each species collected at Cosseys Dam during the 2024-2025 upstream trap and haul season.

Date	Elver (g)	Galaxiids (g)
29/10/2024	3	-
7/11/2024	2	-
14/11/2024	2	-
2/12/2024	16	-
3/12/2024	5	-
3/12/2024	16	-
16/12/2024	12	-
26/12/2024	10	-
29/12/2024	26	-
31/12/2024	18	-
5/01/2025	16	-
7/01/2025	12	-
14/01/2025	12	-
27/01/2025	66	-
4/02/2025	24	-
12/02/2025	5	-
18/02/2025	11	-
19/02/2025	11	-
21/02/2025	15	-
10/03/2025	34	-
14/03/2025	3	-
18/03/2025	4	-
Total	**323**	**0.0**

Table 2-5: Approximate total weight of each species collected at Mangatangi weir during the 2024-2025 upstream trap and haul season.

Date	Elver (g)	Galaxiids (g)
8/10/2024	1	-
30/10/2024	1	-
13/11/2024	1	-
17/11/2024	2	-
20/11/2024	4	-

Date	Elver (g)	Galaxiids (g)
25/11/2024	4	-
26/11/2024	4	-
29/11/2024	6	-
1/12/2024	50	-
9/12/2024	1	-
11/12/2024	23	0.5
13/12/2024	24	-
16/12/2024	19	-
23/12/2024	3	-
24/12/2024	4	-
30/12/2024	11	1.0
31/12/2024	13	-
2/01/2025	7	-
3/01/2025	11	-
5/01/2025	13	0.5
8/01/2025	14	-
10/01/2025	5	-
20/01/2025	55	5.5
27/01/2025	78	1.5
28/01/2025	13	-
29/01/2025	35	-
30/01/2025	3	-
3/02/2025	15	0.5
7/02/2025	24	-
16/02/2025	4	-
21/02/2025	7	0.5
28/02/2025	3	-
10/03/2025	1	-
Total	**459**	**10**

2.3 Juvenile eel length

Condition 28c requires the weight of juvenile eels (i.e., greater than 20 g in weight) collected for transfer to be measured. The length was measured instead of weight, consistent with previous years' practices. The data is provided in Table 2-6.

Table 2-6: Length of juvenile eels reported during the 2024-2025 upstream trap and haul season

Location	Date	Length of juvenile eel (mm)
Waitākere	23/10/2024	250

2.4 Bycatch species and weight

The most caught bycatch species were the Kōura (*Paranephrops planifrons*) and bullies (*Gobiomorphus spp*). All bycatch species were caught in the permanent fish trap structures located at the base of the dams. On average, the bullies are estimated to weigh 2.5 g, and smelt (*Retropinna retropinna*) approximately 0.5 g, though no smelt were caught during this trap and haul season. When the bully species could not be identified, they were assumed to be common bullies. The results of the bycatch are presented in Table 2-7.

Table 2-7: Approximate total weight of bycatch reported during the 2024-2025 upstream trap and haul season.

Location	Date	Species (number if weight unknown)	Weight (g)
Lower Nihotupu	20/10/2024	Common bully	2.5
	24/10/2024	Common bully	2.5
	3/11/2024	Common bully	65.0
	7/11/2024	Common bully	17.5
	13/11/2024	Common bully	12.5
	25/11/2024	Common bully	27.5
	3/12/2024	Common bully	7.5
	3/12/2024	Common bully	15
	9/12/2024	Common bully	7.5
	10/12/2024	Common bully	17.5
	15/12/2024	Common bully	2.5
	22/12/2024	Common bully	2.5
	22/12/2024	Common bully	12.5
	14/01/2025	Common bully	2.5
	16/01/2025	Common bully	2.5
	7/03/2025	Common bully	2.5
	10/04/2025	Common bully	25.0
Waitākere	18/11/2024	Common bully	2.5
	29/12/2024	Common bully	10.0
	3/01/2025	Common bully	5.0
	10/02/2025	Common bully	7.5
Hays Creek	1/12/2024	Common bully	2.5
	7/01/2025	Common bully	2.5
Mangatangi	8/10/2025	Common bully	15.0
		Kōura (1)	n/a
	11/10/2025	Common bully	5.0
	14/10/2025	Common bully	2.5
	18/10/2024	Common bully	2.5
	22/10/2024	Kōura (1)	n/a

Location	Date	Species (number if weight unknown)	Weight (g)
	22/10/2024	Common bully	2.5
	22/10/2024	Redfin bully (1)	2.5
	24/10/2024	Kōura (1)	n/a
	29/10/2024	Kōura (1)	n/a
	29/10/2024	Common bully	7.5
	1/11/2024	Redfin bully	2.5
	4/11/2024	Common bully	2.5
	6/11/2024	Common bully	2.5
	8/11/2024	Common bully	5.0
	11/11/2024	Common bully	15.0
	13/11/2024	Common bully	15.0
	18/11/2024	Common bully	7.5
	20/11/2024	Common bully	7.5
	21/11/2024	Kōura (1)	n/a
	25/11/2024	Common bully	7.5
	26/11/2024	Kōura (1)	n/a
	26/11/2024	Common bully	17.5
	1/12/2024	Kōura (10)	n/a
	1/12/2024	Common bully	30.0
	1/12/2024	Common bully	22.5
	6/12/2024	Kōura (1)	n/a
	9/12/2024	Common bully	37.5
	11/12/2024	Common bully	42.5
	13/12/2024	Kōura (2)	n/a
	13/12/2024	Common bully	32.5
	16/12/2024	Common bully	40.0
	18/12/2024	Common bully	15.0
	23/12/2024	Common bully	12.5
	24/12/2024	Kōura (1)	n/a
	24/12/2024	Common bully	105.0
	27/12/2024	Common bully	117.5
	30/12/2024	Common bully	170.0
	31/12/2024	Common bully	27.5
	3/01/2025	Common bully	45.0
	6/01/2025	Common bully	75.0
	8/01/2025	Common bully	32.5
	10/01/2025	Common bully	12.5
	21/01/2025	Common bully	27.5

Location	Date	Species (number if weight unknown)	Weight (g)
	27/01/2025	Kōura (1)	n/a
	27/01/2025	Common bully	45.0
	29/01/2025	Common bully	37.5
	3/02/2025	Common bully	12.5
	7/02/2025	Common bully	120.0
	10/02/2025	Common bully	25.0
	16/02/2025	Common bully	42.5
	18/02/2025	Common bully	25.0
	21/02/2025	Common bully	175.0
	24/02/2025	Common bully	20.0
	28/02/2025	Kōura (1)	n/a
	28/02/2025	Common bully	10.0
	3/03/2025	Common bully	12.5
	6/03/2025	Kōura (1)	n/a
	10/03/2025	Kōura (1)	n/a
	10/03/2025	Common bully	7.5
	21/03/2025	Kōura (2)	n/a
	24/03/2025	Common bully	15.0
	24/03/2025	Kōura (2)	n/a
	26/03/2025	Kōura (4)	n/a
	31/03/2025	Kōura (3)	n/a
Total			**1,767.5**

2.5 Fish deaths

Fish deaths were observed on a number of occasions during the upstream trapping season, detailed in Table 2-8. When the bully species could not be identified, they were assumed to be common bullies. Fish deaths primarily occurred inside the permanent fish trap structures, however, deceased juvenile brown trout (*Salmo trutta*) were located on the netted ramp leading to the tank at the Mangatangi weir, and some elvers were found in the trap's outlet structure at Waitākere Dam.

Table 2-8: Fish deaths during the 2024-2025 upstream trap and haul.

Location	Date	Species	Number
Lower Nihotupu	30/10/2024	Galaxiid	5
	3/11/2024	Common bully	5
Waitākere	7/01/2025	Elver	1
	7/02/2025	Elver	2
	10/03/2025	Elver	12
	16/04/2025	Elver	4
Hays Creek	29/10/2024	Galaxiids	3
	31/10/2024	Galaxiids	1

Location	Date	Species	Number
	2/11/2024	Galaxiids	1
Cosseys	30/12/2024	Elver	1
Mangatangi	20/11/2024	Brown trout	1
	21/11/2024	Brown trout	6
	25/11/2024	Brown trout	1
	26/11/2024	Brown trout	10
	29/11/2024	Brown trout	9
	2/12/2024	Brown trout	4
	2/12/2024	Elver	3

3 DOWNSTREAM TRANSFER

3.1 Collection methods

Net setting for eels was conducted at the following eight sites for the purpose of downstream transfer:

- Lower Nihotupu Dam
- Lower Huia Dam
- Waitākere Dam
- Hays Creek Dam
- Cosseys Dam
- Wairoa Dam
- Upper Mangatāwhiri Dam
- Mangatangi Dam

Fyke nets are used as the downstream eel trapping method. They are long cylindrical netting bags with netting cones, designed for easy entry but a difficult exit. Two fyke nets were deployed near the dam face in all permitted water supply dams overnight, collected on the dates listed in Table 3-1 during the eel migration season. Migrating eels exhibit distinctive morphological features and can therefore be identified from non-migrating eels during the trapping process.

3.2 Migrating eel

Condition 28h requires reporting on several aspects of the downstream eel transfer process, including the total weight, approximate number, and species of adult migrating eels collected for transfer. It also requires the date of collection, comments on the prevailing flow conditions (e.g., normal, flood), the site of release, and the percentage of eels caught that were successfully transferred and released.

Table 3-1 provides most of the data required by this condition. There were 19 migrating eels caught in the 2024-2025 trap and haul season, this is an increase compared to the 11 eels caught in 2023-2024. Any migrant eels caught were transferred downstream on the day of capture and the remainder of the catch was released back into dams. Flow conditions were normal on the days trapping occurred.

Table 3-1: Total weight per day, eel species and approximate numbers caught for transfer, and the number and percentage of adult migrating eels transferred.

Location	Date	Total	Species		Weight (g)		Length (mm)		Migrators	
		Eels	Longfin	Shortfin	Average	Largest	Average	Largest	Count	(%)
Lower Nihotupu	4/03/2025	3	0	3	340	510	550	600	0	0
	25/03/2025	6	3	3	400	600	550	750	2	33.3
	15/04/2025	0	0	0	0	0	0	0	0	0
	6/05/2025	4	1	3	1162.5	2,900	712.5	950	2	50
	27/05/2025	3	2	1	4066.7	7,700	1000	1,400	2	66.7
Lower Huia	2/04/2025	0	0	0	0	0	0	0	0	0
	23/04/2025	0	0	0	0	0	0	0	0	0
	13/05/2025	0	0	0	0	0	0	0	0	0

Location	Date	Total Eels	Species		Weight (g)		Length (mm)		Migrators	
			Longfin	Shortfin	Average	Largest	Average	Largest	Count	(%)
	22/05/2025	0	0	0	0	0	0	0	0	0
	27/06/2025	0	0	0	0	0	0	0	0	0
Waitākere	20/03/2025	1	0	1	750	750	700	700	0	0
	5/06/2025	0	0	0	0	0	0	0	0	0
Hays Creek	19/03/2025	0	0	0	0	0	0	0	0	0
	24/04/2025	7	4	3	1000	2,900	671.4	1,100	1	14.3
	28/05/2025	4	4	0	1,780	3,555	1,000	1,500	0	0
	30/05/2025	4	4	0	3,650	6,850	912.5	1,300	1	25
Cosseys	12/03/2025	2	2	0	2,025	3,000	750	900	0	-
	14/03/2025	5	5	0	3,253	9,000	780	950	1	20
	15/04/2025	0	0	0	0	0	0	0	0	-
	18/04/2025	1	1	0	1,634	1,634	800	800	0	-
	20/05/2025	1	1	0	400	400	400	400	0	-
	21/05/2025	2	2	0	1142.5	1,600	825	900	0	-
	26/06/2025	3	3	0	569.7	956	500	800	0	-
Wairoa	5/03/2025	1	1	0	5,900	5,900	1,270	1,270	1	100
	7/03/2025	1	1	0	1,525	1,525	570	570	1	100
	9/04/2025	4	4	0	4,050.5	6,702	1,026.25	1,205	0	-
	11/04/2025	0	0	0	0	0	0	0	0	-
	14/05/2025	1	1	0	3,000	3,000	950	950	0	-
	16/05/2025	1	1	0	3,674	3,674	1,200	1,200	1	100
Mangatāwhiri	7/05/2025	3	3	0	2,803	5,675	916.7	1,200	1	33.3
	9/05/2025	6	6	0	617	985	520	600	0	-
	11/06/2025	0	0	0	0	0	0	0	0	-
	13/06/2025	0	0	0	0	0	0	0	0	-
Mangatangi	26/03/2025	1	1	0	1,950	1,950	960	960	0	-
	27/03/2025	0	0	0	0	0	0	0	0	-
	2/05/2025	7	7	0	1,205	2,390	714.3	900	6	85.7

3.3 Bycatch species and weight

Perch (*Perca fluviatilis*), rudd (*Scardinius erythrophthalamus*) and carp (*Cyprinus rubrofuscus*) were caught in the dams as part of the downstream transfer and weighed onsite.

Table 3-2: Approximate total weight of the bycatch reported during the 2024-2025 downstream trap and haul season.

Location	Date	Species	Weight (g)
Lower Nihotupu	25/03/2025	Perch	50
		Rudd	100
Hays Creek	30/05/2025	Carp	150
Cosseys	26/06/2025	Perch	300

Location	Date	Species	Weight (g)
Upper Mangatāwhiri	2/04/2025	Common bully	34

3.4 Fish deaths

Fish deaths occurred on two occasions as part of the downstream transfer operations. One deceased rudd was found at Cosseys Dam on 21 May 2025, and two carp were found on 30 May 2025 at Hays Creek Dam.

4 SUMMARY

Upstream transfer of migrating species occurred at five Watercare dams for the 2024-2025 season: Lower Nihotupu Dam, Waitākere Dam, Hays Creek Dam, Cosseys Dam and at the Mangatangi weir. All transferred both galaxiids and elvers, with Lower Nihotupu having the greatest catch rates, consistent with previous years. Notably, a significant number of bullies were also caught at the Mangatangi weir.

The downstream transfer of migrating species was undertaken at eight Watercare dams for the season: Lower Nihotupu Dam, Lower Huia Dam and Waitākere Dam in the Waitākere Ranges and Hays Creek dam, Cosseys Dam, Wairoa Dam, Upper Mangatawhiri Dam and at the Mangatangi weir in the Hunua Ranges. Eels (migratory and non-migratory) were caught on at least one occasion at most dams, with the exception of Lower Huia Dam. Migrating eels were caught at all five Hunua Ranges dams, and only at Lower Nihotupu Dam in the Waitākere Ranges.

Appendix A. Ministry of Primary Industries Special Permit 737

Fisheries New Zealand
Tini a Tangaroa

SPECIAL PERMIT (737)

The Director-General of the Ministry for Primary Industries (**MPI**) acting through his delegated officer (**Director-General**) and pursuant to section 97(1) of the *Fisheries Act 1996* (**the Act**), hereby issues a special permit to:

Watercare Services Limited
Private Bag 92521
Wellesley Street
Auckland 1141

Client Number: 9720100

and agents, representatives and employees of, as part of their association with Watercare Services Limited (**the permit holder**), subject to the following conditions specified below.

Purpose

1. This special permit is issued for the following purpose specified in section 97(1)(c) of the Act:
    a) to allow persons or agencies to take aquatic life and relocate it to a suitable habitat where this is necessary or required to mitigate adverse effects of habitat modification on the aquatic life.
2. The permit holder is permitted to take, transfer, and release native fish of the following species: shortfin and longfin eels (*Anguilla* spp.), *Galaxias* spp., *Gobiomorphus* spp., and torrentfish (*Cheimarrichthys fosteri*), irrespective of size for the above purpose.

Term of Permit

3. This special permit revokes and replaces special permit 610 and any previous amendments.
4. This special permit is valid from the date of signature until 1 October 2025, unless sooner varied or revoked.

Permitted Activities

5. This special permit allows the taking (as defined in section 2 of the Act) of aquatic life, for the purposes of relocating aquatic life, to mitigate adverse effects of habitat modification, carried out by the permit holder.

6. Fishing under the authority of this special permit for upstream migration may only be taken from the following waterways:
    a) Hūnua area:

i) Cosseys Stream or its tributaries downstream of the Cosseys Dam;

ii) Hays Creek or its tributaries downstream of the Hays Creek Dam;

iii) Mangatangi stream or its tributaries downstream of the Mangatangi Weir.

b) Waitākere area:

i) Huia Stream, downstream of the lower Huia Dam;

ii) Nihotupu Stream, downstream of the lower Nihotupu Dam, near the spillway;

iii) Waitākere River, downstream of the Waitākere Dam.

7. Fishing under the authority of this special permit may be undertaken for downstream migrant eels from the following waterways:

a) Hūnua area:

i) Cosseys Reservoir upstream of the Cosseys Dam;

ii) Hays Creek Reservoir upstream of the Hays Creek Dam;

iii) Wairoa Reservoir upstream of the Wairoa Dam;

iv) Mangatangi Reservoir upstream of the Mangatangi Dam;

v) Mangatawhiri Reservoir upstream of the Upper Mangatawhiri Dam.

b) Waitakere area:

i) Lower Huia Reservoir, upstream of the Huia Dam;

ii) Lower Nihotupu Reservoir, upstream of the Nihotupu Dam;

iii) Waitākere Reservoir, upstream of the Waitakere Dam.

8. New sites or species may only be added under the authority of this special permit through an amendment to the special permit. An application for inclusion of new site or species must be lodged with the Customary Fisheries and Spatial Allocations Manager (see Schedule One for contact details).

9. The permit holder is to obtain written approval from the taiāpure management committee or Tangata Kaitiaki/Tiaki prior to fishing in any taiāpure–local fisheries or mātaitai area. The permit holder should contact the relevant Fisheries Compliance Team Manager (see contact details in Schedule One) for current details of taiāpure-local fisheries or mātaitai reserves in the area where collection is proposed.

10. The permit holder is to consult with Waikato-Tainui before fishing in Waikato Tainui's rohe (illustrated as area A on the Iwi map attached in Schedule Two). The permit holder should avoid fishing in wāhi tapu areas within area A. To determine areas of significance to Iwi, the permit holder is advised to contact local marae in areas where fishing is to take place. Local marae details can be obtained from Waikato Raupatu River Trust [ph. (07) 858 0400].

11. Any transfer of native fish may only be undertaken with an appropriate approval pursuant to section 26ZM(2) of the *Conservation Act 1987*, or any statutory re-enactment or amendment of that provision.

Fishing Conditions

12. No fish, aquatic life, or seaweed may be taken for personal use or collection, to provide for broodstock for commercial production, or for sale, bait or berley, while fishing under the authority of this special permit.

13. For the purpose of fishing pursuant to this special permit, the permit holder is authorised to use:

    a) Fyke nets irrespective of mesh size (escapement tubes blocked if required);

    b) A floating pontoon set trap with wings and holding pen;

    c) Dip nets irrespective of mesh size;

    d) Mesh liners may be used on fyke nets to meet the desired net mesh size;

    e) A fish trap with a ramp, shaded holding tank and using a fish attractant;

    f) Any other catching device as approved by the Customary Fisheries and Spatial Allocations Manager;

    g) Any suitable vessel.

14. Any fishing equipment left unattended must be clearly labelled with the permit holder's name and the words: "Fisheries New Zealand Special Permit No. 737".

15. Explosive or toxic gas, or toxic, poisonous, or narcotic substance must not be used to take native fish under the authority of this special permit unless prior written approval is obtained from the Customary Fisheries and Spatial Allocations Manager, Fisheries New Zealand.

16. Any vessel(s) nominated to fish under the authority of this special permit must not engage in commercial fishing for any species under the authority of a fishing permit, issued under section 91 of the Act, while fishing under the authority of this special permit. Unless written approval is obtained from a Regional Fisheries Compliance Team Manager prior to fishing. For the purposes of interpretation, 'commercial fishing' is defined as the taking of fish, aquatic life, or seaweed within New Zealand fisheries waters for the purpose of sale.

Disposal Conditions

17. Any bycatch species caught while fishing under the authority of this special permit shall be released at the point of capture with the exception of dead, diseased or unwanted aquatic life[1]. The permit holder shall take measures as appropriate to minimise the capture of non-target species (eg, trout). These may include appropriate placement of fishing gear and using grills or coarse mesh.

18. The permit holder must not use any fish or aquatic life taken under this permit for personal use or collection, to stock a fish farm or use as food on a fish farm, for consumption, or for bait.

19. Native fish that cannot be returned alive to the environment (including dead, diseased or contaminated eels), must be humanely killed and disposed of in a biosecure manner, after relevant data has been collected, as per appendices.

[1] Unwanted aquatic life as defined in section 2 of the *Fisheries Act 1996*.

Upstream migrants

20. Fish taken under this special permit may be held in a 'holding pen' at the point of capture for a period of no more than 7 days. Fishing equipment should be inspected more frequently during peak migration or following floods. Releases of fish may not be made beyond any natural barrier (as natural recruitment processes should determine passage beyond these points).

Downstream migrants

21. Eels taken under this special permit as adult downstream migrants may be held at the specific capture sites for a maximum of 72 hours from the time of capture and are to be released as follows:

    a) Eels taken from the lower Nihotupu Reservoir: either below the Nihotupu Dam or in the Huia Stream below the lower Huia Dam;

    b) Eels taken from all other reservoirs: at a point in the river catchment from which they were taken where their subsequent migration is unhindered by any manmade barrier.

22. All non-migrant eels collected shall be released upstream of the collection point.

Biosecurity Conditions

23. In order to eliminate the risk of transferring species declared as noxious or unwanted organisms within the aquatic environment, the permit holder must screen catch for signs of disease or morbidity and any unwanted aquatic life before transportation.

24. During the collection fish, aquatic life, or seaweed the permit holder shall ensure that no aquatic plant, noxious fish, or unwanted organism, including eggs and larvae of noxious fish or unwanted organisms, is introduced into any other waterway, either from the water holding the collected fish, aquatic life, or seaweed, or enmeshed in fishing gear.

25. To prevent the spread of unwanted aquatic plants and animals, all equipment used in the collection and removal of fish, aquatic life or seaweed must be thoroughly checked, cleaned and dried before and after being used for fishing under this special permit:

    a) all equipment used in the transport, holding and release of aquatic life should be treated, as outlined below, before being used again:

        i. all non-fibrous (metal and plastic) smooth surfaced equipment is to be thoroughly cleaned using freshwater (chlorinated town supply water, bore water or collected rain water); and

        ii. any non-fibrous smooth surfaced equipment that can retain water such as under seals and hollows within handles etc. must be dismantled in such a way that all surfaces can be thoroughly cleaned using freshwater (chlorinated town supply water, bore water or collected rain water); and

    b) all other equipment must be:

        i. immersed for a minimum of 30 seconds, in a water bath heated to at least 50° C; or

ii. immersed in water, for a minimum of 5 minutes containing at least 35 g of sodium chloride per litre.

26. The permit holder must notify Biosecurity New Zealand's emergency hotline (0800 809 966) as soon as practicable should it observe unwanted or unusual organisms, including any distressed, diseased, or moribund aquatic life during any of its operations. None of the above organisms or contaminated water, should be released into any waterway and samples should be kept for Biosecurity New Zealand investigation. Samples should be chilled not frozen, or as advised after contacting Biosecurity New Zealand.

Reporting Requirements

27. The permit holder shall supply an annual report of all work undertaken under the authority of this special permit to the Customary Fisheries and Spatial Allocations Manager, Fisheries New Zealand (see contact details in Schedule One). This report shall be supplied no later than the 31st of August of each year. A nil return shall be made if no collection activities are undertaken by the 31st August of each year.

28. The report should contain the following information:

Upstream transfers

a) the species and approximate total weight of each species collected for transfer, and the date of collection;

b) the total weight of elvers (ie, less than 20 g in weight) collected for transfer, and the date of collection;

c) the total weight of juvenile eels (ie, greater than 20 g in weight) collected for transfer, and the date of collection;

d) the species and total weight of each bycatch species caught, and which method or specific trap resulted in their capture;

e) numbers of each species that die before release of the fish can occur;

f) the total weight of each species released at each respective release site, the location of the site, and date of respective releases;

g) the number and type of collection mechanisms employed, and any factors that reduced collection efficiency.

Downstream transfers

h) the total weight, approximate number and species of adult migrating eels collected for transfer, and the date of collection, including comment on the flow conditions that prevailed on that date (eg, normal, flood), the site of release, and the percentage caught that were transferred and released;

i) the species and total weight of each bycatch species caught, and which method or specific trap resulted in their capture;

j) numbers of each species that die before release of the fish can occur;

k) the number and type of collection mechanisms employed, and a brief description of how they work.

29. To obtain useful data for the management of native eel fisheries, the permit holder is also required to:

a) record the number and total weight of shortfin and longfin elvers in a representative sample of the catch (100 elvers) at 15 day intervals, when catch allows. For the purpose of this data collection elvers are those up to 20 g in weight;

b) supply electronic records (in Excel or txt format) on fish caught for entry into the New Zealand Freshwater Fish or eel recruitment database (currently maintained by NIWA) to Fisheries New Zealand with the annual report required by condition 27.

30. For any projects, or part projects that are carried out in Waikato-Tainui's rohe (area A in Schedule Two) a summary report of those projects must be submitted to Waikato Raupatu River Trust annually (see contact details in Schedule One).

31. For the purpose of this permit, the permit holder is not required to meet the requirements of the *Fisheries (Reporting) Regulations 2017* and the *Fisheries (Geospatial Position Reporting) Regulations 2017*.

General Conditions

32. Except as otherwise expressly provided, the provisions of the Act or any regulation, notice, direction, restriction, requirement, or condition under the Act will apply to any fishing, or any person engaged in fishing, under this special permit.

33. The permit holder must ensure that all personnel, read, understand and are fully conversant with the conditions of the special permit before the taking aquatic life commences under this special permit.

34. This special permit must be held at the permit holder's premises. The permit holder of their employees or agents at the location, must have a copy of this special permit in their possession while collecting aquatic life under the authority of this special permit. In all cases, copies of this special permit must be produced for sighting on request by a Fishery Officer.

35. The Director-General (or his delegate) may amend, add or revoke any conditions to this special permit, or revoke this special permit by notice in writing to the permit holder.

36. This special permit does not preclude the permit holder from complying with any other statutory requirement from any other governing agency.

37. No fishing undertaken, or catch taken or otherwise possessed under this special permit shall give rise to any right, privilege, or expectation or preference in regard to the granting of any future permit, license, authorisation, quota, catch history, individual catch entitlement or other right whatsoever under the Act.

38. Failure to comply with the conditions of this special permit can, at the discretion of the delegated officer, result in the revocation of the permit. Every person commits an offence who contravenes any term or condition placed on this special permit and is liable to a fine not exceeding $100 000.

DATED at Nelson on the 9th of June 2020.

David Scranney
Manager Customary Fisheries and Spatial Allocations
Acting pursuant to a delegation issued under Section 41 of the State Sector Act 1988.

SCHEDULE ONE:
Contact Details

Fisheries New Zealand Manager Customary Fisheries and Spatial Allocations can be contacted by the following:

Nelson	David Scranney Tel (03) 548 1069 Email: David.Scranney@mpi.govt.nz cc. Christine.Bowden@mpi.govt.nz

Fisheries Compliance Regional Manager can be contacted by the following:

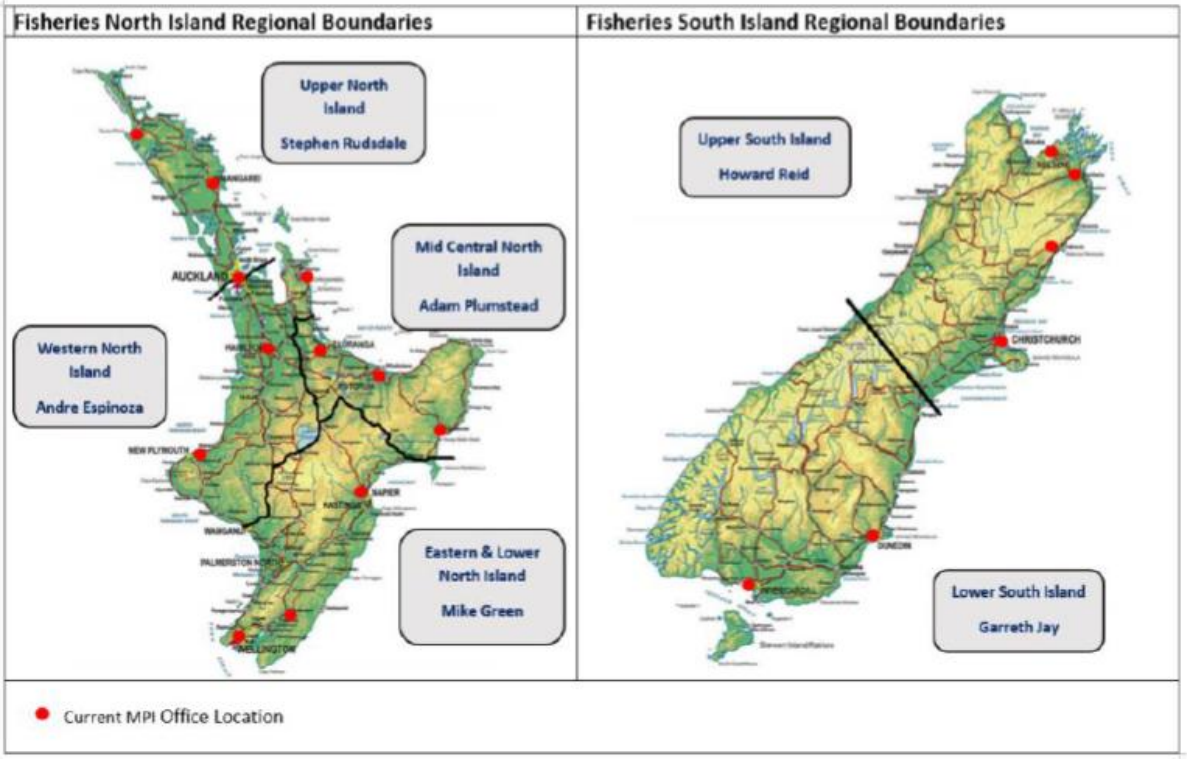
Upper North Island	Stephen Rudsdale Tel (09) 470 0580 Email Stephen.Rudsdale@mpi.govt.nz cc. Charlene.Sutton@mpi.govt.nz
Western North Island	Andre Espinoza Tel (09) 820 7742 Email: Andre.Espinoza@mpi.govt.nz cc. Louise.Kay@mpi.govt.nz

Waikato-Tainui River Iwi can be contacted on the following:

Hamilton	Taroi Rawiri Waikato-Tainui Environmental Manager Waikato Raupatu River Trust Private Bag 3344 Hamilton Tel: (07) 858 0400 Email: taroi.rawiri@tainui.co.nz

NIWA agent for otolith submissions can be contacted by the following:

Christchurch	Dr Shannan Crow NIWA 10 Kyle Street Riccarton Tel: 027 291 9119 Email: shannan.crow@niwa.co.nz


Fisheries North Island Regional Boundaries
Upper North Island
Stephen Rudsdale
Mid Central North Island
Adam Plumstead
Western North Island
Andre Espinoza
Eastern & Lower North Island
Mike Green
AUCKLAND
Fisheries South Island Regional Boundaries
Upper South Island
Howard Reid
Lower South Island
Garreth Jay
CHRISTCHURCH
Current MPI Office Location

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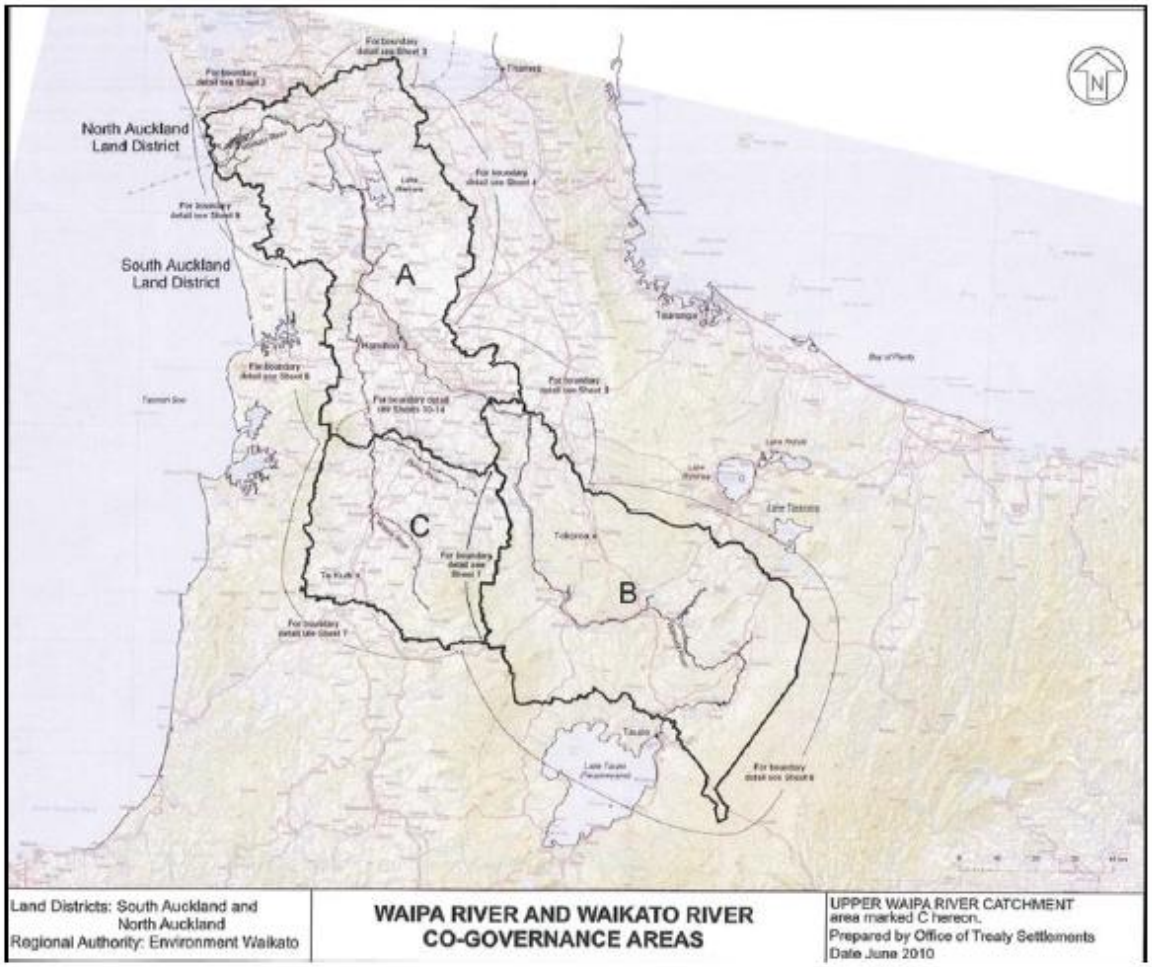
SCHEDULE TWO
Map of Waikato co-governance areas; Waikato-Tainui's rohe is area A



Appendix E. reports Wildlands fish and Hochstetter's Frog survey

Fish Surveys in the Waitākere and Wairoa River Catchments: February – March 2025

Contract Report No. 7476

Providing outstanding ecological services to sustain and improve our environments

Wildlands

Fish Surveys in the Waitākere and Wairoa River Catchments: February – March 2025

Contract Report No. 7476

April 2025

Project Team:

Brent Henry – Field survey, project management
Jessica Peart – Field survey, report author
Joshua Thoresen – Field survey
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Reviewed and approved for release by:

Sarah Budd
Principal Ecologist, Auckland Ecology Team Leader and Coordinator
Wildland Consultants Ltd
29/04/2025

Cite this report as follows:

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1.0 Introduction

Watercare Services Limited has gained resource consent to reduce the environmental compensation flows that are required to be released from three water-supply dams, Wairoa and Cosseys Dams in the Hunua Ranges and Waitākere Dam in the Waitākere Ranges (consents DIS60382588 and DIS60382532 respectively). The discharges are required to maintain healthy freshwater ecosystems downstream of the dams. As such, a reduction in these compensation flows has the potential to result in adverse impacts on the resident fish populations within the downstream catchments. Wildland Consultants Ltd (Wildlands) have been contracted to undertake quantitative fish surveys within both catchments.

This report describes the methods and the results of the quantitative fish surveys undertaken at five sites within the Waitākere River, Wairoa River, and Cosseys Creek catchments during February and March 2025.

2.0 Methods

2.1 Site selection

A total of three impact sites, one within each of the respective sub-catchments below Waitākere Dam (Site B), Cosseys Dam (Site E), and Wairoa Dam (Site F) were selected to evaluate the impact of the reduction in environmental compensation flows on the resident fish communities (Figures 1 and 2). Quantitative fish surveys and physical habitat assessments were undertaken at each of these sites, which are a sub-set of existing sites that have been used to monitor macroinvertebrate communities and water quality. Monitoring Sites A, C, and D were not used for this survey work.

Quantitative fish surveys were also carried out at two control sites, one located in the Wairoa River catchment, which also includes the Cosseys Creek sub-catchment, and the other in the Waitākere River catchment (Figures 1 and 2). Because these sites are not affected by any reduction in environmental compensation flows, they were used to compare the fish community structure with the impact sites.

2.2 Quantitative fish surveys

The fish surveys were undertaken using a NIWA EFM300 electric fishing machine to gather data on the species diversity, relative abundance, and density of the fish communities at each site. At each site, a 150-metre section of stream was isolated using temporary barriers at the upstream and downstream ends to prevent fish from escaping or entering the reach (Plate 1).

Three electric fishing passes were then carried out within the 150-metre section, with aquatic fauna netted and placed in aerated buckets during each pass. Following each pass, all fish captured were identified and measured before being released back into the stream, outside of the fish barriers. After the three passes were completed, the fish barriers were removed.

Although they are not fish, kōura/freshwater crayfish (*Paranephrops planifrons*) are a standard inclusion in freshwater fish surveys in New Zealand and were therefore included in the reporting and analysis for this project as well. They are a keystone species in freshwater aquatic communities, and their presence indicates good water quality, making them a useful component of the freshwater community to include in the analysis. Freshwater shrimp (*Paratya curvirostris*) were also noted as they were a significant component of the community in Cossey Creek.

Parameters recorded at each site included pH, water temperature, and wetted width of the channel. Fish surveys were carried out between 26 February and 14 March 2025.

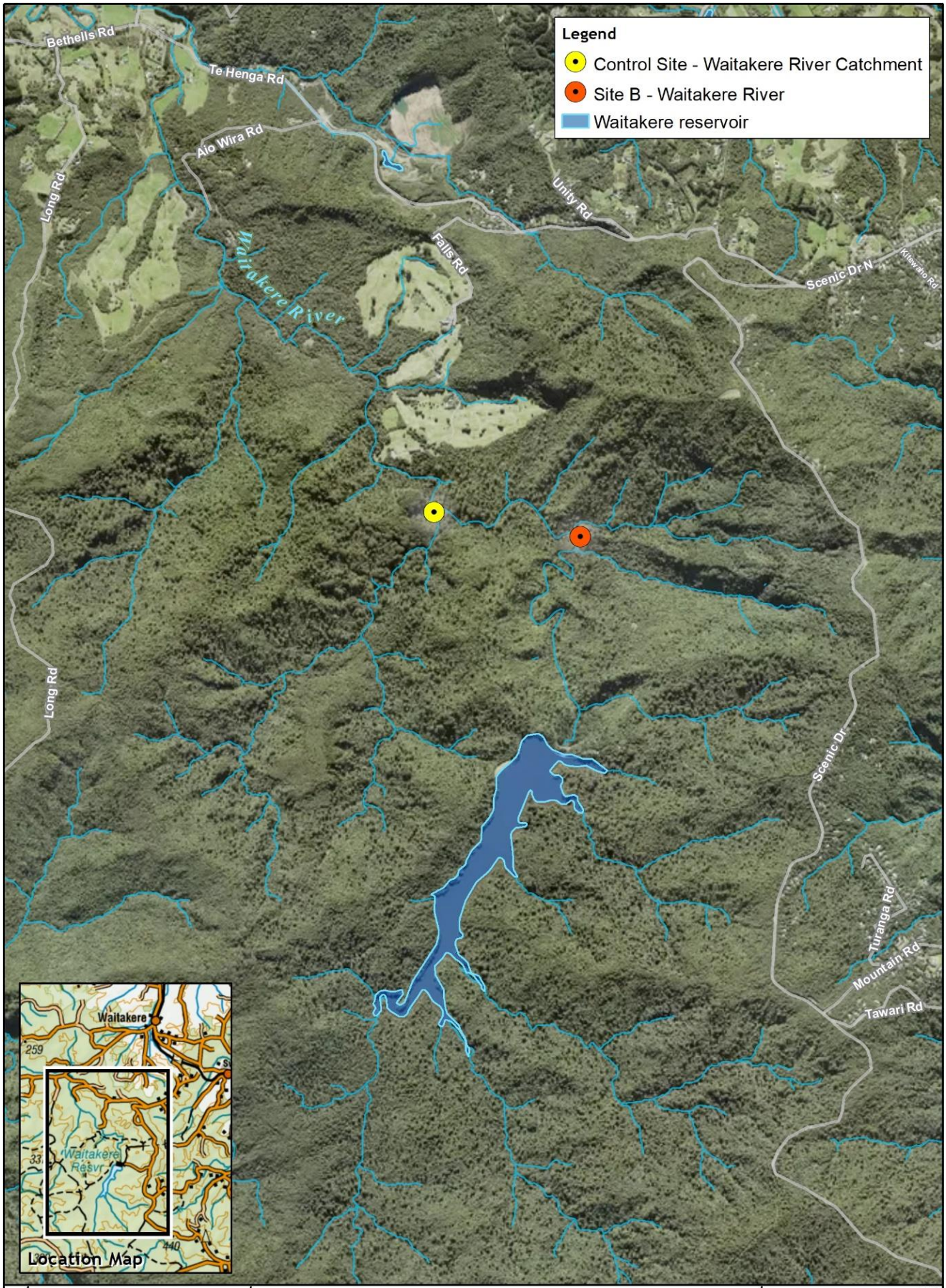

Figure 1. Location of fish survey sites in Waitakere River Catchment

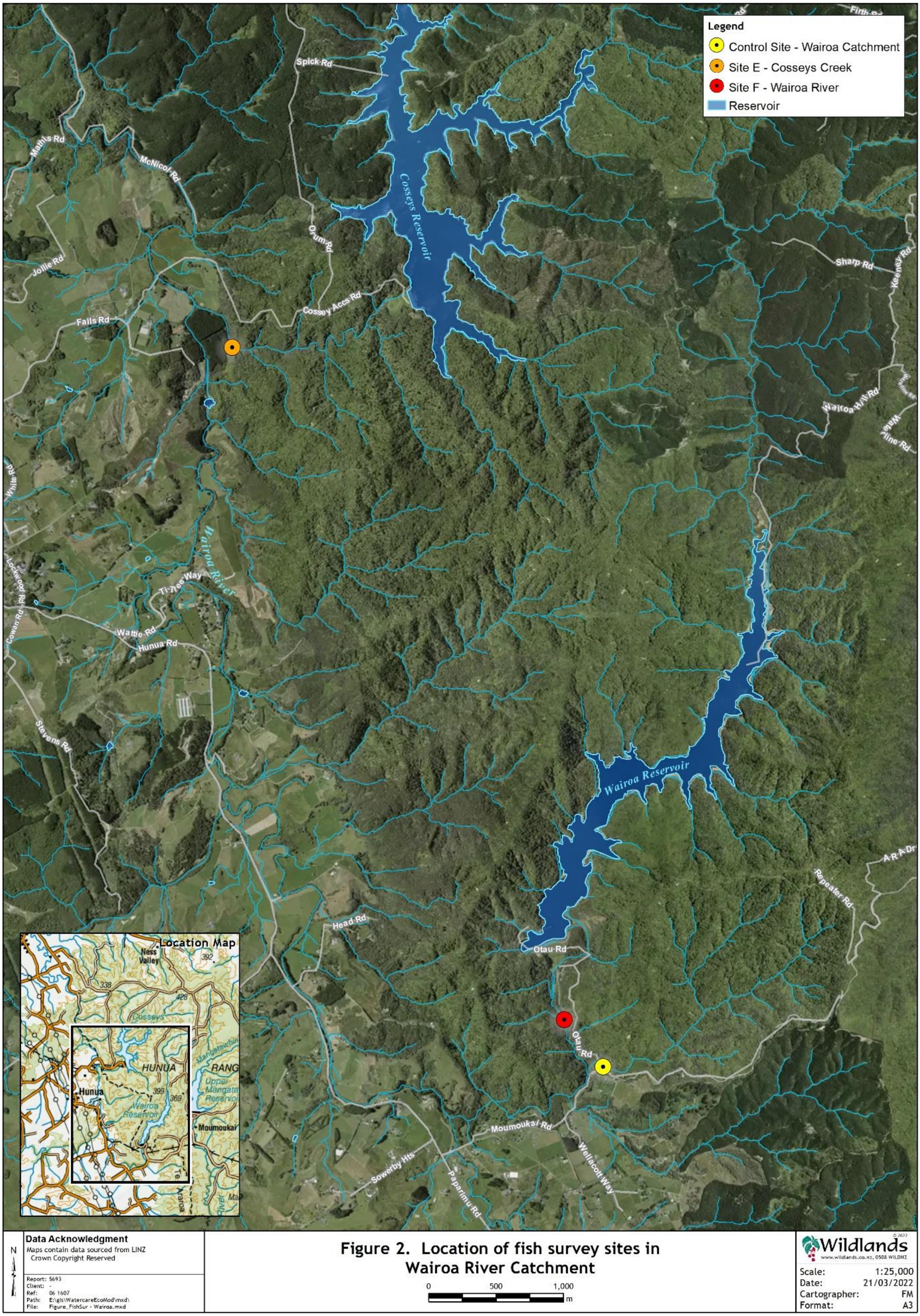

Figure 2. Location of fish survey sites in Wairoa River Catchment

Plate 1 – Temporary fish barrier installed at Site B – Waitākere River. 4 March 2025.

2.3 Biosecurity

To prevent the spread of unwanted freshwater organisms to other waterways, strict biosecurity protocols were observed, including:

- All water from the capture location was discharged at the site.
- As far as practicable, all plant fragments, debris, and mud were removed from fishing equipment before leaving the site. Equipment was also visually inspected for freshwater gold clams (*Corbicula fluminea*) at the end of each use.
- All equipment that came into contact with water at the site was cleaned before and after use following standard 'Check, Clean, Dry' procedures developed by the Ministry for Primary Industries and the Department of Conservation.
- Equipment was thoroughly dried and left for a minimum of 48 hours before moving between sites.

Standard kauri dieback protocols were also followed when entering and exiting all sites, including thorough cleaning of footwear and other equipment that had been in contact with the ground or potentially infected catchments. As kauri dieback is yet to be identified in Hunua Ranges Regional Park, the Wairoa catchment sites were completed first in order to minimise the risk of spread.

2.4 Fish Index of Biotic Integrity

A Fish Index of Biotic Integrity (IBI) was developed for the Auckland Region in 2004 by Dr Mike Joy, based on a methodology that had originated in the USA in the mid-1980s (Joy 2010). This method allows the biological condition of a site to be assessed by using data on the number of fish species present in relation to the site's elevation and distance from the sea. These metrics are used because New Zealand's fish fauna is predominantly migratory, and therefore, fish assemblages are highly correlated with proximity to the marine environment.

A Fish IBI score was calculated for each site using a spreadsheet into which the presence/absence data for the fish species recorded was entered, along with the site's elevation in metres and its distance from the coast in kilometres. Using this data the spreadsheet produces an IBI score, out of 60, for each site. This score can then be interpreted into integrity classes that describe the quality of the freshwater environment at each site based on the indigenous fish community (Table 1).

Table 1 – Attributes and integrity classes for the Auckland IBI (adapted from Joy 2010).

Total IBI Score	Integrity Class	Attributes
48-60	Excellent	Comparable to the best situations without human disturbance; all regionally expected species for the stream position are present. Site is above the 90th percentile of Auckland sites.
36-47	Good	Site is above the 60th percentile of Auckland sites but species richness and habitat or migratory fish access reduced, site shows some signs of stress.
24-35	Fair	Site is scores higher than the 30th percentile of all sites but less than the 60th. Some stressors present, biotic integrity impaired.
1-23	Poor	Site is above 10th percentile and less than 30th Species richness is drastically reduced and biotic integrity harmed. Habitat and/or migratory fish access is impacted.
0	No indigenous fish	Site is grossly impacted or migratory fish access is non-existent.

2.5 Species density and relative abundance

The density for each species, and overall density per site, was calculated by dividing the number of individuals recorded by the area fished at each site. The area fished was estimated by multiplying the length of the stream reach (up to 150 metres) by the average wetted width for the site. The metric for relative abundance was calculated by dividing the number of individuals recorded for a species by the total number of individuals recorded at the site, thereby showing the proportion of the fish community that the species makes up.

3.0 Survey site descriptions

3.1 Waitākere River Catchment

Two survey sites were located within the Waitākere River catchment, both of which are within Waitākere Ranges Regional Park.

3.1.1 Control Site – Waitākere River catchment

Coordinates: NZTM 1735618 5916380

The control site for the Waitākere River catchment is located on Cascades Stream, above the confluence with the Waitākere River. This site is hard-bottomed, with a mix of cobble and boulder substrates (Plate 2), and is located at an elevation of 43 metres above sea level and approximately 12 kilometres inland from the coast.

Terrestrial habitat within this area was dominated by indigenous forest species, with an understorey of abundant ponga (*Cyathea dealbata*), nīkau (*Rhopalostylis spida*), Kiekie (*Freycinetia banksia*) and kiokio (Parablechnum-zelandiae)

Plate 2 – Control Site – Waitākere River Catchment, view looking upstream.
14 March 2025.

The average stream width at this site was 4.95 metres, while the water temperature was 15.2°C with a pH of 7.98 (Table 2).

3.1.2 Site B - Waitākere River

Coordinates: NZTM 1736338 5916259

Site B is located on the Waitākere River upstream from the confluence with Anderson Stream and roughly one kilometre downstream of Waitākere Dam. The site is located at an elevation of 67 metres above sea level and 13 kilometres from the coast.

The site is a hard-bottom stream and features a variety of boulders, cobbles, and woody debris, providing an ideal habitat for aquatic fauna. The terrestrial habitat within this area was dominated by indigenous forest species, with an understorey of abundant mamaku (Sphaeropteris medullaris), ponga, kiekie, and kiokio. The stream had an average wetted width of five metres, a water temperature of 17.3°C, and pH of 7.41 (Table 2; Plate 3).

Plate 3 – Site B - Waitākere River looking upstream. 4 March 2025.

3.2 Wairoa River Catchment

3.2.1 Control Site - Wairoa River catchment

Coordinates: NZTM 1788723 5890562

The Wairoa River catchment control site is located on an unnamed tributary that joins the Wairoa River near Otau Crossing. This reach is upstream of a large waterfall and culvert at an elevation of 135 metres above sea level and 33 kilometres from the coast. Montbretia (*Crocosmia ×crocosmiiflora*), blackberry (*Rubus fruticosus* agg.) and Himalayan honeysuckle (*Leycesteria formosa*) were common in the understorey along the stream banks, with indigenous tree species providing canopy cover.

Within the survey reach, the stream was shallow with mostly small pools present. Nīkau seedlings were occasionally present within the channel, suggesting that there had been periods were the channel was dry. The substrate was predominantly stoney with areas of sand (Plate 4). The channel was around two metres wide, and the water temperature was 13.7°C with a pH of 7.37 (Table 2).

Plate 4 – Wairoa River, catchment control site, view looking upstream. 27 February 2025.

3.2.2 Site E - Cosseys Creek

Coordinates: NZTM 1785973 5895899

Site E is located on Cosseys Creek, approximately 1.5 kilometres downstream from Cosseys Reservoir. It is positioned at 45 metres elevation above sea level and around 22 kilometres from the coast.

Terrestrial habitat within this area largely comprised indigenous vegetation with a predominantly open canopy (Plate 5). Some pest plant species were present along the riparian margin, including montbretia and Chinese privet (*Ligustrum sinense*). The stream has a rocky substrate and a variety of boulders and woody debris, providing ideal aquatic fauna habitat. The average wetted width of the channel was 5.44 metres (Table 2), and the water temperature was 17.9°C with a pH of 7.69. Mats of algae covered the rocky substrate in shallow areas.

Plate 5 – Site E – Cosseys Creek, view looking upstream. 3 March 2025.

3.2.3 Site F – Wairoa River

Coordinates: NZTM 1788436 5890912

Site F is located in the upper reaches of the Wairoa River, adjacent to Otau Road and approximately 400 metres downstream of Wairoa Reservoir at an elevation of 162 metres above sea level and at a distance of 33 kilometres from the coast.

Vegetation within this area was dominated by indigenous forest species, with an understorey of abundant ponga. Some exotic and pest plant species are present along the banks, with African club moss (*Selaginella kraussiana*) forming a dense ground cover. The substrate mostly comprised rocks and mud/silt, while the channel width was approximately 4.5 metres at the widest point, with large pools. Dense algal swathes of a *Chara* species were common within the channel, as well as duckweed (*Lemna minor*). The bridge that extended across the stream was in the process of being replaced at the time of the survey. A small section of the stream was obstructed by scaffolding and was difficult to survey (Plate 6).

At this site the stream had a pH of 6.98 and a temperature of 20.2°C (Table 2).

Plate 6 – Stream habitat at Site F – Wairoa River, view looking upstream. Note the small area obstructed by scaffolding. 26 February 2025.

Table 2 – Parameters recorded at the Waitākere and Wairoa River catchment monitoring sites.

Site	Survey Date	Water Temp (°C)	pH	Average Wetted Width (m)	Reach Length (m)	Est. Stream Area Fished (m^2)
Control Site – Waitākere River Catchment	14/03/2025	15.2	7.98	4.95	150	742.5
Site B – Waitākere River	04/03/2025	17.3	7.41	5	150	750
Control Site – Wairoa River Catchment	27/02/2025	13.7	7.37	2.16	150	324
Site E – Cosseys Creek	3/03/2025	17.9	7.69	5.44	150	816
Site F – Wairoa River	26/02/2025	20.2	6.98	3.38	150	507

4.0 Results

4.1 Waitākere River Catchment

4.1.1 Control Site – Waitākere River Catchment

A total of 59 fish and three kōura were recorded within the Waitākere River Control Site (Table 3). This included nine different fish species. Common bullies (*Gobiomorphus cotidianus*) and elvers (*Anguilla* sp.) were present at the highest density and relative abundance (Table 3). Overall fauna densities averaged 0.084 individuals/m^2. One perch (*Perca fluviatilis*) was also caught.

Table 3 – Aquatic fauna recorded at the Waitākere River Catchment control site.

Common Name	Species	Total	Size Range (mm)	Density (individ./m^2)	Relative Abundance
Longfin eel	*Anguilla dieffenbachii*	13	150-700	0.018	0.210
Unidentified elver	*Anguilla* sp.	16	80-200	0.022	0.258
Kōaro	*Galaxias brevipinnis*	3	105-150	0.004	0.048
Banded kōkopu	*Galaxias fasciatus*	1	65	0.001	0.016
Īnanga	*Galaxias maculatus*	2	80-85	0.003	0.032
Cran's bully	*Gobiomorphus basalis*	5	65-75	0.007	0.081
Common bully	*Gobiomorphus cotidianus*	16	45-70	0.022	0.258
Giant bully	*Gobiomorphus gobiodies*	1	100	0.001	0.016
Smelt	*Retropinna retropinna*	1	95	0.001	0.016
Kōura/freshwater crayfish	*Paranephrops planifrons*	3	20-70	0.004	0.048
Perch	*Perca fluviatilis*	1	65	0.001	0.016
Total		**62**		**0.084**	

4.1.2 Site B – Waitākere River

Five indigenous and one exotic freshwater species were recorded at Site B (Table 4). A total of 71 individual fish and four kōura were captured, resulting in an overall density of 0.1 individuals/m² (Table 8). Īnanga (*Galaxias maculatus*) made up almost a quarter of the total number of fish captured at this site, at a density of 0.024 fish/m². Eels were also frequently captured, with elvers and adult longfin eels (*Anguilla dieffenbachii*) comprising over a third of the total number of fish. Six perch were also caught.

Table 4 – Aquatic fauna recorded at Site B – Waitākere River.

Common Name	Species	Total	Size Range (mm)	Density (individ./m²)	Relative Abundance
Longfin eel	*Anguilla dieffenbachii*	15	200-1200	0.020	0.200
Unidentified elver	*Anguilla* sp.	17	70-250	0.023	0.227
Īnanga	*Galaxias maculatus*	18	55-100	0.024	0.240
Unidentified bully	*Gobiomorphus sp.*	2	40	0.003	0.027
Common bully	*Gobiomorphus cotidianus*	11	45-65	0.015	0.147
Banded kōkopu	*Galaxias fasciatus*	2	130-140	0.003	0.027
Kōura/freshwater crayfish	*Paranephrops planifrons*	4	25-60	0.005	0.053
Perch	*Perca fluviatilis*	6	65-80	0.008	0.080
Total		**75**		**0.100**	

4.2 Wairoa River Catchment

4.2.1 Control Site – Wairoa River Catchment

The overall number of fish at the Wairoa River control site was low, with a total of 20 individuals recorded comprising only longfin eels (Table 5). Kōura were also present at a range of size classes. Including the kōura, the overall density was 0.123 individuals/m².

Table 5 – Aquatic fauna recorded at the Wairoa River Catchment control site.

Common Name	Species	Total	Size Range (mm)	Density (individ./m²)	Relative Abundance
Longfin eel	*Anguilla dieffenbachii*	20	90-1300	0.062	0.5
Kōura/freshwater crayfish	*Paranephrops planifrons*	20	40-70	0.062	0.5
Total		**40**		**0.123**	

4.2.2 Site E – Cosseys Creek

Eight indigenous and one exotic freshwater species were recorded at Site E - Cosseys Creek (Table 6). Bullies (*Gobiomorphus* spp.) were abundant, with redfin (*G. huttoni*) and common bullies each comprising almost a quarter of all fish caught. Torrentfish (*Cheimarrichthys fosteri*) and longfin eels were also common. Freshwater shrimp were also abundant, but were not targeted for capture. Some shrimp were observed carrying eggs. One large perch measuring 34 centimetres was also caught.

Table 6 – Aquatic fauna recorded at Site E – Cosseys Creek.

Common Name	Species	Total	Size Range (mm)	Density (individ./m²)	Relative Abundance
Longfin eel	*Anguilla dieffenbachii*	15	100-1400	0.018	0.066
Unidentified elver	*Anguilla* sp.	12	85-200	0.015	0.053
Torrentfish	*Cheimarrichthys fosteri*	22	45-110	0.027	0.096
Īnanga	*Galaxias maculatus*	7	60-90	0.009	0.031
Common bully	*Gobiomorphus cotidianus*	47	30-70	0.058	0.206
Redfin bully	*Gobiomorphus huttoni*	55	40-80	0.067	0.241
Unidentified bully	*Gobiomorphus* sp.	49	20-60	0.060	0.215
Kōura/freshwater crayfish	*Paranephrops planifrons*	17	20-80	0.021	0.075
Common smelt	*Retropinna retropinna*	3	75-90	0.004	0.013
Perch	*Perca fluviatilis*	1	340	0.001	0.004
Total		**228**		**0.279**	

4.2.3 Site F – Wairoa River

A total of 288 fish of at least three species and seven kōura, were captured at Site F - Wairoa River, with a comparatively high density of 0.582 individuals/m² (Table 7). There were a large number of elvers at the site, comprising almost 70% of all fish caught. Banded kōkopu (*Galaxias fasciatus*) and bullies were also frequently captured.

Table 7 – Aquatic fauna recorded at Site F – Wairoa River.

Common Name	Species	Total	Size Range (mm)	Density (individ./m²)	Relative Abundance
Longfin eel	*Anguilla dieffenbachii*	16	250-800	0.032	0.054
Unidentified elver	*Anguilla* sp.	204	80-110	0.402	0.692
Banded kōkopu	*Galaxias fasciatus*	21	60-180	0.041	0.071
Common bully	*Gobiomorphus cotidianus*	8	40-70	0.016	0.027
Unidentified bully	*Gobiomorphus* sp.	39	25-50	0.077	0.132
Kōura/freshwater crayfish	*Paranephrops planifrons*	7	40-100	0.014	0.024
Total		**295**		**0.582**	

4.3 Comparisons between control and impact sites

4.3.1 Number of species and density

In both catchments, total number of individuals and overall densities were greater at the impact sites than at the control sites (Table 8).

Table 8 – Comparison of species density for all sites.

Catchment	Site	No. Species[1]	Total no. Individuals	Overall Density (individ./m²)
Waitākere River	Control	10	62	0.084
	Site B – Waitākere River	6	75	0.100
Wairoa River	Control	2	40	0.123
	Site E – Cosseys Creek	9	228	0.279
	Site F – Wairoa River	4	295	0.582

4.3.2 Species recorded

Eleven species of fish and two freshwater invertebrate species were recorded across all sites (Table 9). The only species common to all five sites were longfin eel and kōura. Adult shortfin eels were not recorded in this survey, but this species may have been present at all sites in the form of unidentified elvers. Giant bully (*Gobiomorphus gobiodies*) were recorded for the first time in any of the surveys at the Waitākere control site.

Five species with a threat classification of 'At Risk' were recorded (giant bully, īnanga, kōaro, longfin eel, and torrentfish). One exotic fish species (perch) was also recorded.

The Waitākere control site had the most species recorded with ten, while the control site for the Wairoa River catchment had the least, with two.

A selection of photos showing the fish species caught during the surveys are provided in Appendix 1.

4.3.3 Fish Index of Biotic Integrity

Four sites (including all three of the impact sites) scored within the 'excellent' integrity class, with scores ranging from 50 to 58 (Table 10). This means that the number of indigenous fish species recorded at each site is consistent with high-quality instream habitat and indicates a lack of downstream barriers to fish migration. This allows a full complement of indigenous species to utilise these sites, relative to their elevation and distance from the coast.

[1] Unidentified species were not counted as a separate category for this metric.

Table 9 – Aquatic species that could be definitively identified at all sites, including threat classifications[1].

Common Name	Species	Threat Classification[2]	Waitākere River Catchment		Wairoa River Catchment		
			Control	Site B - Waitākere	Control	Site E – Cosseys Creek	Site F – Wairoa River
Longfin eel	*Anguilla dieffenbachii*	At Risk-Declining	✓	✓	✓	✓	✓
Torrentfish	*Cheimarrichthys fosteri*	At Risk-Declining				✓	
Kōaro	*Galaxias brevipinnis*	At Risk-Declining	✓				
Banded kōkopu	*Galaxias fasciatus*	Not Threatened	✓				✓
Īnanga	*Galaxias maculatus*	At Risk-Declining	✓	✓		✓	
Cran's bully	*Gobiomorphus basalis*	Not Threatened	✓	✓			
Common bully	*Gobiomorphus cotidianus*	Not Threatened	✓	✓		✓	✓
Giant bully	*Gobiomorphus gobiodies*	At Risk-Naturally Uncommon	✓				
Redfin bully	*Gobiomorphus huttoni*	Not Threatened				✓	
Kōura/freshwater crayfish	*Paranephrops planifrons*	Not Threatened	✓	✓	✓	✓	✓
Freshwater shrimp	*Paratya curvirostris*	Not Threatened				✓	
Common smelt	*Retropinna retropinna*	Not Threatened	✓			✓	
Perch	*Perca fluviatilis*	Introduced	✓	✓		✓	
Total no. species			**10**	**6**	**2**	**9**	**4**

[1] Excludes unidentified eels and bullies

[2] All threat classifications are per Dunn *et al.* (2018), except for kōura and freshwater shrimp which are per Grainger *et al.* (2018).

The Wairoa River control site scored within the 'good' integrity class, which is consistent with the results from the previous two surveys. As there is a large waterfall and culvert downstream of the assessed reach, the species that can reach the stream are limited to fish that can climb (e.g. banded kōkopu and kōaro). There was also evidence that stretches of the stream may have run dry at some point during the summer, which could have further reduced fish diversity.

Table 10 – Fish IBI scores.

Catchment	Site	IBI score	Integrity Class
Waitākere River	Control - Waitākere River Catchment	58	Excellent
	Site B - Waitākere River	50	Excellent
Wairoa River	Control - Wairoa River Catchment	44	Good
	Site E - Cosseys Creek	54	Excellent
	Site F - Wairoa River	54	Excellent

4.4 Comparisons between years

The results of the surveys undertaken between 2021 and 2025 (Wildland Consultants 2021, 2023, and 2024) demonstrate that the fish community has persisted in all of the streams, but with some changes (Table 11).

The IBI score has remained at the "Excellent" integrity class for all of the impact sites, with only small fluctuations in score (Figure 3 and 6). However, with the exception of the Waitākere control site, the number of species present in all the streams decreased in this survey compared to the previous 2024 survey (Figure 4 and 7). Notably, species diversity has been slowly decreasing between 2021 and 2025 in both the Wairoa control site and Site F.

The overall fish density at both the Waitākere River Catchment sites have decreased slightly (Figure 5). The overall fish densities for all three Wairoa River Catchment sites shows a positive trend, with the densities recorded in 2025 higher than in the original 2021 surveys (Figure 8).

The species composition has remained mostly indigenous in all streams, however some exotic species have been caught across the surveys. No exotic fish species were recorded at any of the sites in 2023, while in 2021 a single rudd (*Scardinius erythrophthalmus*) was recorded at Site E – Cosseys Creek. Perch were caught in both streams in the Waitākere River Catchment in 2024, and a single rainbow trout (*Oncorhynchus mykiss*) was caught in Cosseys Creek. In 2025, a large perch was caught in Cosseys Creek, and several small perch were caught within the Waitākere River Catchment.

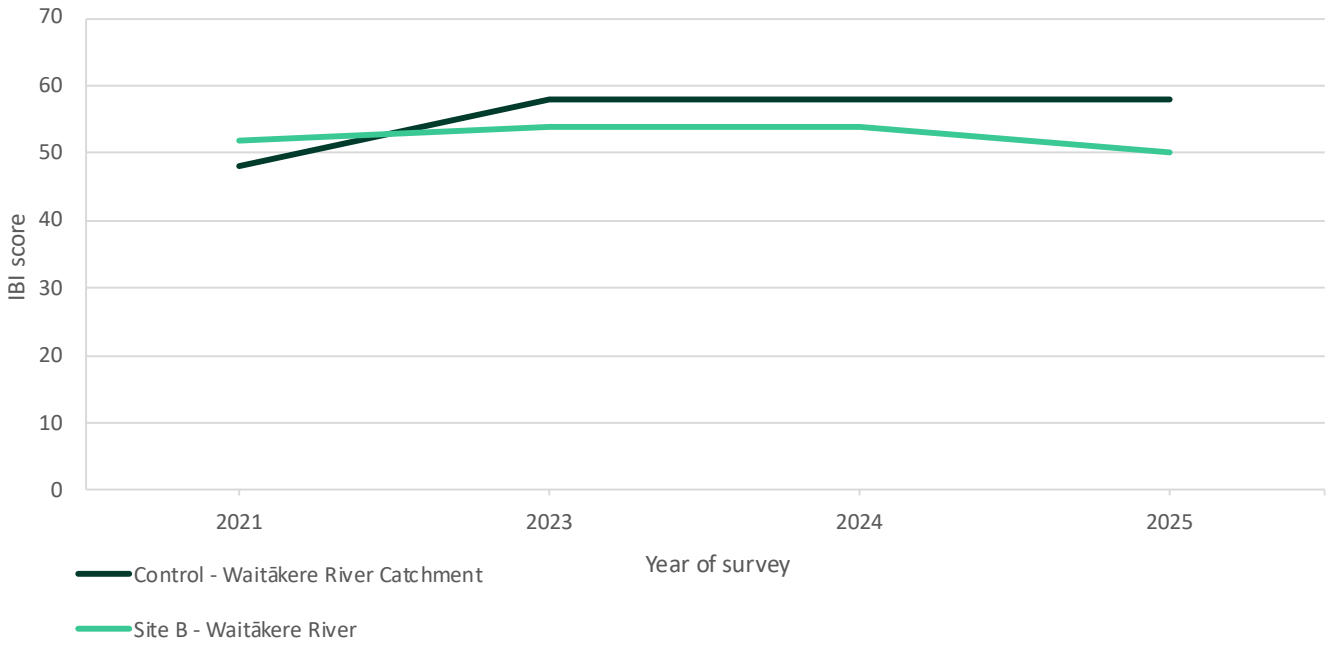

Figure 3 – Fish Index of Biotic Integrity (IBI) scores from the Waitākere River Catchment streams surveyed between 2021 and 2025.

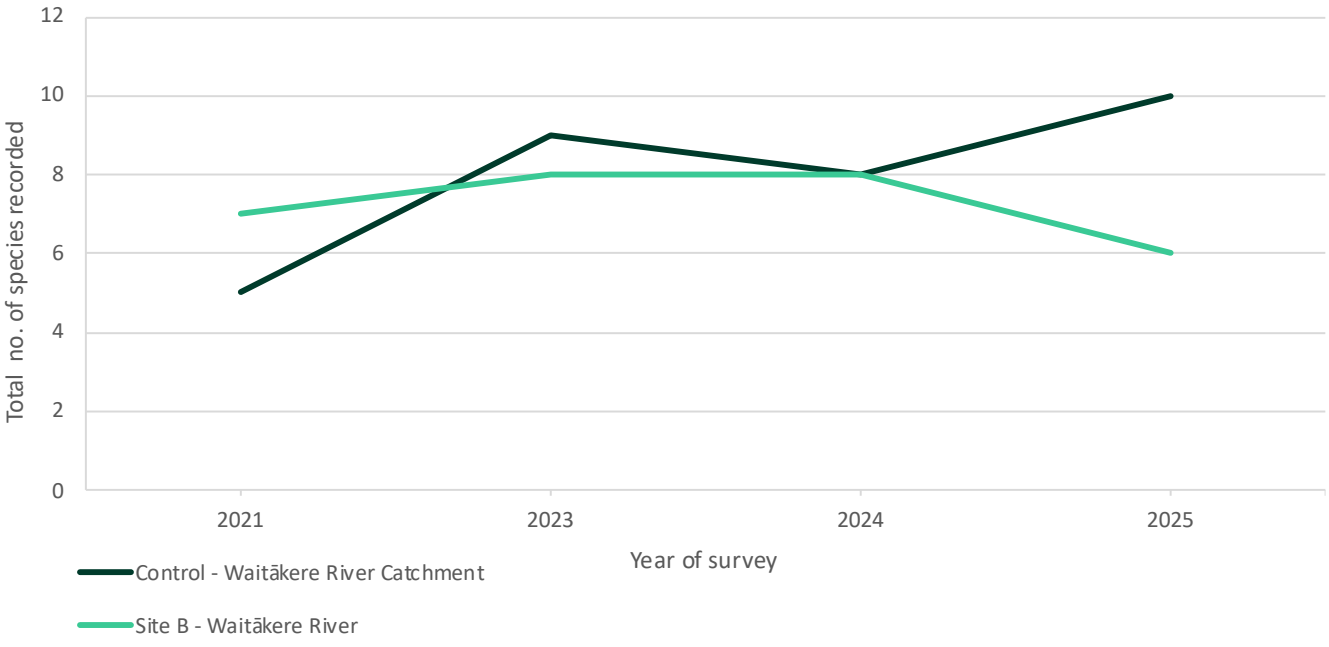

Figure 4 – The total number of species recorded from the Waitākere River Catchment streams surveyed between 2021 and 2025.

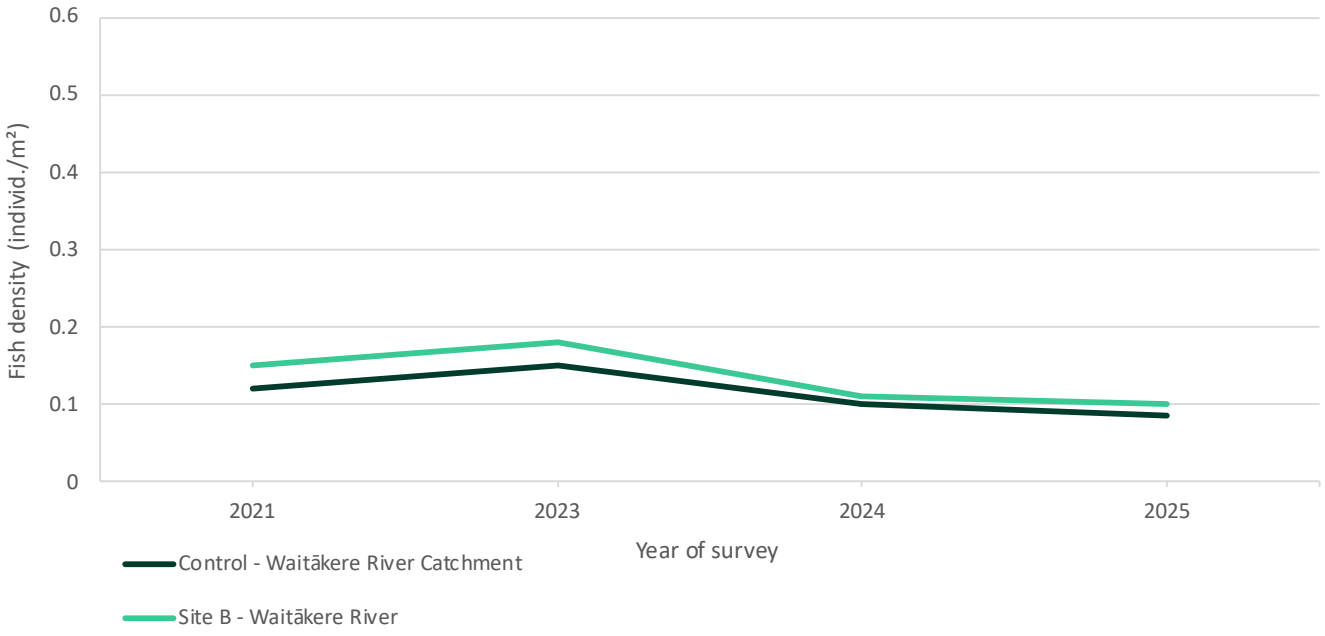

Figure 5 – Overall fish density (individuals per m^2) recorded from the Waitākere River Catchment streams surveyed between 2021 and 2025.

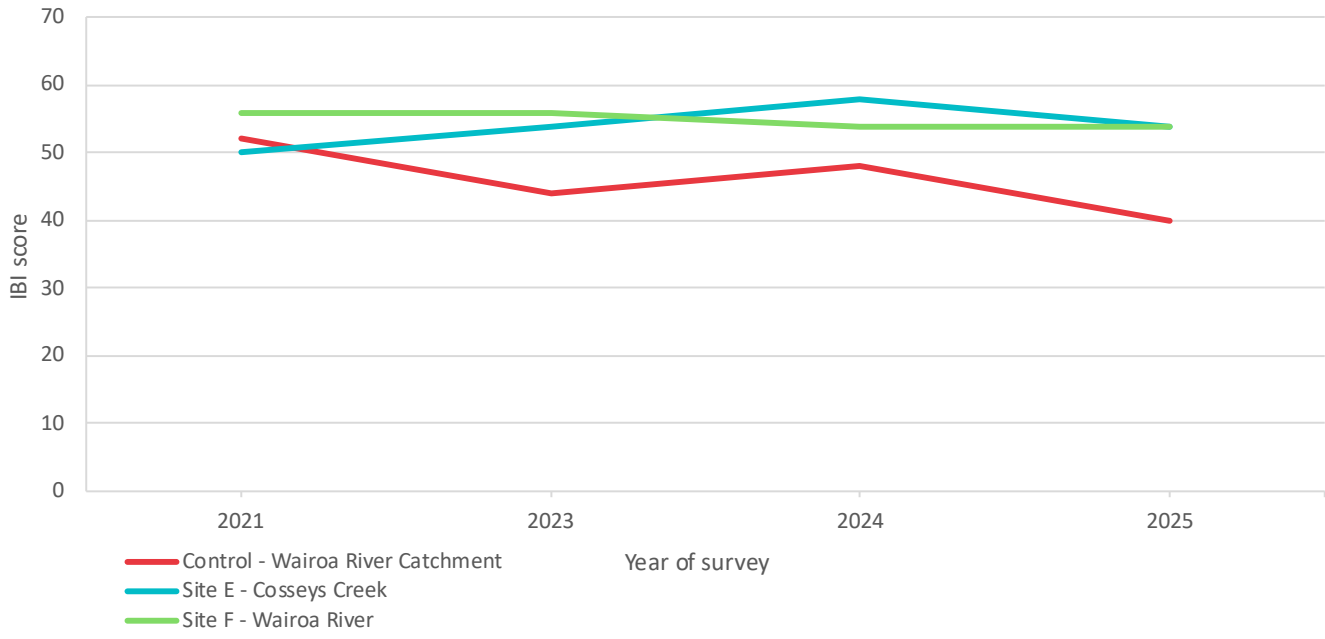

Figure 6 – Fish Index of Biotic Integrity (IBI) scores from the Wairoa River Catchment streams surveyed between 2021 and 2025.

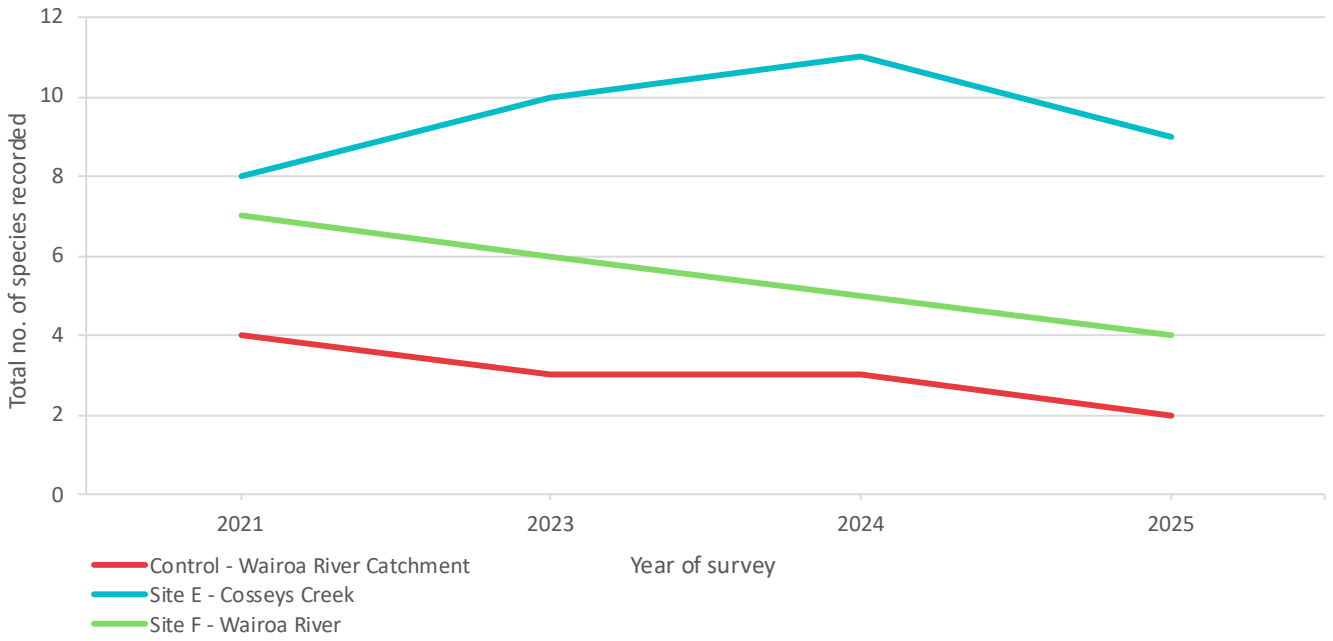

Figure 7 – The total number of species recorded from the Wairoa River Catchment streams surveyed between 2021 and 2025.

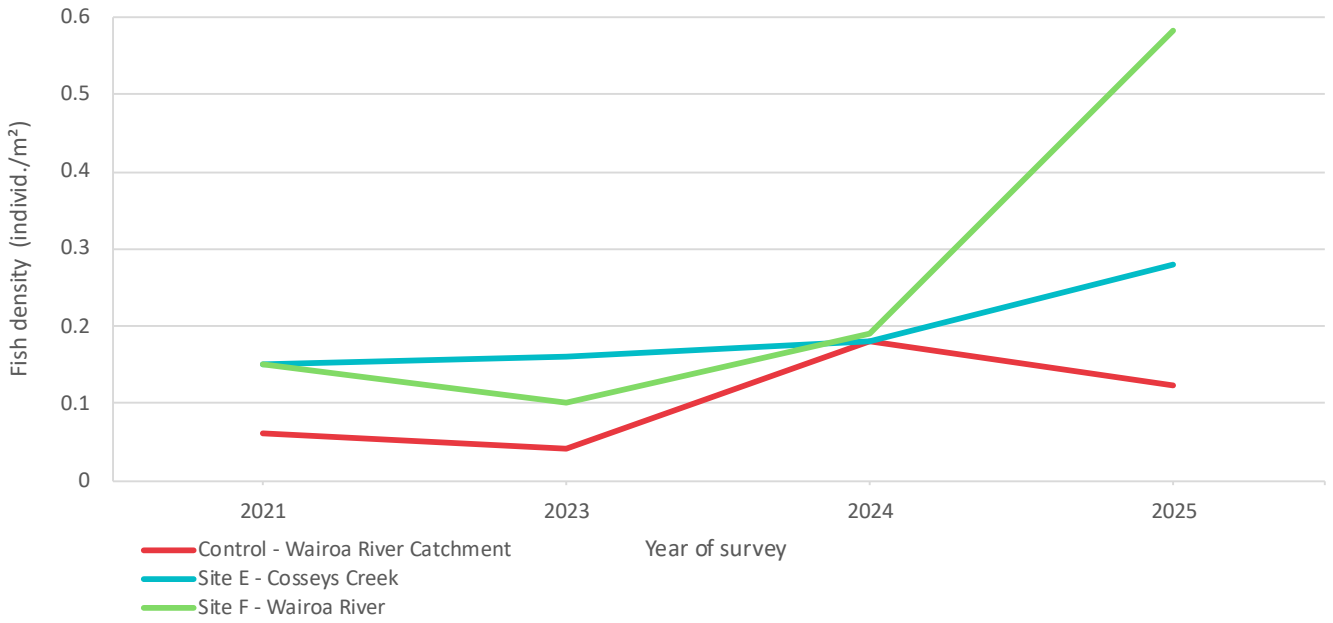

Figure 8 – Overall fish density (individuals per m^2) recorded from the Wairoa River Catchment streams surveyed between 2021 and 2025.

Table 11 – Comparison of fish survey results between 2021 and 2025.

Catchment	Site	IBI score				Total no. of species				Overall fish density (individuals/m^2)			
		2021	2023	2024	2025	2021	2023	2024	2025	2021	2023	2024	2025
Waitākere River	Control - Waitākere River Catchment	48	58	58	58	5	9	8	10	0.12	0.15	0.10	0.084
	Site B - Waitākere River	52	54	54	50	7	8	8	6	0.15	0.18	0.11	0.1
Wairoa River	Control - Wairoa River Catchment	52	44	48	44	4	3	3	2	0.06	0.04	0.18	0.123
	Site E - Cosseys Creek	50	54	58	54	8	10	11	9	0.15	0.16	0.18	0.279
	Site F - Wairoa River	56	56	54	54	7	6	5	4	0.15	0.10	0.19	0.582

5.0 Summary and conclusions

From this data, there is no clear adverse impact on fish communities due to the reduced compensation flow regimes from the dams. Fish communities continue to persist at all sites. Impact sites from Wairoa, Cosseys, and Waitākere Dams all showed a greater or similar diversity of species, higher number of individuals, and overall higher fish density compared to the control sites, while all sites scored within the 'excellent' or 'good' category for the Fish IBI.

There appears to be a gradual decline in species diversity at both the Wairoa control site and Site F – Wairoa River. Species diversity in the 2025 survey was also lower for all sites except the Waitākere control site. The cause of this is unknown, and may just reflect yearly variations in species' abundance, with low abundance species less likely to be captured during the surveys. Water levels were also noticably lower than previous years at the time of the 2025 survey, which may have impacted the fish community. The number of perch caught this year was also higher than previous surveys, and perch were caught for the first time in Wairoa River Catchment. Increased predation of indigenous fish by exotic species could also contribute to lower diversity.

Acknowledgments

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References

Dunn N.R., Allibone R.M., Closs G.P., Crow S.K., David B.O., Goodman J.M., Griffiths M, Jack D.C., Ling N., Waters J.M. and Rolfe J.R., 2018: *Conservation status of New Zealand freshwater fishes, 2017*. New Zealand Threat Classification Series 24. Department of Conservation, Wellington. 11 p.

Grainger N., Harding J., Drinan T., Collier K., Smith B., Death R.; Makan T., Rolfe J., 2018: *Conservation status of New Zealand freshwater invertebrates, 2018.* New Zealand Threat Classification Series 28. Department of Conservation, Wellington. 25 p.

Joy M. K., 2010: *A Fish Index of Biotic Integrity using quantile regressions – Fish QIBI for the Auckland Region.* Auckland Regional Council Internal Report No. 005. July 2010. 20pp.

Wildland Consultants Ltd. 2021. Quantitative fish surveys in the Waitākere and Wairoa River catchments. *Wildland Consultants Ltd Report No. 5693*. Prepared for Watercare Services Ltd. 25 pp.

Wildland Consultants Ltd. 2023. Fish surveys in the Waitākere and Wairoa River Catchments. *Wildland Consultants Ltd Report No. 6692*. Prepared for Watercare Services Ltd. 29 pp.

Appendix 1

A selection of images of fish and freshwater invertebrate species captured during the site surveys.

Kōaro (*Galaxias brevipennis*)

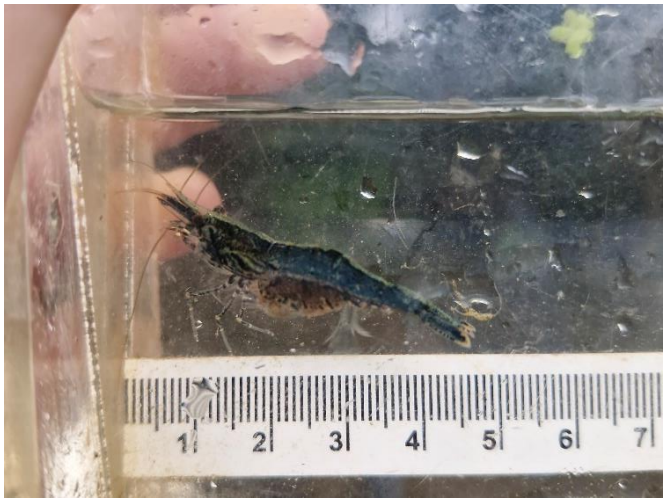
Banded kōkopu (*Galaxias fasciatus*)

Redfin bully (*Gobiomorphus huttoni*)

Kōura (*Paranephrops planifrons*)

Giant bully (*Gobiomorphus gobiodies*)

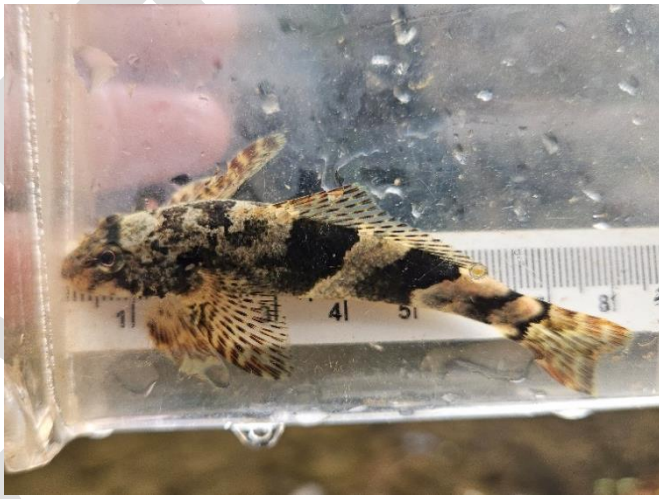
Longfin eel (*Anguilla dieffenbachii*)



Freshwater shrimp (*Paratya curvirostris*) with eggs.

Common bullies (*Gobiomorphus cotidianus*)

Common smelt (*Retropinna retropinna*; top left) and īnanga (*Galaxias maculatus*; bottom)



Torrentfish (*Cheimarrichthys fosteri*)

Elvers (*Anguilla* sp.)

Perch (*Perca fluviatilis*)

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Hochstetter's Frog Surveys in the Waitākere River, Waitākere Ranges (2024 – 2025)

Contract Report No. 7439a

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Contract Report No. 7439a

June 2025

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1.0 Introduction

Watercare Services Limited (Watercare) gained resource consent (DIS60357054) to lower the environmental flows required to be supplied from the Waitākere dam to tributaries that flow downstream into the Waitākere River between July 2020 and January 2022. However, the duration of the reduced flow period has been extended under a new consent (DIS60382532) which is due to expire in 2025. To measure and monitor the ecological effects of the lowered flow rates, survey sites were established by the client to measure a range of environmental variables along the Waitākere River.

Downstream flow alterations have been identified as potentially affecting resident aquatic fauna. Hochstetter's frog (*Leiopelma hochstetteri*) is an endemic, semi-aquatic frog species that is widespread throughout the Waitākere Ranges, residing near and within streams and tributaries. Hochstetter's frogs are nocturnal, extremely cryptic and vulnerable to predation by the usual suite of mammalian predators in New Zealand (e.g. rodents, mustelids and even feral pigs). The threat classification of Hochstetter's frog was recently updated with the species now split into regional populations. The Waitākere population (*Leiopelma aff. hochstetteri "Waitākere"*) is classified as 'At Risk-Declining' as per Burns *et al.* (2024).

Streams and tributaries throughout the catchment provide valuable potential habitat to Hochstetter's frogs, and it was therefore recommended that surveys be undertaken in suitable locations to gain information on the presence/absence and distribution of the species. Wildland Consultants Ltd (Wildlands) has been engaged to undertake surveys for Hochstetter's frogs at monitoring sites in the Waitākere River Catchment since late 2020 (Wildland Consultants, 2021 to 2024). Hochstetter's frogs have been identified at all of the survey sites during this time.

Wildland Consultants Ltd was engaged to undertake further surveys in December 2024 and March 2025 at the same monitoring locations. This report describes the methods and results of these surveys and a discussion of results to date.

2.0 Wildlife Act Authority

All indigenous frogs are absolutely protected under the Wildlife Act 1953. Therefore, frogs and their habitats cannot be disturbed, handled or removed without an approved Wildlife Act Authority issued by the Department of Conservation. Wildland Consultants is authorised under Wildlife Act Authority 99271-FAU to survey for indigenous frogs.

Amphibian and Reptile Distribution cards (ARDs) are presented in Appendix 2.

3.0 Methods

3.1 Survey transects

Surveys were carried out along 50 metre long transects in the same locations as in the initial surveys (Wildland Consultants, 2021). This includes four impact sites and one control site (Anderson Stream) in the Waitākere River Catchment (Figure 1). Updated site photographs of each transect are presented in Appendix 1.

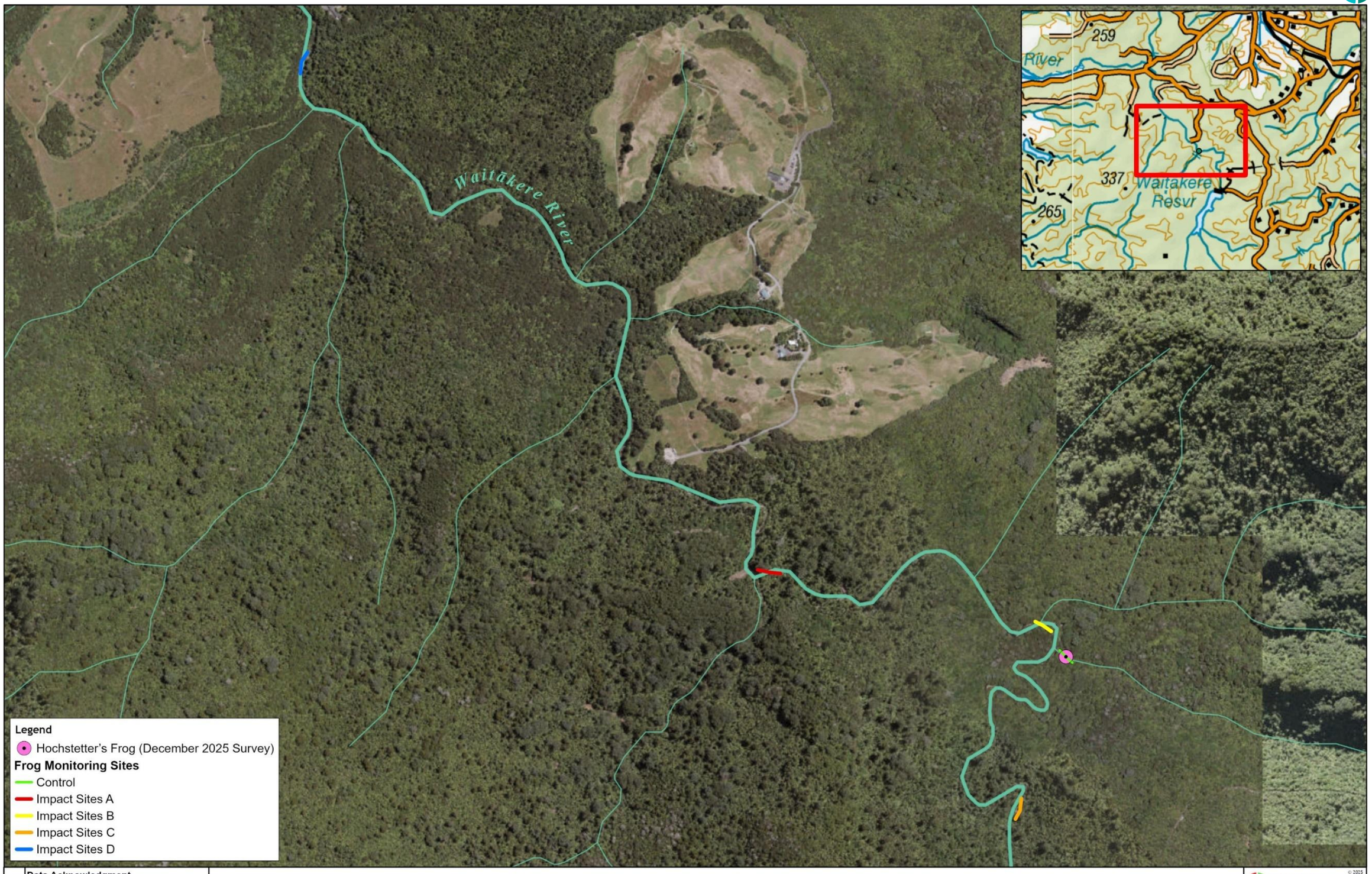

Figure 1. Survey sites and Hochstetter's frog observation at the Waitakere River, Waitakere

3.2 Survey protocol

The methods used to survey for Hochstetter's frogs followed the protocol recommended by Bell (1996):

- Each transect was surveyed by a team of two experienced Wildlands staff and supervised by the project herpetologist.
- Surveys were undertaken during daylight hours (between 9am and 5pm) during suitable weather conditions (i.e., on fine, calm days with little or no rainfall within the 24-48 hours preceding the survey).
- Survey transects were divided in half, with each staff member surveying a different side of the stream.
- If Hochstetter's frogs were detected quickly within a transect, the survey was continued until completion to gain count data to represent simplistic indices of relative abundance and encounter rate.
- Each site was searched by slowly moving upstream from the start point, carefully examining all available refugia for Hochstetter's frogs (beneath rocks, logs and leaves, and inside crevices and tunnels).
- If replacing an object posed a risk to a Hochstetter's frog, the frog was gently nudged aside using a blunt object (e.g., a leaf or twig). After the object was returned to its position, the frog was gently nudged back under it.
- Both sides of the stream at each site were searched between the water's edge and one metre into the stream bank (if horizontal, or to 60 centimetres high if the stream bank was vertically sloped).
- Hochstetter's frogs were not captured or handled in order to collect morphometric data, but snout-urostyle-length was crudely measured by extending a soft measuring tape alongside it to gain an estimate. Each frog was photographed where possible.
- GPS location data was recorded through track logs and waypoints marked the site of each located frog.

3.3 Data collection

The following data was collected at each of the survey transects:

- Date.
- Transect length.
- Weather.
- Elevation.
- Transect suitability (based on presence and abundance of frog habitat):
  - Unsuitable (no habitat and no canopy cover).
  - Marginal (limited frog habitat present and minimal canopy cover).
  - Suitable (frog habitat present with some canopy cover).
  - Optimal (abundance of frog refuges present and full canopy cover).
- Search start/stop time:
  - Total search time.
  - Person search hours.
- Number of refuges searched.
- Stream width at 10-metre intervals along the transect.

- Canopy cover:
  - Open.
  - Partial.
  - Full.
- Habitat composition (%):
  - Bedrock.
  - Boulders.
  - Cobbles.
  - Sand.
  - Silt.
  - Clay.
  - Vegetation.
- Transect searchability (based on searchable habitats including rocks and crevices):
  - Suitable (at least one or more suitable Hochstetter's frog refuges present that can be searched).
  - Not suitable (no suitable Hochstetter's frog refuges present).
  - Suitable but unsearchable (Hochstetter's frog refuges present but none of them are searchable; i.e., boulders too large to lift, debris and vegetation that could not be searched as it would require deconstruction, which was not acceptable).
- Frogs:
  - Approximate snout-urostyle-length.
  - Approximate age class (juvenile/adult).

3.4 Frog hygiene

- Due to the risk of fungal pathogens to indigenous frogs (i.e., chytridiomycosis, Batrachochytrium dendrobatidis), hygiene protocols were followed in accordance with the New Zealand Frog Recovery Group's recommendations.
- Prior to commencing field work each day, all waders and field equipment were sprayed liberally with Sterigene™ to disinfect them. Following disinfection time (one minute), all equipment and boots were rinsed with fresh water. This process was repeated between survey sites and at the end of each field day.[1]
- Although it was not intended that staff would catch or handle frogs as part of these surveys, a supply of disposable latex gloves was kept with each staff member. This ensured that in the event that a frog had to be handled a clean glove was available for use.

3.5 Freshwater gold clams

The above frog hygiene protocols are considered sufficient to reduce the risk of spreading gold clams at the site. However, additional procedures were followed including:

- A visual inspection of all equipment was undertaken prior to changing streams or locations and at the end of each day to check for clams.
- Equipment was thoroughly dried and left for a minimum of 48 hours before moving locations (i.e. from Hunua to Waitākere or vice versa).

There were no freshwater gold clams observed within any of the catchments.

[1] This protocol is also considered sufficient to fulfil the requirements of Kauri Dieback Hygiene protocols for the Waitākere Ranges.

4.0 Results

4.1 Frog observations

One Hochstetter's frog was observed at the control transect during the survey in December 2024 (Figure 1; Plate 1). No frogs were observed within any of the transects during the April 2025 survey. Survey results for all years are presented in Table 1 with detailed results provided in a separate Excel spreadsheet in Addendum A. Mean relative abundance and encounter rates for all years are presented in Table 2 below.

Plate 1 – Hochstetter's frog observed at the Waitākere River control transect. December 2025.

4.2 Search variables and habitat suitability

In general, the Waitākere River contains an abundance of good quality habitat (including areas with full or partial canopy cover, boulders, rocks, riparian vegetation, and debris dams) considered to be 'suitable' for Hochstetter's frogs. The canopy was open on Transects C and D which led to these transects being ranked as 'Marginal'. During the April 2025 surveys the water was turbid at the impact sites, making assessing some habitat and search variables difficult.

The abundance of searchable frog habitats (i.e., rocks) has been consistently variable between all survey sites and between surveys (Table 1). Overall, the varying number of refuges between surveys at all sites likely reflects the changing nature of the wider stream system and is influenced by rock and sediment movements and water levels.

The ratio of habitat types along the impact site transects (A-D) in the Waitākere River changed between the December 2024 survey and April 2025 survey, with the proportion of bedrock and boulders declining over that period while cobbles and sand increased. In contrast, the habitats at the control site remained similar between December 2024 and March 2025.

Table 1 – Frog survey data for all transects on the Waitākere River and its tributaries (December 2020 to April 2025).

Survey No.	Person Search Time (minutes)					No. of refuges searched					No. of frogs detected					Frog Measurements (Snout-Urostyle Length, mm)				
	Transect A	Transect B	Transect C	Transect D	Control	Transect A	Transect B	Transect C	Transect D	Control	Transect A	Transect B	Transect C	Transect D	Control	Transect A	Transect B	Transect C	Transect D	Control
Survey 1 – December 2020	59	50	88	64	95	506	315	848	538	798	0	0	1	0	0	-	-	32	-	-
Survey 2 – April 2021	65	96	96	114	104	1162	668	626	687	828	1	1	1	1	0	34	25	33	44	-
Survey 3 – March 2022	62	118	104	64	72	656	556	963	575	661	0	0	0	0	0	-	-	-	-	-
Survey 4 – December 2022	60	58	50	32	40	392	401	276	309	224	1	0	0	0	0		-	-	-	-
Survey 5 – March 2023	96	153	46	80	138	476	840	257	499	1187	0	0	0	0	0	-	-	-	-	-
Survey 6 – December 2023	40	28	40	30	60	256	176	499	225	428	0	0	0	0	0	-	-	-	-	-
Survey 7 – April 2024	112	66	114	112	120	800	392	1187	1149	787	0	0	0	0	1	-	-	-	-	34
Survey 8 – December 2024	90	30	30	60	60	337	129	122	103	393	0	0	0	0	1	-	-	-	-	40
Survey 9 – April 2025	22	40	60	29	86	161	335	410	250	1037	0	0	0	0	0	-	-	-	-	-

Table 2 – Mean relative abundance and encounter rates of Hochstetter's frogs from all surveys on the Waitākere River and its tributaries (December 2020 to April 2025).

Survey No.	Impacts Transects A-D			Control Transect		
	Number of frogs found	Mean relative abundance (frogs/100 metre)	Mean Encounter rates (# frogs/person search hour	Number of frogs found	Mean relative abundance (frogs/100 metre)	Mean Encounter rates (# frogs/person search hour
Survey 1 – December 2020	1	0.5 frogs/100m	0.17 frogs/hour	0	0 frogs/100m	0 frogs/hour
Survey 2 – April 2021	4	2 frogs/100m	0.56 frogs/hour	0	0 frogs/100m	0 frogs/hour
Survey 3 – March 2022	0	0 frogs/100m	0 frogs/hour	0	0 frogs/100m	0 frogs/hour
Survey 4 – December 2022	1	0.5 frogs/100m	0.25 frogs/hour	0	0 frogs/100m	0 frogs/hour
Survey 5 – March 2023	0	0 frogs/100m	0 frogs/hour	0	0 frogs/100m	0 frogs/hour
Survey 6 – December 2023	0	0 frogs/100m	0 frogs/hour	0	0 frogs/100m	0 frogs/hour
Survey 7 – April 2024	0	0 frogs/100m	0 frogs/hour	1	2 frogs/100m	1 frogs/hour
Survey 8 – December 2024	0	0 frogs/100m	0 frogs/hour	1	2 frogs/100m	1 frogs/hour
Survey 9 – April 2025	0	0 frogs/100m	0 frogs/hour	0	0 frogs/100m	0 frogs/hour

5.0 Conclusion

Watercare Services Ltd has gained resource consent to lower the environmental flows required to be supplied from the Waitākere Dam to the Waitākere River. Downstream flow alterations have been identified as potentially affecting resident aquatic fauna. Hochstetter's frog is a semi-aquatic indigenous frog species that is classified as 'At Risk - Declining' and may be affected by the altered flows. As such, surveys are required to determine if the altered flow rate has impacted the presence and/or abundance of Hochstetter's frog within Waitākere River. Flows were reduced in 2020 and were due to be reinstated in January 2022. However, the duration of the reduced flow period was extended requiring additional surveys.

Frog survey methods followed the Bell (1996) protocol and did not involve capture or handling. The number of refuges inspected for each survey was recorded, together with search time and a range of river/stream variables including substrate, canopy cover, and stream width. Strict hygiene protocols were followed to minimise the risk of spreading either chytrid disease or kauri dieback on boots and survey equipment.

A total of six frogs were detected at impact sites across three out of the four surveys from December 2020 to December 2022, inclusive), and at least one frog was found at all four impact sites on one of these occasions (April 2021). However, no frogs have been detected at an impact site during the five surveys from March 2023 to April 2025.

There are a number of variables that could have led to this reduction in detection rates at the impact sites. Given the low number of frogs at each site and highly cryptic nature of this species, the lack of detection may be statistically unimportant (i.e., it may be a part of normal variability when surveying this population). Alternatively, the lack of recent detections could be from a natural reduction in habitat suitability for frogs within the current transects relating to weather conditions. A third possibility is that the low detection rates could be an indicator of potential adverse impacts associated with the dam flow reductions.

Further surveys are recommended to continue to monitor the health of this frog population, particularly if environmental flows continue to be altered.

Acknowledgments

We thank Emma Baker from Watercare and David Markham from Auckland Council for their liaison and assistance with site access.

References

Bell B. (1996). *Aspects of the ecological management of New Zealand frogs: conservation status, location, identification, examination and survey techniques. Ecological management 4.* 91-111pp.

Burns, R.J.; Armstrong, D.P.; Bell, B.D.; Haigh, A.; Germano, J.; Rawlence, N.J.; Thurley, T.; Hitchmough, R.A.; Makan, T.; Michel, P. 2025: Conservation status of amphibians in Aotearoa New Zealand, 2024. New Zealand Threat Classification Series 44. Department of Conservation, Wellington. 19 p Burns,

Wildland Consultants (2021). *Hochstetter's Frog Surveys in Waitākere River, Waitākere*. Wildland Consultants Contract Report No. 5670. Prepared for Watercare Services Ltd.

Wildland Consultants (2022). *Repeat Hochstetter's Frog Surveys in Waitākere River, Waitākere Ranges*. Wildland Consultants Contract Report No. 5670b. Prepared for Watercare Services Ltd.

Wildland Consultants (2023). *Hochstetter's Frog Surveys in the Waitākere River, Waitākere Ranges (2022-2023).* Wildland Consultants Contract Report No. 6648a. Prepared for Watercare Services Ltd. 24pp.

Wildland Consultants (2024). *Hochstetter's Frog Surveys in the Waitākere River, Waitākere Ranges (2023-2024).* Wildland Consultants Contract Report No. 7082a. Prepared for Watercare Services Ltd. 24pp.

Appendix 1 Updated photographs of survey transect locations from the April 2025 survey.

Plate 2 – Waitākere River Transect A, at 0m facing upstream. April 2025.

Plate 3 – Waitākere River Transect B, at 0m facing upstream. April 2025

Plate 4 – Waitākere River Transect C, at 0m facing upstream. April 2025.

Plate 5 – Waitākere River Transect D, at 0m facing upstream. April 2025.

Plate 6 – Waitākere River Control Transect facing upstream. April 2025.

Appendix 2

Amphibian and Reptile Distribution card

ARDS CARD

NEW ZEALAND AMPHIBIAN/REPTILE DISTRIBUTION SCHEME

Herpetofauna Administrator, RD&I, Department of Conservation, P.O. Box 10420, Wellington.

Card No:1

Observer: B S (Initials) Balsom (Surname)

Date: 04/12/2024

Alt (m): 61m

Locality Name: Waitākere Ranges

Address: 12 Nixon Street, Grey Lynn, PO Box 46-299, Herne Bay, Auckland 1011

Affiliation: Wildland Consultants Ltd

	Easting	Northing
GPS	1736336	5916187

Series | Map No. | Easting | Northing

Area Office: Conservancy: Ecol. District:

Species name	No.	Time	Habitat	Weather
Leiopelma hochstetteri	1	12:15 – 12:50	11, D	4, 1, 1

Voucher specimen(s) No Specify:

Photograph(s) Yes

Extra notes on reverse side No Release site:

Notes: One adult frog found beneath a boulder in the middle of a stream.

Identified by: Blair Balsom
Authority used: Wildland Consultants Ltd, Permit 99271-FAU

Weather

1. Light
2 Fine/Sunny
3 Part Cloudy
4 Overcast
5 Showers
6 Rain
7 Night
8 0-½ Moonlit
9 ½-1 Moonlit

Temperature
1 Hot
2 Warm
3 Moderate
4 Cool
5 Cold

Wind
1 Calm
2 Light breeze
3 Mod breeze
4 Gusty
5 Strong winds

Major Habitat Types

1 Beech Forest
2 Podocarp forest
3 Broadleaf forest
4 Exotic forest
5 Scrub
6 Sub-alpine
7 Alpine
8 Undeveloped tussock land
9 Developed farmland
10 River terrace
11 Fresh water
12 Wet land
13 Coastal
14 Scree
15 Bare rocks
16 Beach
17 Urban
18
19
20

Micro habitats

A Foliage
B Trunk
C Branches
D Under stones
E Under wood
F Open ground
G Crevices
H ground veg
I under flax

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