Wellsford Wastewater Treatment Plant 2024-2025 Annual report

Final - September 2025

Watercare

QUALITY INFORMATION

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Name and position of originator	Laurent Daghdevirenian, Senior Environmental Scientist

REVISION HISTORY

Rev	Revision Date	Name	Position	Signature
1	10/09/2025	Michiel Jonker	Environmental Care Manager	
3	30/09/2025	Jonathan Piggot	Head of Wastewater	

APPROVED

Date	Name	Position	Signature
30/09/2025	Michiel Jonker	Environmental Care Manager	

CONSENT CHANGE AND MONITORING HISTORY

Change type	Description	Effective date	Reference / condition	Reporting / monitoring implications
Consent variation	Land use consent (s9) – DIS60068492 - extension of time to discharge to Tributary A for an extra 3 years up until November 2025	01/11/2022	Condition 24	Aligned consent deadline for Short-term/Long-term transition
Consent variation	Land use consent (s9) – (DIS60068492) (as varied by DIS60068492-A) - To continue the short-term discharge of treated wastewater at the same quantity and quality from the Wellsford WWTP for a further year and 1 month through until 31 December 2026	05/07/2023	Condition 24	Aligned consent deadline for Short-term/Long-term transition

EXECUTIVE SUMMARY

The 2024-2025 Annual Compliance Report for the Wellsford Wastewater Treatment Plant (WWTP) outlines the plant's operational performance, environmental compliance, and monitoring results from July 1, 2024, to June 30, 2025. The Wellsford WWTP is responsible for treating wastewater from the local community and discharging treated effluent into an unnamed tributary of the Hōteo River. This report evaluates the plant's performance against resource consent conditions, particularly in terms of effluent quality, discharge volumes, and environmental impact.

Key highlights from the reporting year include:

- Effluent discharge and quality: The Wellsford WWTP maintained compliance with most effluent quality parameters, including carbonaceous biochemical oxygen demand (cBOD5), total suspended solids (TSS), and total inorganic nitrogen (TIN). Faecal coliforms exceeded the 95th percentile compliance limit in some cases, primarily during wet weather events, but overall compliance was high.
- Effluent volumes: The plant's discharge volume did not exceed the consented limit of 3,950 m^3/day as the rolling 12-month 95th percentile figure or the average daily flow limit of 1,730 m^3/day. However, during high rainfall events, some treated effluent was diverted through the wetland bypass to manage flow.
- Air quality: Weekly odour walkovers recorded no noxious, offensive, or objectionable effects beyond the boundary.
- Receiving environment monitoring: Water quality monitoring of the receiving environment showed that the WWTP's discharge had limited impact on the water quality of the Hōteo River. However, elevated levels of ammoniacal nitrogen and dissolved reactive phosphorus were observed at certain monitoring points, suggesting localised effects in the immediate vicinity of the discharge.
- Plant upgrades and future changes: No major changes were made to the plant in 2024-2025, The Wellsford WWTP is undergoing a full upgrade to meet long-term effluent quality standards and the construction started this year. The new plant will feature two MABR/MBR trains, with provision for a third in future, and will replace the existing facility. Commissioning is scheduled for mid 2026, with full operation expected by the end of the year. Civil and mechanical works were the main focus during 2024-2025, including completion of the new inlet pump station and outlet, both pending commissioning. The upcoming upgrades aim to address potential future growth and maintain high environmental standards.
- Compliance summary: The plant met most of its compliance obligations, with no significant incidents or complaints reported during the year. Air quality monitoring confirmed full compliance with consent conditions for odour and emissions. The plant received a Category 2 compliance rating for the period, reflecting minor non-compliance related to faecal coliform levels.

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1 INTRODUCTION

1.1 Outline

This report covers resource consent compliance for the Wellsford Wastewater Treatment Plant (WWTP) from 1 July 2024 to 30 June 2025. The report includes:

- Description of the WWTP
- Relevant consents and management plans
- Plant performance
- Summary of compliance.

1.2 Consents and plans

1.2.1 Consents

Table 1-1-1 Wellsford WWTP Resource Consents lists the active resource consents for the Wellsford WWTP.

Table 1-1-1 Wellsford WWTP Resource Consents

Consent type	Consent number	Expiration date
Discharge to Air	DIS60068494	27/11/2052
Discharge to Water	DIS60068492 – A DIS60068492 - B	27/11/2052

1.2.2 Plans

The Wellsford WWTP has three management plans that relate to its active resource consents. Table 1-1-2 Wellsford WWTP Management Plans lists these plans.

Table 1-1-2 Wellsford WWTP Management Plans

Plan	Revision Date
Receiving Environment Monitoring Plan	March 2018
Midge Management Plan	March 2018
Odour Management Plan	July 2018

1.3 Abbreviations

For ease of reading, this report uses abbreviations for some technical terms. Table 1-3 lists these abbreviations.

Table 1-3 Table of abbreviations

Abbreviation	Description
$cBOD_5$	5-day carbonaceous biochemical oxygen demand
DO	Dissolved oxygen
DRP	Dissolved reactive phosphorus or dissolved soluble phosphorus (synonyms)
E. coli	*Escherichia coli*
MABR/MBR	Membrane aerated biofilm reactor/ Membrane biofilm reactor
NH_x	Ammonia and ammonium, reported in milligrams nitrogen
NO_2	Nitrite, reported in milligrams nitrogen
NO_3	Nitrate, reported in milligrams nitrogen
REMP	Receiving environmental monitoring program
TIN	Total inorganic nitrogen (NH_x-N + NO_2-N + NO_3-N)
TN	Total nitrogen
TP	Total phosphorus
TSS	Total suspended solids
UF	Ultra-filtration system
UV	Ultra-violet
Watercare	Watercare Services Limited
WWTP	Wastewater treatment plant

2 TREATMENT PLANT

2.1 Current operation

The Wellsford WWTP is 1.8 km south of Wellsford on State Highway 1. The WWTP uses:

- An inlet screen
- An oxidation pond with aerators (with curtain installed to prevent short-circuiting)
- An ultrafiltration unit
- Wetland (four cells with a total area of 0.63 ha)
    - Since the end of March 2018, the wetland only takes flows above what the ultrafiltration plant can treat.

Treated effluent discharges to an unnamed tributary of the Hōteo River. The ultrafiltration pipeline bypasses the wetland and discharges into the effluent cascade and then into the stream. During period of high inflow, part of the flow is passing through the wetland.

2.2 Operational changes in 2024-2025

Watercare did not make any changes to the operation of the wastewater treatment plant in 2024-2025.

2.3 Future changes

The WWTP is undergoing a full upgrade to meet long-term effluent quality standards. The new plant will feature two MABR/MBR trains, with provision for a third in future, and will replace the existing facility. Commissioning is scheduled for early 2026, with full operation expected by winter 2026. Civil and mechanical works were the main focus during 2024-2025, including completion of the new inlet pump station and outlet, both pending commissioning.

3 COMPLIANCE

3.1 Introduction

The assessment of WWTP performance considers:

- Results of required WWTP monitoring
- Recorded incidents and complaints
- Receiving environment monitoring results for Wellsford annual receiving environment monitoring.

Watercare assesses compliance with consent using the same compliance rating system utilised by the Auckland Council (Table 3-1).

Table 3-1: Compliance assessment criteria

Rating	Detail
Category 1	Watercare has complied with the consent condition. Where a consent condition refers to a provision in a Management Plan, then the plan has been referred to in assessing consent compliance.
Category 2	Watercare has not complied with the consent condition. Watercare has assessed the non-compliance as technical or having no more than minor adverse effect.
Category 3	Watercare has not complied with the consent condition. Watercare has assessed the non-compliance having the potential to result in more than minor adverse effects on the environment. Alternatively, since the last audit, there is evidence of repeat Category 2 non-compliance.
Category 4	Watercare has not complied with the consent condition. Watercare has assessed the non-compliance as having the potential to cause significant adverse effects on the environment. Alternatively, since the last audit, there is evidence of repeat Category 3 non-compliance.

3.2 Plant performance

3.2.1 Effluent volumes

Figure 3-1 Wellsford WWTP effluent volumes and rainfall (2024-2025) shows the daily discharge volumes of effluent and recorded rainfall during the reporting year. Increased volumes into the plant in 2024-2025 meant that, on occasion, Watercare needed to divert water from the treatment ponds via the existing wetland rather than the UF plant.

The consent requires that discharge volumes shall not exceed 3,950 m^3/day when measured as the rolling 12-month 95th percentile figure, and not exceed an average daily flow limit of 1,730 m^3/day across any consecutive 12 months. The WWTP met these conditions, even when accounting for wetland bypass flows. Consent condition 20 specifies that the average daily flow should be calculated after at least three consecutive days of no rainfall. Using this method, the results show that the WWTP met the dry weather flow limit during 2024-2025.

The total effluent discharge volume recorded for the reporting year was 243,524 m^3. Volumes were slightly lower than the previous reporting year (250,984 m^3).

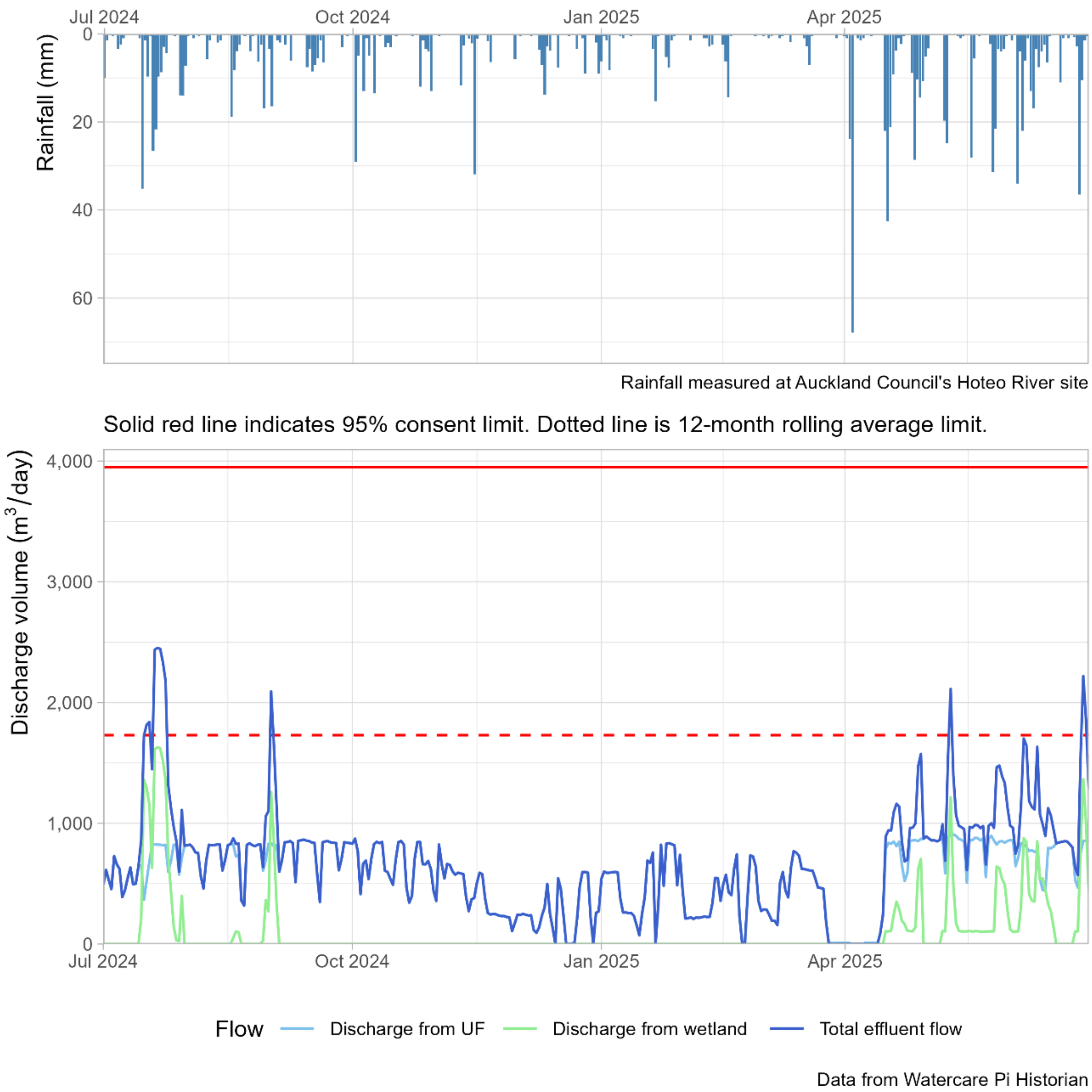

Figure 3-1 Wellsford WWTP effluent volumes and rainfall (2024-2025).

3.2.2 Effluent quality

Table 3-2 summarises effluent quality compliance. These data were flow-weighted* to account for both the UF plant and wetland bypasses. Appendix A-1 has the data.

During the 2024-2025 period, the WWTP did not meet its 95th percentile compliance limit for faecal coliforms under the short-term discharge criteria, with exceedances observed in quarters 1, 3, and 4. This is attributed to the portion of flow routed through the wetland, which is only utilised when inflows exceed the UF system's capacity. Due to this current process restriction, non-compliances are more.

* *Flow-weighted measurements are calculated based on the volume of flow passing through both the UF system and the wetland system. Effluent quality is monitored separately for each of these two flow streams.*

Table 3-2: Treated effluent quality 2024-2025 based on weighted flows

Metric	Discharge Volume	$cBOD_5$	TSS	TIN	Dissolved Oxygen	Faecal coliforms
Units	m^3/day	mg O_2/L	mg/L	mg N/L	mg O_2/L	MPN/100 mL
Samples	365	50	50.0	50.0	50.0	50.0
Minimum	0	0.7	1.0	1.2	5.0	1.6
Average	667	2.8	5.5	8.0	10.3	827.7
Maximum	2,452	12.2	37.9	24.0	39.0	6,418.1
Median	635	2.1	4.1	6.5	8.7	260.0
Median/95%ile consent limit	<1,730*	<20***	<30***	<15**	>3***	<1000***
95%ile	1524	100%	100%	NA	100%	76.9%
Upper limit	3,950***	NA	NA	NA	NA	
Compliant	Yes	Yes	Yes	Yes	Yes	No

Notes: *Average **Median ***95%ile limit

3.2.3 Long-term trend analysis

Figure 3-2 Wellsford WWTP effluent water quality - measurements over 5 years (2020-2025) shows the variation over five years for all the compliance monitoring parameters. Over the past five years, monitored water quality parameters have shown variable behaviours. CBOD5 and TSS levels fluctuated within expected operational ranges, with occasional peaks likely tied to seasonal or load-related events. Total Inorganic Nitrogen exhibited episodic increases, suggesting opportunities for improved nutrient management. Dissolved Oxygen remained mostly within healthy thresholds, supporting stable biological treatment, though some dips may warrant operational review. Faecal coliforms showed the highest variability, with several spikes clearly associated with weather events.

Overall, the system demonstrates consistent performance.

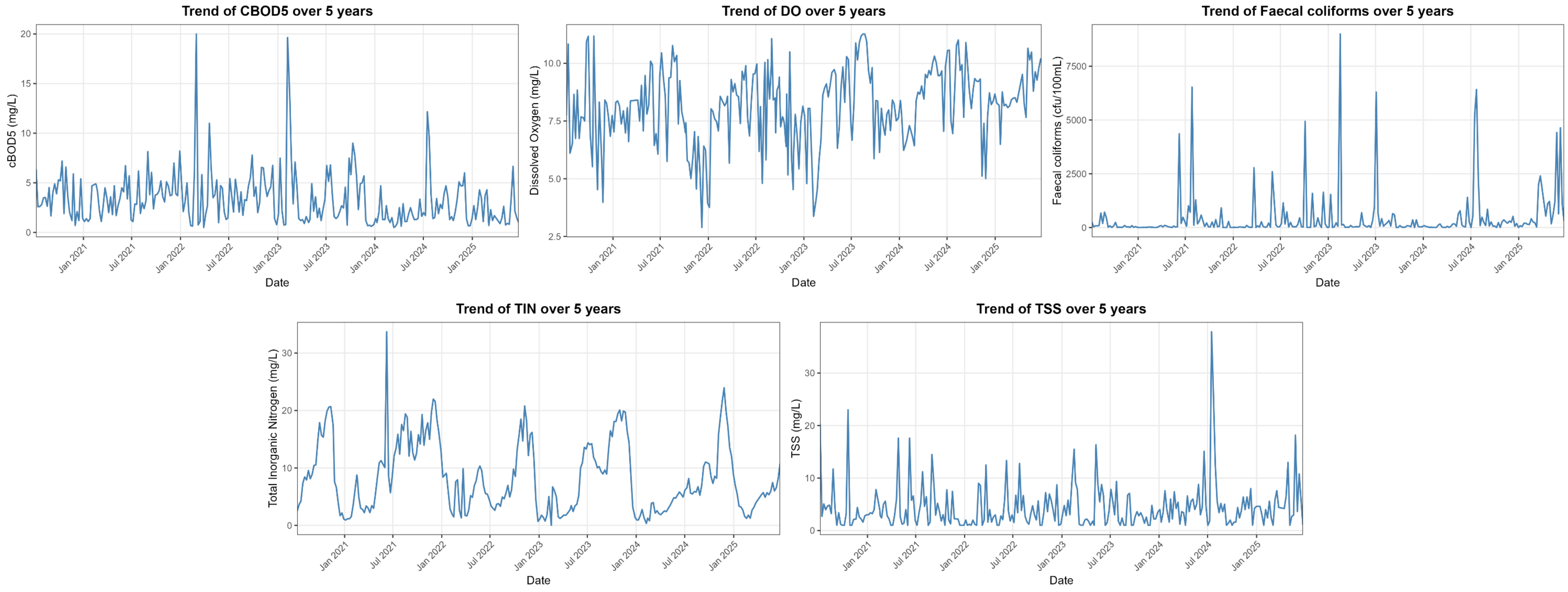

Figure 3-2 Wellsford WWTP effluent water quality - measurements over 5 years (2020-2025).

3.2.4 Air quality

Watercare met all its air quality monitoring requirements. The WWTP was fully compliant with its air discharge consent.

3.3 Receiving environment monitoring

Watercare engaged AECOM to carry out the receiving environmental monitoring for 2024-2025. The 2024-2025 report is included as Appendix C. The report concludes that the WWTP operations have had minimal direct impact on the receiving freshwater environment. Monitoring was conducted across multiple sites upstream and downstream of the WWTP discharge point, assessing water quality, Whole Effluent Toxicity, habitat conditions, macroinvertebrate communities, and diatom assemblages.

Improved nitrification was observed, with higher nitrate and the lowest median ammonia levels since 2019. The only significant water quality difference between control and test sites was elevated dissolved reactive phosphorus (DRP) at one test site, likely unrelated to WWTP discharge. Another site showed a DRP increase likely linked to the WWTP's artificial wetland.

Hydrochemical analysis in 2025 revealed a shift in water chemistry downstream of the WWTP, from calcium bicarbonate to calcium chloride, possibly due to recent instream construction introducing calcium and chloride ions.

Aquatic macroinvertebrate communities were dominated by pollutant-tolerant taxa. Differences in MCI-sb scores appeared to reflect habitat availability rather than water quality. At other sites, scores were within or above historical ranges, with impact sites scoring higher than controls—indicating no direct WWTP impact.

Whole Effluent Toxicity testing showed a toxicity effect at one downstream site, but not at the discharge point or other locations, suggesting the WWTP is not the source.

Diatom assessments showed spatial water quality differences. One control site reflected 'Good' ecological condition, while test sites ranged from 'Moderate' to 'Good', with improving trends since 2021. In contrast, river sites showed 'Moderate' conditions with signs of gradual decline, likely due to broader catchment pressures.

3.4 Complaints and incidents

The WWTP did not receive any complaints and no incidents occurred in 2024-2025.

3.5 Summary of compliance

Appendix C lists a condition-by-condition assessment of compliance for the WWTP. Across all consents, the plant was **Category 2** in 2024-2025.

4 CONCLUSION

The 2024-2025 compliance period for the Wellsford WWTP demonstrates overall strong performance in meeting regulatory requirements for all monitoring parameters except faecal coliforms, despite challenges posed by increased rainfall and operational demands.

While the plant managed to comply with most of its effluent discharge conditions, occasional non-compliance occurred with faecal coliform levels, particularly during periods of extended wet weather. These issues are being closely monitored, and a full plant upgrade is currently under construction with an expected delivery in winter 2026.

Air quality monitoring showed full compliance with the discharge to air consent, and no odour or dust complaints were received during the reporting year.

Additionally, the receiving environment monitoring concludes that while the WWTP discharge contributes to elevated ammonia and nitrate levels downstream, the ecological response to these increases is indistinguishable from other catchment pressures. Any potential ecological effects from the WWTP are relatively minor compared to the broader, unrelated sources of stress within the catchment.

Appendix A. Effluent Quality

Date	cBOD5	TSS	TIN	DO	Faecal coliforms
	mg O_2/L	mg/L	mg/L N	g O_2/m^3	cfu/100 mL
2/07/2024	2.00	1.00	6.17	10.55	1.60
9/07/2024	1.70	1.80	6.52	10.57	540.00
16/07/2024	12.16	37.87	8.16	7.49	5280.25
23/07/2024	9.63	25.96	5.62	6.95	6418.11
30/07/2024	3.80	12.46	5.48	8.77	2230.46
6/08/2024	1.40	5.60	5.89	10.77	86.00
13/08/2024	1.50	3.40	5.80	11.01	480.00
20/08/2024	3.42	5.17	6.75	9.69	239.17
27/08/2024	1.90	3.60	5.25	9.94	96.00
3/09/2024	2.83	5.01	7.02	7.66	851.49
10/09/2024	2.40	1.00	10.27	10.90	70.00
17/09/2024	3.90	1.40	11.03	10.04	260.00
24/09/2024	4.70	2.00	10.90	8.84	64.00
1/10/2024	3.60	1.00	10.70	8.04	72.00
8/10/2024	1.30	1.60	8.45	8.87	1.60
15/10/2024	1.60	1.60	7.30	9.34	230.00
22/10/2024	1.20	4.40	8.58	9.23	1.60
29/10/2024	2.10	2.40	8.20	9.21	270.00
5/11/2024	3.30	3.80	15.84	9.32	360.00
12/11/2024	5.10	6.40	18.86	5.11	270.00
19/11/2024	4.70	4.00	21.64	7.40	200.00
26/11/2024	4.70	6.40	23.96	5.01	300.00
3/12/2024	6.00	4.20	20.00	7.69	240.00
10/12/2024	1.40	8.00	17.28	8.72	520.00
17/12/2024	0.66	1.00	13.50	8.21	58.00
24/12/2024	0.68	4.20	11.99	8.35	190.00
31/12/2024	1.40	4.60	8.84	8.67	1.60
7/01/2025	2.70	4.60	6.94	8.28	84.00
14/01/2025	1.30	4.60	5.49	8.18	44.00
21/01/2025	2.50	3.00	3.34	6.49	200.00
28/01/2025	4.30	1.00	3.22	8.76	200.00
4/02/2025	3.50	4.00	2.71	8.16	150.00
11/02/2025	1.10	2.40	1.59	8.22	140.00
18/02/2025	3.70	5.60	1.22	8.08	410.00
25/02/2025	4.30	2.40	1.79	8.15	260.00
4/03/2025	0.70	1.00	1.25	8.42	220.00
11/03/2025	2.30	5.80	2.68	8.49	21.00
18/03/2025	1.20	7.60	3.16	8.51	2000.00
25/03/2025	1.70	4.40	3.92	8.31	2400.00
15/04/2025	0.89	4.20	5.34	9.52	530.00
22/04/2025	1.42	6.56	5.71	8.24	1106.53
29/04/2025	2.63	12.98	4.90	7.66	1216.70
6/05/2025	0.75	1.00	5.70	10.65	170.00

Date	cBOD5	TSS	TIN	DO	Faecal coliforms
	mg O_2/L	mg/L	mg/L N	g O_2/m^3	cfu/100 mL
13/05/2025	0.92	2.69	5.34	10.15	606.75
20/05/2025	0.82	2.94	5.93	10.49	1213.63
27/05/2025	3.39	18.19	7.47	8.79	4423.94
3/06/2025	6.66	3.63	6.00	9.63	639.08
10/06/2025	2.17	10.79	6.57	9.27	4637.19
17/06/2025	1.48	5.85	8.17	9.80	1082.01
24/06/2025	1.00	1.00	10.75	10.19	300.00

Note: All data are flow-weighted (samples taken from UF-treated and by-pass flows).

Appendix B. Wellsford Receiving Environment Report

Prepared for
Watercare Services Limited
ABN: N/A

AECOM

Annual Ecological Monitoring Report 2025

Wellsford Wastewater Treatment Plant (WWTP)

08-Sep-2025

aecom.com

Delivering a better world

Annual Ecological Monitoring Report 2025

Wellsford Wastewater Treatment Plant (WWTP)

Client: Watercare Services Limited

ABN: N/A

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1	22-Jul-2025	Final	Dr Morgan Witton – Principal Ecologist/ Project Manager	
1	08-Sept-2025	Final	Dr Morgan Witton – Principal Ecologist/ Project Manager	

Table of Contents

Abbreviations

Abbreviation/Acronym	Definition
AECOM	AECOM New Zealand Limited
ANZG	Australian & New Zealand Guidelines for Fresh and Marine Water Quality
EPT taxa	*Ephemeroptera* (mayflies), *Plecoptera* (stoneflies) and *Trichoptera* (caddisflies) Taxa
LOR	Laboratory Limit of Reporting
MCI	Macroinvertebrate Community Index
NPS:FM	National Policy Statement for Freshwater Management (2020)
%PTV	Percentage Pollution Tolerant Value
RDC	Rodney District Council
REMP	Receiving Environmental Monitoring Plan
SEV	Stream Ecological Valuation
SPI	Specific Pollution Sensitivity Index
Watercare	Watercare Services Limited
WET test	Whole Effluent Toxicity Test
WWTP	Wastewater Treatment Plant

Executive Summary

Watercare Services Limited (Watercare) have engaged AECOM New Zealand Limited (AECOM) to undertake freshwater ecological surveys in accordance with the Wellsford Wastewater Treatment Plant (WWTP) Receiving Environmental Monitoring Plan (REMP) (Watercare, 2021). The REMP is a requirement of the WWTP's resource consent conditions.

This report presents the results of the ecological surveys completed by AECOM in 2025 and the quarterly water quality monitoring completed by Watercare during the last monitoring period (2024 to 2025). The annual ecological survey and analysis of quarterly surface water quality sampling have been undertaken at locations upstream and downstream of the WWTP discharge point on Tributary A (Site A1, A2), Tributary B (Site B1 and B3) and the Hōteo River (Sites H3 and H2). In each case the former site is the control, and the latter is the test site. An additional monitoring point at Tributary A (Site A3) has been included since 2022 due to an increase in conductivity recorded during the 2021 monitoring, this is a secondary test site for Tributary A.

Monitoring attributes for each site included:

- Quarterly monitoring results of in-situ, biochemical oxygen demand, total suspended solids, nutrient and microbial constituents;
- Instream and riparian habitat assessment;
- Annual water quality results;
- Invertebrate habitat availability (IHA) assessment;
- Macroinvertebrate community assessment;
- Whole Effluent Toxicity testing (WET testing);
- Diatom community assessment (specifically percentage (%) Pollution Tolerant Valves (%PTV)).

During the 2024/2025 monitoring period, improved nitrification was indicated by higher nitrate levels and the lowest recorded median ammonia concentration since 2019. In addition, the only water quality parameter that showed a significant difference between the control and test site was dissolved reactive phosphorus (DRP). This difference was observed at Tributary B, where higher levels of both parameters were recorded at site B3 compared to site B1. However, no significant differences were found at the Tributary A or Hōteo River sites, suggesting that the elevated levels of DRP at site B3 are likely due to influences unrelated to the WWTP discharge. Although a significant increase of DRP was not observed in the Tributary A (between A1 and A2), a notable increase in DRP occurred at site A3 which is likely attributable to the discharge from the WWTP's artificial wetland.

In 2025, hydrochemical characterisation indicated a shift in water chemistry downstream of the WWTP discharge on Tributary A, with sites A2, A3, and the discharge point displaying a calcium chloride water type, in contrast to the upstream calcium bicarbonate type at A1. This change may be associated with recent instream construction works, where the use of cement and concrete may have introduced additional calcium and chloride ions. However, an ecological stress response was not observed in the 2025 annual monitoring[1].

The aquatic macroinvertebrate community composition at all sites was dominated by pollutant-tolerant taxa, typically found in soft sediment environments. Differences in Macroinvertebrate Community Index for soft-bottomed streams (MCI-sb) scores at Tributary A sites appear related to habitat availability rather than water quality. At Tributary B and the Hōteo River, MCI-sb values scored higher than or within the historical range, and the impact sites score higher than their respective control sites. Overall, the findings indicate no direct impact from the WWTP discharge.

Whole Effluent Toxicity (WET) testing was undertaken using *Daphnia magna* to assess the potential aquatic toxicity risk posed by the Wellsford WWTP discharge, which may not be detectable through existing monitoring protocols. The testing showed a toxicity effect at site H2, however since this effect

[1] It is noted that an assessment for construction effects of instream works associated with the construction of the new discharge outlet is not within scope of the annual monitoring.

was not observed at the discharge point or any other monitoring locations, it is unlikely that the WWTP discharge is contributing to aquatic toxicity in the receiving environment.

Diatom community assessments from the 2025 monitoring indicate spatial differences in water quality between control and test sites. At Tributary A, site A1 reflected ‘Good’ ecological condition, A2 and A3 showed ‘Moderate’ conditions and A2 recording the poorest quality. Specific Pollution Sensitivity Index (SPI) trends at Tributary A since 2021 suggest gradual improvement across all sites. At Tributary B, B3 showed ‘Good’ ecological condition and low organic pollution, while B1 reflected a ‘Moderate’ condition, likely due to non-WWTP-related influences. Similarly to Tributary A, both Tributary B sites have shown improving trends with increasing SPI and decreasing %PTV since 2021. In contrast, both Hōteo River sites reflected ‘Moderate’ conditions in 2025, with H3 showing poorer quality. A slight increase in %PTV and decline in SPI since 2021 suggests a gradual decline in condition at these sites, however this is likely driven by other catchment pressures unrelated to the WWTP.

To conclude, there is no evidence that the Hōteo River is affected by the inflows from Tributary A and B for all parameters considered. Any potential ecological effect associated with the WWTP is masked by other (unrelated) sources or catchments stress and is therefore minor at the scale of the Hōteo River. The following recommendations have been made:

- Continue the use of artificial substrates for diatom sampling during future monitoring events. To increase the retrieval rates of artificial substrates following high rainfall/storm events, it is recommended that the artificial substrates are deployed approximately three months prior to annual sampling. This should allow sufficient time for the diatom community assemblages to stabilise.
- Analyse water quality samples at Watercare Labs to maintain comparability (due to Hill laboratory's limit of reporting (LOR) for Biological Oxygen Demand, *Escherichia coli* and Total Coliforms), noting that these parameters were excluded from statistical testing during this monitoring period due to results above or below the LOR; and
- Continue monitoring at site A3 until at least the completion of the WWTP upgrade and ensure that site A2 sampling is collected downstream of the discharge point of the artificial wetland. This recommendation is based on evidence from the 2024 and 2025 annual monitoring events, which showed elevated conductivity and DRP downstream of the artificial wetland discharge point, which is the likely cause of the increase in conductivity that was recorded in Tributary A during the 2021 monitoring.
- Monitor change in hydrochemical characterisation to confirm changes in water chemistry are temporary and related to the recent instream works.
- WWTP upgrades are currently being undertaken to improve water treatment at the facility. Should ecological improvements be detected in future annual monitoring, an update to the REMP may be recommended to refine monitoring based on the ecological risk.

1.0 Introduction

Watercare Services Limited (Watercare) have engaged AECOM New Zealand Limited (AECOM) to undertake freshwater ecological surveys in accordance with the Wellsford Wastewater Treatment Plant (WWTP) Receiving Environmental Monitoring Plan (REMP) (Watercare, 2021). The REMP is a requirement of the WWTP's resource consent conditions.

This report presents the results of the ecological surveys completed by AECOM in April 2025 and the quarterly water quality monitoring completed by Watercare for 2024 to 2025.

1.1 Operation of the Wellsford WWTP

The Wellsford WWTP has been in operation since 1972 and is currently operated by Watercare. It was established to treat wastewater from the township and a small portion of industrial wastewater. Today the WWTP treats all municipal wastewater from the Wellsford and Te Hana townships (estimated population: 2049) and wash down water from nearby cattle sale yards.

The treatment system currently consists of a 5-ha oxidation pond equipped with aerators and two curtains to provide primary and secondary treatment areas (Figure 1-1). The pond can treat wastewater from 5,000 persons at 84 kg biochemical oxygen demand (BOD) per day. The WWTP has an ultrafiltration plant, which has been operational since February 2016. Treated wastewater from the wetland is then discharged into an unnamed tributary (hereafter referred to as Tributary A, illustrated on Figure 2-1) of the Hōteo River via a 300 mm diameter pipe.

An upgrade to the WWTP commenced in 2024 with an expected completion in 2026. The purpose of the upgrade is to enhance the treatment process and involves installing advanced Membrane Aerated Biofilm Reactors (MABR) and Membrane Bioreactors (MBR) at the plant. The new technologies use microorganisms to improved nitrogen removal process, and it is anticipated that this will result in cleaner water being discharged. Construction activities related to the upgrade, including instream works at Tributary A, were occurring the 2025 monitoring period.

Figure 1-1 WWTP layout

1.2 Historical monitoring

Since 2006, Watercare has undertaken annual monitoring of the receiving watercourses, which includes the Hōteo River, as part of the compliance monitoring required by Auckland Council (and formerly Auckland Regional Council)[2]. From 2006 to 2017, annual monitoring followed guidelines set out in the Rodney District Council (RDC) Wellsford Monitoring Plan (Kingett Mitchell, 2006). These included assessments of water quality, instream habitat and ecology, and riparian characteristics.

Monitoring has generally been completed in February or March during baseline conditions; however, there were instances, such as in 2017 (AECOM, 2017) and 2021 (AECOM, 2021), where monitoring was completed in April due to high rainfall in the Auckland region. During 2020, monitoring could not be completed during the normal period due to Covid-19 restrictions. The 2020 monitoring (AECOM, 2020) was completed during June of that year. During 2025, monitoring was completed in April due to unavoidable scheduling constraints relating to construction adjacent to Tributary A.

1.3 Consent renewal

In 2017, Watercare was granted a resource consent renewal to discharge wastewater to Tributary A of the Hōteo River (Discharge permit DIS60068492). Condition 39 of this consent requires Watercare to prepare and implement a plant specific REMP. Condition 41 specifies the following monitoring requirements:

- Water quality, stream and riparian habitat and stream biology sampling of Tributary A, Tributary B and the Hōteo River. Sampling points shall include locations above and below the mixing of the water body with the discharge (Condition 41.i.);
- Quarterly monitoring of instream water quality in January, April, July and October each year during baseflow conditions (Condition 41.ii.); and
- Monitoring of stream and riparian habitat, and instream biology to be conducted once annually during the period November – April (Condition 41.iv.).

1.4 Scope and purpose

The purpose of this Annual Ecological Monitoring Report (2025) is to assess the potential impacts of discharge from the Wellsford WWTP on the receiving freshwater environment. This includes analysis of instream and riparian habitat quality (habitat availability and quality) and bioindicators (biotoxicity, macroinvertebrate communities and diatom communities). In accordance with the REMP (Watercare, 2021), this study aimed to identify any variation in the water quality (including aquatic toxicity) and the aquatic community assemblages, that may be attributed to the WWTP activities.

The scope of the ecological survey aims to inform potential ecological effects associated with the WWTP in terms of (i) aquatic toxicity, (ii) stream function and (iii) community assemblages. The main components of the scope include:

- Analysis of instream water quality results obtained by Watercare during quarterly water quality monitoring as required under the REMP. Included in this assessment is the annual water quality data generated as part of the ecological monitoring by AECOM;
- Hyrdrochemical characterisation of major ions;
- Spatial variation in conductivity as an indicator of point source pollution;
- An assessment of instream habitat availability using the Invertebrate Habitat Availability Assessment. The specific application of this assessment is to assist with the interpretation of the macroinvertebrate assessment results;

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[2] Bioresearches (1999); Poynter & Associates (2005); Kingett Mitchell (2005-2007); Golder (2008-2010); URS (2011-2014); AECOM (2015-2018).

- Assessment of the instream macroinvertebrate communities and analysis using different variants of the Macroinvertebrate Community Index (MCI) and community metrics to denote overall stream health; and
- Whole Effluent Toxicity Testing screening assessment using a single concentration exposure on *Daphnia magna;*
- Diatom community analysis was included for the monitoring locations. Diatoms are autotrophic (produce their own food) and represents a potential stress response at a primary production level and may therefore aid the understanding of potential ecological effects over multiple trophic levels.

2.0 Methodology

2.1 Literature review and desktop study

A desktop study was undertaken to determine any new or applicable information with regards to the greater catchment area, associated ecoregions, nature of the drainage systems and overall catchment utilisation. Reference was made to the following desktop information: Ecological regions and districts (McEwen, 1987); river ecological classification (Snelder et al., 2010), national modelled river hydrology data (Ministry for the Environment, 2022).

2.2 Field survey and site selection

In accordance with Consent Condition 41, annual ecological surveys and quarterly surface water quality sampling were undertaken at locations upstream and downstream of the discharge mixing points in Tributary A, Tributary B, and the Hōteo River (Figure 2-1). The monitoring sites are delineated in the REMP (Watercare, 2021) and include seven sites[3]. The coordinates for each monitoring site are provided in Table 2-1 and provide the starting point for each SEV sample reach. The locations of each site in relation to the Wellsford WWTP is illustrated in Figure 2-1 and a photographic log showing instream and riparian conditions from 29 April 2025 is provided in Appendix A.

Table 2-1 Wellsford ecological monitoring sites grid references

Monitoring Sites		Coordinates	
Site	**Description**	**WGS 1984 Latitude**	**WGS 1984 Longitude**
A1	Tributary A upstream (Control Site)	-36.307224	174.539186
A2	Tributary A downstream (Test Site)	-36.308670	174.543124
A3	Tributary A downstream (Secondary Test Site)	-36.309028	174.544104
B1	Tributary B upstream (Control Site)	-36.308616	174.553514
B3	Tributary B downstream (Test Site)	-36.314169	174.551463
H3	Hōteo River upstream (Control Site)	-36.317314	174.555725
H2	Hōteo River downstream (Test Site)	-36.323102	174.554258

[3] An additional monitoring point at Tributary A (Site A3) has been included since 2022 due to an increase in conductivity in this area recorded during the 2021 monitoring, this is a secondary test site for Tributary A.

Figure 2-1 Monitoring sites (A1, A2, A3, B1, B3, H3, and H2) in relation to the WWTP Oxidation Pond and WWTP Discharge Point

2.3 Water quality

2.3.1 Discharge point water quality

This report includes an overview of the weekly ammonia and total nitrogen measurement undertaken by Watercare. This was achieved through the inclusion descriptive statistics (median, minimum, maximum etc.) for these two constituents for weekly monitoring results during the period May 2024 to April 2025. Values were compared to the NPS:FM attribute bands.

2.3.2 Watercare quarterly monitoring data

Monitoring data constituents collected quarterly by Watercare and repeated by AECOM during the annual biomonitoring is outlined in Table 2-2.

The variation in data for all variables was represented in Tukey box-and-whiskers plots showing the data range including median, upper quartile (75th percentile), 99th percentile, lower quartile (25th percentile) and 1st quartile distributions. All values exceeding the upper or lower quartile by 1.5 times were represented as outliers. The 2025 results were added to the overall data set and are included within the box-whiskers plots. Where relevant, measurements were compared to NPS:FM attribute bands and the Australian and New Zealand guidelines for freshwater and marine water quality (ANZG Guidelines) (ANZG, 2018).

A two-sample t-test ($p < 0.05$)[4] was used to assess statistical significance in the difference in water quality parameters between the control sites and their respective test sites for the 2024 to 2025 monitoring period.

Table 2-2 In situ, nutrients and microbial water quality parameters measured

Water Quality Parameters	Abbreviation	Units	Watercare Quarterly	AECOM Annually
***In situ* variables**				
pH	pH	[H¹+ ions]	-	✓
Temperature	Temp	°C	✓	✓
Electrical Conductivity	EC	$\mu S\text{-}cm^{-1}$	✓	✓
Dissolved Oxygen	DO	mg/L	✓	✓
Dissolved Oxygen	DO%	%	✓	✓
Clarity	Clarity	cm	-	✓
Nutrients and General				
Total Suspended Solids	TSS	mg/L	✓	✓
Biochemical Oxygen Demand	BOD5	mg/L	✓	✓
Ammoniacal-Nitrogen	NH_4-N	mg/L	✓	✓
Nitrate	NO_3-N	mg/L	✓	✓
Nitrite	NO_2-N	mg/L	✓	✓
Total Nitrogen	N	mg/L	✓	✓
Dissolved Reactive Phosphorus	SRP	mg/L	✓	✓
Microbial				
Escherichia coli	*E.coli*	cfu/100mL	✓	✓
Total Coliforms	Tot. coliforms	cfu/100mL	✓	✓

Notes: ✓ = Water quality parameter sampled.

[4] A Wilcoxon Rank-Sum Test was used when the data was not normally distributed.

2.3.3 Hydrochemical characterisation

The hydrochemical characterisation of each monitoring site was determined using piper diagrams generated using Rockware AquaChem©. Piper diagrams involve plotting cations (magnesium, calcium, sodium, and potassium) and anions (chloride, carbonate, bicarbonate, and sulphate) on adjacent tri-linear fields. These points are then extrapolated to a central diamond. Different water types will plot differently within the piper diagram. The area in which a specific water type plots is diagnostic of the water type (character). The spatial ordination of different samples from the same stream is indicative of changes in water quality.

2.3.4 Spatial variation in conductivity

Spatial variation in conductivity was measured using a YSI ProDSS between 10 metres before the WWTP discharge point and 105 metres downstream of the WWTP discharge point. The extent of these readings is presented in Figure 2-2. The aim of the conductivity readings was to elucidate a potential contamination gradient and/or to pinpoint specific areas along the profile of the stream where a change in salt load indicates a potential contamination point.

Longitudinal conductivity readings were initially introduced during the 2022 monitoring, covering approximately 1 km of stream with readings taken every 100 metres. However, in previous years it was observed that the likely contamination point was situated between the WWTP discharge point and monitoring site A3. As a result, the 2025 monitoring incorporated readings approximately every 10 metres within this section to more accurately identify the specific location of potential contamination.

Figure 2-2 Extent of Tributary A longitudinal conductivity readings

2.4 Ecological surveys

AECOM undertook ecological surveys from 29-30 April 2025. The following surveys were completed at all monitoring sites:

i. Instream and riparian habitat assessment

ii. Invertebrate habitat availability assessment

iii. Aquatic macroinvertebrate assessments

iv. Whole Effluent Toxicity (WET) testing

v. Diatom assessments

2.4.1 Instream and riparian habitat assessment

Physical habitat quality of the instream and riparian habitat was assessed through adopting the Stream Ecological Valuation (SEV) reach scale habitat quality assessment for a 100 m reach representing each monitoring location. The results of the habitat quality assessment were interpreted separately for instream (the first four parameters from Figure 2-3) and riparian components (the last parameter). Results for both components were averaged and described based on the corresponding class (Optimal, Suboptimal, Marginal, and Poor) as outlined in Figure 2-3. The results of the habitat quality assessment were interpreted spatially (between sites) and temporally (between years).

$V_{physhab}$	Physical habitat quality (Page 58)			
Habitat Parameter	**Optimal**	**Suboptimal**	**Marginal**	**Poor**
Aquatic Habitat Diversity	Wide variety of favourable aquatic habitat types present including: woody debris, riffles, undercut banks, root mats, rooted aquatic vegetation, cobble or other stable habitat.	Moderate variety of habitat types; 3-4 habitats present including woody debris.	Habitat diversity limited to 1-2 types; woody debris rare or may be smothered by sediment.	Favourable habitats lacking or limited to macrophytes (a few macrophyte species scores lower than several).
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
Aquatic Habitat Abundance - proportion of stream channel occupied by suitable habitat features for in-stream fauna	> 50% of channel favourable for macroinvertebrate colonisation and fish cover; includes woody debris, undercut banks, root mats, rooted aquatic vegetation, cobble or other stable habitat.	30-50% of channel contains favourable habitat.	10-30% of channel contains favourable habitat.	< 10% of channel contains favourable habitat. Note: Algae does not constitute stable habitat.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
Hydrologic Heterogeneity	Mixture of hydrologic conditions i.e. pool, riffle, run, chute, waterfalls; variety of pool sizes and depths.	Moderate variety of hydrologic conditions; deep and shallow pools present (pool size relative to size of stream).	Limited variety of hydrologic conditions; deep pools absent (pool size relative to size of stream) .	Uniform hydrologic conditions; uniform depth and velocity; pools absent (includes uniformly deep streams).
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
Channel Shade	>80% of water surface shaded. Full canopy.	60 - 80% of water surface shaded; mostly shaded with open patches.	20 - 60% of water surface shaded; mostly open with shaded patches.	<20% of water surface shaded. Fully open; lack of canopy cover.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
Riparian Vegetation Integrity (within 20 metres)	No direct human activity in the last 30 years; mature native tree canopy and intact native understorey	Minimal human activity; mature native tree canopy or native scrub; understorey shows some impact (e.g. weeds, feral animal grazing).	Extensive human activity affecting canopy and understorey; trees exotic (pine, willow, poplar); understorey native or exotic.	Extensive human activity; little or no canopy; managed vegetation (e.g. livestock grazing, mowed); permanent structures may be present (e.g. building, roads, car parks).
Left bank	10 9	8 7 6	5 4 3	2 1 0
Right bank	10 9	8 7 6	5 4 3	2 1 0

Figure 2-3 Physical habitat quality assessment adopted from the SEV reach scale metrics (Storey et al. 2011)

2.4.2 Invertebrate Habitat Availability assessment

Invertebrate Habitat Availability (IHA)[5] was assessed through adopting a similar method from McMillan (1998). The semi-quantitative assessment considers the availability of different substrate and flows through assigning an abundance score from 0 (none available) to 5 (maximum quantity in criteria available). The criteria for different habitat units and scores are provided in Appendix E. The scores for different habitat units are combined for an overall IHA score out of 55 which can fall into one of four categories described in Table 2-3. The results of the habitat availability assessment informed the interpretation of the macroinvertebrate assessment (refer Section 2.4.3), in that, it provides a control for the influence of habitat on invertebrate assemblages. Sites with similar habitat availability but with different invertebrate assemblages indicates that water quality is the main driver for differences within invertebrate assemblages.

Table 2-3 Interpretation of IHA scores in relation to Diversity and Pattern

Habitat Score Description	IHA Score Range
Very High habitat availability	> 45
High habitat availability	> 30 and ≤ 45
Moderate habitat availability	>15 and ≤ 30
Low habitat availability	≤ 15

2.4.3 Macroinvertebrate community assessment

The value of macroinvertebrates as bioindicators are well known and they are widely applied as indicators of ecological stress and have also been shown to respond to WWTP effluent (Suckling, 1982).

Instream macroinvertebrate communities were sampled at each monitoring site following protocols developed for the sampling of macroinvertebrates in wadeable, soft-bottomed streams in New Zealand (Stark et al*.,* 2001). Using protocol C2 (soft-bottomed, semi-quantitative) (Stark et al., 2001) a substrate area of approximately 3 m^2 was manually disturbed at various locations at each site. Dislodged organisms and materials were then swept up using a D-net (0.5 mm mesh). Sampled substrate types varied according to availability at each site, but included submerged wood and macrophytes, banks, margins and overhanging vegetation.

Composite samples were preserved on-site in ethanol and shipped to a qualified macroinvertebrate taxonomist where they were processed following protocol P3 (full count with subsampling option) (Stark et al., 2001).

The analyses of macroinvertebrate data included:

- Taxonomic richness – the number of macroinvertebrate taxa recorded at each site; and
- Macroinvertebrate Community index (MCI) (Stark, 1985) is a standardised method used in New Zealand to assess water quality in streams. The index reflects changes in taxonomic composition and uses a scoring system between 1 (tolerance to organic enrichment) and 10 (sensitive to organic enrichment) to assign a value to each taxon. The soft-bottom variant MCI-sb has been used to evaluate stream health (refer to Table 2-4).

All temporal and spatial data were represented through Tukey box-and-whiskers plots. Where applicable, category thresholds were indicated on the graphs as well as the 2025 monitoring value (as a blue dot) and in relation to the previous year's observation (as a red dot). The REMP review determined that the MCI-sb scores provides the best indicator of changes in water quality and although all the invertebrate metrics are included and discussed in this report, inferences based on the MCI-sb scores are provided with a higher confidence.

[5] The assessment of invertebrate habitat availability is based on the availability of suitable invertebrate habitat sampled.

Table 2-4 Interpretation of MCI-sb scores to denote stream health as per NPS:FM attribute bands A, B, C, and D (MfE, 2024)

MCI-sb	NPS:FM Attribute Band	Description
≥130	A	Macroinvertebrate community, indicative of pristine conditions with almost no organic pollution or nutrient enrichment.
≥110 and <130	B	Macroinvertebrate community indicative of mild organic pollution or nutrient enrichment. Largely composed of taxa sensitive to organic pollution/nutrient enrichment.
≥90 and <110	C	Macroinvertebrate community indicative of moderate organic pollution or nutrient enrichment. There is a mix of taxa sensitive and insensitive to organic pollution/nutrient enrichment.
<90	D	Macroinvertebrate community indicative of severe organic pollution or nutrient enrichment. Communities are largely composed of taxa insensitive to inorganic pollution/nutrient enrichment.

2.4.4 Whole Effluent Toxicity testing

Whole Effluent Toxicity testing (WET testing) provides a measure of the aggregate of toxicity of effluent and can be completed for chronic or acute toxicity over several trophic levels (bacteria, algae, invertebrates and fish). Definitive testing over multiple trophic levels is typically applied to ascertain a dose response curve which in turn informs the dilution requirement of toxic effluent. In the context of this assessment, we applied toxicity testing experimentally, to control for potential toxicity (in addition to the invertebrate community-based endpoint). Accordingly, an acute screening WET test over a single trophic level (invertebrates-*Daphnia magna*) was completed to indicate potential toxicity of effluent in relation to that of the receiving environment.

Grab samples were collected at all monitoring sites (A1, A2, A3, B1, B3, H2, and H3) including the discharge point for WET testing. Samples were collected in 500 ml bottles and immediately sent to NIWA for analysis. Testing was completed using *Daphnia magna* in a 48-hour acute survival screening test, based on the NIWA Standard Operating Procedure 10.1- Daphnid acute toxicity test procedure[6] (Appendix F).

2.4.5 Diatom community assessment

Diatoms were collected at all monitoring locations. Although not generally used in New Zealand, diatoms are commonly used internationally as indicators of river and wetland health as they provide a rapid response to water quality and are often the first indication of change (Besse-Lototskaya et al*.,* 2011). The presence or absence of indicator taxa can be used to detect specific changes in environmental conditions such as eutrophication, organic enrichment, salinization, and changes in pH. They are therefore useful for providing an overall picture of trends within an aquatic system as they show an ecological memory of water quality over a period.

There are different diatom-based water quality indices that are used globally and are based on the specific water quality tolerances of diatoms. Most of the indices are based on a weighted average equation by Zelinka & Marvan (1961). Two values are assigned to each diatom species used in the calculations of the indices that reflects the tolerance or affinity of the diatom species to a certain water quality (good or bad); and indicates how strong (or weak) the relationship is (Taylor, 2005). These values are then weighted by the abundance of the diatom species in the sample (Lavoie et al., 2006; Taylor, 2005). The main difference between indices is in the indicator sets (number of indicators and list of taxa) used in calculations (Eloranta & Soininen, 2002). These indices underpin the software packages used to estimate biological water quality. One such software package commonly used and approved by the European Union is OMNIDIA (Lecointe et al., 1993). The program is a taxonomic and ecological database of 7500 diatom species, and it contains indicator values and degrees of sensitivity

[6] NIWA (1995) Standard Operating Procedure 10.1. Daphnid acute toxicity test procedure. National Institute of Water and Atmospheric Research, Hamilton, New Zealand: 9.

for given species. It allows rapid calculations of indices of general pollution, saprobity and trophic state, indices of species diversity, as well as of ecological systems (Szczepocka, 2007).

In the context of this assessment, one diatom index was selected namely the Percentage Pollution Tolerant Value (%PTV). The %PTV is part of the UK Trophic Diatom Index (TDI) (Kelly & Whitton, 1995) and was developed for monitoring organic pollution (using sewage outfall- orthophosphate-phosphorus concentrations), but not general stream quality (Table 2-5). The %PTV has a maximum score of 100, where a score of 0 indicates no organic pollution and a score of 100 indicates definite and severe organic pollution. The presence of more than 20% PTVs shows organic impact. The Interpretation of the Specific Pollution Sensitivity index (SPI) is based between scores of 0-20, where a score of zero is indicative of an increasing level of population while a score of 20 indicates no pollution. The interpretation of the SPI score is provided in Table 2-6. All calculations were computed using OMNIDIA ver. 4.2 programme (Lecointe et al., 1993).

During the 2025 annual monitoring, crates filled with river rocks were installed at each monitoring location as artificial substrates. The purpose of the artificial substrates is to provide a stable and consistent substrate for sampling diatoms, and it is recommended to be used for future monitoring events.

Table 2-5 Interpretation of the percentage Pollution Tolerant Valves scores (adapted from Kelly, 1998)

%PTV	Interpretation	Descriptor
< 20	Site free from organic pollution	Good
20 to < 40	There is some evidence of organic pollution	Moderate
40 to 60	Organic pollution likely to contribute significantly to eutrophication	Poor
> 60	Site is heavily contaminated with organic pollution	Bad

Table 2-6 Interpretation of the Specific Pollution Sensitivity Index (Adapted from Eloranta & Soininen, 2002; Harding & Taylor, 2011)

Index Score (SPI Score)	Ecological Category (EC)	Descriptor
>17.3	A	High Quality
16.8-17.2	A/B	
13.3-16.7	B	Good Quality
12.9-13.2	B/C	
9.2-12.8	C	Moderate Quality
8.9-9.1	C/D	
5.3-8.8	D	Poor Quality
4.8-5.2	D/E	
<4.8	E	Bad quality

3.0 Results

This section outlines the results of specific 'drivers' (abiotic and/or habitat aspects by which the assemblages of organisms/responders are predicated) including a general description of site conditions (Sections 3.2), water quality (Section 3.3), physical habitat quality (Sections 3.4.1 and 3.4.2) and the subsequent biological 'responses' to these drivers; macroinvertebrate community assessments, *Daphnia magna* toxicity, and diatom community assessments (Sections 3.4.3 to 3.4.53.4.4) in relation to the WWTP discharge.

Rainfall records were obtained from a weather station (643510 - Hoteo at Oldfields) owned by Auckland Council (2025). This was the closest weather station to the Site that was operational at the time of surveying. These records are presented in Table 3-1.

Table 3-1 Rainfall records from the nearest available weather station for the two weeks prior to sampling

Date	Rainfall (mm)
15 April 2025	0.0
16 April 2025	23.5
17 April 2025	45.5*
18 April 2025	22.6
19 April 2025	9.90
20 April 2025	4.0
21 April 2025	1.0
22 April 2025	2.5
23 April 2025	0.5
24 April 2025	0.0
25 April 2025	0.0
26 April 2025	9.5
27 April 2025	30.5*
28 April 2025	11.0

Notes: * = Denotes rainfall event exceeding 25 mm in a 24-hour period. Due to unavoidable scheduling constraints relating to construction adjacent to Tributary A, the resampling was collected within 2 weeks of a rainfall event exceeding 25 mm in a 24-hour period. This deviation was necessary to ensure that the resampling was completed within the required month as per the consent.

3.1 Catchment and stream characterisation

The study area is located on an ecotone between the Rodney and Kaipara ecological regions. Monitoring sites on the Hōteo River fall within the former and sites in the tributaries fall within the latter (McEwen, 1987). The ecological district for the Hōteo River is Eastern Northland and the Ōtamatea for the other monitoring sites.

An overview of stream characterisation information for each monitoring site is provided in Table 3-2. The sub-catchments (Tributary A and B) drain a pastoral area extending over approximately 673 ha, prior to their confluence with the Hōteo River. The much larger Hōteo River which, at the monitoring location drains a catchment of over 18,000 ha and measures mean annual flows 28 times that of Tributary A and B (Table 3-3).

Watercourses within these ecological districts vary widely, but are generally consist of hard sedimentary, miscellaneous or soft bottom, low gradient streams associated with a warm wet climate (Table 3-2). Baseflows are relatively high but with large seasonal variation (Table 3-3). Modelled mean annual low flows are approximately 10 times less than that of the mean annual flows. The dominant landcover is pastoral and has remained mostly unchanged during the monitoring period (2009 to 2025).

Table 3-2 Stream characterisation including climate, stream order, slope, landcover and geology (Snelder et al., 2010)

Site	River Name	Climate	Catchment size (ha)	Order	Gradient	Landcover
A1 Control	Tributary A	Warm wet	187	2	Low	Pastoral
A2 Test	Tributary A	Warm wet	289	2	Low	Pastoral
A3 Secondary Test	Tributary A	Warm wet	~295	2	Low	Pastoral
B1 Control	Tributary B	Warm Wet	241	2	Low	Pastoral
B3 Test	Tributary B	Warm Wet	673	3	Low	Pastoral
H3 Control	Hōteo	Warm wet	18,645	5	Low	Pastoral
H2 Test	Hōteo	Warm Wet	19,443	5	Low	Pastoral

Table 3-3 Approximated (modelled) hydrological data including mean annual flows and mean annual low flows for stream reaches associated with monitoring sites (Ministry for the Environment, 2022)

Sites	Mean annual (m^3/s)	Mean annual low flow[7] (m^3/s)
A1 Control	0.036	0.0034
A2 Test	0.057	0.0054
A3 Secondary Test	0.057	0.0054
B1 Control	0.047	0.0046
B3 Test	0.132	0.0136
H3 Control	3.785	0.3340
H2 Test	3.956	0.3560

3.2 Site description

A photographic log of site conditions during the 2025 monitoring event is included in Appendix A. It is noted that instream conditions at all sites at the time of sampling reflected recent high rainfall events, resulting in higher flow velocities and greater water depths compared to previous monitoring rounds. During the 2025 monitoring period, there was construction works adjacent to Tributary A, including instream works at the artificial wetland discharge point at A2, where a new discharge point had been installed.

3.2.1 Tributary A

Tributary A is a soft-bottomed stream of low gradient and velocity (<0.3 m^3/s). The channel and margins have undergone modification as a result of historical land use change. The upstream catchment is largely composed of rural farmland. No canopy cover remains at Tributary A. There was macrophyte growth present in sites A1, A2, and A3, and woody debris present in A1. During the 2025 monitoring period, there was construction works adjacent to Tributary A, including instream works at the artificial wetland discharge point at A2, where a new discharge point had been installed, including riprap. These works were related to the ongoing upgrade of the WWTP as described in Section 1.1. No major changes since the previous monitoring year were observed at A1 and A3.

[7] Seven day mean annual low flow.

3.2.2 Tributary B

At B1, there is dense macrophyte growth in the stream except under the road bridge. To the south, the stream is unfenced and heavily impacted by stock grazing and heavily incised. The stream is fenced to the north of the road and riparian vegetation is less overgrown. Site B3 has macrophyte growth with limited woody debris, and the only stream shade cover is artificial from the road bridges. The stream is fenced, and heavily incised. No major changes since the previous monitoring year were observed at either site.

3.2.3 Hōteo River

The Hōteo River is much larger than Tributaries A and B. Like the tributaries, the river is soft-bottomed and of low gradient; however, it is faster flowing, with an average velocity of approximately 0.3 m^3/s. Although the wider catchment has been impacted by land use change, the riparian margins are less disturbed, and several contributing tributaries also flow through the Dome Forest to the east.

Riparian vegetation continues to grow back following a large flood event in early 2023, but instream fish and invertebrate habitat is still limited in both the upstream and downstream sample reach for the Hōteo River (sites H2 and H3). No major changes since the previous monitoring year were observed at either site.

3.3 Water quality

3.3.1 Discharge point water quality

Descriptive statistics of nitrate and ammonia levels within the final effluent for the period 1 May 2024 to 30 April 2025 in relation to the relevant NPS:FM attribute bands is presented in Table 3-4. The median nitrate value was within Band C, and the 95th percentile nitrate value was within Band D. The median ammonia value was within Band C, and the 95th percentile ammonia value was within Band D (largely impaired). Generally, nitrate levels were higher than ammonia levels during the 2024-2025 period.

The previous annual results from the preceding five years are provided in Table 9-13 in Appendix B.

Table 3-4 Descriptive statistics of nitrate and ammonia weekly observations of final effluent quality (May 2025 to April 2025) compared to the NPS:FM attribute bands

Descriptive Statistics	Nitrate (mg/L)	Ammonia (mg/L)
Annual Median	4.51	0.40
Annual 95th Percentile	12.48	15.00
Annual Maximum	16.90	20.00
Range[8]	16.82	19.97
Number of Observations	50	50

Notes: Green = Band A (healthy), Yellow = Band B (slightly impaired), Orange = Band C (moderately impaired), Red = Band D (largely impaired).

3.3.2 Watercare quarterly monitoring data

Analytical results for water quality samples are presented in Appendix B. The following reports on notable results from the last annual monitoring cycle (2024-2025) and historical differences are reported on for context and reference where necessary. In summary:

- No statistically significant difference between the control sites and their respective test sites for the following parameters was recorded during the last annual monitoring cycle:
  - Dissolved oxygen (Table 9-1)
  - Temperature (Table 9-2)

[8] Range as determined by the difference between the maximum and the minimum values.

- Conductivity (Table 9-3)
- Biological Oxygen Demand (Table 9-5)
- Total Suspended Solids (Table 9-6)
- Ammoniacal Nitrogen (Table 9-8)
- Nitrate Nitrogen (Table 9-9)
- *Escherichia coli* (Table 9-11)
- Total coliforms (Table 9-12)

- Similarly to previous years, there was a significant difference in dissolved reactive phosphorous (DRP) between site B1 and B3, with higher levels of DRP recorded at site B3 (Table 9-10). This increase was not reflected in the Tributary A sites, with no significant difference of DRP recorded between site A1 and A2. The increase in DRP was also not reflected in the Hōteo River sites.
- pH is only monitored annually during the ecological monitoring (April 2025). All recorded pH values were below the ANZG Guidelines freshwater 20th percentile (WW-Low), and they represent some of the lowest levels since monitoring began in 2009. However, low pH levels were observed at all control sites, indicating a catchment-wide effect rather than influenced by the WWTP discharge. Two rainfall events (>25 mm in 24 hours) occurred in the two weeks prior to the survey, therefore it is possible that these rainfall events introduced acidic runoff or diluted buffering capacity, potentially contributing to the observed pH reduction across the catchment.
- Visual clarity is only monitored annually during the ecological monitoring (April 2025). At Tributary A, visual clarity was recorded higher than the historical range at A1 and within NPS:FM attribute band B, sites A2 and A3 were recorded within attribute band C, however results remain within the historical range. This suggests a decline in clarity downstream, but not beyond historically observed variability. At Tributary B, visual clarity was recorded within attribute band A and higher than the historical range. At the Hōteo River sites, visual clarity was recorded within attribute band D and lower than the historical range, however the results were the same at both the control and impact site (35 cm), suggesting a catchment-wide influence. It is likely that the two rainfall events prior to monitoring contributed to increased sediment loads and reduced visual clarity, and therefore rainfall-driven catchment runoff, rather than point-source impacts, was the dominant factor affecting clarity.

3.3.3 Hydrochemical characterisation

Figure 3-1 and Figure 3-2 illustrates the hydrochemical characterisation (major ion signature) of all the monitoring sites, and the Discharge Point on a piper diagram during the March 2023 and April 2025 monitoring events[9], respectively. The diagram shows the spatial ordination, based on the similarity of major ions, between sites.

In 2025, the hydrochemical characterisation of site A1 remained consistent with previous years, presenting a calcium bicarbonate water type. In contrast, both downstream sites on Tributary A (A2 and A3), located below the discharge point, exhibited a calcium chloride water type. The discharge point also presented a calcium chloride water type, indicating a shift in water chemistry below A1.

Both Tributary B sites showed a calcium sulphate water type, differing from the calcium bicarbonate type observed in previous years. This suggests a notable change in hydrochemistry within this tributary. Tributary B sites may be partially influenced by inputs from Tributary A, however the distinct water type indicates that other catchment-specific factors (unrelated to the WWTP) are likely influencing the hydrochemistry. This is consistent with previous year's results.

Both Hōteo River sites presented a sodium chloride water type, consistent across the control and impact locations and similar to previous observations, indicating stable water chemistry in the main river stem.

[9] No hydrochemical characterisation is available for the 2024 monitoring due to laboratory error.

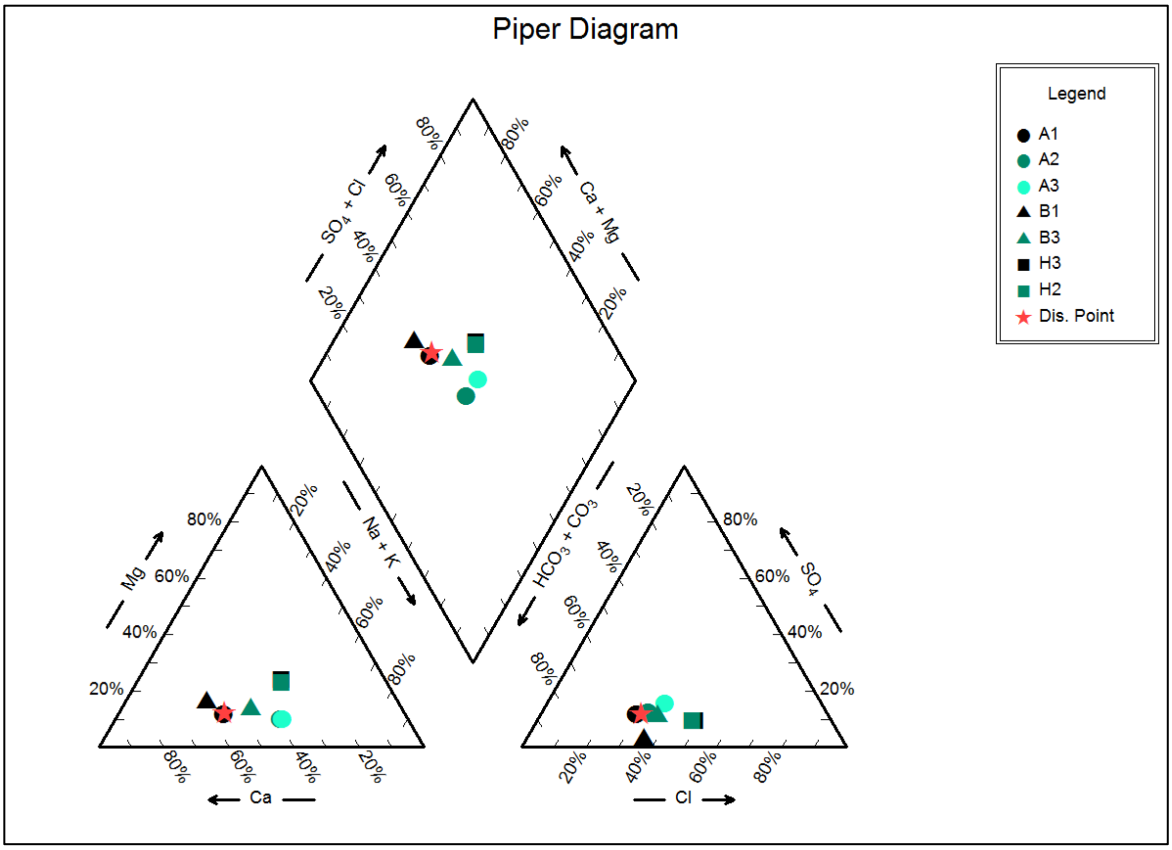

Figure 3-1 Piper diagram illustrating major ions at all sites during March 2023 monitoring

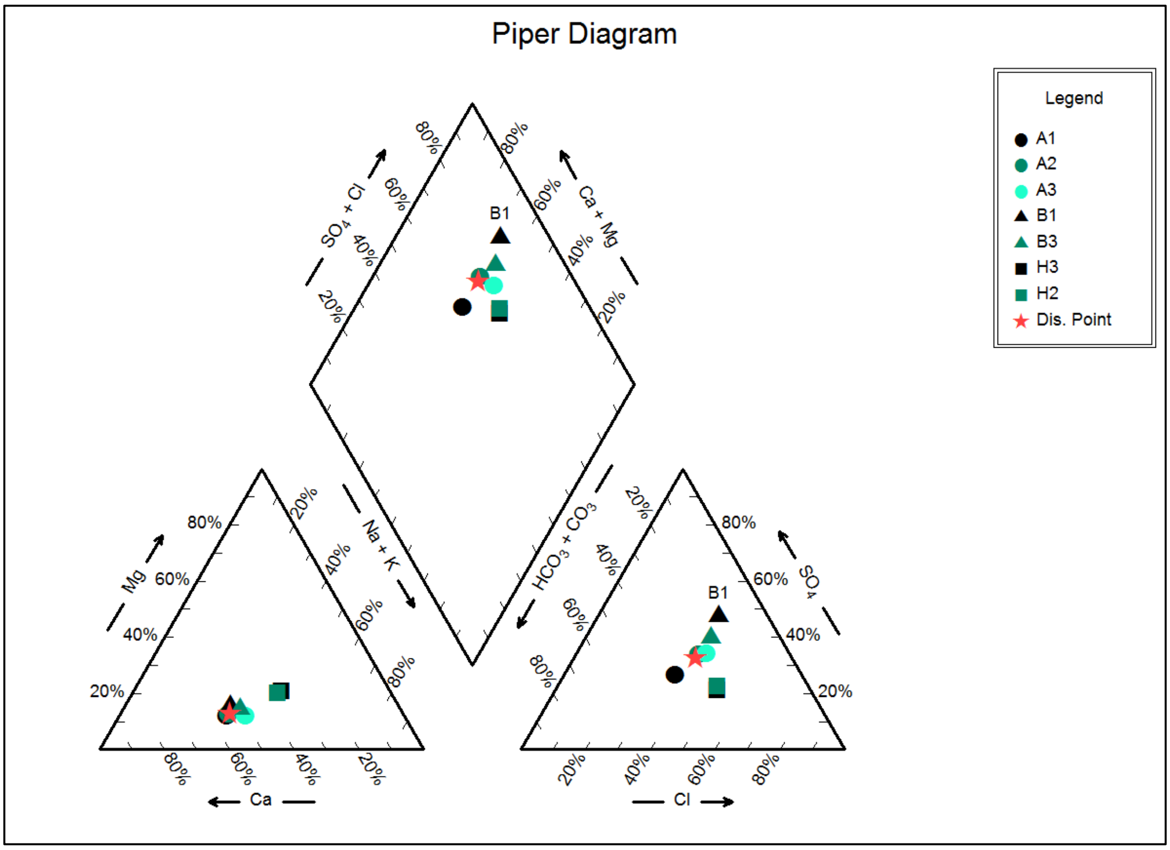

Figure 3-2 Piper diagram illustrating major ions at all sites during April 2025 monitoring

3.3.4 Spatial variation in conductivity

The spatial changes in the electrical conductivity along Tributary A are illustrated in Figure 3-3 (including location of monitoring sites of A2, A3, and the WWTP discharge point). An aerial image with the location of the observation points is provided in Figure 2-2.

Conductivity levels remained relatively stable from 10 metres upstream of the wastewater discharge point to 30 metres downstream (ranging between 217.6 µS/cm and 220.9 µS/cm). An increase in conductivity was observed at 30 metres, coinciding with the discharge point of the artificial wetland. This increase continued downstream, peaking at 50 metres with a maximum conductivity of 272.4 µS/cm. Conductivity remained elevated from 60 to 80 metres, ranging between 248.8 µS/cm and 260.8 µS/cm. At 100 metres, a reading was taken in a separate drain, which showed a low conductivity of 181.9 µS/cm, indicating the elevated conductivity levels is not attributable to the farm drain.

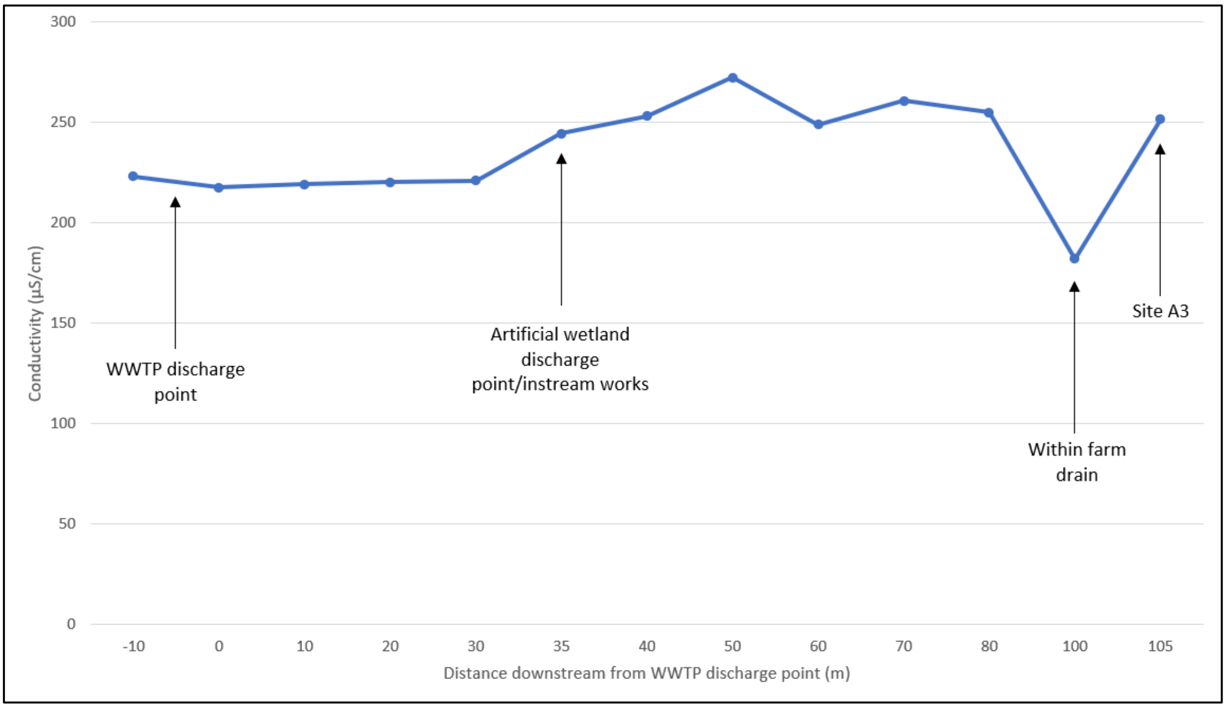

Figure 3-3 Spatial variation in longitudinal conductivity downstream from the WWTP discharge point

3.4 Ecological surveys

3.4.1 Instream and riparian habitat

Results of the 2025 instream and riparian habitat assessment are presented in Table 3-5 and the raw data is included in Appendix D. A photographic log depicting the general riparian habitat conditions is also included in Appendix A.

Tributary A sites scored ‘Marginal’ for Aquatic Habitat Diversity, while all other habitat parameters scored ‘Poor’, with the exception of Hydrologic Heterogeneity and Channel Shade at site A1. The relatively higher scores at A1 for these two parameters reflect a slightly greater range of hydrological conditions and increased shading from overhanging vegetation along the narrow channel, compared to the more uniform and exposed conditions at A2 and A3.

Tributary B sites scored between ‘Poor’ and ‘Marginal’ across all habitat parameters. Site B3 recorded higher scores than B1 for Aquatic Habitat Diversity and Aquatic Habitat Abundance, primarily due to the presence of woody debris at B3, which was absent at B1. In contrast, B1 scored higher in Channel Shade and Riparian Vegetation Integrity, due to increased shading from a road bridge and the absence of stock access/grazing impacts in the riparian zone.

Hōteo River sites H2 and H3 generally scored similarly, ranging from ‘Marginal’ to ‘Suboptimal’ across most parameters. The exception was Aquatic Habitat Diversity, which scored ‘Marginal’ at H2 and

'Suboptimal' at H3. This difference was attributed to a greater variety of habitat types at H3, including more extensive woody debris. While woody debris was also present at H2, it was limited in quantity and partially smothered by sediment, reducing its habitat value.

Overall, habitat scores across all sites in 2025 were comparable to those recorded during the 2024 assessment, indicating no substantial change in habitat condition over the past year.

Table 3-5 Instream and riparian habitat assessment results at sites A1, A2, A3, B1, B3, H3, and H2 (April 2025)

Habitat Parameter	Site						
	A1	A2	A3	B1	B3	H3	H2
Aquatic Habitat Diversity	Marginal	Marginal	Marginal	Poor	Marginal	Sub-optimal	Marginal
Aquatic Habitat Abundance	Poor	Poor	Poor	Poor	Marginal	Sub-optimal	Sub-optimal
Hydrologic Heterogeneity	Marginal	Poor	Poor	Marginal	Marginal	Sub-optimal	Sub-optimal
Channel Shade	Marginal	Poor	Poor	Marginal	Poor	Marginal	Marginal
Riparian Vegetation Integrity (Left Bank)	Poor	Poor	Poor	Marginal	Poor	Marginal	Marginal
Riparian Vegetation Integrity (Right Bank)	Poor	Poor	Poor	Marginal	Poor	Marginal	Marginal

3.4.2 Invertebrate habitat availability

A key consideration when interpreting macroinvertebrate community data is the quality of habitat availability (i.e., diversity and abundances of substrate or structure in relation to different flows). Sites with similar habitat availability but with differences within invertebrate community assemblages indicate changes in water quality. Although care is taken to standardise the sampling effort between sites, it will always be necessary to report on differences in habitat availability.

Results of the 2025 IHA assessment are presented in Table 3-6 and the raw data is included in Appendix E. Between 2024 and 2025, a decline in habitat availability was recorded at sites A1, A2, A3, and B1, with scores decreasing from 'Moderate' to 'Low'. This reduction is attributed to the limited availability of suitable invertebrate habitat at these sites, where only macrophytes were present, except for A1, which had some limited woody debris.

Site H2 showed an improvement in habitat availability, increasing from 'Poor' to 'Moderate'. No change was observed at sites B3 and H3 compared to 2024. At these three sites (H2, B3, and H3), a mixture of woody debris and macrophytes was available, providing a more diverse range of microhabitats for aquatic invertebrates.

Since habitat availability across the sampling sites is considered Low to Moderate, it is likely that the presence of more sensitive invertebrates is naturally constrained by habitat availability.

Table 3-6 Habitat availability assessment for sites A1, A2, A3, B1, B3, H3, H2 (April 2025)

IHA Parameter	A1	A2	A3	B1	B3	H3	H2
Substrate Score	2	0	0	0	2	7	9
Vegetation Score	13	13	13	14	16	13	13
Gravel/Sand/ Mud Score	0	0	0	0	0	0	0
IHA Total Score	15	13	13	14	18	20	22

IHA Parameter	A1	A2	A3	B1	B3	H3	H2
Diversity and Pattern Interpretation	Low	Low	Low	Low	Moderate	Moderate	Moderate

3.4.3 Macroinvertebrate community assemblages

Macroinvertebrate community results (MCI-sb) over the entire monitoring period (2009 – 2025) are depicted in Figure 3-4, and a summary of the 2025 results are presented in Table 3-7 are detailed further in Appendix C.

A total of 18 taxa were sampled during the April 2025 assessment. The highest number of taxa was sampled at site B1 (9 taxa) and the lowest number of taxa was sampled at site B3 (2 taxa). The dominant taxa (*Potamopyrgus*) at all sites (with the exception of Tributary B) are considered pollution tolerant at soft bottom sites (Landcare Research, 2025c). At B1, the dominant taxa were *Chironomus*, and at B3 the only taxa recorded was *Isopoda* and *Paracalliope*. *Chironomus* have low tolerance values and often indicate low oxygen and organic nutrient enrichment (Landcare Research, 2025b). *Paracalliope* can be abundant in streams with a wide range of water qualities and *Isopoda* indicate little about stream water quality (Landcare Research, 2025a).

The MCI-sb scores for sites A1, A2, A3, and B1 were within NPS:FM attribute band D indicating probable severe pollution and/or very poor habitat. In addition, the Tributary A sites scored lower than the historical range (since the assessment was introduced in 2021). It is likely that recent rainfall has impacted the habitat availability score as these sites scored ‘Low’ in invertebrate habitat availability, which is the lowest score since the assessment was introduced in 2021.

Sites B3, H3, and H2 were within attribute band C which is indicative or moderate organic pollution or nutrient enrichment. However, at Tributary B, the MCI-sb value scored higher than the historical range at both sites, and the impact site (B3) scored higher than the control site (B1). At the Hōteo River sites, the MCI-sb value was within the historical range at both sites, and the impact site (H2) scored higher than the control site (H3).

Table 3-7 Interpretation of MCI-sb scores to denote stream health as per NPS:FM attribute bands A, B, C, and D (MfE, 2024)

Site	A1	A2	A3	B1	B3	H3	H2
MCI-sb Value	38.4	44.7	22.7	88.7	90.0	92.5	108.7
NPS:FM Attribute Band	D	D	D	D	C	C	C

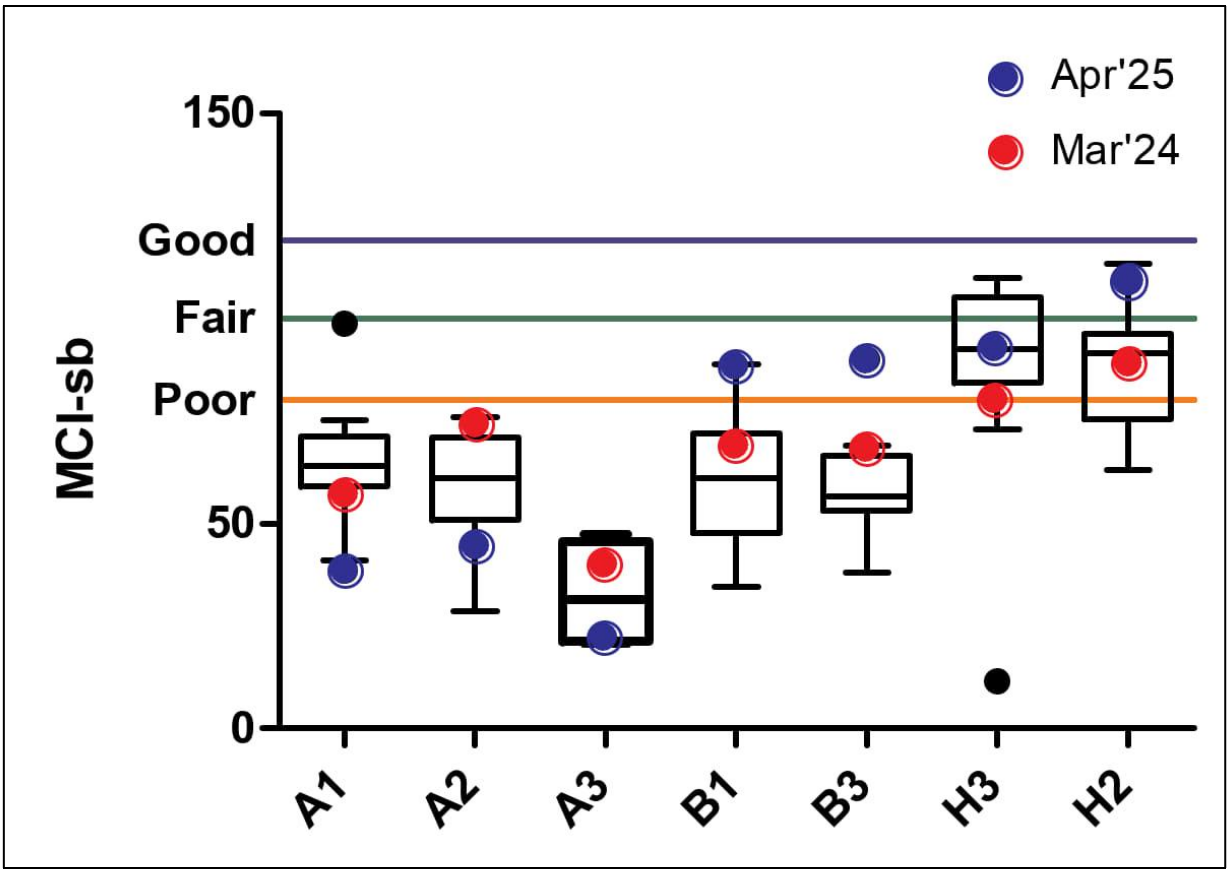

Figure 3-4 Spatial and temporal differences in water pollution levels as indicated by macroinvertebrate community index MCI-sb (2009 to 2025) (outliners denoted by black points)

3.4.4 Whole Effluent Toxicity Testing

The WET testing results (provided by NIWA) for the monitoring locations are presented in Table 3-8. Mean survival percentage and effect on survival percentage are provided below along with the hazard classification (described in Section 2.4.4). The *Daphnia* Toxicity Screen memorandum for 2025 is included in Appendix F. The results showed no significant toxicity effect at all sites with the exception of H2. Site H2 indicated toxicity effect with a significant reduction in survival (mean 77%) with a 22% effect on survival relative to the control.

Table 3-8 Acute toxicity results of water collected at sites A1, A2, A3, B1, B3, H3, H2 and the Discharge Point (April 2025)

Toxicity Metric		A1	A2	A3	B1	B3	H3	H2	Dis. Point [10]
Daphnia magna (water flea)	Mean survival %	100	93	100	93	100	100	77	97
	Effect on survival (%)	0	5	0	5	0	0	22	1

[10] The toxicity sample was taken in the waterbody immediately downstream of the discharge point (see Figure 2-1). Refer to Appendix F for a detailed methodology for the WET testing, noting that all samples were tested in triplicate at 100% of the sampled concentration and against a zinc sulfate control.

3.4.5 Diatoms community assemblages

A total of 89 diatom taxa were recorded at the seven monitoring sites and the dominant species recorded included *Nitzschia* sp., *Eunotia* sp., and *Gomphonema* sp. This is an increase in species richness compared to all previous diatom monitoring years (2021 to 2024).

The full Diatom Analysis Report for 2025 is included in Appendix G and SPI and %PTV results are presented in Table 3-9. In summary:

- Diatom assemblages recorded in April 2025 reflected ecological water quality ranging from Good (A1, B3) to Moderate (A2, A3, B1, H2, H3), consistent with fresh-brackish, circumneutral–alkaline, eutrophic conditions.
- The SPI values placed A1 (14.0) and B3 (14.8) in the Good category, while the remaining sites fell within the Moderate category (SPI; 9.2 to 11.8). Supporting %PTV values indicated low to moderate levels of organic pollution (%PVT; 5.5 to 25.8).
- Temporal analysis shows improvements at A1 (Moderate to Good) and B3 (Poor to Good), stability at A2, A3, and B1, and declines at H2 and H3 (Good to Moderate)[11].

Table 3-9 Diatom index scores for sites A1, A2, A3, B1, B3, H3, and H2 (April 2025)

Index Score	A1	A2	A3	B1	B3	H3	H2
%PTV	16.3	22.0	12.5	10.3	5.5	25.8	11.3
%PVT interpretation (as per Table 2-5)	Free from organic pollution	Evidence of organic pollution	Free from organic pollution	Free from organic pollution	Free from organic pollution	Evidence of organic pollution	Free from organic pollution
SPI	14.0	10.4	11.2	11.8	14.8	9.2	8.2
SPI interpretation (Ecological category as per Table 2-6)	B	C	C	C	B	C	C/D
SPI interpretation (Class as per Table 2-6)	Good	Moderate	Moderate	Moderate	Good	Moderate	Moderate

[11] Refer to the appendix of previous reports for diatom results from 2021 to 2024.

4.0 Discussion

Annual monitoring is undertaken within three watercourses (Tributary A, Tributary B and Hōteo River) to assess whether the discharge from the Wellsford WWTP is having a negative impact on the instream ecology of the receiving environment. The results of the quarterly Watercare water quality monitoring (2024 to 2025) and annual 2025 AECOM ecology assessment have been reported, and the following sections provide a discussion in relation to the previous year's monitoring results. During the 2025 monitoring period, there was construction works adjacent to Tributary A, including instream works at the artificial wetland discharge point at A2, where a new discharge point had been installed.

4.1 Discharge point water quality

During the 2024/2025 monitoring period, nitrate levels were generally higher than ammonia levels, indicating more effective nitrification than previous years. This is supported by the fact that median ammonia concentration was the lowest recorded since 2019 (NPS: Band C), while the median nitrate concentration was the highest recorded since 2019 (NPS:FM Band C). As identified in the 2020/2021 REMP review, sampling for specific point sources of contamination was recommended and additional biological responses via WET testing and diatom community assemblages were also included.

4.2 Water quality

The potential effects of the Wellsford WWTP discharge on the water quality to the receiving environment were assessed through the consideration of in situ variables, nutrients, and microbial parameters based upon the following monitoring results analyses:

- Watercare quarterly results for the last year (2024 to 2025) including the AECOM April 2025 monitoring.
- Historical review of available water quality data (2009 to 2025).

The only water quality parameter that showed a significant difference between the control sites and their respective test sites during the 2024 to 2025 monitoring period was DRP at Tributary B, with higher levels of DRP recorded at site B3 than B1. However, this increase was not reflected at the Tributary A or Hōteo River sites (with no significant difference between A1 and A2, and no significant difference between H3 and H2). This suggests that the higher levels of DRP are likely related to an influence that is unrelated to the WWTP discharge.

Although a significant increase of DRP was not observed in the Tributary A sites between A1 and A2, a substantial increase in DRP occurred at site A3 (from 0.040 mg/L at A2 to 0.340 mg/L at A3). This suggests that the heightened DRP concentration is likely attributable to the discharge from the WWTP's artificial wetland rather than stemming solely from the discharge point. This observation is further supported by the corresponding spike in conductivity recorded at site A3, which was not mirrored at site A2 or in the inflow from the farm drain immediately south of site A3 (Figure 3-3). The relationship between the increased DRP levels and the conductivity spike at site A3 suggests a point source discharge that is likely attributable to artificial wetland.

In 2025, hydrochemical characterisation revealed that site A1 maintained a calcium bicarbonate water type, consistent with previous years. However, both downstream sites on Tributary A (A2 and A3) and the discharge point presented a calcium chloride type, indicating a shift in water chemistry downstream of A1. This shift may be linked to recent instream works associated with the construction of the new discharge outlet, where the use of cement and concrete materials could have introduced additional calcium and chloride ions into the stream system. However, an ecological stress response was not observed in the 2025 annual monitoring[12]. The increase in DRP levels and shift in water chemistry were not reflected in Hōteo River sites. Overall, it is evident that the water quality to the receiving Hōteo River remains unaffected by the inflows from Tributary A and Tributary B.

[12] It is noted that an assessment for construction effects of instream works associated with the construction of the new discharge outlet is not within scope of the annual monitoring.

4.3 Macroinvertebrate community assemblages

MCI-sb index scores were determined to be better at predicting ecological effects due to changes in water quality (AECOM, 2020), therefore discussion points are based on the results of the MCI-sb index scores. The general community composition of aquatic invertebrates in Tributary A, Tributary B, and the Hōteo River sites were dominantly pollutant tolerant taxa commonly associated with soft sediment environments.

At Tributary A, MCI-sb scores were lower than the historical range, however the invertebrate habitat availability also scored the lowest score since the assessment was introduced in 2021. In addition, test site A2 scored higher than the control site. This suggests that the low MCI-sb scores are likely attributed to differences in habitat availability rather than water quality conditions.

At both Tributary B and the Hōteo River sites, the MCI-sb value was either higher than or within the historical range, and the impact sites scored higher than their respective control sites. Therefore, this indicates that macroinvertebrate community assemblages at the receiving Hōteo River remain unaffected by the inflows from Tributary A and Tributary.

4.4 Whole Effluent Toxicity testing

The WET testing was undertaken on a single trophic level (namely *Daphnia magna*) for all monitoring sites as well as the direct effluent (at the Discharge Point). The aim of this testing was to determine if the Wellsford WWTP discharge poses an aquatic toxicity risk that is not perceivable by the existing monitoring protocol. Note that the hazard classification is based on the standardised selection of test biota and therefore, represents the risk/hazard towards similar biota in the receiving aquatic environment (in this case *Daphnia magna*). The toxicity hazard relates to the aquatic biotic integrity and does in no way represent toxicology towards humans or other mammals.

Although a toxicity effect was recorded at impact site H2, toxicity effect was not present upstream in Tributary A and B, and there was no cumulative toxicity trend moving downstream. Therefore, it is unlikely that WWTP discharge is directly causing the toxicity observed at site H2, and the toxicity effect is likely due to a localised impact near H2. Therefore, there is no indication that the discharge point is contributing to aquatic toxicity.

4.5 Diatom community assemblages

A diatom assessment was included for all monitoring sites. The 2025 monitoring indicated there has been an increase in species richness compared to all previous diatom monitoring years (2021 to 2024). However, the %PVT indicated that low to moderate organic pollution remains present at all sites. Overall, diatoms trends suggest that the WWTP discharge has not resulted in adverse ecological shifts and this is detailed below.

The diatom community assessment indicated spatial differences in water quality between control and test sites during the 2025 monitoring. At Tributary A, the ecological water quality at A1 reflected ‘Good’ conditions with low levels of organic pollution. Sites A2 and A3 reflected ‘Moderate’ conditions with worse ecological condition recorded at A2. At Tributary A, there has been an overall upward trend in SPI values since 2021 across all sites, suggesting a gradual improvement in ecological condition.

At Tributary B, the ecological water quality at B3 reflected ‘Good’ conditions with low levels of organic pollution, and control site B1 that reflected ‘Moderate’ conditions. Historically, B1 has indicated organic pollution that is unrelated to the WWTP discharge, and this was also confirmed by hydrochemical characteristics recorded during the 2025 monitoring. Similarly to Tributary A, a consistent increase in SPI and decrease in %PTV at both Tributary B sites since 2021 also suggests a gradual improvement in ecological condition.

Both Hōteo River sites reflected ‘Moderate’ conditions during the 2025 monitoring, with worse ecological condition recorded at H3. However, since this difference in ecological condition was not recorded further upstream at Tributary B, this indicates that the organic pollution at H3 is unrelated to the WWTP discharge. Both Hōteo River sites have shown a slight increase in %PTV and a slight decline in SPI since 2021, suggesting a gradual deterioration in ecological condition. However, since this deterioration is not observed at the Tributary A and B sites, this is likely due to other catchment pressures or disturbances unrelated to the WWTP.

5.0 Conclusion

The 2025 monitoring aimed to assess the potential impacts of discharge from the Wellsford WWTP on the receiving freshwater environment. Overall, the results indicate that the WWTP discharge continues to result in higher ammonia and nitrate levels within the downstream reach. However, the ecological response to elevated ammonia and nitrate levels remains indistinguishable from other unrelated catchment pressures.

To conclude, there is no evidence that the Hōteo River is affected by the inflows from Tributary A and B for all parameters considered. Any potential ecological effect associated with the WWTP is relatively minor when all other (unrelated) sources or catchment stresses are considered.

6.0 Recommendations

Based on the findings of the 2025 monitoring event, the following recommendations are provided to improve the effectiveness and consistency of future monitoring:

- Continue the use of artificial substrates for diatom sampling during future monitoring events. To increase the retrieval rates of artificial substrates following high rainfall/storm events, it is recommended that the artificial substrates are deployed approximately three months prior to annual sampling. This should allow sufficient time for the diatom community assemblages to stabilise.
- Analyse water quality samples at Watercare Labs to maintain comparability (due to Hill laboratory's limit of reporting (LOR) for Biological Oxygen Demand, Escherichia coli and Total Coliforms), noting that these parameters were excluded from statistical testing during this monitoring period due to results above or below the LOR; and
- Continue monitoring at site A3 until at least the completion of the WWTP upgrade and ensure that site A2 sampling is collected downstream of the discharge point of the artificial wetland. This recommendation is based on evidence from the 2024 and 2025 annual monitoring events, which showed elevated conductivity and DRP downstream of the artificial wetland discharge point, which is the likely cause of the increase in conductivity that was recorded in Tributary A during the 2021 monitoring.
- Monitor change in hydrochemical characterisation to confirm changes in water chemistry are temporary and related to the recent instream works.
- WWTP upgrades are currently being undertaken to improve water treatment at the facility. Should ecological improvements be detected in future annual monitoring, an update to the REMP may be recommended to refine monitoring based on the ecological risk.

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9.0 Standard Limitations

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Any estimates of potential costs which have been provided are presented as estimates only as at the date of the Report. Any cost estimates that have been provided may therefore vary from actual costs at the time of expenditure.

Appendix A

Photographic Log

Appendix A Photographic Log

<table>
<tr><th colspan="3">Photographic Log</th></tr>
<tr><td>Photo No:
1</td><td>Date:
29 April 2025</td><td rowspan="2"></td></tr>
<tr><td colspan="2">Description:
Site A1, facing west.</td></tr>
<tr><td>Photo No:
2</td><td>Date:
29 April 2025</td><td rowspan="2"></td></tr>
<tr><td colspan="2">Description:
WWTP discharge point.</td></tr>
</table>

Photographic Log		
Photo No: 5	**Date:** 29 April 2025	
Description: Site A2, facing east.		
Photo No: 6	**Date:** 29 April 2025	
Description: Site A3, facing east.		

Photographic Log		
Photo No: 7	**Date:** 29 April 2025	
Description: Site B1, south of bridge.		
Photo No: 8	**Date:** 29 April 2025	
Description: Site B3, facing east.		

Photographic Log		
Photo No: 9	**Date:** 29 April 2025	
Description: Site H3, facing south.		
Photo No: 10	**Date:** 29 April 2025	
Description: Site H3, facing north.		

Photographic Log		
Photo No: 11	**Date:** 29 April 2025	
Description: Site H2, facing north.		
Photo No: 12	**Date:** 29 April 2025	
Description: Site H2, facing south.		

Photographic Log		
Photo No: 13	**Date:** 29 April 2025	
Description: Construction works located adjacent to site A2 during sampling.		
Photo No: 14	**Date:** 29 April 2025	
Description: WWTP artificial wetland discharge point located near site A2. Discharge point and riprap newly installed.		

Appendix B

Water Quality Results (2009 to 2025)

Appendix B Water Quality Results (2009 to 2025)

Dissolved Oxygen

Table 9-1 Dissolved oxygen results (mg/L) at all monitoring locations (2024 to 2025) and statistical summary of historical results (2009 to 2025). Band A is green, Band B is yellow, Band C is Orange and Band D is red (MfE, 2024). "-" indicates no data

Date	A1	A2	A3	B1	B3	H3	H2	Dis. Point
Jul '24	7.9	8.9	-	4.8	6.8	10.9	10.8	-
Oct '24	5.5	7.6	-	2.5	9.6	9.7	9.6	-
Jan '25	3.7	5.8	-	3.0	3.7	8.3	8.1	-
Apr '25	4.8	6.5	-	8.3	0.9	8.9	8.2	-
Apr '25	6.4	6.0	5.9	5.0	3.8	8.5	8.3	6.0
P Value	**0.1941**		-	**0.8975**		**0.7233**		-
N	**61**	**61**	**4**	**59**	**61**	**61**	**61**	**4**
Min	**0.5**	**0.6**	**0.9**	**0.3**	**0.2**	**1.9**	**0.8**	**2.1**
Max	**11.5**	**10.2**	**8.7**	**12.3**	**9.6**	**11.9**	**12.1**	**8.0**
Average	**6.6**	**6.2**	**5.2**	**4.7**	**4.5**	**8.5**	**8.4**	**6.0**
StDev	**2.5**	**2.4**	**3.2**	**3.0**	**2.6**	**1.7**	**1.9**	**2.8**

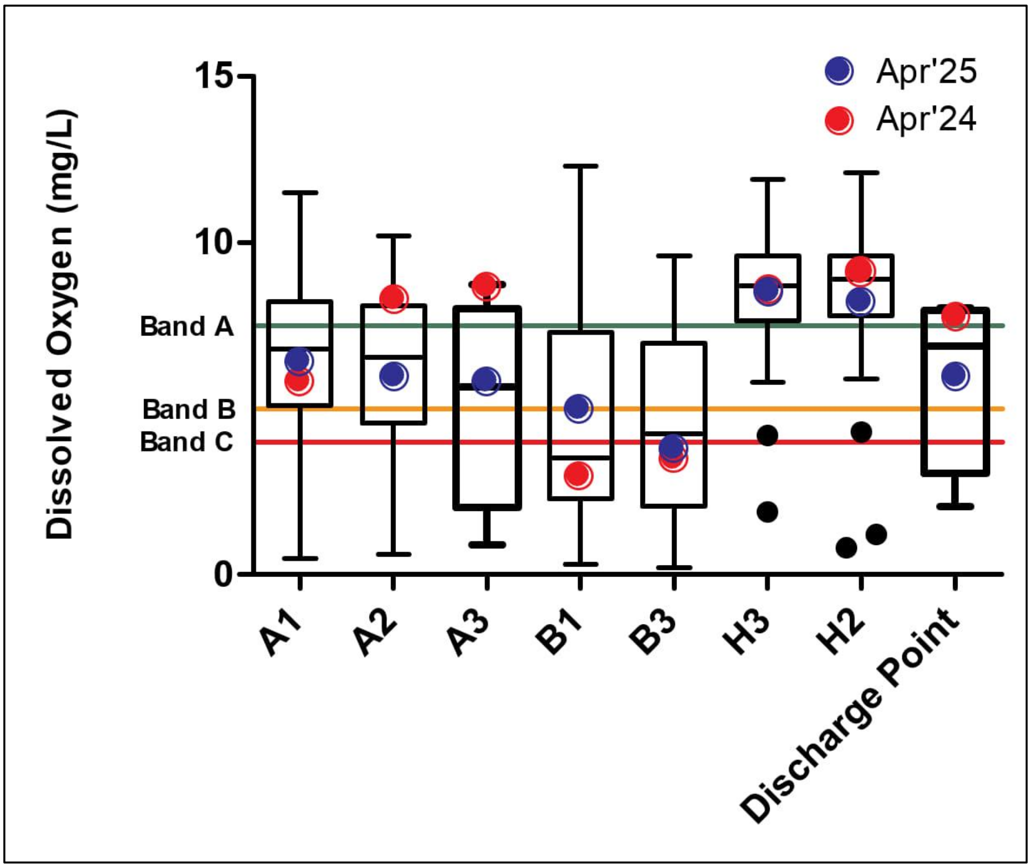

Figure 9-1 Spatial and temporal variation in dissolved oxygen concentrations for all monitoring locations (2009 to 2025), variation is presented in relation to the NPS:FM attribute bands A, B and C

Temperature

Table 9-2 Temperature results (°C) at all monitoring locations (2024 to 2025) and statistical summary of historical results (2009 to 2025)

Date	A1	A2	A3	B1	B3	H3	H2	Dis. Point
Jul '24	10.4	10.9	-	10.9	11.4	10.8	10.6	-
Oct '24	16.0	15.6	-	14.3	14.5	14.7	14.5	-
Jan '25	19.9	19.7	-	18.9	20.0	19.1	19.3	-
Apr '25	17.0	17.8	-	17.7	17.6	17.0	17.0	-
Apr '25	18.5	18.8	18.7	18.9	18.9	17.7	17.8	18.6
P Value	**0.9318**		-	**0.8816**		**0.9926**		-
N	**72**	**72**	**4**	**70**	**72**	**72**	**72**	**4**
Min	**8.5**	**8.5**	**15.8**	**8.2**	**8.9**	**9.2**	**9.3**	**14.8**
Max	**21.1**	**24.3**	**18.7**	**21.8**	**22.6**	**21.8**	**22.6**	**18.6**
Average	**15.1**	**16.0**	**17.1**	**15.5**	**15.9**	**15.7**	**15.8**	**16.4**
StDev	**3.1**	**3.6**	**1.3**	**3.4**	**3.3**	**3.3**	**3.3**	**1.9**

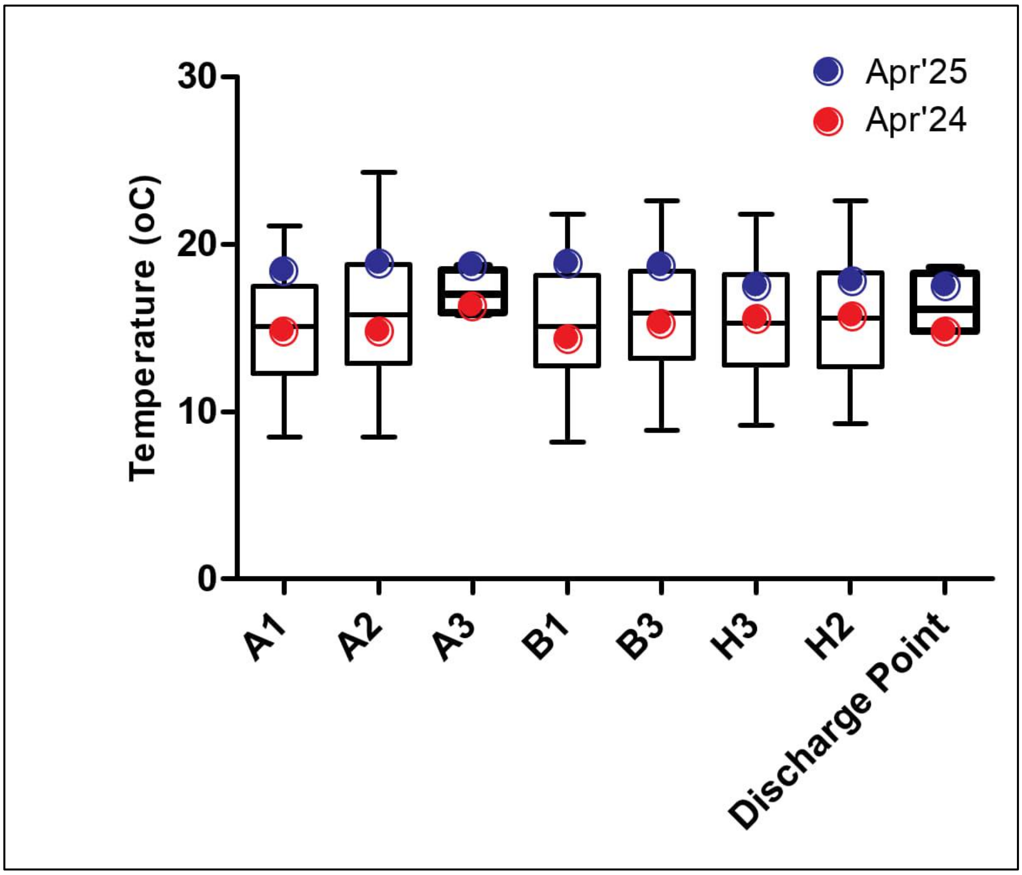

Figure 9-2 Spatial and temporal variation in temperature for all monitoring locations (2009 to 2025)

Conductivity

Table 9-3 Conductivity results (µS/cm) at all monitoring locations (2024 to 2025) and statistical summary of historical results (2009 to 2025)

Date	A1	A2	A3	B1	B3	H3	H2	Dis. Point
Jul '24	310	318	-	276	294	188	190	-
Oct '24	280	390	-	240	290	200	190	-
Jan '25	326	327	-	478	371	173	172	-
Apr '25	283	377	-	363	342	196	202	-
Apr '25	215	267	236	222	216	135	140	214
P Value	**0.1064**		-	**0.8135**		**0.9807**		-
N	**73**	**72**	**4**	**71**	**72**	**72**	**72**	**5**
Min	**128**	**205**	**180**	**181**	**185**	**135**	**103**	**209**
Max	**787**	**766**	**532**	**604**	**638**	**421**	**231**	**343**
Average	**292**	**387**	**295**	**296**	**342**	**187**	**183**	**272**
StDev	**79**	**143**	**160**	**90**	**118**	**35**	**23**	**60**

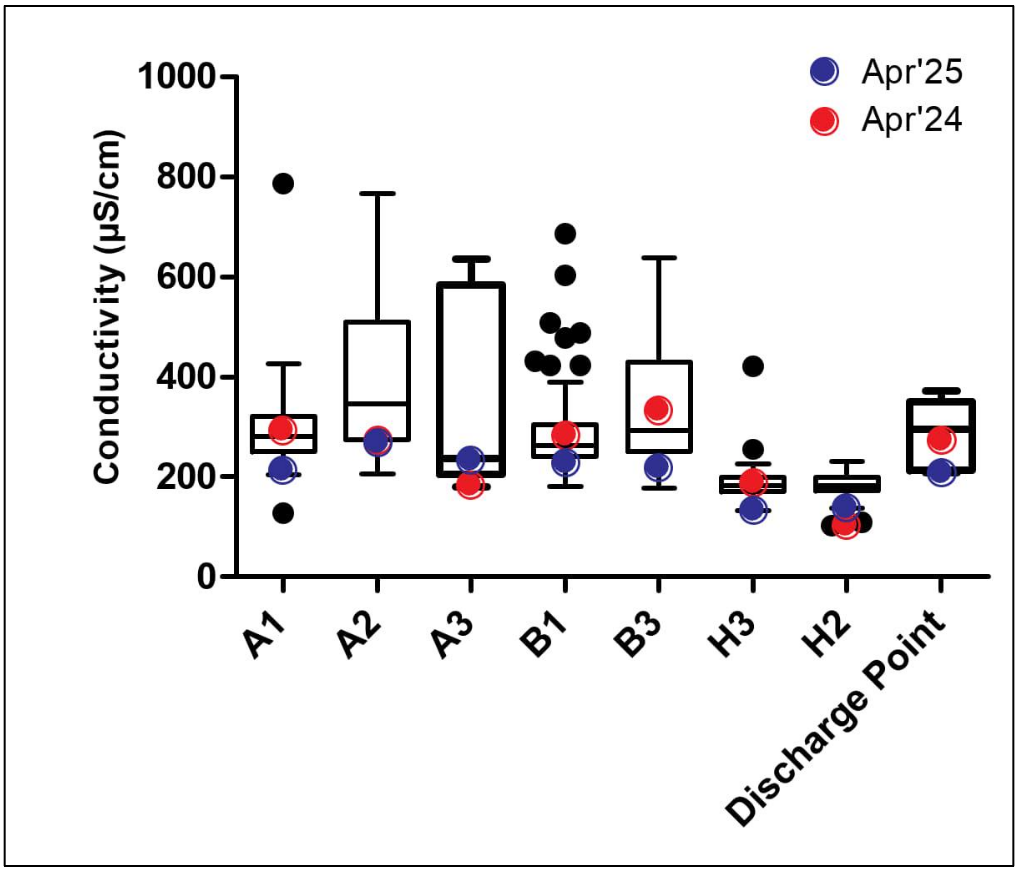

Figure 9-3 Spatial and temporal variation in conductivity for all monitoring locations (2009 to 2025)

pH

Table 9-4 pH results at all monitoring locations (2024 to 2025) and statistical summary of historical results (2009 to 2025)

Date	A1	A2	A3	B1	B3	H3	H2	Dis. Point
Apr '25	6.7	6.4	6.4	6.2	6.3	6.8	6.7	6.4
N	**24**	**24**	**4**	**23**	**24**	**24**	**24**	**5**
Min	**6.4**	**6.4**	**6.4**	**5.9**	**6.0**	**6.7**	**6.6**	**6.4**
Max	**7.7**	**7.7**	**7.5**	**7.3**	**7.7**	**7.7**	**7.7**	**7.4**
Average	**7.1**	**7.1**	**7.0**	**6.6**	**7.0**	**7.2**	**7.3**	**7.0**
StDev	**0.3**	**0.3**	**0.5**	**0.4**	**0.4**	**0.3**	**0.3**	**0.4**

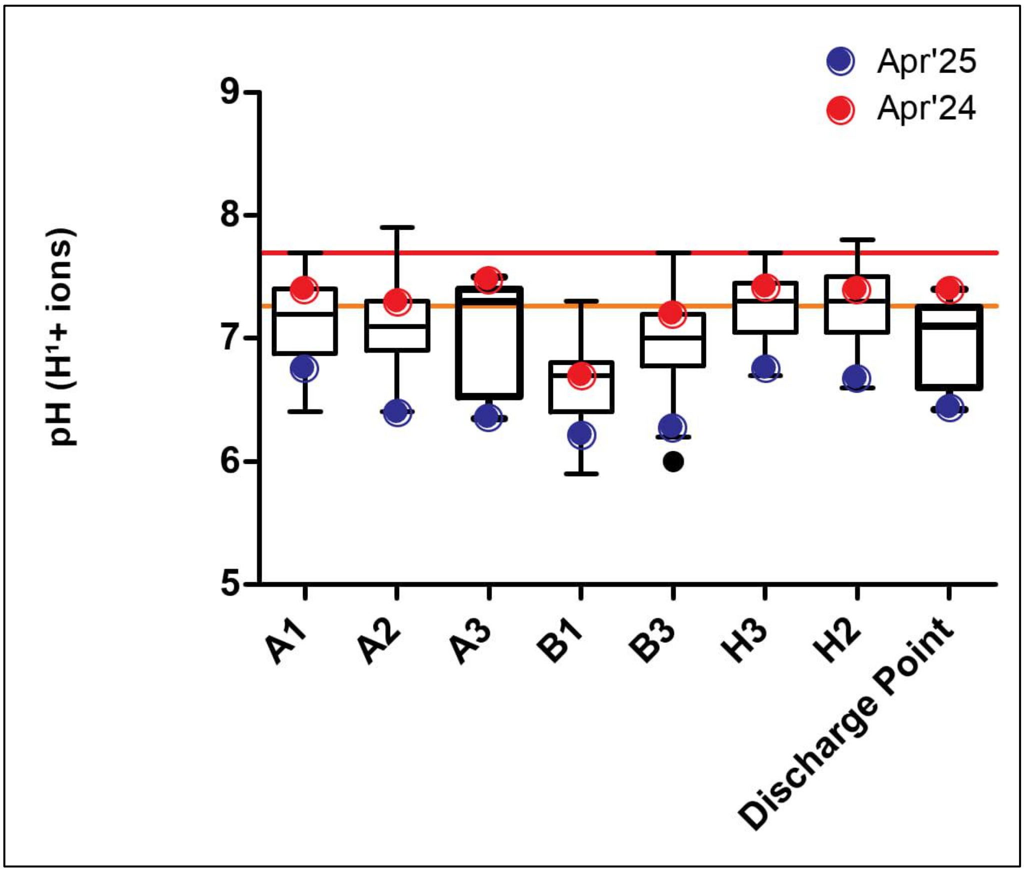

Figure 9-4 Spatial and temporal variation in pH levels for all monitoring locations (2009 to 2025), ANZG freshwater (WW-Low) 80th percentile and 20th percentile trigger values denoted by red lines

Biochemical Oxygen Demand

Table 9-5 Biological Oxygen Demand (BOD) (mg/L) results at all monitoring locations (2024 to 2025) and statistical summary of historical results (2009 to 2025)

Date	A1	A2	A3	B1	B3	H3	H2	Dis. Point
Jul '24	0.65	0.87	-	0.68	0.70	< 0.5	0.53	-
Oct '24	2.10	7.60	-	1.40	1.20	0.81	0.62	-
Jan '25	< 0.5	< 0.5	-	4.10	0.61	1.60	1.90	-
Apr '25	0.57	0.67	-	0.67	2.20	< 0.5	0.53	-
Apr '25[13]	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
P Value	**0.5614**		-	**0.5706**		**0.6612**		-
N	**67**	**65**	**3**	**55**	**66**	**66**	**56**	**4**
Min	**0.50**	**0.50**	**2.00**	**0.04**	**0.14**	**0.50**	**0.50**	**2.00**
Max	**42.00**	**15.00**	**5.00**	**68.00**	**9.00**	**4.50**	**5.00**	**3.00**
Average	**3.05**	**2.33**	**3.00**	**3.46**	**1.46**	**1.02**	**1.01**	**2.25**
StDev	**5.63**	**3.04**	**1.73**	**9.08**	**1.41**	**0.76**	**0.81**	**0.50**

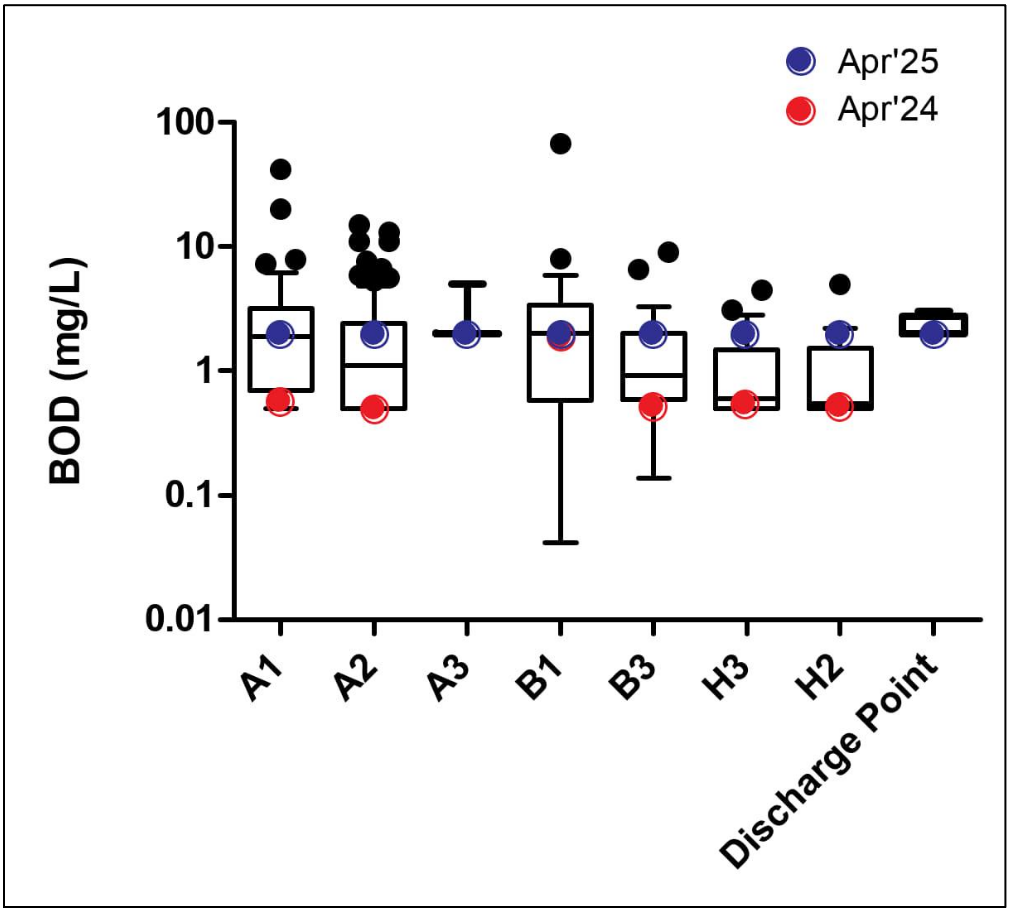

Figure 9-5 Spatial and temporal variation in biochemical oxygen demand for all monitoring locations (2009 to 2025). A3 and Discharge Point results are not available for April 2024 monitoring.

[13] Results excluded from t-test due to lower laboratory limit of reporting.

Total Suspended Solids

Table 9-6 Total Suspended Solids (TSS) (mg/L) results at all monitoring locations (2024 to 2025) and statistical summary of historical results (2009 to 2025)

Date	A1	A2	A3	B1	B3	H3	H2	Dis. Point
Jul '24	1.4	2.2	-	2.4	11.0	3.2	3.8	-
Oct '24	3.2	3.6	-	1.4	23.0	4.4	2.6	-
Jan '25	4.1	4.7	-	33.0	2.9	13.0	11.0	-
Apr '25	3.8	1.4	-	3.6	2.0	5.6	6.0	-
Apr '25	6.0	8.0	8.0	4.0	5.0	31.0	33.0	6.0
P Value	**0.8434**		-	**0.6761**		**1.0000**		-
N	**62**	**60**	**3**	**59**	**60**	**60**	**60**	**4**
Min	**1.4**	**1.4**	**8.0**	**1.0**	**1.7**	**0.8**	**1.3**	**3.0**
Max	**252.0**	**420.0**	**48.0**	**2380.0**	**280.0**	**258.0**	**1800.0**	**210.0**
Average	**19.9**	**22.0**	**21.7**	**71.7**	**19.3**	**12.6**	**44.1**	**56.0**
StDev	**44.7**	**56.3**	**22.8**	**312.5**	**36.8**	**34.0**	**232.9**	**102.7**

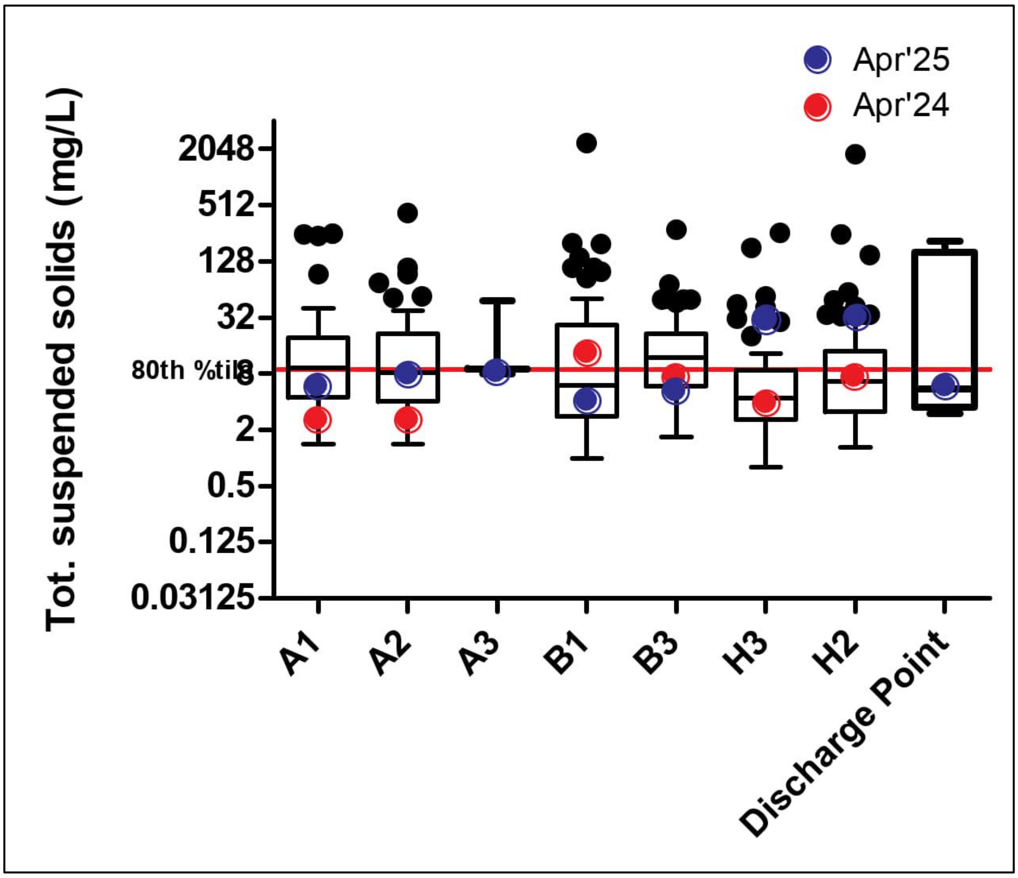

Figure 9-6 Spatial and temporal variation in total suspended solids for all monitoring locations (2009 to 2025), ANZG freshwater (WW-Low) 80th percentile trigger value is denoted by red line. A3 and Discharge Point results are not available for April 2024 monitoring.

Visual Clarity

Table 9-7 Visual clarity (cm) results at all monitoring locations (2024 to 2025) and statistical summary of historical results (2011 to 2025). Band A is green, Band B is yellow, Band C is Orange and Band D is red (numeric attribute state = 2 (WW_Low_SS)) (MfE, 2024). "-" indicates no data.

Date	A1	A2	A3	B1	B3	H3	H2	Dis. Point
Apr '25	91	75	63	120	117	35	35	70
N	**15**	**15**	**4**	**15**	**15**	**15**	**15**	**4**
Min	**13**	**7**	**19**	**0**	**10**	**35**	**20**	**19**
Max	**120**	**120**	**120**	**120**	**117**	**120**	**120**	**120**
Average	**56.7**	**55.8**	**70.8**	**33.9**	**50.2**	**71.7**	**62.5**	**63.3**
StDev	**26**	**34**	**42**	**32**	**31**	**31**	**29**	**43**

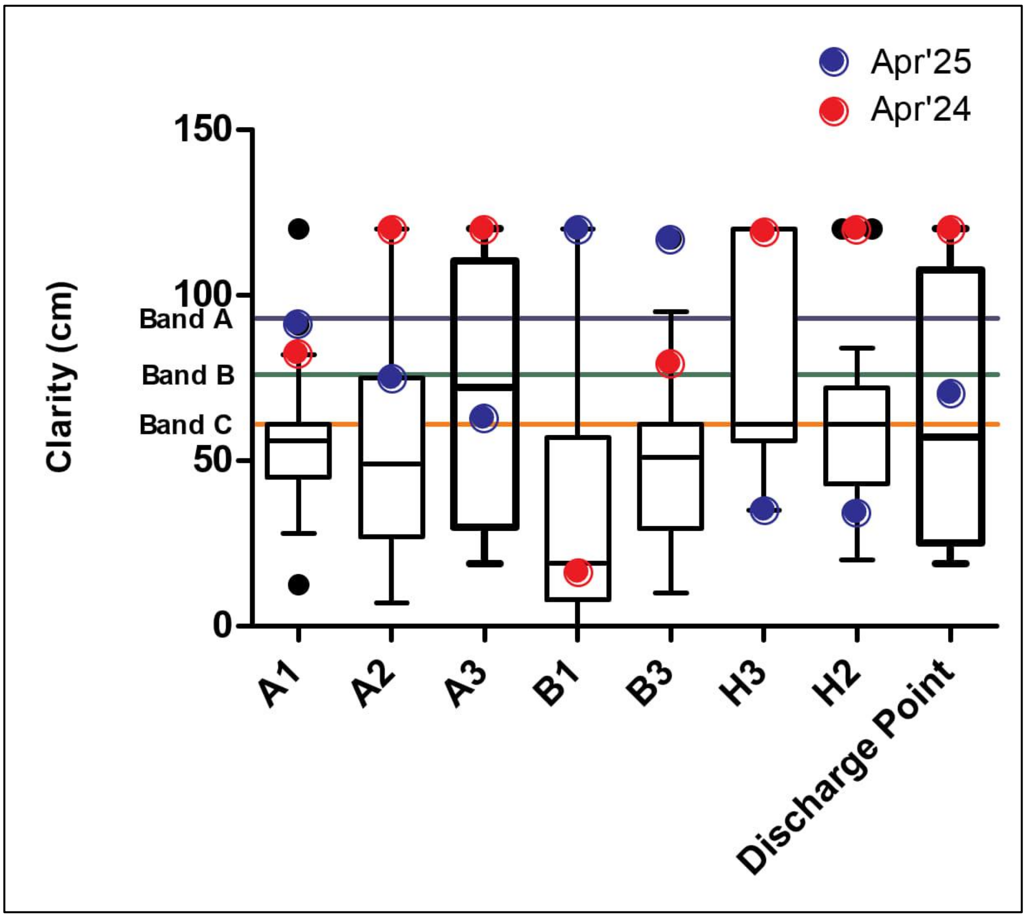

Figure 9-7 Spatial and temporal variation in visual clarity for all monitoring locations (2011 to 2025), variation is presented in relation to the NPS:FM attribute bands A, B and C

Ammoniacal Nitrogen

Table 9-8 Ammoniacal nitrogen (mg/L) results at all monitoring locations (2024 to 2025) and statistical summary of historical results (2009 to 2025). Band A is green, Band B is yellow, Band C is Orange and Band D is red (based on annual median; MfE, 2024). "-" indicates no data

Date	A1	A2	A3	B1	B3	H3	H2	Dis. Point
Jul '24	0.015	0.036	-	0.042	0.079	0.015	0.028	-
Oct '24	0.016	2.400	-	0.011	0.490	0.160	0.022	-
Jan '25	0.016	0.010	-	0.620	0.033	0.011	0.010	-
Apr '25	0.029	0.047	-	0.170	0.260	0.027	0.036	-
Apr '25	< 0.010	0.026	0.022	0.043	0.025	0.023	0.022	0.019
P Value	**0.5525**		**-**	**1.0000**		**1.0000**		**-**
N	**62**	**60**	**3**	**59**	**61**	**61**	**61**	**4**
Min	**0.01**	**0.01**	**0.01**	**0.00**	**0.01**	**0.01**	**0.00**	**0.01**
Max	**3.40**	**16.00**	**0.05**	**0.62**	**7.30**	**0.40**	**0.40**	**0.14**
Average	**0.16**	**1.91**	**0.03**	**0.08**	**0.60**	**0.05**	**0.04**	**0.05**
StDev	**0.51**	**3.31**	**0.02**	**0.12**	**1.24**	**0.08**	**0.08**	**0.07**

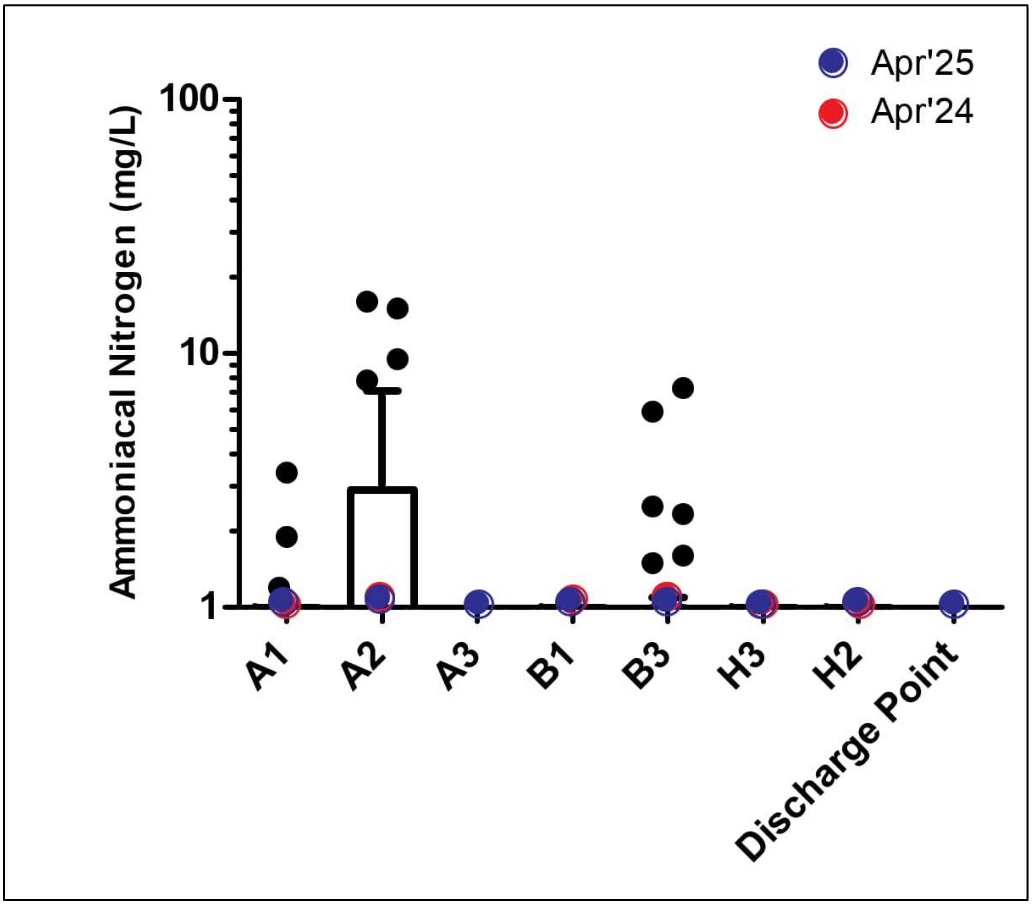

Figure 9-8 Spatial and temporal variation in ammoniacal-nitrogen for all monitoring locations (2009 to 2025). A3 and Discharge Point results are not available for April 2024 monitoring.

Nitrate-Nitrogen

Table 9-9 Nitrate-nitrogen (mg/L) results at all monitoring locations (2024 to 2025) and statistical summary of historical results (2009 to 2025). Band A is green, Band B is yellow, Band C is Orange and Band D is red (based on annual median; MfE, 2024). "-" indicates no data

Date	A1	A2	A3	B1	B3	H3	H2	Dis. Point
Jul '24	0.189	0.870	-	0.161	0.661	0.323	0.328	-
Oct '24	0.044	2.000	-	0.011	0.980	0.300	0.240	-
Jan '25	0.011	0.003	-	0.753	0.058	0.005	0.003	-
Apr '25	0.099	1.830	-	0.032	0.016	0.319	0.303	-
Apr '25	0.199	0.220	0.590	0.060	0.370	0.250	0.270	0.210
P Value	**0.0973**		-	**0.5309**		**0.8345**		-
N	**62**	**60**	**3**	**59**	**60**	**60**	**60**	**4**
Min	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.01**
Max	**2.50**	**7.20**	**0.59**	**1.99**	**2.20**	**0.71**	**1.15**	**0.21**
Average	**0.36**	**0.86**	**0.39**	**0.13**	**0.62**	**0.26**	**0.27**	**0.07**
StDev	**0.59**	**1.13**	**0.33**	**0.30**	**0.51**	**0.18**	**0.21**	**0.09**

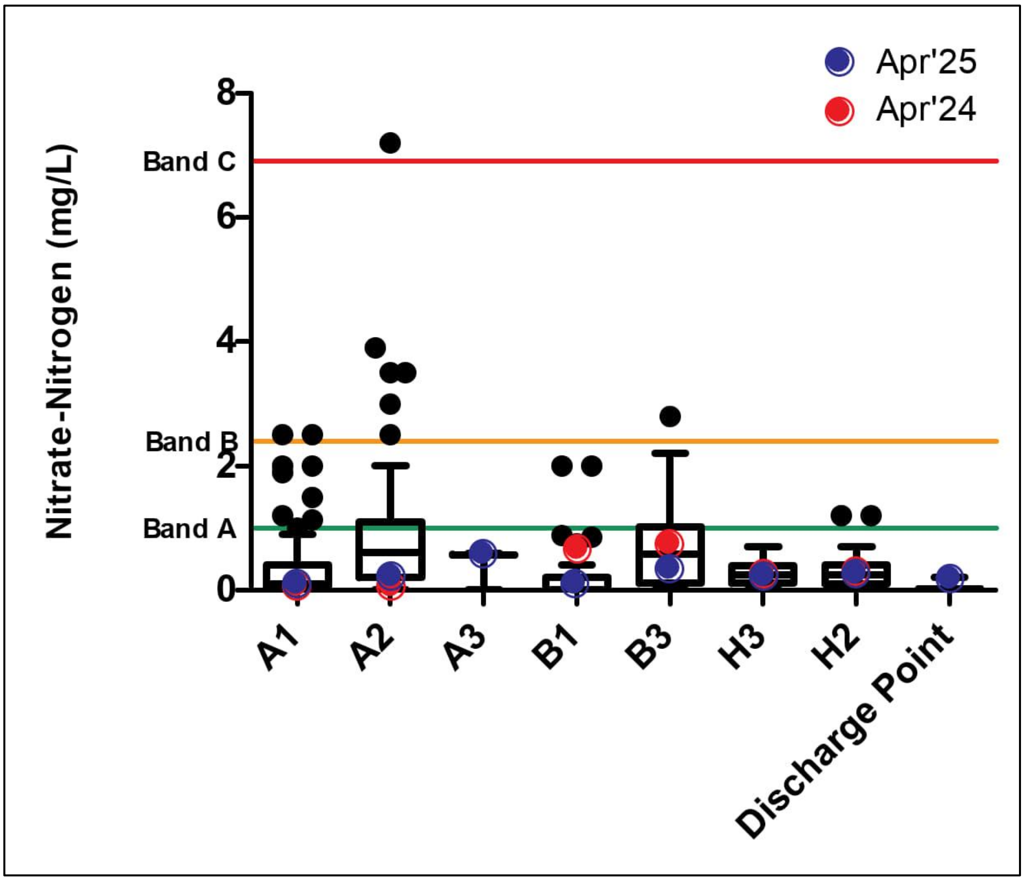

Figure 9-9 Spatial and temporal variation in nitrate-nitrogen for all monitoring locations (2009 to 2025), variation is presented in relation to the NPS:FM attribute bands A, B and C. A3 and Discharge Point results are not available for April 2024 monitoring.

Dissolved Reactive Phosphorus

Table 9-10 Dissolved reactive phosphorus (mg/L) results at all monitoring locations (2024 to 2025) and statistical summary of historical results (2009 to 2025)

Date	A1	A2	A3	B1	B3	H3	H2	Dis. Point
Jul '24	0.022	0.458	-	0.012	0.184	0.016	0.021	-
Oct '24	0.028	2.380	-	0.022	0.482	0.020	0.020	-
Jan '25	0.082	0.071	-	0.008	0.786	0.006	0.018	-
Apr '25	0.048	1.510	-	0.015	0.395	0.020	0.037	-
Apr '25	0.049	0.040	0.340	0.029	0.184	0.013	0.018	0.041
P Value	**0.1381**		-	**0.0251**		**0.1376**		-
N	**61**	**60**	**3**	**58**	**60**	**60**	**60**	**4**
Min	**0.003**	**0.021**	**0.340**	**0.002**	**0.014**	**0.002**	**0.002**	**0.020**
Max	**0.950**	**8.479**	**6.200**	**0.510**	**5.200**	**1.800**	**0.240**	**0.125**
Average	**0.089**	**1.740**	**2.727**	**0.043**	**0.846**	**0.051**	**0.035**	**0.059**
StDev	**0.126**	**2.018**	**3.077**	**0.074**	**1.005**	**0.230**	**0.034**	**0.046**

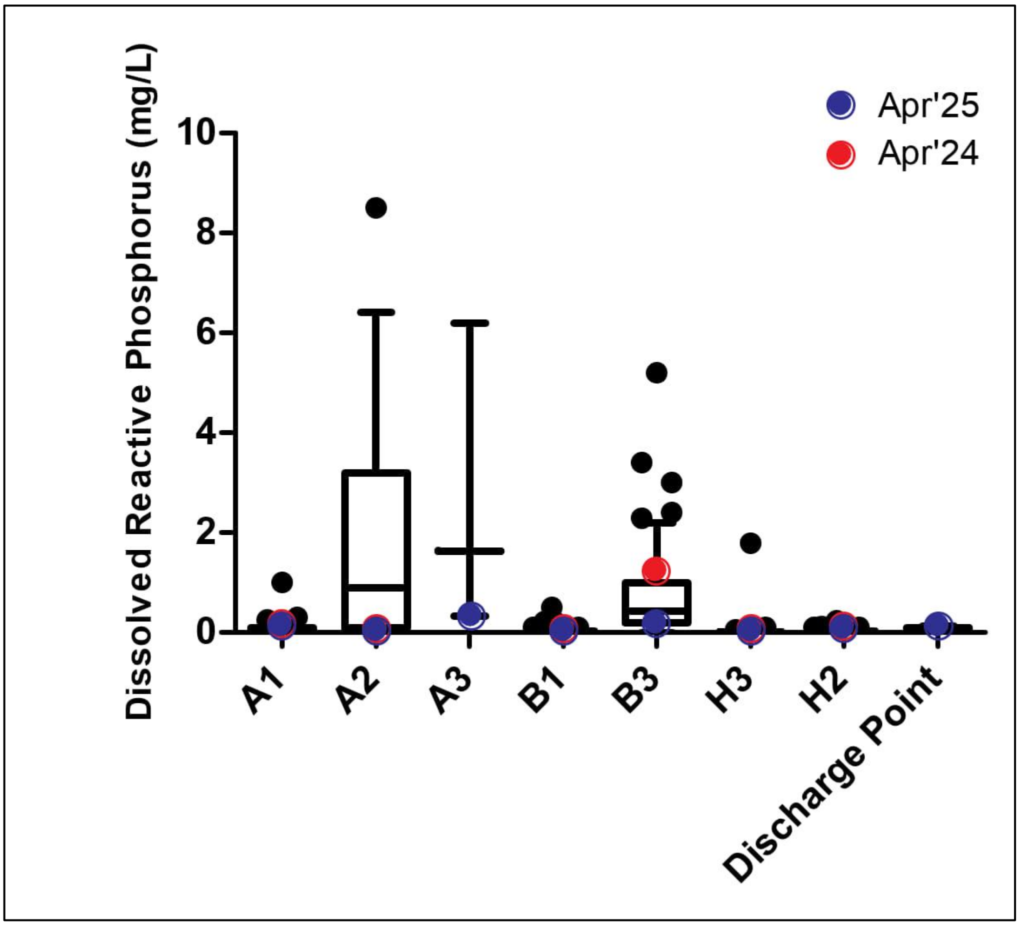

Figure 9-10 Spatial and temporal variation in dissolved reactive phosphorus for all monitoring locations (2009 to 2025). A3 and Discharge Point results are not available for April 2024 monitoring.

Escherichia coli

Table 9-11 *Escherichia coli* (cfu/100 mL) results at all monitoring locations (2024 to 2025) and statistical summary of historical results (2009 to 2025)

Date	A1	A2	A3	B1	B3	H3	H2	Dis. Point
Jul '24	190	190	-	220	810	360	52	-
Oct '24	190	580	-	390	2000	2400	690	-
Jan '25	1400	2400	-	70000	2000	2000	1700	-
Apr '25	330	1100	-	460	98	390	390	-
Apr '25	687	816	816	727	411	1120	649	649
P Value	**0.3292**		-	**0.8340**		**0.2948**		-
N	62	61	4	59	61	61	61	5
Min	60	74	548	10	98	1	1	326
Max	24000	14000	2420	73000	11000	40000	29000	770
Average	1563	1613	1551	3626	1343	1129	1064	556
StDev	3546	2391	1009	13045	1809	5098	3744	167

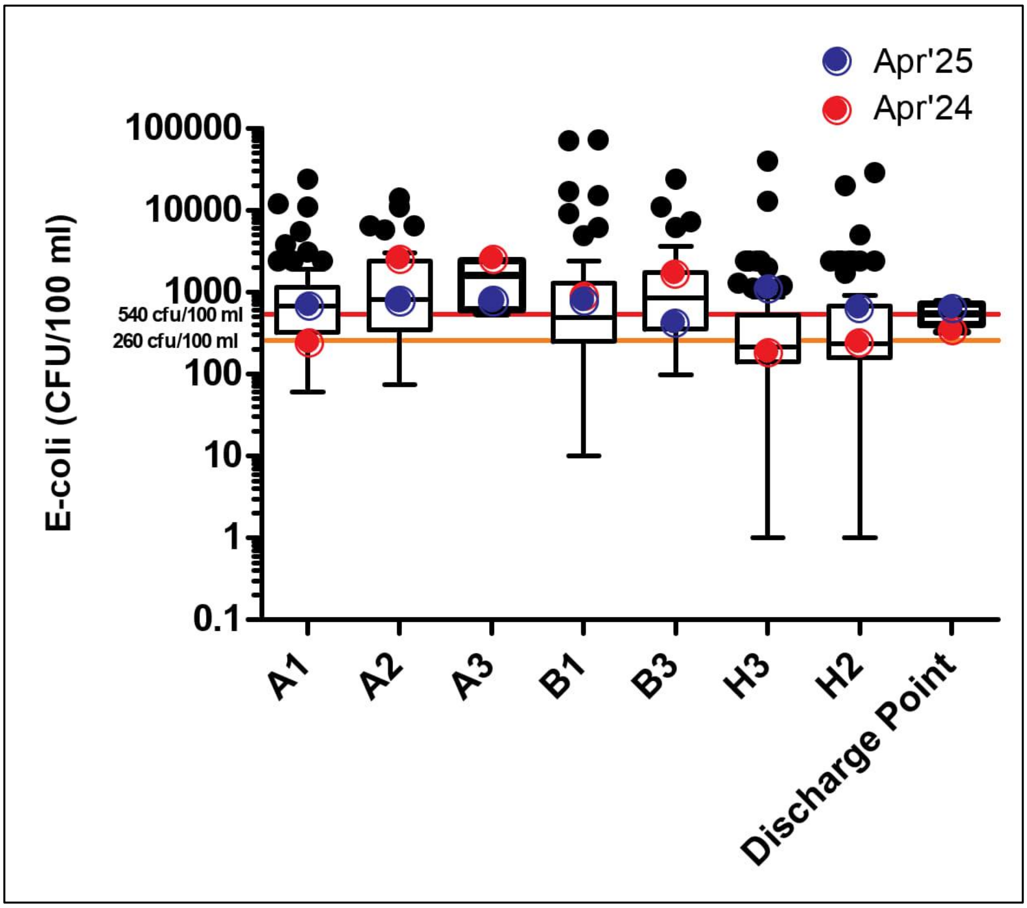

Figure 9-11 Spatial and temporal variation in *Escherichia coli* for all monitoring locations (2009 to 2025), orange line denotes the 260 cfu/100 mL level and red line denotes the 540 cfu/100 mL level from the NPS:FM (described as "Fair" condition)

Total Coliforms

Table 9-12 Total coliforms *(cfu/100 mL)* at all monitoring locations (2024 to 2025) and statistical summary of historical results (2013 to 2025)

Date	A1	A2	A3	B1	B3	H3	H2	Dis. Point
Jul ‘24	2400	3300	-	3100	20000	2100	2000	-
Oct ‘24	2400	2400	-	2000	>2400	>2400	2000	-
Jan ‘25	>2400	>2400	-	1300000	24000	>24000	>2400	-
Apr ‘25	17000	20000	-	15000	6500	8200	8200	-
Apr ‘25[14]	> 2,420	> 2,420	> 2,420	> 2,420	> 2,420	> 2,420	> 2,420	> 2,420
P Value	**0.6198**		-	**0.8852**		**0.3035**		-
N	**52**	**51**	**4**	**50**	**30**	**35**	**51**	**4**
Min	**1000**	**2200**	**2420**	**1500**	**2400**	**1**	**4**	**2420**
Max	**240000**	**240000**	**2420**	**1300000**	**28000**	**2000000**	**2400000**	**2420**
Average	**15630**	**16825**	**2420**	**70374**	**9349**	**60540**	**51791**	**2420**
StDev	**39685**	**46118**	**0**	**235322**	**8603**	**337502**	**335444**	**0**

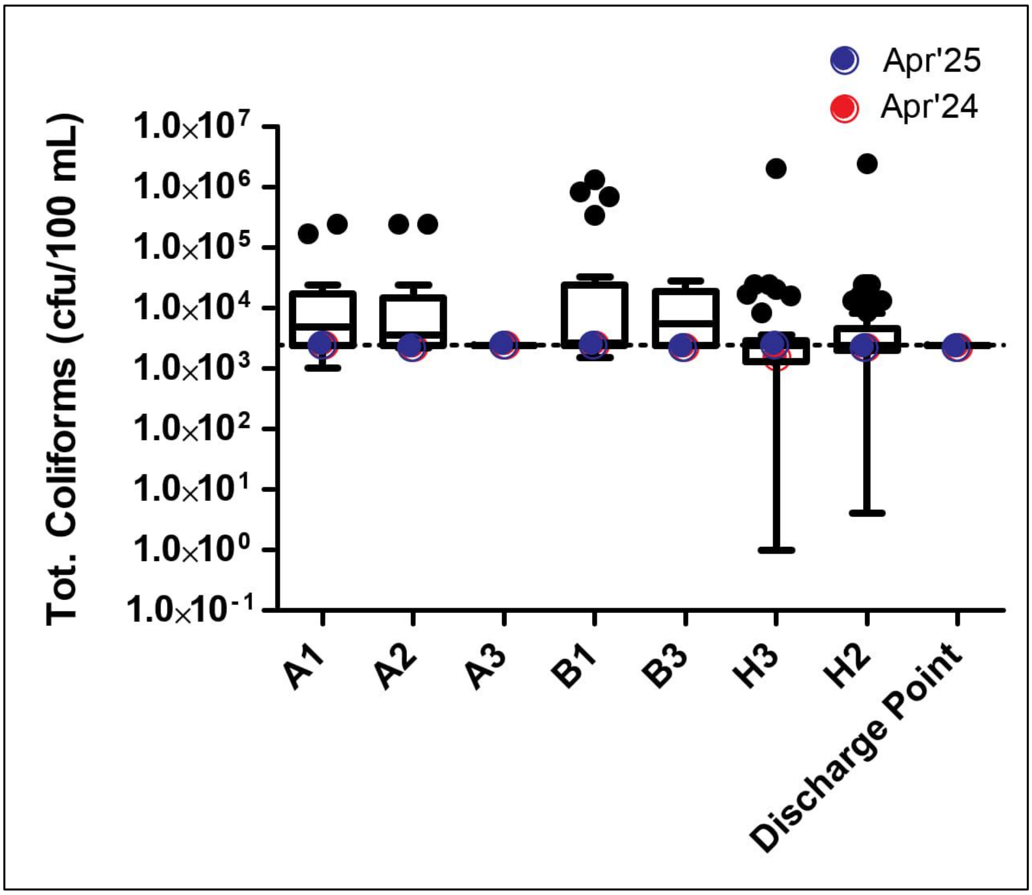

Figure 9-12 Spatial and temporal variation in total coliforms for all monitoring locations (2013 to 2025)

[14] Results excluded from t-test due to lower laboratory limit of reporting.

Table 9-13 Consecutive annual Watercare monitoring of nitrate and ammonia at discharge (mg/L)

Year	Median nitrate	Maximum nitrate	Median ammonia	Maximum ammonia
2019/2020	1.20	7.70	5.20	25.00
2020/2021	1.75	7.20	1.58	22.00
2021/2022	1.20	8.00	7.95	19.50
2022/2023	1.70	7.40	2.41	17.60
2023/2024	1.79	14.30	0.62	18.80
2024/2025	4.51	16.90	0.40	20.00

Notes: Green = Band A (healthy), Yellow = Band B (slightly impaired), Orange **=** Band C (moderately impaired), Red = Band D (**l**argely impaired).

Appendix C

Macroinvertebrate Community Results (2025)

Appendix C Macroinvertebrate Community Results (2025)

Taxa	MCI Score	MCI-sb Score	Site						
			A1	A2	A3	B1	B3	H3	H2
Mayfly Austroclima	9	6.5						1	
Damselfly Xanthocnemis	5	1.2	3		1				
Beetle Hydrophilidae	5	8.0				2			
Beetle Rhantus	5	1.0				3			
True Fly Chironomus	1	3.4				42			
True Fly Molophilus	5	6.3						1	
True Fly Orthocladiinae	2	3.2				4			
True Fly Paradixa	4	8.5				1			
True Fly Polypedilum	3	8.0							1
True Fly Stratiomyidae	5	4.2				1			
Crustacea Isopoda	5	4.5	14	4		21	2		
Crustacea Paracalliope	5	0.0					5	2	3
Crustacea Paratya	5	3.6						1	
Crustacea Talitridae	5	5.0				1			
SPIDERS Dolomedes	5	6.2							1
Mollusc Gyraulus	3	1.7	2						
Mollusc Physella (Physa)	3	0.1	22	13	19				
Mollusc Potamopyrgus	4	2.1	18	60	3	3		800	1600
Number of Taxa	-	-	**5**	**3**	**3**	**9**	**2**	**5**	**4**
Number of Individuals	-	-	**59**	**77**	**23**	**78**	**7**	**805**	**1605**
% EPT Taxa	-	-	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**20**	**0.00**
QMCI-sb Value	-	-	**1.86**	**1.89**	**0.41**	**3.76**	**4.50**	**2.11**	**2.11**
MCI-sb Value	-	-	**38.4**	**44.7**	**22.7**	**88.7**	**90.0**	**92.5**	**108.7**

Appendix D

Instream and Riparian Habitat Assessment Results (2025)

Appendix D Instream and Riparian Habitat Assessment Results (2025)

Habitat Parameter	Site						
	A1	A2	A3	B1	B3	H3	H2
Aquatic Diversity	Marginal (7)	Marginal (6)	Marginal (6)	Poor (3)	Marginal (6)	Suboptimal (12)	Marginal (10)
Aquatic Habitat Abundance	Poor (5)	Poor (3)	Poor (3)	Poor (5)	Marginal (6)	Suboptimal (12)	Suboptimal (11)
Hydrologic Heterogeneity	Marginal (6)	Poor (5)	Poor (5)	Marginal (6)	Marginal (6)	Suboptimal (13)	Suboptimal (12)
Channel Shade	Marginal (10)	Poor (3)	Poor (3)	Marginal (7)	Poor (5)	Marginal (10)	Marginal (10)
Riparian Vegetation Integrity (Left Bank)	Poor (1)	Poor (1)	Poor (1)	Marginal (3)	Poor (2)	Marginal (5)	Marginal (5)
Riparian Vegetation Integrity (Right Bank)	Poor (1)	Poor (1)	Poor (1)	Marginal (3)	Poor (3)	Marginal (5)	Marginal (5)

Appendix E

Invertebrate Habitat Availability Results (2025)

Appendix E Invertebrate Habitat Availability Results (2025)

Invertebrate Biotopes	Scores						A1	A2	A3	B1	B3	H3	H2
	0	1	2	3	4	5							
Stones (woody debris) in current (associated with riffles and rapids) (m)	-	0-1m	>1-2m	>2-3m	>3-5m	>5m	-	-	-	-	-	-	-
Stones (woody debris) in current (runs and glides) (m)	None	1m	2-3m	4-5m	6+m	-	-	-	-	-	1	1	1
Total length (m) of submerged stones (woody debris)	-	0-2m	>2-5m	>5-10m	>10m	-	1	-	-	-	1	1	2
Stones (woody debris) out of current (m^2)	-	0-0.5m^2	>0.5-1m^2	1m^2	>1m^2	-	1	-	-	-	-	-	-
Stone (woody debris) size (cm)	None	<2>20cm	2-10cm	11-20cm	2-20cm	-	-	-	-	-	2	1	2
Stone surface clear of algae (%)	-	0-25%	26-50%	51-75%	>75%	-	-	-	-	-	1	4	4
Marginal vegetation (run, pool, mix)	None	-	run	pool	-	mix	2	2	2	3	2	2	2
Marginal vegetation (m)	None	<0.5m	>0.5-1m	>1-2m	2m	>2m	5	5	5	5	5	5	5
Aquatic vegetation (submerged m^2)	None	<0.5m^2	>0.5-1m^2	>1m^2	-	-	3	3	3	3	3	3	3
Type of veg. (% leafy veg, as opposed to stems / shoots) (aq. veg. only = 49)	-	-	1-25%	26-50%	51-75%	>75%	3	3	3	3	3	3	3
Gravel (submerged m^2)	-	0-0.5m^2	0.5m^2	>0.5m^2	-	-	-	-	-	-	-	-	-
Sand (submerged m^2)	-	-	0-0.5m^2	>0.5-1m^2	1m^2	>1m^2	-	-	-	-	-	-	-
Silt/mud/clay (submerged m^2)	-	-	0-0.5m^2	0.5m^2	>0.5m^2	-	-	-	-	-	-	-	-
Total	-	-	-	-	-	-	**15**	**13**	**13**	**14**	**18**	**20**	**22**

Appendix F

Daphnia Toxicity Screening Memorandum (2025)

Memo

From	**Mashanta Mohsin**
To	Liz Yu and Dannie Cullen
CC	Morgan Witton
Date	16 May 2025
Subject	AECOM Daphnia Toxicity Screening April 2025
File	SCJ252PRO

AECOM engaged NIWA to undertake toxicity screening of eight samples using a cladocera, *Daphnia magna*.

Testing was completed on eight supplied samples using *D. magna* in a 48-hour acute survival screening test. Samples were tested at one concentration (100% sample) alongside control (NIWA culture water) and quality control (zinc reference toxicant) treatments.

Methods

Grab samples from 8 sites were collected in 1000 mL bottles (provided by NIWA) by AECOM staff on 30 April 2025. The samples were immediately transported to NIWA, Hamilton and upon arrival a unique sample code was assigned to each of the samples and the physico-chemical parameters were measured (Table 1). The screening test was initiated, and the remaining bulk samples were refrigerated for storage.

Screening was completed based on Standard Operating Procedure 10.0 – Cladocera acute toxicity test (NIWA 2022). All samples were tested in triplicate at one concentration (100%). A summary of test conditions, dilutions, reference toxicant testing, method detection limit and test acceptability information is provided in Appendix A.

Test acceptability criteria and reference toxicant

The test has criteria that must be met for the test to be considered acceptable (Appendix A). In the acute *D. magna* test, the mean control survival must be 90% or greater and all control replicates must have greater than 80% survival.

A reference toxicant test using zinc sulfate was undertaken concurrently using the standard test procedure to measure the sensitivity and condition of the test organisms by comparing the results to the known sensitivity of the test organism to zinc (NIWA, unpublished long-term data set). This is part of the quality control procedures and enables comparability between laboratory test results undertaken at different times to be assessed. The zinc sulfate stock concentration was validated by analysis (Hill Laboratories, data not shown).

Statistical analyses were completed using CETIS v2.1.4.5 (Comprehensive Environmental Toxicity Information System) software by Tidepool Scientific. Statistical analyses were used to determine the percentage adverse effect of each sample relative to the control.

Results and Discussion

Results are summarized in this section. Eight samples were received at NIWA, Hamilton on 30 April 2025. The mean temperature of samples upon arrival was 10.1 °C. Samples codes 25.010.1-25.010.8 were assigned to the samples (Figure 1). Table 1 presents the physicochemical measurements of the samples before initiation of the toxicity screening test.

Figure 1: Samples upon arrival at NIWA.

Table 1: Physicochemical measurements of the samples upon arrival at NIWA.

NIWA Lab ID	Sample ID	Sample Date	Sample Time	pH	Conductivity $\mu S\ cm^{-1}$	Dissolved Oxygen $mg\ L^{-1}$	Temp °C [a]
25.010.1	A1_WET	30/04/2025	08:40	7.04	245	9.0	20.9
25.010.2	A2_WET	30/04/2025	09:15	6.97	247	9.1	20.9
25.010.3	A3_WET	30/04/2025	09:30	6.88	275	8.8	20.9
25.010.4	B1_WET	30/04/2025	10:10	6.82	259	8.2	20.8
25.010.5	B3_WET	30/04/2025	10:30	6.78	250	7.0	21.0
25.010.6	H2_WET	30/04/2025	11:30	7.05	165.6	8.7	21.0
25.010.7	H3_WET	30/04/2025	10:55	7.14	161.1	9.0	21.0
25.010.8	DIS_WET	30/04/2025	09:00	6.98	251	9.1	20.9

[a] Temperature at time of measurements.

Test Acceptability and Reference Toxicant

The acute cladocera survival test achieved the minimum acceptability criterion, with mean control survival of 98% and with all replicates having greater than 80% survival.

Temperature was constant in all test treatments, and pH and dissolved oxygen values were in the acceptable range for the test (data not shown).

Reference toxicant exposure using zinc sulphate was within the normal and expected range (± 2SD of long- term mean), EC_{50} = 0.61 mg L^{-1} Zn^{2+} (Appendix A).

Sample Toxicity

Results of testing are summarised in Table 2. No significant (α=0.05) effect on survival was observed in seven of the eight samples. However, sample H2_WET exhibited a significant reduction in survival (mean 77%) with a 22% effect on survival relative to the control.

Table 2: Summary of toxicity screening results for *Daphnia* exposed to 30 April 2025 samples.

NIWA Lab ID	Sample ID	Mean survival %	Effect relative to control survival %	Significant toxicity Yes/No
25.010.1	A1_WET	100	0	No
25.010.2	A2_WET	93	5	No
25.010.3	A3_WET	100	0	No
25.010.4	B1_WET	93	5	No
25.010.5	B3_WET	100	0	No
25.010.6	H2_WET	77	22	Yes
25.010.7	H3_WET	100	0	No
25.010.8	DIS_WET	97	1	No

Care must be taken when using these screening results for protection of organisms present in the environment. To provide a higher degree of confidence in assessing the toxicity of these samples it is recommended that toxicity testing is carried out with a range of organisms from various trophic levels.

References

Environment Canada. (1990). Biological test method: Acute lethality test using *Daphnia* spp. Environmental Protection Series, Method Development and Applications Section, Environment Canada, Report EPS 1/RM/11, July 1990 (with May 1996 amendments).

NIWA (2022) Ecotoxicology Standard Operating Procedure 10.0, V3.0. Cladocera acute toxicity test . National Institute of Water and Atmospheric Research, Hamilton, New Zealand: 32.

OECD (2004), Test No. 202: Daphnia sp. Acute Immobilisation Test, OECD Guidelines for the Testing of Chemicals, Section 2, OECD Publishing, Paris, https://doi.org/10.1787/9789264069947-en.

Tidepool (2001-2022) CETIS -Comprehensive Environmental Toxicity Information System. CETIS Users Guide v2.1.3 Tidepool Scientific Software, MacKinleyville, Ca.: 305.

Appendix A Test conditions

Organism	Cladocera
Test Initiation:	01/05/2025
Reference Method:	Environment Canada (1990), OECD (2004)
Test Protocol:	NIWA SOP 10.0, Version 3.0 - NIWA (2022)
Test Organisms:	*Daphnia magna*
Source:	NIWA Laboratory culture
Organisms/Container:	10
Test concentrations:	Control (NIWA Culture water), 100%
Test Duration:	48 hours
Replicates:	5 for controls, 3 for treatments
Sample pre-treatment:	Nil
Test Chambers:	55 mL polypropylene beakers
Lighting:	16:8h light: dark
Temperature:	20 ± 1°C
Aeration:	Nil
Chemical Data:	Initial and final conductivity, pH, temperature, dissolved oxygen
Effect Measured:	Survival
Zn sensitivity current test; Long-term lab mean (EC_{50}±2sd):	0.61 g Zn^{2+} L^{-1}; 0.75 (0.00-1.69) mg Zn^{2+} L^{-1} (n=22)
Test Acceptability:	90% mean control survival; 80% or greater survival in all control reps
Test Acceptability Compliance:	Achieved
Method Detection Limit :	13.9%

Appendix G

Diatom Analysis Report (2025)

Aecom

Diatom Analysis Report
Q3 - 2025

Reference: Aecom_Diatom_Report_Q3_July_2025_Final
Date: July 2025
No. of samples: 7
Version: Final

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The spatial and temporal extents of Ecotone Freshwater Consultants CC (Ecotone) services are described in the proposal and are subject to restrictions and limitations. A total assessment of all probable scenarios or circumstances that may exist on the study site was not undertaken. No assumptions should be made unless opinions are specifically indicated and provided. Data presented in this document may not elucidate all possible conditions that may exist given the limited nature of the enquiry.

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DECLARATION OF INDEPENDENCE

I, Marco Alexandre, as duly authorised representative of Ecotone Freshwater Consultants CC (Ecotone), hereby confirm my independence (as well as that of Ecotone) as a specialist and declare that neither I nor Ecotone have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal, other than fair remuneration for work performed, specifically in connection with the diatom assessment for Aecom sites.

____

Full Name: Marco Alexandre

Title / Position: Director and Principal Consultant

Qualification(s): M.Sc. (Aquatic Health)

Registration: *Pr. Sci. Nat.* (400079/13)

TABLE OF CONTENTS

LIST OF TABLES

LIST OF ABBREVIATIONS

BDI	Biological Diatom Index
%PTV	Percentage Pollution Tolerant Valves
SPI	Specific Pollution Sensitivity Index
TDI	Trophic Diatom Index

KEY TERMINOLOGY OUTLINED IN (TAYLOR *ET AL.*, 2007A)

Trophy	Description
Dystrophic	Rich in organic matter, usually in the form of suspended plant colloids, but of a low nutrient content.
Oligotrophic	Low levels or primary productivity, containing low levels of mineral nutrients required by plants.
Mesotrophic	Intermediate levels of primary productivity, with intermediate levels of mineral nutrients required by plants.
Eutrophic	High primary productivity, rich in mineral nutrients required by plants.
Hypereutrophic	Very high primary productivity, constantly elevated supply of mineral nutrients required by plants.

Mineral Content	Value
Very electrolyte poor	< 50 µS/cm
Electrolyte-poor (low electrolyte content)	50 - 100 µS/cm
Moderate electrolyte content	100 - 500 µS/cm
Electrolyte-rich (high electrolyte content)	> 500 µS/cm
Brackish (very high electrolyte content)	> 1000 µS/cm
Saline	6000 µS/cm

Pollution (Saprobity)	Value
Unpolluted to slightly polluted (oligosaprobic)	BOD <2, O_2 deficit <15%
Moderately polluted (β-mesosaprobic)	BOD <4, O_2 deficit <30%
Critical level of pollution (α -mesosaprobic)	BOD <7(10), O_2 deficit <50%
Strongly polluted (α-meso-polysaprobic)	BOD <13, O_2 deficit <75%
Very heavily polluted (polysaprobic)	BOD <22, O_2 deficit <90%

EXECUTIVE SUMMARY

Diatom laboratory procedures were carried out according to the methodology described by Taylor *et al.* (2005) and Taylor *et al*. (2007a). The Percentage of Pollution Tolerant Valves (%PTV; Kelly & Whitton, 1995) was included in the analysis to indicate organic pollution. A total of 89 diatom species were recorded at the seven sites and the diatom assemblages were generally comprised of species characteristic of fresh brackish conditions, circumneutral to alkaline waters and eutrophic conditions. The pollution levels indicated that there was some form of pollution present at all the sites. The results from the April 2025 assessment support the following conclusions:

- According to the spatial diatom analyses the ecological water quality for all the sites ranged from *Good* to *Moderate* conditions with low (PTV <20%) to moderate (PTV 20 – 40%) levels of organic pollution.
- All sites showed low to moderate oxygen levels indicating that there was some level of nutrients present; however this did not appear to be causing eutrophication at any of the sites. Sites A1 and B3 reflected better conditions with low levels of organic pollution, whereas site H3 showed slightly poorer conditions.
- Based on the temporal diatom analyses, sites A1, H2 and H3 have on average reflected better ecological conditions with lower levels of organic pollution compared to the other sites; whereas sites A3 and B1 have on average reflected poorer conditions.

1. INTRODUCTION AND SCOPE OF WORK

Diatoms are the unicellular algal group most widely used as indicators of river and wetland health as they provide a rapid response to specific physico-chemical conditions in water and are often the first indication of change. The presence or absence of indicator taxa can be used to detect specific changes in environmental conditions such as eutrophication, organic enrichment, salinisation and changes in pH. They are therefore useful for providing an overall picture of trends within an aquatic system as they show an ecological memory of water quality over a period of time.

2. METHODOLOGY

2.1. LABORATORY PROCEDURES

Diatom laboratory procedures were carried out according to the methodology described by Taylor *et al.* (2005) and Taylor *et al*. (2007a). Diatom samples were prepared for microscopy by using the hot hydrochloric acid and potassium permanganate method. Approximately 300 to 400 diatom valves were identified and counted to produce semi-quantitative data for analysis. Prygiel *et al*. (2002) found that diatom counts of 300 valves and above were necessary to make correct environmental inferences. The taxonomic guide by Taylor *et al.* (2007b) and Cantonati *et al*. (2017) was consulted for identification purposes. Where necessary, Krammer & Lange-Bertalot (1986, 1988, 1991 a, b) were used for identification and confirmation of species identification. Environmental preferences were inferred from Taylor *et al.* (2007b) and Cantonati *et al*. (2017) and various other literature sources as indicated in the discussion section to describe the environmental water quality at each site.

2.2. DIATOM-BASED WATER QUALITY INDICES

There are different diatom-based water quality indices that are used globally and are based on the specific water quality tolerances of diatoms. Most of the indices are based on a weighted average equation by Zelinka and Marvan (1961). Two values are assigned to each diatom species used in the calculations of the indices that reflects the tolerance or affinity of the diatom species to a certain water quality (good or bad); and indicates how strong (or weak) the relationship is (Taylor, 2004). These values are then weighted by the abundance of the diatom species in the sample (Lavoie *et al*., 2006; Taylor, 2004; Besse-Lototskaya *et al.,* 2011). The main difference between indices is in the indicator sets (number of indicators and list of taxa) used in calculations (Eloranta & Soininen, 2002). These indices underpin the software packages used to estimate biological water quality. One such software package commonly used and approved by the European Union is OMNIDIA (Lecointe *et al.,* 1993). The program is a taxonomic and ecological database of 7500 diatom species, and it contains indicator values and degrees of sensitivity for given species. It allows rapid calculations of indices of general pollution, saprobity and trophic state, indices of species diversity, as well as of ecological systems (Szczepocka, 2007).

2.2.1. The Specific Pollution Sensitivity Index (SPI)

The SPI was used in this diatom assessment (**Table 2-1**) and is an inclusive index and takes factors such as salinity, eutrophication and organic pollution into account (CEMAGREF, 1982). This index comprises 2035 taxa (Taylor, 2004) and is recognised as the broadest species base of any index currently in use and has been adapted to include taxa endemic to and commonly found in South Africa, thus increasing the accuracy of diatom-based water quality assessments and is known as the South African Diatom Index (SADI) (Harding & Taylor, 2011). The limit values and associated ecological water quality classes adapted from Eloranta & Soininen (2002) were used for interpretation of the SPI scores. The SPI index is based on a score between 0 – 20, where a score of 20 indicates no pollution and a score of zero indicates an increasing level of pollution or eutrophication.

Table 2-1: Adjusted class limit boundaries for the Specific Pollution Index in the evaluation of water quality applied in this study (adapted from Eloranta & Soininen, 2002; Harding & Taylor, 2011)

Interpretation of Index Scores		
Ecological Category (EC)	**Class**	**Index Score (SPI Score)**
A	High quality	>17.3
A/B		16.8-17.2
B	Good quality	13.3-16.7
B/C		12.9-13.2
C	Moderate quality	9.2-12.8
C/D		8.9-9.1
D	Poor quality	5.3-8.8
D/E		4.8-5.2
E	Bad quality	< 4.8

2.2.2. The Percentage Pollution Tolerant Valves (%PTV)

The %PTV is part of the UK Trophic Diatom Index (TDI) (Kelly & Whitton, 1995) and was developed for monitoring organic pollution (sewage outfall- orthophosphate-phosphorus concentrations), and not general stream quality (**Table 2-2**). The %PTV has a maximum score of 100, where a score above 0 indicates no organic pollution and a score of 100 indicates definite and severe organic pollution. The presence of more than 20% PTVs shows organic impact. All calculations were computed using OMNIDIA ver. 4.2 program (Lecointe *et al*., 1993).

Table 2-2: Interpretation of the percentage Pollution Tolerant Valves scores (adapted from Kelly, 1998)

%PTV	Interpretation
<20	Site free from organic pollution.
20 to <40	There is some evidence of organic pollution.
40 to 60	Organic pollution likely to contribute significantly to eutrophication.
>60	Site is heavily contaminated with organic pollution.

2.3. Application of Diatom Assessment Protocol in New Zealand

While diatoms are widely recognised as useful biological indicators and incorporated into water quality monitoring in North America and Europe, up until 2014, no formal diatom-based index has been developed for riverine systems in New Zealand (Schowe & Harding, 2014). Since most species are cosmopolitan, floras developed for Europe and North America can be used in New Zealand (Harper and Harper, 2010). Based on the cosmopolitan nature of diatoms the SPI index was applied to determine the state of the biological water quality (Coste in CEMAGREF, 1982). The SPI has the broadest species base and highest taxonomic resolution of all the indices and evaluates organic and inorganic pollution based on the sensitivity of each taxon, while taking into account the response of the whole diatom community (Almeida, 2001). This index is used to indicate general water quality.

3. Assumptions and Limitation

3.1. Sampling

Sites B3 had low diatom cell counts during the June 2024 assessment. Therefore, caution should be taken when analysing these results at this site. Sites with more than 300 diatom cell counts provide more accurate results with regards to the specific indices used for the diatom communities. However, a count of 100 diatom cell counts is considered the minimum number to run the indices.

3.2. Identification

An attempt was made to identify as many species as possible to species level, where this was not possible species were identified to genus level. The confidence in the overall assessment is thus moderate as the majority of species were cosmopolitan species of which the water tolerance limits are well documented. The diatom communities of the study sites had an overall low to moderate abundance of endemic species and therefore these species could not be identified to species level.

4. Results and Discussion

The diatom assessment is divided into three sub-sections: (i) Discusses the ecological classification of water quality for each site according to the diatom assemblage during this assessment. (ii) Provides analysis and discussion of the dominant species and their ecological preferences at each site. Thus, allowing spatial variation analyses of ecological water quality between sites. (iii) Discusses the temporal variation analysis of the ecological water quality between sites.

4.1. Ecological Classification for Water Quality

The ecological classification for water quality according to Van Dam *et al*. (1994) and Taylor *et al*. (2007) are provided in **Table 4-1** for the April 2025 Q3 assessment. The overall diatom assemblages comprised of species with a preference for:

- Fresh brackish (<500 µS/cm), circumneutral (pH 6.5 – 7.5) to alkaline (pH > 7.5) waters and eutrophic conditions.
- The nitrogen requirements for all the sites ranged from N-Autotrophic tolerant, indicating a tolerance for high concentrations of organically bound nitrogen to N-Heterotrophic facultative, indicating a requirement for periodically high concentrations of organically bound nitrogen. The latter points to the presence of organic nitrogen in the water.
- The dissolved oxygen saturation requirements ranged from low (<10%) to moderate (<50%) for all the sites.

Table 4-1: Ecological descriptors for the sites based on the diatom community (Van Dam *et al.*, 1994 and Taylor *et al.*, 2007)

Site	pH	Salinity	Organic Nitrogen uptake	Oxygen Levels	Trophic State
A1	Alkaline	Fresh brackish	N-Autotrophic tolerant	Low	Eutrophic
A2	Alkaline	Fresh brackish	N-Autotrophic tolerant	Low	Eutrophic
A3	Circumneutral	Fresh brackish	N-Heterotrophic facultative	Low	Eutrophic
B1	Circumneutral	Fresh brackish	N-Heterotrophic facultative	Low	Eutrophic
B3	Alkaline	Fresh brackish	N-Heterotrophic facultative	Moderate	Eutrophic
H2	Alkaline	Fresh brackish	N-Autotrophic tolerant	Moderate	Eutrophic
H3	Alkaline	Fresh brackish	N-Autotrophic tolerant	Moderate	Eutrophic

4.2. DIATOM SPATIAL ANALYSIS

A total of 89 diatom taxa were recorded at the seven sites and the dominant species recorded included, *Nitzschia sp., Eunotia sp., and Gomphonema sp.* (**Table 7-1**). These taxa are cosmopolitan in nature and have wide ecological amplitudes and thus caution must be taken when analysing the predominance of these species at specific sites. It is important to consider these dominant species in conjunction with the entire diatom assemblage when analysing the results. Diatom communities reflect ecological conditions over a period of 2-3 weeks; thus diatom communities require enough time for establishment to reflect these conditions. Sites A2 and B3 had low diatom cell counts during the April 2025 Q3 assessment therefore caution should be taken when analysing the results at this site. Ecological information is provided below for the dominant and sub-dominant species in order to make ecological inferences for the sites (**Table 4-2**; **Table 7-1;** Taylor *et al.*, 2007, Cantonati *et al*., 2017):

- **Sites A1, & B3:** The ecological water quality at these sites reflected *Good* conditions with low levels of organic pollution (**Table 4-2**):
  - The dominant diatom taxa at these sites pointed to meso-to eutrophic conditions with low to moderate electrolyte content. These taxa are tolerant to moderately polluted conditions.
  - The low to moderate levels of oxygen suggest that there are nutrients present, resulting in some decomposition of organic material by micro-organisms at these sites. However, it does not appear to be impacting this site.
  - The %PTV score indicated that the percentage of diatom taxa that were tolerant to organic pollution ranged was low, suggesting that these levels are likely leading to primary production and do not appear to be associated with eutrophication impacts. Overall, the ecological conditions at these sites reflected *Good* conditions.
- **Sites A2, A3, B1, H2 & H2:** The ecological water quality at these sites reflected *Moderate* conditions with low to moderate levels of organic pollution (**Table 4-2**):
  - The dominant diatom taxa at these sites pointed to eutrophic waters with moderate to high electrolyte content. These taxa are tolerant to moderately to strongly polluted conditions.
  - The presence of *Nitzschia sp.* and *Eunotia sp.,* pointed to the presence of nutrient and the low to moderate oxygen levels suggest that decomposition of organic material by micro-organisms is occurring. The presence of nutrients appears to be supporting productivity at these sites but may become a problem if it increases to higher levels.
  - The %PTV score indicated that the percentage of diatom taxa that were tolerant to organic pollution ranged from low to moderate, suggesting that these levels may be

resulting in moderate conditions at this site. The overall ecological conditions was *Moderate* at these sites.

According to the diatom community there appeared to be spatial variation in the ecological water quality between the sites. The ecological water quality for all the sites ranged from *Good* to *Moderate* conditions with low (PTV <20%) to moderate (PTV 20 – 40%) levels of organic pollution. The results indicated that all the sites reflected low to high levels of electrolyte content with some sites exhibiting slightly brackish conditions. All the sites had low to moderate levels of oxygen indicating that decomposition of organic material by micro-organisms is occurring. At some sites the organic material is resulting in productivity but at other sites it may become more of a problem if the level increases (e.g. site H3). Overall, sites A1 and B3 reflected better conditions with low levels of organic pollution, whereas site H3 showed slightly poorer conditions.

Table 4-2: Diatom index scores for the study sites indicating the ecological water quality, April 2025

Site	%PTV	SPI	Ecological Category (EC)	Class
A1	16.3	14.0	B	*Good*
A2	22.0	10.4	**C**	*Moderate*
A3	12.5	11.2	**C**	*Moderate*
B1	10.3	11.8	**C**	*Moderate*
B3	5.5	14.8	**B**	*Good*
H2	11.3	9.2	**C**	*Moderate*
H3	25.8	8.2	C/D	*Moderate*

4.3. Diatom Temporal Analyses

It is important to monitor temporal trends in the diatom community to determine any variation in the ecological conditions of the aquatic environment and the associated impacts if any (**Table 4-3**). The main points are briefly discussed below:

- In comparison to the previous survey, the ecological water quality (which is expressed by the SPI score) at sites A1 and B3 showed an improvement (i.e., Site A1: *Moderate to Good* and Site B3: *Poor to Good*). The level of organic pollution at site A1 showed an improvement from moderate to low levels; whereas, the levels at site B3 remained low since the previous survey.
- The ecological condition at site H2 and H3 showed a decline from *Good to Moderate* since the previous survey. The level of organic pollution at site H2 remained low; whereas, for site H3, the level increased from low to moderate since the previous survey.

- The ecological condition at sites A2, A3 and B1 remained in a stable condition reflecting *Moderate* conditions. The level of organic pollution at site A2 showed a slight increase from low to moderate levels; whereas, at sites A3 and B1, the level remained low since the previous survey. Despite the slight increase at site A2 there appeared to be no impact on the water quality of this site.
- According to the temporal analyses over all the monitoring periods, the diatom results indicated that sites A1, H2 and H3 have on average reflected better ecological conditions with lower levels of organic pollution compared to the other sites. Whereas sites A3 and B1 have on average reflected poorer conditions with higher levels of organic pollution over time. These results are consistent with the previous survey.

Table 4-3: Diatom index scores indicating the ecological water quality for all the study sites over the monitoring periods (June 2021 – April 2025)

Site	SPI					Trend	%PTV					Trend	Ecological Category (EC)					Trend
	Jun-21	May-22	Jun-23	Jun-24	April-25		Jun-21	May-22	Jun-23	Jun-24	April-25		Jun-21	May-22	Jun-23	Jun-24	April-25	
A1	11.1	5.5	9.6	10.6	14.0	▲	2.6	25.5	7.5	27.3	16.3	▲	C/D	D	C	C	B	▲
A2	8.6	6.9	7.0	11.4	10.4	►	27.5	23.5	19.8	18.0	22.0	▼	D	D	D	C	C	►
A3	*	5.9	4.4	9.9	11.2	►	NA	34.0	49.8	17.1	12.5	►	NA	D	E	C	C	►
B1	3.7	6.5	10.6	9.4	11.8	►	72.3	54.0	32.0	20.8	10.3	►	E	D	C	C	C	►
B3	8.1	6.5	8.8	8.8	14.8	▲	27.8	17.5	23.5	18.0	5.5	►	D	D	D	D	B	▲
H2	12.8	13.9	10.0	13.3	9.2	▼	0.0	1.5	20.0	6.0	11.3	►	C	B	C	B	C	▼
H3	13.1	15.0	10.0	12.9	8.2	▼	0.0	0.3	22.0	6.0	25.8	▼	B/C	B	C	B/C	C/D	▼

5. SUMMARY AND CONCLUSIONS

The main objective of the aquatic study was to monitor stress responses in the diatom community assemblages that may be attributed to the surrounding land use. The results from the April 2025 Q3 assessment support the following conclusions:

- The diatom assemblages were generally comprised of species characteristic of fresh brackish conditions, circumneutral to alkaline waters and eutrophic condition.
- Based on the spatial diatom analyses the ecological water quality for all the sites ranged from *Good* to *Moderate* conditions with low (PTV <20%) to moderate (PTV 20 – 40%) levels of organic pollution.
- All sites showed some level of nutrients present but this did not appear to be causing eutrophication at any of the sites. Sites A1 and B3 reflected better conditions with low levels of organic pollution, whereas site H3 showed slightly poorer conditions.
- Based on the temporal diatom analyses, sites A1, H2 and H3 have on average reflected better ecological conditions with lower levels of organic pollution compared to the other sites; whereas sites A3 and B1 have on average reflected poorer conditions.

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7. APPENDIX

Table 7-1: Species and their abundances for the sites, April 2025

Taxa	A1	A2	A3	B1	B3	H2	H3
ACHNANTHIDIUM F.T. Kützing	26	22	9	12	6	8	11
Aulacoseira granulata (Ehr.) Simonsen var.*angustissima* (O.M.)Simonsen						1	
Aulacoseira granulata (Ehr.) Simonsen			1				
AULACOSEIRA G.H.K. Thwaites	1						
Amphora veneta Kützing					1		
Cyclotella meneghiniana Kützing	7	1	10	54	18		
Craticula molestiformis (Hustedt) Lange-Bertalot			2				
COCCONEIS C.G. Ehrenberg	3				1		
Cocconeis pediculus Ehrenberg		2					
Cocconeis placentula Ehrenberg var. *placentula*		2	6			64	24
Cocconeis placentula Ehrenberg var.*lineata* (Ehr.)Van Heurck						5	4
CRATICULA A. Grunow					1		
Cymbella simonsenii Krammer	2						
CYCLOTELLA F.T. Kützing ex A de Brébisson			1				
Diadesmis confervacea Kützing var. *confervacea*		4	7		68		
Diadesmis contenta (Grunow ex V. Heurck) Mann	4	2	10	11	1	2	7
Abnormal diatom valve (unidentified) or sum of deformities abundances	1			3	1		
DENTICULA F.T. Kützing				1			
DISCOSTELLA Houk et Klee	1		4				
ENCYONOPSIS Krammer	1						
Encyonema minutum (Hilse in Rabh.) D.G. Mann	1				1		
EOLIMNA Lange-Bertalot & Schiller	5	3	20	21	16		
Eolimna subminuscula (Manguin) Moser Lange-Bertalot & Metzeltin					3		
EUNOTIA C.G. Ehrenberg	51	8	29	48	7	3	
Fallacia pygmaea (Kützing) Stickle & Mann ssp.*pygmaea* Lange-Bertalot			1				
FRAGILARIA H.C. Lyngbye		1	3			11	4

Taxa	A1	A2	A3	B1	B3	H2	H3
FRUSTULIA L. Rabenhorst		1		2			
Gomphonema acuminatum Ehrenberg	1		1				
Gomphonema affine Kützing					1		1
Gomphonema *clavatum* Ehr.						2	
GOMPHONEMA C.G. Ehrenberg	14		11	1	3	8	8
Gomphonema parvulum (Kützing) Kützing var. *parvulum* f. parvulum	45	3	39	18	8	10	8
Hantzschia amphioxys (Ehr.) Grunow in Cleve et Grunow 1880	1					3	
KARAYEVIA Round & Bukhtiyarova		1					
Karayevia nitidiformis (Lange-Bertalot) Bukhtiyarova						6	2
Karayevia oblongella (Oestrup) M. Aboal	8		2			2	
Luticola mutica (Kützing) D.G. Mann			1	2	1		
Mayamaea atomus (Kützing) Lange-Bertalot							
Mayamaea atomus var. permitis (Hustedt) Lange-Bertalot			1	1	1		
MAYAMAEA Lange-Bertalot	2		4		1		
Melosira varians Agardh	8		9		100	3	
Nitzschia amphibia Grunow f.*amphibia*	2		20			2	
Navicula antonii Lange-Bertalot							
NAVICULA J.B.M. Bory de St. Vincent	5	9	3	2	3	5	2
Navicula capitatoradiata Germain						1	
Navicula cryptocephala Kützing	8		7	1	5		2
Nitzschia dissipata(Kützing)Grunow var.*dissipata*							2
Nitzschia draveillensis Coste & Ricard	5				1		
NEIDIUM E. Pfitzer				1			
Navicula gregaria Donkin	2						2
Nitzschia frustulum(Kützing)Grunow var.*frustulum*						1	2
NITZSCHIA A.H. Hassall	47	17	120	91	33	15	5
Nitzschia liebetruthii Rabenhorst var.*liebetruthii*							

Taxa	A1	A2	A3	B1	B3	H2	H3
Nitzschia linearis(Agardh) W.M.Smith var.*linearis*		3		1	6	3	
Nitzschia lorenziana Grunow in Cleve et Möller	1					1	
Navicula oblonga Kützing							4
Nitzschia palea (Kützing) W.Smith	9	9	41	40	11	2	
Navicula rhynchocephala Kützing	1						
Navicula rostellata Kützing	35		5		52	1	2
Navicula small species				6			
Nitzschia sociabilis Hustedt			1	4		1	
Navicula schroeteri Meister var. *symmetrica* (Patrick) Lange-Bertalot	1		3			3	2
Navicula tripunctata (O.F.Müller) Bory	1						
Navicula trivialis Lange-Bertalot var. *trivialis*	1		1	5			
NUPELA W. Vyverman & P. Compere					1		
Navicula veneta Kützing	11	2					
ORTHOSEIRA G.H.K. Thwaites						13	2
PINNULARIA C.G. Ehrenberg	3	4	3	36	1	4	
PLACONEIS C. Mereschkowsky				1			
Planothidium frequentissimum(Lange-Bertalot)Lange-Bertalot	2	2	2		10		
PLANOTHIDIUM Round & Bukhtiyarova	1	1				2	
Placoneis placentula (Ehr.) Heinzerling						1	
Planothidium rostratum (Oestrup) Lange-Bertalot	32	2	8		2		
Pinnularia subbrevistriata Krammer				7			
Planothidium lanceolatum(Brebisson ex Kützing) Lange-Bertalot	7						
Rhoicosphenia curvata (Kützing) Grunow	9					3	4
Rhopalodia gibba (Ehr.) O.Muller var.*gibba*						1	
Surirella angusta Kützing	14	1	7	15	7	1	
Staurosira elliptica (Schumann) Williams & Round							
SELLAPHORA C. Mereschkowsky		1		6	2		

Taxa	A1	A2	A3	B1	B3	H2	H3
Sellaphora pupula (Kützing) Mereschkowksy						1	
Sellaphora seminulum (Grunow) D.G. Mann			1				
STEPHANODISCUS C.G. Ehrenberg	3		2				
SURIRELLA P. J.F. Turpin					1		
Tryblionella debilis Arnott ex O'Meara						1	
Tryblionella hungarica (Grunow) D.G. Mann	1						
TRYBLIONELLA W. Smith						1	
Thalassiosira weissflogii (Grunow) Fryxell & Hasle	9			4	1		
ULNARIA Compère	8	1	5	6	25	9	2
Total	400	102	400	400	400	200	100

Nutrients
Organics
Salinity
Other dominant

Appendix C. Compliance Assessment for the Wellsford WWTP

Compliance Assessment for the Wellsford WWTP -2023-2024

Condition Number	Consent Condition Wellsford WWTP Discharge to Water (#DIS60068492) and Discharge to Air (#DIS60068494)	Compliance Rating	Comment
01	The wastewater treatment plant facility shall be carried out in accordance with the plans and all information submitted with the application, detailed below, and all referenced by the council as consent numbers BUN60068493, DIS60068492 and DIS60068494.	1	
02	Under section 125 of the RMA, the consents shall lapse five years after the date it is granted unless: a. The consent is given effect to; or b. The council extends the period after which the consent lapses.	1	
03	Pursuant to section 123 of the RMA, these discharge consents shall expire 35 years after the date they are granted, unless surrendered or cancelled at an earlier date pursuant to the RMA.	1	
04	The consent holder shall pay the council an initial consent compliance monitoring charge of $960 (inclusive of GST), plus any further monitoring charge or charges to recover the actual and reasonable costs incurred to ensure compliance with the conditions attached to this consent.	1	
05	In the event of any conflict between the documents listed above and the conditions of this consent, the conditions shall prevail. The consent holder shall ensure that all staff and contractors undertaking works on site are aware of, and adhere to, all conditions of this consent.	1	
06	Within one month of the completion of the new wastewater treatment plant (WWTP) or of any interim works required to meet effluent quality requirements in this consent, the consent holder shall notify the Team Leader, Compliance Monitoring North West 1, Auckland Council, in writing that the works are completed and shall provide 'as-built certification' from a suitably qualified engineer that the new WWTP has been installed and is operating in accordance with industry standard.	1	New plant has not been constructed yet, so this condition does not yet apply.
07	Within three months of the commencement of this consent, the consent holder shall invite representatives of Te Uri o Hau, Nga Maunga Whakahii o Kaipara, Ngati Manuhiri, Te Runanga o Ngati Whatua and Ngati Whanaunga, as a minimum, in association with the consent holder to establish a group to be named the Wellsford Mana Whenua Consultation Group (WMWCG). If established, the consent holder shall provide reasonable organisation and administrative support to facilitate the development and ongoing role of the group for the duration of the consents. The WMWCG shall establish its own meeting protocols having regard to relevant customary practices and shall operate in accordance with the principles of the Treaty of Waitangi (Te Tiriti o Waitangi), especially the principles of consultation, active participation and partnership.	1	A Mana Whenua meeting was held on the 30th Nov 2017 where the wetland trail was discussed. This was considered as the first official Mana Whenua Group Meeting. In regard to the WWTP pilot plant update site commissioning visit was on 29 Nov 2018. The group has not requested any further formal meetings.
08	The purpose of the WMWCG is to facilitate consultation between the WMWCG and the consent holder. To that end, the functions of the WMWCG shall include, but not necessarily be limited to the following:	1	

Condition Number	Consent Condition Wellsford WWTP Discharge to Water (#DIS60068492) and Discharge to Air (#DIS60068494)	Compliance Rating	Comment
09	Prior to submitting the Riparian Planting Plan required under condition 35, the consent holder shall invite the WMWCG to a meeting to discuss matters relating to that Plan. The Riparian Planting Plan shall be provided to the WMWCG sufficiently in advance of the meeting so that the WMWCG has time to review and consider it.	1	
10	Within 3 months of it formation, the consent holder shall invite the WMWCG to a meeting to discuss matters relating to the Receiving Environment Monitoring Plan. The plan shall be provided to the WMWCG sufficiently in advance of the meeting so that the WMWCG has time to review and consider it. Any amendments to the plan as a result of these meeting shall be submitted to the Council for approval in accordance with condition 42.	1	
11	The consent holder shall keep minutes of the meetings held in accordance with conditions 9 and 10 and shall forward them to all attendees and to the Council (Team Leader, Compliance Monitoring North West 1). These meetings do not need to occur if the WMWCG notifies the consent holder that a meeting is not required.	1	
12	The consent holder shall provide the WMWCG with final copies of all reports required by conditions 35 (Riparian Planting), 39 (Receiving Environment Monitoring Plan), 44 (the Updated Quantitative Microbial Health Risk Assessment), 47 (Emerging Contaminants Risk Assessment), 71 (Annual Performance Report), 72 (Water Quality Review) and 75 (Technology and Growth Review) of these conditions concurrently with them being submitted to the Council (Team Leader, Compliance Monitoring North West 1).	1	
13	The consent holder shall within three months of the commencement of this consent, facilitate the establishment and maintenance of a Community Liaison Group (CLG). The consent holder shall invite representatives of the following parties to participate in the CLG:	1	The last CLG meeting was in November 2024, the next is scheduled for Nov 2025.
14	The purpose of the CLG shall be to provide a forum to: i. Facilitate communication and dialogue between the consent holder, the Council and the community on issues concerning plant operation, performance and upgrade works; and ii. Facilitate communication and dialogue between the consent holder and the community on effects on the community arising from plant operations and on future intentions.	1	
15	The consent holder shall use its best endeavours to ensure that formal meetings of the CLG are held at least once annually and where practicable within three months of the completion of the Annual Performance Report required by condition 71. The CLG meeting can be cancelled or deferred subject to agreement being obtained from all parties who attended the prior year's CLG meeting or have requested to be invited to all future CLG meetings.	1	The last CLG meeting was in November 2024, the next is scheduled for Nov 2025. Ongoing
16	The consent holder shall provide an appropriate venue for the CLG meetings, inform all parties listed above of each CLG meeting a minimum of ten working days prior to the scheduled meeting date, and provide the minutes of the CLG meeting to all parties listed above within one month following the CLG meeting.	1	

Condition Number	Consent Condition Wellsford WWTP Discharge to Water (#DIS60068492) and Discharge to Air (#DIS60068494)	Compliance Rating	Comment
17	The consent holder shall assist the CLG to fulfil its purpose by providing information to the CLG parties on: i. Any concerns and complaints of the local community, aspects of non-compliance and remedial actions or proposals; ii. Plant performance, including an overview of the most recent annual report and receiving environment monitoring; iii. Any investigations and works at the plant; iv. Updates on issues that have been resolved.	1	
18	The discharge volume from the wastewater treatment system to the unnamed tributary of the Hōteo River shall not exceed 3,950 m3 per day when measured as the rolling 12-month 95th percentile figure.	1	
19	The discharge volume from the wastewater treatment system to the unnamed tributary of the Hōteo River shall not exceed an average daily flow of 1,730 m3 per day across any 12-month period.	1	
20	For the purposes of assessing compliance with condition 19, average daily flow shall be calculated based on flows with at least three consecutive days of zero rainfall.	1	Ongoing
21	The consent holder shall ensure that for the duration of this consent, the wastewater treatment system is maintained and operated by a suitably qualified and experienced wastewater plant operator.	1	Ongoing
22	The consent holder shall maintain flow meters to measure the total daily inflow to the wastewater treatment plant and the total daily discharge to the unnamed tributary of the Hōteo River. The discharge flow meters must be maintained to ensure an accuracy of plus or minus five percent.	1	Ongoing
23	The consent holder shall record daily inflow and discharge volumes from the meters required by condition 22. Records shall be kept of the volumes discharged to the unnamed tributary of the Hōteo River.	1	Ongoing
24	This condition shall apply to the continued operation of the Wellsford WWTP and shall apply until the upgrades to the Wellsford WWTP have been commissioned in accordance with condition 6 above, but in any event, for no longer than eight years from commencement of this consent. Treated wastewater discharges from the Wellsford WWTP shall be equal to or better than the limit specified for that parameter as set out in Table 1. Collection of treated wastewater samples shall occur weekly and take place following treatment and prior to discharge to the unnamed tributary. Please see the consent document for further details.	2	The faecal coliforms 95%-ile was above the consented limit during the 2024-2025 reporting period
25	The consent holder shall, within three months of commencement of this consent, complete construction works to bypass treated wastewater around the wetland prior to discharge to the unnamed tributary.	1	Wetland bypass pipe installed
26	Compliance with the faecal coliform standard in Table 1 are not required until three months from the commencement of this consent. During this period all other aspects of the wastewater treatment plant shall be operated in order to meet the other required standards as given in Table 1.	1	
27	The consent holder shall ensure that all chemical analyses and sampling techniques are carried out in accordance with the latest edition of “Standard Methods for the Examination of Water and Wastewater”, APHA AWWA WEF, or other standards approved in writing by the Council (Team Leader, Compliance Monitoring North West 1).	1	

Condition Number	Consent Condition Wellsford WWTP Discharge to Water (#DIS60068492) and Discharge to Air (#DIS60068494)	Compliance Rating	Comment
28	If no discharge is occurring on a scheduled sampling day, a sample shall be collected as soon as reasonably practicable following resumption of operation.	1	
29	This condition shall apply to the operation of the Wellsford WWTP once it has been upgraded in accordance with condition 6 above. Treated wastewater discharges from the Wellsford WWTP shall be equal to or better than the limit specified for that parameter as set out in Table 2. Please see the consent document for further details.	N/A	
30	Collection of treated wastewater samples shall occur weekly and take place following UV treatment, prior to discharge.	N/A	Long Term Discharges
31	The consent holder shall ensure that a validated UV dose of 45 mWs/cm2 is delivered by the UV disinfection facility for 99% of the time (calculated on the basis of a 15-minute average) over each calendar month.	N/A	Long Term Discharges
32	The consent holder shall, on a daily basis, record and log the UV dose applied to the treated wastewater following treatment through the UV system. The records of the UV dose shall be reported in the Annual Performance Report required in condition 71.	N/A	Long Term Discharges
33	The consent holder shall ensure that all chemical analyses and sampling techniques are carried out in accordance with the latest edition of "Standard Methods for the Examination of Water and Wastewater", APHA AWWA WEF, or other standards approved in writing by the Council (Team Leader, Compliance Monitoring North West 1). If no discharge is occurring on a scheduled sampling day, a sample shall be collected as soon as reasonably practicable following resumption of normal operation.	N/A	Long Term Discharges
34	Within six months of the commencement of the consents, the consent holder shall submit to the Council (Team Leader, Compliance Monitoring North West 1) details of discussions with the owners of 106 Rustybrook Road, being Lot 1 DP 203808 and Lot 2 DP 201302, CT NA129D/984, in relation to riparian planting and fencing along the unnamed tributary of the Hōteo River and the outcome of those discussions.	1	Complete
35	Within twelve months of the commencement of the consents, the consent holder shall submit to the Council (Team Leader, Compliance Monitoring North West 1), a Riparian Planting Plan (RPP) prepared by a suitably qualified independent person. As a minimum, the RPP shall: Please see the consent document for further details.	1	Complete
36	The RPP shall be in general accordance with the "Auckland Regional Council Riparian Zone Management Strategy for the Auckland Region" Technical Publication 148 June 2001. Any amendments to the approved RPP shall be submitted to the Council (Team Leader, Compliance Monitoring North West 1) for confirmation that the requirements of this condition have been met prior to their implementation.	N/A	
37	Once approved in accordance with conditions 35 and 36, the RPP shall be implemented in accordance with the time frames specified in the approved RPP and shall be fully implemented within five years of the consent holder receiving the Council's (Team Leader, Compliance Monitoring North West 1) approval of the RPP.	N/A	

Condition Number	Consent Condition Wellsford WWTP Discharge to Water (#DIS60068492) and Discharge to Air (#DIS60068494)	Compliance Rating	Comment
38	If within six months of commencement of this consent, the consent holder has not reached agreement with the owners of 106 Rustybrook Road (Lot 1 DP 203808 and Lot 2 DP 201302, CT NA129D/984) in relation to the implementation of the riparian planting and fencing provided for by conditions 35 and 36 with respect to that portion of the RPP on that property, the consent holder shall: i. advise the Council (Team Leader, Compliance Monitoring North West 1) of this in writing as soon as reasonably practicable; and ii. within 12 months of this consent commencing, put forward a proposal to the Council (Team Leader, Compliance Monitoring North West 1) for approval that provides for an equivalent area of riparian planting and fencing elsewhere in the Hōteo River catchment.	1	Complete
39	The consent holder shall design and implement a Receiving Environment Monitoring Plan (REMP) within one month of the commencement of this consent, with the purpose being to measure water quality in the receiving environment to ascertain any changes in water quality attributable to the discharge and to confirm predictions on effects.	1	REMP was approved in March 2018
40	The REMP shall be in general accordance with the Draft REMP, a copy of which is attached as Appendix One.	1	
41	The REMP shall be designed and implemented such that any obvious temporal trends in water quality in the vicinity of any discharges from the Wellsford WWTP can be delineated, and shall include: Please see the consent document for further details.	1	REMP was approved in March 2018
42	Revisions to the REMP shall be submitted to the Council (Team Leader, Compliance Monitoring North West 1) for approval at least three months prior to the proposed date of commencement.	1	REMP was approved in March 2018
43	The consent holder shall undertake the activities in accordance with the REMP developed in condition 39.	1	
44	The consent holder shall engage a suitably qualified person to undertake an updated Quantitative Microbial Health Risk Assessment (QMHRA) of the impact of treated wastewater from the Wellsford Wastewater Treatment Plant on the unnamed tributary, the Hōteo River, and the Kaipara Harbour by 30 September of the fifteenth anniversary of the commencement of this consent.	N/A	
45	The QMHRA shall as a minimum consider i. Developments in pathogen response to biological treatment and UV disinfection; ii. Results of any sampling and monitoring required under conditions 29, 30, and 31 of this consent; iii. Any new national or regional standards relating to risk of exposure to pathogens; iv. Any new information relating to water quality of the unnamed tributary, the Hōteo River and the Kaipara Harbour; and v. An updated assessment of the risk to users of the unnamed tributary, the Hōteo River, and the Kaipara River	N/A	
46	The QMHRA shall be forwarded to the Council (Team Leader, Compliance Monitoring North West 1) by 30 September of the year that it is required.	N/A	

Condition Number	Consent Condition Wellsford WWTP Discharge to Water (#DIS60068492) and Discharge to Air (#DIS60068494)	Compliance Rating	Comment
47	The consent holder shall engage a suitably qualified person to undertake an Emerging Contaminants Risk Assessment (ECRA) of the treated wastewater from the Wellsford WWTP by 30 September of the fifth anniversary of the commencement of this consent and subsequently at five yearly intervals thereafter.	1	Done in 2022, next one due in 2027
48	The ECRA shall as a minimum include: i. A review of changes in the state of knowledge of emerging contaminants relevant to the upgraded Wellsford WWTP either since the commencement of these consents or the previous ECRA, whichever is more recent. ii. Consideration of whether additional samples are required for the purposes of the ECRA. iii. Measurement of emerging contaminants if determined necessary and the results of any samples collected. iv. An assessment of the risks to the environment from emerging contaminants in the treated wastewater discharged from the upgraded Wellsford WWTP.	1	
49	The ECRA shall be forwarded to the Council (Team Leader, Compliance Monitoring North West 1) by 30 September of each year that it is required.	1	
50	The consent holder shall prepare and maintain a Midge Management and Monitoring Plan (MMMP), as part of the Environmental Management Plan (EMP) required by condition 67, for the control of pest midges at the Wellsford WWTP within three months of the commencement of this consent.	1	Compliant
51	The MMMP shall as a minimum specify: i. Midge monitoring locations, methodology and frequency, methods for controlling midge populations, including the use of chemical pesticides, treatment process adjustments and measures to enhance biological control. ii. A process for responding to midge complaints. iii. A procedure for modifying the MMMP, including consultation with interested parties (including the CLG) and the Team Leader, Compliance Monitoring North West 1; and iv. Any other issue considered important by the consent holder.	1	
52	The MMMP shall be submitted to the Council (Team Leader, Compliance Monitoring North West 1) for approval within six months of the date of commencement of this consent. Once approved the Midge Management and Monitoring Plan shall be implemented as soon as the consent holder receives the approval of the Council (Team Leader, Compliance Monitoring North West 1) for the Midge Monitoring and Management Plan.	1	Compliant
53	All processes on site shall be operated, maintained, supervised, monitored and controlled using the best practicable option to ensure that all emissions authorised by this consent are maintained at the minimum practicable level.	1	Ongoing
54	Beyond the boundary of the site, there shall be no dust and/or odour caused by discharges from the site, which in the opinion of an enforcement officer, is the cause of a noxious, dangerous, offensive or objectionable effect.	1	
55	No discharges from any activity on site shall give rise to visible emissions, other than water vapour, to an extent which, in the opinion of an enforcement officer, is the cause of a noxious, dangerous, offensive or objectionable effect.	1	

Condition Number	Consent Condition Wellsford WWTP Discharge to Water (#DIS60068492) and Discharge to Air (#DIS60068494)	Compliance Rating	Comment
56	Beyond the boundary of the site, there shall be no hazardous air pollutant, caused by discharges from the site, which is present at a concentration that causes, or is likely to cause, adverse effects to human health, the environment or property.	1	
57	All processes on site shall be operated in accordance with the Odour Management Plan (OMP) submitted and accepted in accordance with condition 63 of this consent.	1	Ongoing
58	All practicable measures shall be taken to ensure no part of the process shall be operated without the associated emissions control equipment being fully operational and functioning correctly.	1	Ongoing
59	All processing equipment, buildings, ducting and emissions control equipment shall be maintained in good condition and as far as practicable be free from leaks in order to prevent the escape of fugitive emissions.	1	Ongoing
60	The meteorological conditions and proximity of sensitive receptors shall be considered prior to undertaking any potentially-odorous activities at the site.	1	Ongoing
61	All sludge removal from the oxidation ponds and subsequent de-watering and disposal shall be carried out in a manner that minimises odour as far as practicable.	1	Ongoing
62	A walkover inspection of the site shall be undertaken at least once per week to identify any odours that may be originating from the site. The results shall be recorded and the cause of any odour potentially detectable off-site investigated immediately. Where necessary, remedial action shall be undertaken as soon as practicable. The procedures for the walkover, recording of the results and any remedial actions taken shall be as specified in the OMP required by condition 63.	1	Ongoing
63	The consent holder shall prepare and maintain an OMP as part of the Environmental Management Plan (EMP) required by condition 67 to describe measures to control, monitor and reduce the potential for odour generation to occur, which could give rise to off-site effects. The OMP shall as a minimum include the following: Please see the consent document for further details.	1	
64	The OMP required by condition 63 shall be submitted within six months of the commencement of these consents and reviewed at least once every year. The OMP and any proposed changes shall be submitted to the Council (Team Leader, Compliance Monitoring North West 1) for review prior to implementation. The Council (Team Leader, Compliance Monitoring North West 1) will advise the consent holder in writing if any aspects of the Odour Management Plan are considered to be inconsistent with the provisions of this consent.	1	
65	All records, monitoring and test results that are required by the conditions of this consent shall be made available upon request by an enforcement officer during working hours and shall be kept for a minimum of two years from the date of each entry.	1	
66	The Council (Team Leader, Compliance Monitoring North West 1) shall be notified as soon as practicable in the event of any significant discharge to air which results, or has the potential to result, in a breach of these conditions or adverse effects on the environment (such as odour caused by the loss of dissolved oxygen within the treatment ponds). The following information shall be included: Please see the consent document for further details.	1	

Condition Number	Consent Condition Wellsford WWTP Discharge to Water (#DIS60068492) and Discharge to Air (#DIS60068494)	Compliance Rating	Comment
67	The consent holder shall prepare an EMP, the purpose of which is to integrate operational practices, environmental monitoring programmes and reporting of results required by the conditions of these consents. The REMP, ECRA, MMMP and OMP required under conditions 39, 47, 50 and 63 respectively shall be included in the EMP. The EMP shall also, as a minimum, include the following matters: Please see the consent document for further details.	1	
68	The EMP shall be submitted to the Council (Team Leader, Compliance Monitoring North West 1) for approval within six months of the consents commencing except for those parts approved under conditions 39, 44, 47, 50 and 63, which shall be submitted in accordance with the timeframes required by those conditions.	1	
69	The consent holder shall comply at all times with the EMP.	1	
70	All subsequent significant updates to the EMP throughout the term of this consent shall be submitted to the Council (Team Leader, Compliance Monitoring North West 1) for approval.	1	
71	An Annual Performance Report shall be submitted to the Council (Team Leader, Compliance Monitoring North West 1) by September 30 of each year. The report shall: i. Collate, analyse and interpret all relevant data and information pertaining to this consent for the previous year from 1 July to 30 June including the results of receiving environment monitoring; ii. Include comment on general plant performance and any trends in changes in the discharge volume and / or the discharge quality standards over time iii. Include a consideration of compliance with each consent condition; and iv. Identify any actions required and submit a timetable to rectify any non-compliance.	1	Ongoing
72	The consent holder shall engage a suitably qualified person to assess and report on the quality of the treated wastewater discharged and the results of the receiving environment monitoring undertaken as part of these consent conditions by 30 October of the fifth anniversary of the commencement of this consent and subsequently at five yearly intervals thereafter. This assessment shall as a minimum: i. Report on any trends in the concentration of parameters measured; ii. Review recorded concentrations in treated wastewater and from the monitoring undertaken in accordance this consent and assess whether the Wellsford WWTP is having any unforeseen adverse effects on the environment. iii. Summarise the findings from the QMHRA (as described in condition 44) in years in which the QMHRA is completed.	1	Done 2022. Due in 2027
73	All complaints received by the consent holder about air and wastewater discharges from the WWTP activity shall be logged. The information shall include: i. The date, time, location and nature of the complaint; ii. Name, phone number and address of the complainant unless the complainant wishes to remain anonymous; iii. Action taken to remedy the problem; iv. Any equipment failure and remedial action taken; and v. The weather conditions on the day of the complaint including estimates of wind direction, wind strength, temperature and cloud cover.	1	

Condition Number	Consent Condition Wellsford WWTP Discharge to Water (#DIS60068492) and Discharge to Air (#DIS60068494)	Compliance Rating	Comment
74	Details of any complaints received that affect the consent holder's ability to comply with the conditions of consent shall be provided to the Auckland Council within 24 hours of receipt of the complaint(s) or on the next working day. All other complaints shall be provided in the Annual Report required by condition 71.	1	
75	The consent holder shall engage a suitably qualified person to undertake a Technology and Growth Review (TGR) of the Wellsford WWTP ten years after the commencement of this consent and at five yearly intervals after that. The TRG shall as a minimum include: i. A review of changes in the state of technology of wastewater disposal and discharge methods relevant to disposal options as they relate to land disposal and re-use options from the Wellsford WWTP either since the commencement of these consents or the previous TGR, whichever is more recent. ii. Consideration of the actual population growth that has occurred over the last five year interval, and whether this indicates that projections exceed design planning, and may trigger an upgrade prior to expiry of this consent.	N/A	
76	If condition 75 ii. indicates higher than expected population growth which may exceed discharge volumes authorised by this consent within the next five year period, then an assessment of alternative discharge environments shall be undertaken, taking consideration, if still relevant, of the Auckland Unitary Plan, the RMA, the National Policy Statement for Freshwater Management 2014 and any other relevant legislation at that time.	N/A	
77	The TGR shall be forwarded to the Council (Team Leader, Compliance Monitoring North West 1) by 30 September of each year that it is required.	N/A	
78	The conditions of this consent may be reviewed by the Council (Team Leader, Compliance Monitoring North West 1) pursuant to section 128 of the Resource Management Act 1991 (RMA), by giving notice pursuant to section 129, on the fifth anniversary of the commencement of these consents and subsequently at intervals of not less than five years thereafter in order to: Please see the consent document for further details.	N/A	
79	The servants or agents of the Council shall be permitted to have access to the relevant parts of the property at all reasonable times for the purpose of carrying out monitoring procedures, inspections, surveys, investigations, tests, measurements or take samples while adhering to the consent holder's health and safety policies. A copy of the consent and these conditions should be held at the Wellsford Wastewater Treatment Plant site. Compliance with the consent conditions will be monitored by the Council in accordance with section 35(d) of the RMA. This will typically include site visits to verify compliance (or non-compliance) and documentation (site notes and photographs) of the activity established under the consents. In order to recover actual and reasonable costs, Inspections will be charged at the relevant hourly rate applicable at the time.	1	