Appendix A:

Summary of EcIA Assessment Methodology

The assessment of ecological effects follows Ecological Impact Assessment guidelines (EcIA) produced by the Environment Institute of Australia and New Zealand (EIANZ, 2018). The EcIA approach follows the steps outlined below:

Step 1: Assessment of ecological values

Ecological values are assigned based on the matters to be considered when assigning ecological value outlined in Table A.1, with corresponding criteria specific to terrestrial and freshwater habitats and species as set out in the EcIA guidelines (Table A.2).

Table A.1. Assignment of values to species, vegetation and habitats within the surveyed area (adapted from EIANZ, 2018).

Matter	Assessment matters considered; terrestrial and aquatic ecosystems
Representativeness	Criteria for representative vegetation and habitats: • Typical structure and composition • Indigenous species dominate • Expected species and tiers are present • Thresholds may need to be lowered where all examples of a type are strongly modified Criteria for representative species and species assemblages: • Species assemblages that are typical of the habitat • Indigenous species that occur in most of the guilds expected for the habitat type
Rarity/distinctiveness	Criteria for rare/distinctive vegetation and habitats: • Naturally uncommon, or induced scarcity • Amount of habitat or vegetation remaining • Distinctive ecological features • National priority for protection Criteria for rare/distinctive species or species assemblages: • Habitat supporting nationally Threatened or At Risk species, or locally uncommon species • Regional or national distribution limits of species or communities • Unusual species or assemblages • Endemism
Diversity and pattern	• Level of natural diversity, abundance and distribution • Biodiversity reflecting underlying diversity • Biogeographical considerations – pattern, complexity • Temporal considerations, considerations of life cycles, daily or seasonal cycles of habitat availability and utilisation
Ecological context	• Site history, and local environmental conditions which have influenced the development of habitats and communities • The essential characteristics that determine an ecosystem's integrity, form, functioning, and resilience (from "intrinsic value" as defined in RMA) • Size, shape and buffering • Condition and sensitivity to change • Contribution of the site to ecological networks, linkages, pathways and the protection and exchange of genetic material • Species role in ecosystem functioning – high level, key species identification, habitat as proxy

Table A.2. Criteria for assigning ecological value to terrestrial and freshwater habitats and species (modified from EIANZ 2018)

Value	Species Value requirements	Habitat Value requirements
Very High	Threatened - (Nationally Critical, Nationally Endangered, Nationally Vulnerable)	Area rates High for 3 or all of the four assessment matters listed in Table A.1. Likely to be nationally important and recognised as such.
High	Important for Nationally At Risk – species and may provide less suitable habitat for Nationally Threatened species	Area rates High for 2 of the assessment matters, Moderate and Low for the remainder, or Area rates High for 1 of the assessment matters, Moderate for the remainder. Likely to be regionally important and recognised as such.
Moderate	At Risk - (Recovering, Relict, Naturally Uncommon) Locally (Ecological District) uncommon or distinctive species	Area rates High for one matter, Moderate and Low for the remainder, or Area rates Moderate for 2 or more assessment matters Low or Very Low for the remainder. Likely to be important at the level of the Ecological District.
Low	Native - Not Threatened. Nationally and locally common indigenous species	Area rates Low or Very Low for majority of assessment matters and Moderate for one. Limited ecological value other than as local habitat for tolerant native species.
Very Low	Exotic species, including pests, species having recreational value	Area rates Very Low for 3 matters and Moderate, Low or Very Low for remainder.

Step 2: Magnitude of effect assessments

Step 2 of the EcIA guidelines requires an evaluation of the magnitude of effects on ecological values based on the extent of any area which is likely to be affected, intensity and duration of effect. The magnitude of the effect that the Project is expected to have on ecological values is evaluated as being either No effect, Negligible, Low, Moderate, High or Very High, based on the proposed works (footprint size, intensity and duration; see Table A.3).

Table A.3. Summary of the criteria for describing the magnitude of effect as outlined in EIANZ, 2018.

Magnitude of effect	Description
Very High	Total loss or major alteration of the existing baseline conditions; and/or Loss of high proportion of the known population or range
High	Major loss or alteration of existing baseline conditions; and/or Loss of high proportion of the known population or range
Moderate	Loss or alteration to existing baseline conditions; and/or Loss of a moderate proportion of the known population or range
Low	Minor shift away from existing baseline conditions; and/or Minor effect on the known population or range
Negligible	Very slight change from the existing baseline conditions; and/or Negligible effect on the known population or range

Step 3: Level of effects assessment in the absence of mitigation

Step 3 of the EcIA guidelines requires the overall level of effect to be determined using a matrix that is based on the ecological values and the magnitude of effects on these values in the absence of any efforts to avoid, remedy or mitigate for potential effects. Level of effect categories include No Effect, Very Low, Low, Moderate, Moderate/High, High and Very High. Table A.4 shows the EcIA matrix outlining criteria to describe the overall level of ecological effects.

Table A.4. Summary of the criteria for describing the overall level of ecological effects as outlined in EIANZ, 2018.

Effect Level		Ecological Value				
		Very High	High	Moderate	Low	Very Low
Magnitude of Impact	Positive	Net gain	Net gain	Net gain	Net gain	Net gain
	Very High	**Very high**	**Very high**	**High**	**Moderate**	Low
	High	**Very high**	**Very high**	**Moderate**	Low	Very low
	Moderate	**High**	**High**	**Moderate**	Low	Very low
	Low	**Moderate**	Low	Low	Very low	Very low
	Negligible	Low	Very low	Very low	Very low	Very low

Assessment also considered the temporal scale at which potential impacts were likely to occur:

- Permanent (>25 years);
- Long-term (15-25 years);
- Medium-term (5-15 years);
- Short-term (0-5 years); or,
- Temporary (during construction).

Step 4: Establish if mitigation is required

Results from the matrix in Table A.4 is used to determine the type of responses that may be required to mitigate potential direct and indirect impacts, considering the following EcIA guidelines:

- A 'Low' or 'Very Low' level of impact is not normally of concern, though design should take measures to minimise potential effects.
- A 'Moderate' to 'High' level of impact indicates a level of impact that qualifies careful assessment on a case-by-case basis. Such activities could be managed through avoidance (revised design) or appropriate mitigation. Where avoidance is not possible, no net loss of biodiversity values would be appropriate.
- A 'Very High' level of impact is are unlikely to be acceptable on ecological grounds alone and should be avoided. Where avoidance is not possible, a net gain in biodiversity values would be appropriate.

As discussed in this report, the Project would largely have only Low to Very Low ecology effects (in terms of Step 3 of the EcIA guidelines), even without taking into account mitigation measures. However, mitigation measures are proposed for specific attributes below to ensure a no-net-loss ecological outcome.

Appendix B:

Baseline Water Quality (Turbidity) Letter

robertson environmental

ECOLOGICAL ASSESSMENT & REPORTING SERVICES

Memo

To:	Neil Donaldson; CCKV (Maitahi Project Manager)	Project:	Maitahi Village - Maitahi/Kaka Baseline Water Quality (Turbidity) Data June-August 2023
From:	Dr Ben Robertson; Robertson Enviro Ltd	Date:	11 September 2023
cc:	Michael Parsonson; Southern Skies Environmental Ltd		
Subject:	CCKV Maitahi Village - Baseline Water Quality (Turbidity) Data 2023		

1 Introduction

As per the agreement with CCKV, Robertson Environmental Ltd conducted baseline water quality sampling focused on turbidity levels within specified areas of Kaka Stream and Maitahi River. We understand the primary objective of the sampling is to establish baseline (pre-construction) turbidity conditions and provide detailed results to Southern Skies Environmental Ltd to assist the development and implementation of an Erosion & Sediment Control Plan for the project.

This memorandum provides an overview of the sampling location/s and the methodologies used during the sampling process. The certified results of the sampling are presented in **Attachment A**.

2 Sites Locations

The specified sampling sites were (refer indicative map in **Attachment B**):

- Kaka Hill Tributary (lower reach) (**K**) - NZTM 1625818 5431184
- Maitahi River (downstream of Kaka confluence) (**M-D**) - NZTM 1625747 5430894
- Maitahi River (upstream of Kaka confluence) (**M-U**) - NZTM 1626030 5431017

3 Sampling Frequency

Between June and August 2023, sampling was undertaken regularly during baseflows (approxi-

- **Ben Robertson** (Principal Consultant, Director) BSc (Hons), PhD, CEnvP
- **Barry Robertson** (Technical Advisor, Director) BSc, Dip Sci, PhD
- **Jodie Robertson** (Senior Consultant) BSc, PG Dip, MSc
- **Julian Goulding** (Technical Officer) BComm, Master 3000 Gross Tonnes

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mately weekly intervals), and additional samples are collected from each site during the falling limb of floodflows where rainfall exceeds 10 mm in the previous 24 hour period.

4 Sampling Procedure

At each site, a 1 litre clean and sealed sample bottle (provided by the contracted analytical laboratory, Hill Labs) is collected on each sampling occasion.

Before taking the samples, the bottles are labelled with a waterproof pen noting the location, date and time. At the same time, an internal record is made of sites sampled, date, time, provisional hourly rainfall (mm) for 24 hours ending immediately prior to relevant sampling event (NZST — Maitai at Forks), and any comments.

A representative sample from each site is then collected by wading into mid stream (or in the case of the narrow stream width of Site K, collecting from the bank) and sampling the water column. Where wading into the water was undertaken the sample was collected upstream of the person sampling in order to avoid contaminating the sample from the disturbed stream bed.

The lid was unscrewed and held in one hand whilst avoiding touching the inside of the lid, or bottle.

The other hand plunged the bottle neck downward beneath the water surface, to a depth of approximately 10-20 cm for Sites M-U and M-D, and 5 cm for the shallower Site K. The bottle neck was tilted upwards, facing upstream towards the current.

The bottle was rinsed three times, discarding the contents downstream of the sampler and then the bottle was filled to the top on the fourth immersion. The full bottle was removed from the water and tightly capped.

The bottle was then stored in a dark bag prior to being dropped off at the courier for transport to the analytical lab.

5 Sample Transport to Laboratory

After sample collection at all three sites, the Sample Custody Sheet provided by R. J. Hill Laboratories was filled out with the relevant information including:

- Chain of Custody Record: Date and time of sampling, person undertaking sampling and their signature.
- Results Sent To: tick email primary contact.
- Quoted Sample Types: record Sample Name, Date/Time, Sample Type (all Aqueous Surface Water) and Tests Required (i.e. TSS, Turbidity (NTU) and pH).

The samples, stored in a dark container, are then dropped off to NZ Post to be couriered to Hill Labs for analysis within 2 to 48 hours of collection.

6 Sample Results Reporting

Hill Labs supplied Robertson Environmental Ltd with the sample results from each sampling event digitally within a week of collection. All results have been saved both on Robertson Environmental Ltd's hard drive and backed up to the cloud, where they will be retained for up to one year.

7 Applicability

Robertson Environmental's professional opinions are based on its professional judgement, experience, and training. These opinions are also based upon data derived from the existing information and analysis described in this document, with the support of relevant national guidelines (EIANZ, 2018). It is possible that additional testing and analyses might produce different results and/or different opinions.

This memorandum has been prepared for the exclusive use of our Client CCKV, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our prior review and agreement.

We understand and agree that CCKV will submit this report to support a resource consent application and that Nelson City Council as the regulatory authority will use this report for the purpose of assessing that application.

Robertson Environmental Limited

Report Prepared by:

Dr Ben Robertson

Principal Consultant, Director

Attachment A:

Certified Water Quality Results (Hill Labs)

R J Hill Laboratories Limited
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Christchurch 8042 New Zealand

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mail@hill-labs.co.nz
www.hill-labs.co.nz

Certificate of Analysis

Client:	Robertson Environmental	**Lab No:**	3294773	SPv1
Contact:	Ben Robertson	**Date Received:**	03-Jun-2023	
	C/- Robertson Environmental	**Date Reported:**	08-Jun-2023	
	89 Halifax Street East	**Quote No:**	124351	
	Nelson 7010	**Order No:**		
		Client Reference:		
		Submitted By:	Ben Robertson	

Sample Type: Aqueous

	Sample Name:	M-D1 02-Jun-2023 11:00 am	M-U1 02-Jun-2023 11:06 am	K-1 02-Jun-2023 11:15 am
	Lab Number:	3294773.1	3294773.2	3294773.3
Turbidity	NTU	1.49	1.32	2.3
pH	pH Units	8.0	8.0	8.1
Total Suspended Solids	g/m³	< 3	< 3	< 3

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request.
Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 2130 B 23rd ed. 2017 (modified).	0.05 NTU	1-3
pH	pH meter. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 4500-H^+ B 23rd ed. 2017. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-3
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 2540 D (modified) 23rd ed. 2017.	3 g/m³	1-3

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 06-Jun-2023 and 07-Jun-2023. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

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Laboratory Technician - Chemistry

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Christchurch 8042 New Zealand

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Certificate of Analysis

Client:	Robertson Environmental	**Lab No:**	3296292	SPv1
Contact:	Ben Robertson	**Date Received:**	07-Jun-2023	
	C/- Robertson Environmental	**Date Reported:**	09-Jun-2023	
	89 Halifax Street East	**Quote No:**	124351	
	Nelson 7010	**Order No:**		
		Client Reference:		
		Submitted By:	Ben Robertson	

Sample Type: Aqueous

	Sample Name:	M-D2 05-Jun-2023 8:35 am	M-U2 05-Jun-2023 8:42 am	K2 05-Jun-2023 8:45 am
	Lab Number:	3296292.1	3296292.2	3296292.3
Turbidity	NTU	2.4	2.8	9.3
pH	pH Units	8.0	8.0	7.9
Total Suspended Solids	g/m³	< 3	< 3	6

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request.
Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 2130 B 23rd ed. 2017 (modified).	0.05 NTU	1-3
pH	pH meter. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 4500-H^+ B 23rd ed. 2017. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-3
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 2540 D (modified) 23rd ed. 2017.	3 g/m³	1-3

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed on 09-Jun-2023. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

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Certificate of Analysis

Client:	Robertson Environmental	**Lab No:**	3297691	SPv1
Contact:	Ben Robertson	**Date Received:**	08-Jun-2023	
	C/- Robertson Environmental	**Date Reported:**	12-Jun-2023	
	89 Halifax Street East	**Quote No:**	124351	
	Nelson 7010	**Order No:**		
		Client Reference:		
		Submitted By:	Ben Robertson	

Sample Type: Aqueous

	Sample Name:	M-D3 07-Jun-2023 11:35 am	M-U3 07-Jun-2023 11:45 am	K3 07-Jun-2023 11:55 am
	Lab Number:	3297691.1	3297691.2	3297691.3
Turbidity	NTU	1.32	0.86	2.9
pH	pH Units	7.9	8.0	8.0
Total Suspended Solids	g/m³	< 3	< 3	6

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request.
Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 2130 B 23rd ed. 2017 (modified).	0.05 NTU	1-3
pH	pH meter. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 4500-H^+ B 23rd ed. 2017. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-3
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 2540 D (modified) 23rd ed. 2017.	3 g/m³	1-3

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 09-Jun-2023 and 12-Jun-2023. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

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Certificate of Analysis

Client:	Robertson Environmental	**Lab No:**	3304407	SPv1
Contact:	Ben Robertson	**Date Received:**	19-Jun-2023	
	C/- Robertson Environmental	**Date Reported:**	21-Jun-2023	
	89 Halifax Street East	**Quote No:**	124351	
	Nelson 7010	**Order No:**		
		Client Reference:		
		Submitted By:	Ben Robertson	

Sample Type: Aqueous

	Sample Name:	M-D4 16-Jun-2023 11:45 am	M-U4 16-Jun-2023 11:55 am	K4 16-Jun-2023 12:05 pm
	Lab Number:	3304407.1	3304407.2	3304407.3
Turbidity	NTU	0.73	0.66	3.5
pH	pH Units	8.1	8.1	8.1
Total Suspended Solids	g/m³	< 3	< 3	< 3

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request.
Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 2130 B 23rd ed. 2017 (modified).	0.05 NTU	1-3
pH	pH meter. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 4500-H^+ B 23rd ed. 2017. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-3
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 2540 D (modified) 23rd ed. 2017.	3 g/m³	1-3

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed on 20-Jun-2023. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

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Certificate of Analysis

Client:	Robertson Environmental	**Lab No:**	3308119	SPv1
Contact:	Ben Robertson	**Date Received:**	23-Jun-2023	
	C/- Robertson Environmental	**Date Reported:**	26-Jun-2023	
	89 Halifax Street East	**Quote No:**	124351	
	Nelson 7010	**Order No:**		
		Client Reference:		
		Submitted By:	Ben Robertson	

Sample Type: Aqueous

	Sample Name:	M-D5 22-Jun-2023 9:30 am	M-U5 22-Jun-2023 9:40 am	K5 22-Jun-2023 9:50 am
	Lab Number:	3308119.1	3308119.2	3308119.3
Turbidity	NTU	0.41	0.71	2.5
pH	pH Units	7.9	7.9	7.9
Total Suspended Solids	g/m³	< 3	< 3	5

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request.
Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 2130 B 23rd ed. 2017 (modified).	0.05 NTU	1-3
pH	pH meter. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 4500-H^+ B 23rd ed. 2017. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-3
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 2540 D (modified) 23rd ed. 2017.	3 g/m³	1-3

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 23-Jun-2023 and 26-Jun-2023. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

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Certificate of Analysis

Client:	Robertson Environmental	**Lab No:**	3310734	SPv1
Contact:	Ben Robertson	**Date Received:**	28-Jun-2023	
	C/- Robertson Environmental	**Date Reported:**	30-Jun-2023	
	89 Halifax Street East	**Quote No:**	124351	
	Nelson 7010	**Order No:**		
		Client Reference:		
		Submitted By:	Ben Robertson	

Sample Type: Aqueous

	Sample Name:	M-D 6 27-Jun-2023 9:30 am	M-U 6 27-Jun-2023 9:40 am	K6 27-Jun-2023 9:50 am
	Lab Number:	3310734.1	3310734.2	3310734.3
Turbidity	NTU	5.4	4.3	67
pH	pH Units	7.9	7.9	7.9
Total Suspended Solids	g/m³	5	< 3	91

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request.
Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 2130 B 23rd ed. 2017 (modified).	0.05 NTU	1-3
pH	pH meter. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 4500-H^+ B 23rd ed. 2017. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-3
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 2540 D (modified) 23rd ed. 2017.	3 g/m³	1-3

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 29-Jun-2023 and 30-Jun-2023. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

Irina Zinoveva BAppSc (Hons)
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Certificate of Analysis

Client:	Robertson Environmental	**Lab No:**	3312567	SPv1
Contact:	Ben Robertson	**Date Received:**	30-Jun-2023	
	C/- Robertson Environmental	**Date Reported:**	03-Jul-2023	
	89 Halifax Street East	**Quote No:**	124351	
	Nelson 7010	**Order No:**		
		Client Reference:		
		Submitted By:	Ben Robertson	

Sample Type: Aqueous

	Sample Name:	M-D7 29-Jun-2023 12:00 pm	M-U7 29-Jun-2023 12:10 pm	K7 29-Jun-2023 12:20 pm
	Lab Number:	3312567.1	3312567.2	3312567.3
Turbidity	NTU	2.1	1.53	3.2
pH	pH Units	8.0	8.1	8.1
Total Suspended Solids	g/m³	< 3	< 3	3

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request.
Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 2130 B 23rd ed. 2017 (modified).	0.05 NTU	1-3
pH	pH meter. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 4500-H^+ B 23rd ed. 2017. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-3
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 2540 D (modified) 23rd ed. 2017.	3 g/m³	1-3

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 30-Jun-2023 and 03-Jul-2023. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

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Certificate of Analysis

Client:	Robertson Environmental	**Lab No:**	3317515	SPv1
Contact:	Ben Robertson	**Date Received:**	07-Jul-2023	
	C/- Robertson Environmental	**Date Reported:**	10-Jul-2023	
	89 Halifax Street East	**Quote No:**	124351	
	Nelson 7010	**Order No:**		
		Client Reference:		
		Submitted By:	Ben Robertson	

Sample Type: Aqueous

	Sample Name:	M-D8 06-Jul-2023 10:30 am	M-U8 06-Jul-2023 10:40 am	K8 06-Jul-2023 10:50 am
	Lab Number:	3317515.1	3317515.2	3317515.3
Turbidity	NTU	0.41	0.34	1.63
pH	pH Units	8.0	8.0	7.9
Total Suspended Solids	g/m³	< 3	< 3	< 3

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request.
Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 2130 B 23rd ed. 2017 (modified).	0.05 NTU	1-3
pH	pH meter. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 4500-H^+ B 23rd ed. 2017. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-3
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 2540 D (modified) 23rd ed. 2017.	3 g/m³	1-3

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 07-Jul-2023 and 10-Jul-2023. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

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Certificate of Analysis

Client:	Robertson Environmental	**Lab No:**	3319608	SPv1
Contact:	Ben Robertson	**Date Received:**	11-Jul-2023	
	C/- Robertson Environmental	**Date Reported:**	13-Jul-2023	
	89 Halifax Street East	**Quote No:**	124351	
	Nelson 7010	**Order No:**		
		Client Reference:		
		Submitted By:	Ben Robertson	

Sample Type: Aqueous

	Sample Name:	M-D9 08-Jul-2023 3:35 pm	M-U9 08-Jul-2023 3:45 pm	K-9 08-Jul-2023 3:55 pm
	Lab Number:	3319608.1	3319608.2	3319608.3
Turbidity	NTU	4.6	2.6	18.9
pH	pH Units	8.1	8.1	8.0
Total Suspended Solids	g/m³	5	4	18

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request.
Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 2130 B 23rd ed. 2017 (modified).	0.05 NTU	1-3
pH	pH meter. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 4500-H^+ B 23rd ed. 2017. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-3
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 2540 D (modified) 23rd ed. 2017.	3 g/m³	1-3

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 12-Jul-2023 and 13-Jul-2023. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

K Addison

Karyn Addison NZCS
Laboratory Technician - Chemistry

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Certificate of Analysis

Client:	Robertson Environmental	**Lab No:**	3322706	SPv1
Contact:	Ben Robertson	**Date Received:**	17-Jul-2023	
	C/- Robertson Environmental	**Date Reported:**	19-Jul-2023	
	89 Halifax Street East	**Quote No:**	124351	
	Nelson 7010	**Order No:**		
		Client Reference:		
		Submitted By:	Ben Robertson	

Sample Type: Aqueous

	Sample Name:	M-D10 13-Jul-2023 10:30 am	M-U10 13-Jul-2023 10:40 am	K10 13-Jul-2023 10:50 am
	Lab Number:	3322706.1	3322706.2	3322706.3
Turbidity	NTU	0.39	0.29	2.0
pH	pH Units	8.0	8.0	8.0
Total Suspended Solids	g/m³	< 3	< 3	4

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request.
Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 2130 B 23rd ed. 2017 (modified).	0.05 NTU	1-3
pH	pH meter. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 4500-H^+ B 23rd ed. 2017. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-3
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 2540 D (modified) 23rd ed. 2017.	3 g/m³	1-3

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 18-Jul-2023 and 19-Jul-2023. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

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Certificate of Analysis

Client:	Robertson Environmental	**Lab No:**	3328063	SPv1
Contact:	Ben Robertson	**Date Received:**	25-Jul-2023	
	C/- Robertson Environmental	**Date Reported:**	26-Jul-2023	
	89 Halifax Street East	**Quote No:**	124351	
	Nelson 7010	**Order No:**		
		Client Reference:		
		Submitted By:	Ben Robertson	

Sample Type: Aqueous

	Sample Name:	M-D11 23-Jul-2023 1:00 pm	M-U11 23-Jul-2023 11:50 am	K11 23-Jul-2023 12:40 pm
	Lab Number:	3328063.1	3328063.2	3328063.3
Turbidity	NTU	0.39	0.49	4.4
pH	pH Units	8.1	8.5	8.0
Total Suspended Solids	g/m³	< 3	< 3	< 3

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request.
Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 2130 B 23rd ed. 2017 (modified).	0.05 NTU	1-3
pH	pH meter. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 4500-H^+ B 23rd ed. 2017. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-3
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 2540 D (modified) 23rd ed. 2017.	3 g/m³	1-3

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 25-Jul-2023 and 26-Jul-2023. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

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Certificate of Analysis

Client:	Robertson Environmental	**Lab No:**	3333119	SPv1
Contact:	Ben Robertson C/- Robertson Environmental 89 Halifax Street East Nelson 7010	**Date Received:** **Date Reported:** **Quote No:** **Order No:** **Client Reference:** **Submitted By:**	01-Aug-2023 02-Aug-2023 124351 Ben Robertson	

Sample Type: Aqueous

		Sample Name:	M-D12 31-Jul-2023 9:30 am	M-U12 31-Jul-2023 9:40 am	K12 31-Jul-2023 9:50 am
		Lab Number:	3333119.1	3333119.2	3333119.3
Turbidity	NTU		0.51	0.55	3.5
pH	pH Units		8.1	8.2	8.0
Total Suspended Solids	g/m³		< 3	< 3	4

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request.
Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 2130 B 23rd ed. 2017 (modified).	0.05 NTU	1-3
pH	pH meter. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 4500-H^+ B 23rd ed. 2017. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-3
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 2540 D (modified) 23rd ed. 2017.	3 g/m³	1-3

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 01-Aug-2023 and 02-Aug-2023. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

Ara Heron BSc (Tech)
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Certificate of Analysis

Client:	Robertson Environmental	**Lab No:**	3339089	SPv1
Contact:	Ben Robertson	**Date Received:**	09-Aug-2023	
	C/- Robertson Environmental	**Date Reported:**	11-Aug-2023	
	89 Halifax Street East	**Quote No:**	124351	
	Nelson 7010	**Order No:**		
		Client Reference:		
		Submitted By:	Ben Robertson	

Sample Type: Aqueous

	Sample Name:	M-D13 07-Aug-2023	M-U13 07-Aug-2023	K13 07-Aug-2023
	Lab Number:	3339089.1	3339089.2	3339089.3
Turbidity	NTU	0.26	0.26	1.65
pH	pH Units	8.1	8.1	8.1
Total Suspended Solids	g/m³	< 3	< 3	< 3

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request.
Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 2130 B 23rd ed. 2017 (modified).	0.05 NTU	1-3
pH	pH meter. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 4500-H^+ B 23rd ed. 2017. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-3
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 2540 D (modified) 23rd ed. 2017.	3 g/m³	1-3

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 09-Aug-2023 and 11-Aug-2023. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

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Certificate of Analysis

Client:	Robertson Environmental	**Lab No:**	3341482	SPv1
Contact:	Ben Robertson	**Date Received:**	12-Aug-2023	
	C/- Robertson Environmental	**Date Reported:**	16-Aug-2023	
	89 Halifax Street East	**Quote No:**	124351	
	Nelson 7010	**Order No:**		
		Client Reference:		
		Submitted By:	Ben Robertson	

Sample Type: Aqueous

	Sample Name:	M-D14 11-Aug-2023 10:00 am	M-U14 11-Aug-2023 10:10 am	K14 11-Aug-2023 10:20 am
	Lab Number:	3341482.1	3341482.2	3341482.3
Turbidity	NTU	0.38	0.38	10.0
pH	pH Units	8.0	8.0	8.0
Total Suspended Solids	g/m³	< 3	< 3	15

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request.
Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 2130 B 23rd ed. 2017 (modified).	0.05 NTU	1-3
pH	pH meter. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 4500-H^+ B 23rd ed. 2017. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-3
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 2540 D (modified) 23rd ed. 2017.	3 g/m³	1-3

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 14-Aug-2023 and 16-Aug-2023. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

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Certificate of Analysis

Client:	Robertson Environmental	**Lab No:**	3346142	SPv1
Contact:	Ben Robertson	**Date Received:**	19-Aug-2023	
	C/- Robertson Environmental	**Date Reported:**	22-Aug-2023	
	89 Halifax Street East	**Quote No:**	124351	
	Nelson 7010	**Order No:**		
		Client Reference:		
		Submitted By:	Ben Robertson	

Sample Type: Aqueous

	Sample Name:	M-D15 16-Aug-2023 10:00 am	M-U15 16-Aug-2023 10:30 am	K15 16-Aug-2023 11:00 am	M-D16 18-Aug-2023 10:45 am	M-U16 18-Aug-2023 11:00 am
	Lab Number:	3346142.1	3346142.2	3346142.3	3346142.4	3346142.5
Turbidity	NTU	1.61	1.38	14.3	0.40	0.41
pH	pH Units	8.1	8.1	8.1	8.0	8.1
Total Suspended Solids	g/m³	< 3	< 3	11	< 3	< 3

	Sample Name:	K16 18-Aug-2023 11:15 am
	Lab Number:	3346142.6
Turbidity	NTU	3.8
pH	pH Units	8.1
Total Suspended Solids	g/m³	< 3

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request. Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 2130 B 23rd ed. 2017 (modified).	0.05 NTU	1-6
pH	pH meter. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 4500-H^+ B 23rd ed. 2017. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-6
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 2540 D (modified) 23rd ed. 2017.	3 g/m³	1-6

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 21-Aug-2023 and 22-Aug-2023. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

This certificate of analysis must not be reproduced, except in full, without the written consent of the signatory.

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Hornby
Christchurch 8042 New Zealand

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+64 7 858 2000
mail@hill-labs.co.nz
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Certificate of Analysis

Client:	Robertson Environmental	**Lab No:**	3347253	SPv1
Contact:	Ben Robertson	**Date Received:**	22-Aug-2023	
	C/- Robertson Environmental	**Date Reported:**	23-Aug-2023	
	89 Halifax Street East	**Quote No:**	124351	
	Nelson 7010	**Order No:**		
		Client Reference:		
		Submitted By:	Ben Robertson	

Sample Type: Aqueous

	Sample Name:	M-D17 21-Aug-2023 9:00 am	M-U17 21-Aug-2023 9:30 am	K17 21-Aug-2023 9:45 am
	Lab Number:	3347253.1	3347253.2	3347253.3
Turbidity	NTU	6.2	5.5	7.6
pH	pH Units	7.8	7.8	7.8
Total Suspended Solids	g/m³	3	< 3	12

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request.
Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 2130 B 23rd ed. 2017 (modified).	0.05 NTU	1-3
pH	pH meter. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 4500-H^+ B 23rd ed. 2017. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-3
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 2540 D (modified) 23rd ed. 2017.	3 g/m³	1-3

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 22-Aug-2023 and 23-Aug-2023. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

Xiaozheng (Nadia) Ni BAppSc
Senior Laboratory Technician - Chemistry

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Certificate of Analysis

Client:	Robertson Environmental	**Lab No:**	3351065	SPv1
Contact:	Ben Robertson	**Date Received:**	26-Aug-2023	
	C/- Robertson Environmental	**Date Reported:**	29-Aug-2023	
	89 Halifax Street East	**Quote No:**	124351	
	Nelson 7010	**Order No:**		
		Client Reference:		
		Submitted By:	Ben Robertson	

Sample Type: Aqueous

	Sample Name:	M-U18 25-Aug-2023 3:15 pm	M-D18 25-Aug-2023 3:30 pm	K18 25-Aug-2023 3:45 pm
	Lab Number:	3351065.1	3351065.2	3351065.3
Turbidity	NTU	0.72	0.74	2.1
pH	pH Units	8.0	8.0	8.1
Total Suspended Solids	g/m³	< 3	< 3	5

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request.
Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 2130 B 23rd ed. 2017 (modified).	0.05 NTU	1-3
pH	pH meter. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 4500-H^+ B 23rd ed. 2017. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-3
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 2540 D (modified) 23rd ed. 2017.	3 g/m³	1-3

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 28-Aug-2023 and 29-Aug-2023. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

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Certificate of Analysis

Client:	Robertson Environmental	**Lab No:**	3357391	SPv1
Contact:	Ben Robertson	**Date Received:**	05-Sep-2023	
	C/- Robertson Environmental	**Date Reported:**	06-Sep-2023	
	89 Halifax Street East	**Quote No:**	124351	
	Nelson 7010	**Order No:**		
		Client Reference:		
		Submitted By:	Ben Robertson	

Sample Type: Aqueous

	Sample Name:	M-D20 01-Sep-2023	M-U20 01-Sep-2023	K20 01-Sep-2023
	Lab Number:	3357391.1	3357391.2	3357391.3
Turbidity	NTU	0.42	0.72	1.43
pH	pH Units	7.9	8.0	8.2
Total Suspended Solids	g/m³	< 3	< 3	< 3

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request. Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Turbidity	Analysis by Turbidity meter. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 2130 B 23rd ed. 2017 (modified).	0.05 NTU	1-3
pH	pH meter. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 4500-H^+ B 23rd ed. 2017. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-3
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. Analysed at Hill Laboratories - Chemistry; 101c Waterloo Road, Christchurch. APHA 2540 D (modified) 23rd ed. 2017.	3 g/m³	1-3

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed on 05-Sep-2023. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

Xiaozheng (Nadia) Ni BAppSc
Senior Laboratory Technician - Chemistry

ATTACHMENT B — Indicative sampling locations, Kaka Hill Tributary (lower reach) and adjacent Maitahi River.

Appendix C:

Plant Species List

Species	NVS Code used on field sheets	Common name	Structural Class	Threat Status[1]	Food Type[2]
Kunzea ericoides	KUNzea	kānuka	Dicotyledonous Trees & Shrubs	Nationally Vulnerable	N, I
Sophora microphylla	SOPmic	kōwhai	Dicotyledonous Trees & Shrubs	Not Threatened	
Dodonaea viscosa	DODvis	akeake	Dicotyledonous Trees & Shrubs	Not Threatened	I
Plagianthus regius	PLAreg	mānatu, ribbonwood	Dicotyledonous Trees & Shrubs	Not Threatened	
Corynocarpus laevigatus	CORlae	karaka	Dicotyledonous Trees & Shrubs	Not Threatened	F, N, I
Melicytus ramiflorus	MELram	māhoe, whitey wood	Dicotyledonous Trees & Shrubs	Not Threatened	N, B, I
Pittosporum crassifolium	PITcra	karo	Dicotyledonous Trees & Shrubs	Not Threatened	F, I
Pittosporum tenuifolium	PITten	kōhūhū, black matipo	Dicotyledonous Trees & Shrubs	Not Threatened	F, I, B
Pittosporum eugenioides	PITeug	tarata, lemonwood	Dicotyledonous Trees & Shrubs	Not Threatened	F, I
Sophora microphylla	SOPmic	small-leaved kōwhai	Dicotyledonous Trees & Shrubs	Not Threatened	N, I, B
Coprosma linariifolia	COPlin	mikimiki	Dicotyledonous Trees & Shrubs	Not Threatened	F, I
Fuscospora cliffortioides	FUScli	mountain beech	Dicotyledonous Trees & Shrubs	Not Threatened	
Schefflera digitata	SCHdig	patatē, seven-finger	Dicotyledonous Trees & Shrubs	Not Threatened	
Muehlenbeckia australis	MUEaus	pōhuehue	Dicotyledonous Lianes/Related Trailing Plants	Not Threatened	F, I, B
Calystegia tuguriorum	CALtug	powhiwhi	Dicotyledonous Lianes/Related Trailing Plants	Not Threatened	
Cordyline australis	CORaus	tī kōuka, cabbage tree	Monocotyledonous Trees & Shrubs	Not Threatened	F, N, I
Polystichum neozelandi-cum	POLnsz	shield fern	Ferns	Not Threatened	
Pteridium esculentum	PTEesc	bracken	Ferns	Not Threatened	
Pellaea rotundifolia	PELrot	round-leaved fern	Ferns	Not Threatened	
Cyathea medullaris	CYAmed	mamaku, black tree fern	Ferns	Not Threatened	

[1] de Lange et al. (2018).

[2] Type of food provided by native plant species for birds and lizards (F= Fruit/seeds, N=Nectar, B=Buds/foliage, I=Insects) (Courtney et al. 2003).

Species	NVS Code used on field sheets	Common name	Structural Class	Threat Status[1]
Cyathea dealbata	CYAdea	ponga, silver fern	Ferns	Not Threatened
Carex virgata	CARvir	pureī	Sedges	Not Threatened
Carex geminata	CARgem	rautahi, cutty grass	Sedges	Not Threatened
Ulex europaeus	ULEeur	gorse	Dicotyledonous Trees & Shrubs	Exotic
Rubus fruticosus	RUBfru	blackberry	Dicotyledonous Trees & Shrubs	Exotic
Berberis glaucocarpa	BERgla	barberry	Dicotyledonous Trees & Shrubs	Exotic
Cytisus scoparius	CYTsco	broom	Dicotyledonous Trees & Shrubs	Exotic
Ligustrum sinense	LIGsin	chinese privet	Dicotyledonous Trees & Shrubs	Exotic
Salix fragilis	SALfra	crack willow	Dicotyledonous Trees & Shrubs	Exotic
Crataegus monogyna	CRAmon	hawthorn	Dicotyledonous Trees & Shrubs	Exotic
Ilex aquifolium	ILEaqu	holly	Dicotyledonous Trees & Shrubs	Exotic
Acer pseudoplatanus	ACEpse	sycamore	Dicotyledonous Trees & Shrubs	Exotic
Juglans regia	JUGpse	common walnut	Dicotyledonous Trees & Shrubs	Exotic
Fraxinus excelsior	FRAexc	common ash	Dicotyledonous Trees & Shrubs	Exotic
Salix babylonica	SALbab	weeping willow	Dicotyledonous Trees & Shrubs	Exotic
Pinus radiata	PINrad	radiata pine	Gymnospermous Trees & Shrubs	Exotic
Ranunculus repens	RANrep	creeping buttercup	Dicotyledonous Herbs other than Composites	Exotic
Clematis vitalba	CLEvit	oldman's beard	Dicotyledonous Herbs other than Composites	Exotic
Cirsium arvense	CIRarv	californian thistle	Dicotyledonous Herbs other than Composites	Exotic
Galium aparine	GALapa	cleavers	Dicotyledonous Herbs other than Composites	Exotic
Digitalis purpurea	DIGpur	foxglove	Dicotyledonous Herbs other than Composites	Exotic

[1] de Lange et al. (2018).

Species	NVS Code used on field sheets	Common name	Structural Class	Threat Status[1]
Agrostis stononifera	AGRsto	creeping bent	Dicotyledonous Herbs other than Composites	Exotic
Agrostis capillaris[p]	AGRcap	browntop	Dicotyledonous Herbs other than Composites	Exotic
Holcus lanatus	HOLlan	Yorkshire fog	Dicotyledonous Herbs other than Composites	Exotic
Lolium perenne[p]	LOLper	perennial ryegrass	Dicotyledonous Herbs other than Composites	Exotic
Rumex obtusifolius	RUMobt	broad-leaved dock	Dicotyledonous Herbs other than Composites	Exotic
Dactylis glomerata[p]	DACglo	cocksfoot	Dicotyledonous Herbs other than Composites	Exotic
Paspalum dilatatum[p]	PASdil	Paspalum	Dicotyledonous Herbs other than Composites	Exotic
Poa pratensis[p]	POApra	Kentucky bluegrass	Dicotyledonous Herbs other than Composites	Exotic
Plantago lanceolata[p]	PLAlan	narrow-leaved plantain	Dicotyledonous Herbs other than Composites	Exotic
Trifolium repens[p]	TRIrep	white clover	Dicotyledonous Herbs other than Composites	Exotic
Lotus corniculatus[p]	LOTcor	birdsfoot trefoil	Dicotyledonous Herbs other than Composites	Exotic
Juncus articulatus	JUNart	jointed rush	Rushes and Allied Plants	Exotic
Juncus effusus	JUNeff	soft rush	Rushes and Allied Plants	Exotic

[1] de Lange et al. (2018).
[p] Pasture species (Cosgrove et al. 2022).

Appendix D:

RMA Ecology Ltd Lizard Survey Report

RMA ECOLOGY LTD

Memo

To:	**Ben Robertson, Robertson Environmental Ltd**	**Job No:**	**2286**
From:	**Zac Milner, RMA Ecology Ltd**	**Date:**	**12 April 2023**
cc:	**Graham Ussher, RMA Ecology Ltd**		
Subject:	**Maitahi Subdivision lizard survey**		

Dear Ben,

In this memorandum we present the results of a lizard survey undertaken by RMA Ecology Ltd across parts of 7 Ralphine Way and 79 Bayview Road, Nelson ("the site"; **Figure 1**) between 26 January and 29 March 2023[1]. We understand that CCKV Maitai Dev Co LP is seeking to develop parts of the property and that the results of the lizard survey will be used to assist with the design of future land use change at the site and/or support a future resource consent application for development of the site.

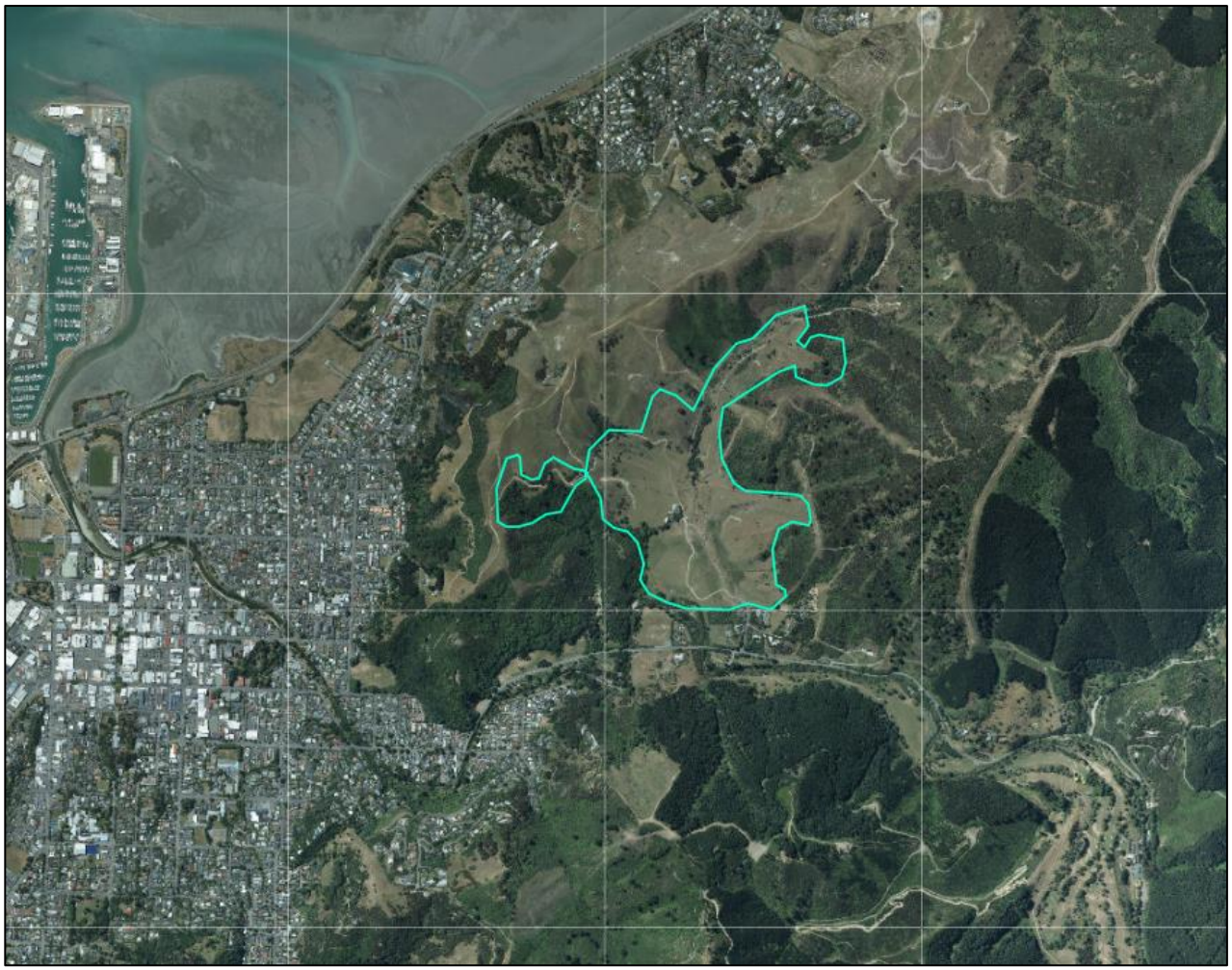

Figure 1. The site (blue border) in relation to the city of Nelson (on left).

[1] We have undertaken this lizard survey in accordance with our offer that was accepted on 20 December 2022.

1. Site description

The site was likely cleared of its original forest cover in the 1800s for timber and to facilitate pastoral agriculture. Since then, the site has been subject to patchy ongoing natural regeneration and consequent control of scrub (i.e., gorse (*Ulex europaeus*) and kānuka (*Kunzea ericoides*)). Presently, the site is predominantly grazed pasture (**Plate 1; Figure 2**). Some steeper or stock-excluded areas are dominated by rank grass, blackberry (*Rubus fruticosus*) and pōhuehue (*Muehlenbeckia australis*). There are also fragmented pockets of mixed native-exotic scrub that are mostly comprised of native kānuka and māhoe (*Melicytus ramiflorus*), and exotic sycamore (*Acer pseudoplatanus*), hawthorn (*Crataegus monogyna*) and barberry (*Berberis glaucocarpa*) – often with a heavily grazed understory and infested with exotic old man's beard (*Clematis vitalba*). The site is surrounded by similar vegetation, i.e., pasture and degraded native-exotic scrubland.

At a finer scale, habitat that may be suitable for lizards includes piles of woody material (**Plate 2**) and anthropogenic debris (e.g., concrete, plywood (**Plate 3**)).

Possums (*Trichosurus vulpecula*) are common at the site and a range of other common exotic predators are likely to be present including mice (*Mus musculus*), rats (*Rattus* spp.) and mustelids (*Mustela* spp.).

Overall, the site constitutes good habitat for grass dwelling skinks and poor habitat for arboreal geckos. The history of land use change, ongoing disturbance, and the presence of exotic predator animals is likely to have impeded the persistence and/or recolonisation of most lizard species that may have originally inhabited the site.

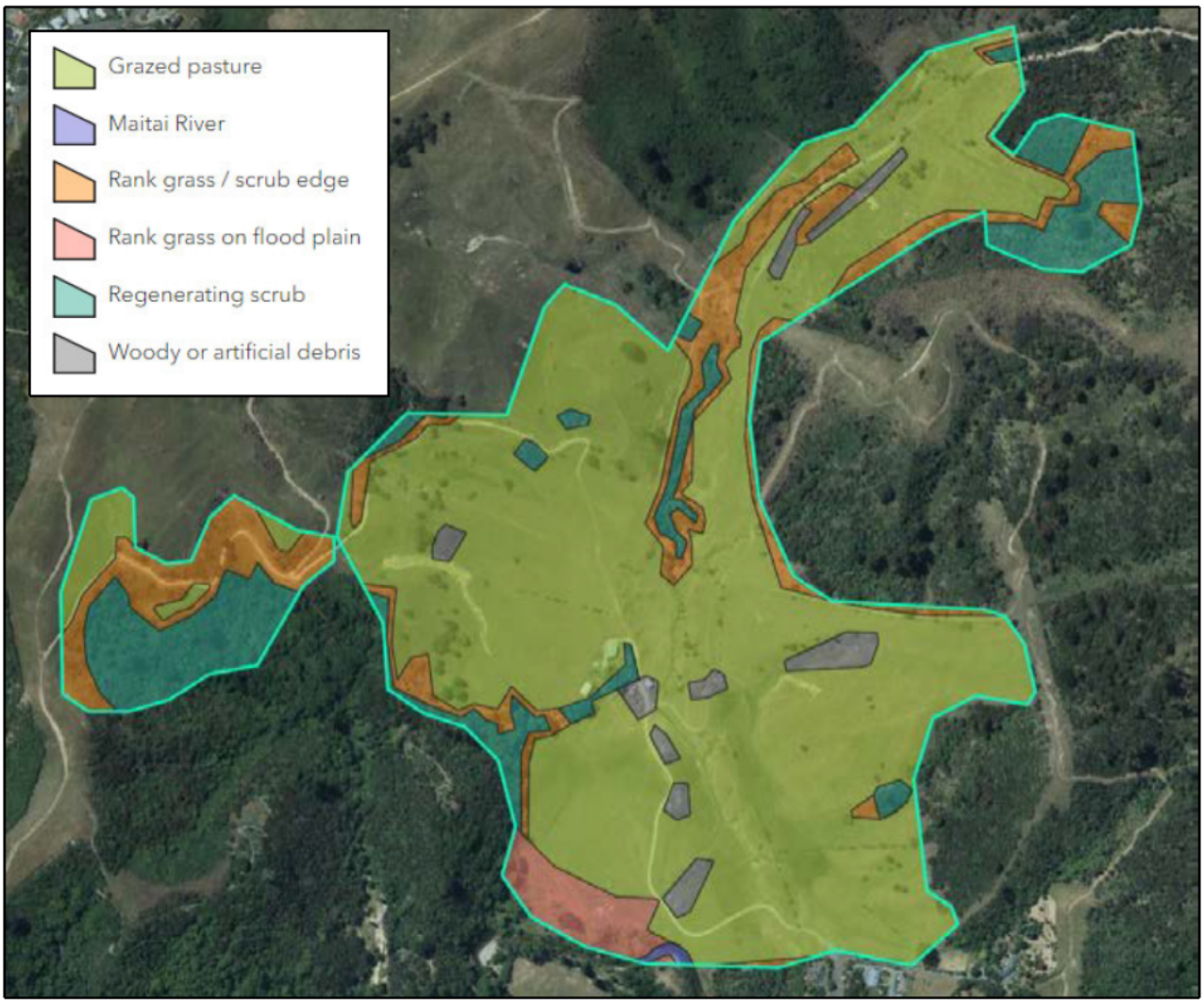

Figure 2. Coarse assessment of habitat types at the site. Habitat quality varies at a finer scale.

Plate 1. Typical vegetation cover at the site: grazed pasture with fragmented pockets of native-exotic scrub.

Plate 2. Decomposing woody debris provides refuge and a food source for native skinks.

Plate 3. Plywood provides good habitat for skinks.

2. Existing records

The national lizard, frog and tuatara (herpetofauna) database managed by the Department of Conservation was reviewed. There are no lizard records at the site but there are multiple records nearby (i.e., within 15 km of the site) for seven lizard species. These species and their habitat preferences are presented in **Table 1**.

Table 1. Herpetofauna records in the vicinity of the site and their preferred habitat type.

Species	Common Name	Nearest record	Threat Status	Preferred Habitat Type	Likelihood of presence
Mokopirirakau granulatus	Forest gecko	6.8 km SE	At Risk - Declining	Primarily arboreal including within swamps, scrubland and mature forest.	Low
Naultinus stellatus	Starred gecko	1.6 km SE	Threatened - Nationally Vulnerable	Arboreal including within swamps, scrubland and mature forest.	Low
Oligosoma kokowai	Northern spotted skink	2.9 km NW	At Risk - Relict	Prefers open areas such as boulder beaches, sand dunes, open coastal forest/scrub, as well as grassland and shrubland.	Very low
Oligosoma polychroma	Northern grass skink	0.6 km SE	Not Threatened	Wide ranging including rock, grassland, flaxland, shrubland and modified habitat.	Confirmed
Oligosoma zelandicum	Glossy brown skink	13.4 km NE	At Risk - Declining	Coastal pebble banks, grassland, wetland, dense scrubland and mature forest.	Very low
Woodworthia maculata	Raukawa gecko	3.4 km SW	Not Threatened	Wide ranging; saxicolous (rock dwelling) or arboreal.	Very low
Woodworthia "Marlborough mini"	Marlborough mini gecko	3.4 km NW	At Risk - Declining	Saxicolous and terrestrial.	Very low

3. Survey design and methodology

Three methods were employed to survey the site for lizards: nocturnal search, diurnal search, and Artificial Cover Objects (ACOs). Together, these methods effectively target the lizard species that could possibly be present at the site.

The diurnal search involved walking slowly and systematically through potential habitat while visually scanning the surroundings for basking or foraging lizards, including investigating vegetation, the ground and lifting potential refuges such as rocks, loose vegetation and debris to search beneath. The diurnal search was undertaken on 26 January 2023 as well as during the first three ACO checks on 14-16 March 2023.

The nocturnal search was undertaken over two nights on 8 February and 20 March 2023 via spotlighting of kānuka scrub and shrubland, as well as associated native vegetation including dense, tight-leaved native trees in the vicinity. The search was aided by high-powered torches and binoculars (to detect reflected eye-shine and resolve canopy detections) (**Plate 4**).

ACOs are an effective means of surveying skinks when there is a local abundance of habitat (as is the case within the rank exotic grassland and shrubland edge areas of this site). ACOs comprise 450 mm x 500 mm sheets of corrugated Onduline™ (a bitumen saturated material) laid in triple stacks with a 10 mm gap between the sheets (**Plate 5**). A total of 112 triple-stacked ACOs were installed in groupings of four across different habitat types where lizard encounters were considered most likely (**Figure 3**). ACOs are used to best effect during the cooler months either side of summer – e.g., September to November, and March - May. Hence, ACOs were installed in early February and left for 5 weeks to allow colonisation by lizards, after which time they were checked on five occasions on 14-16 and 28-29 March 2023 to assess occupancy.

The survey was led by Dr Graham Ussher who holds a Wildlife Act Authority to catch alive and handle lizards for the purpose of survey on private land in the Wellington and northern South Island regions (WAA Authority 91417-FAU).

Plate 4. Nocturnal search.

Plate 5. ACO installed amongst rank grass next to a pile of woody debris.

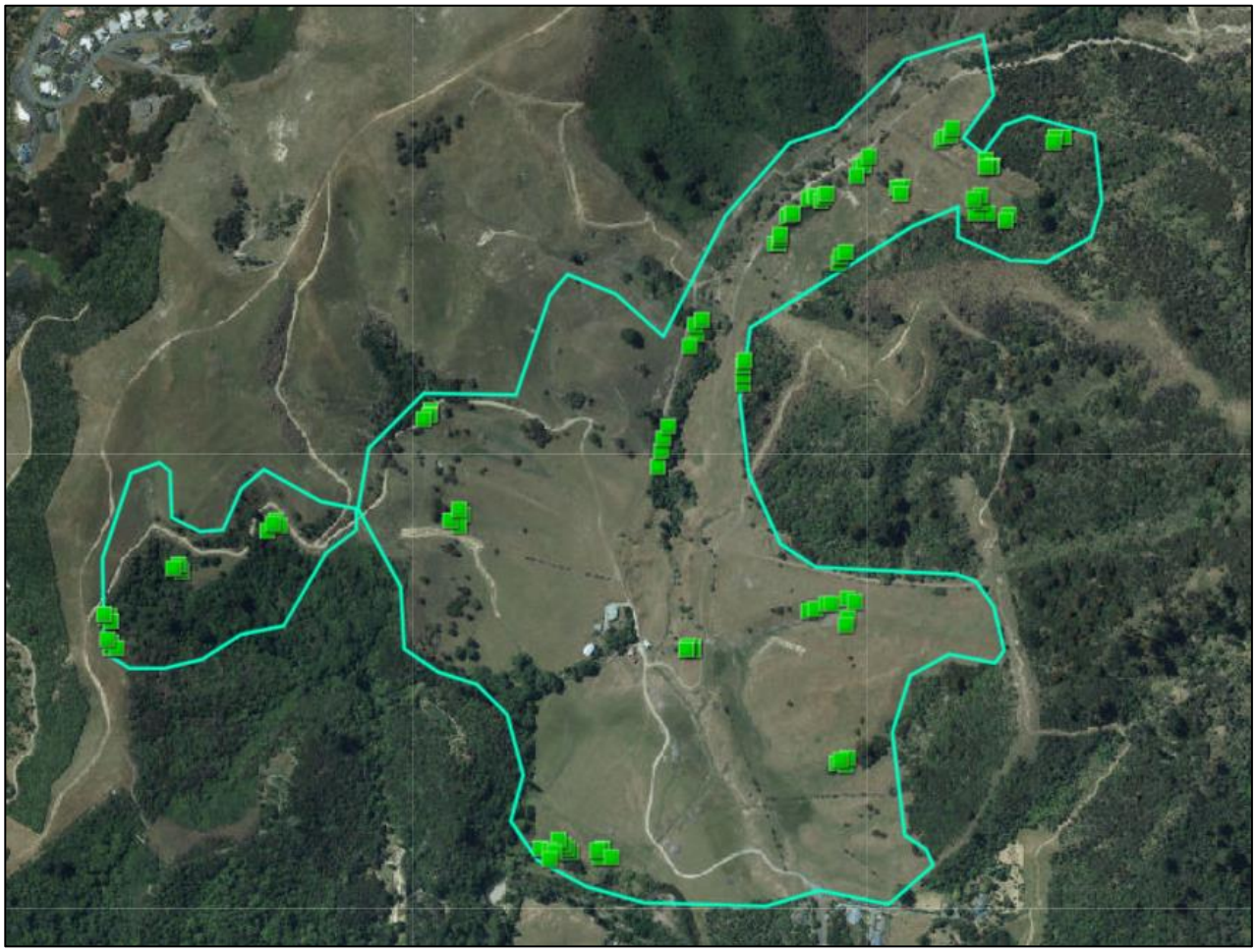

Figure 3. ACO locations (green squares) within the site (blue border).

4. Results

Three survey methods were utilised in suitable conditions (i.e., sunny or overcast with temperatures between 9-22 °C): five checks of 112 ACOs, 16 person hours of nocturnal search effort, and 11 person hours of diurnal search effort (**Table 2**).

Ten northern grass skinks and one unidentified skink (seen and not captured, but likely to also have been a northern grass skink) were detected during the survey (**Table 3; Plate 6; Figure 4**). In addition, lizard scat was detected on three ACOs where no skink was otherwise detected. No other skink species and no gecko species were observed at the site during the survey.

The quality of habitat for arboreal geckos on site is relatively poor. Habitats consist of fragmented pockets of mixed native (māhoe, kānuka) and exotic (sycamore, hawthorn, barberry) scrub and regenerating seral forest. Kānuka was predominantly inspected, as a key habitat for both forest gecko and starred gecko. The best quality habitat included fragments of mature kānuka treeland, and early successional regenerating kānuka.

Due to the cryptic nature of these gecko species and limitations with methods, it is possible that these animals could still likely occur in an area based on habitat quality only. Due to the historic forest clearance and continued pastoral land use on site and surrounding properties, in addition to the presence of predators (we recorded 8 possums in kānuka trees or adjacent to them), and the relative rarity of both starred gecko (Threatened - Nationally Vulnerable) and forest gecko (At Risk – Declining), it is unlikely that these animals are present on site. There is a greater likelihood that forest gecko could be on site, however no lizards or lizard sign (e.g., sloughs, scats) were detected during a thorough survey targeting the best quality habitats during excellent weather conditions.

Table 2. Search effort of diurnal and nocturnal surveys. Survey time does not include ACO trapping effort.

Date	Search type	Time (hours)	Number of staff	Effort (hours)	Lizards recorded	Weather conditions
26/01/23	Diurnal	8	1	8	4	16-22 °C, sunny
08/02/23	Nocturnal	4.5	2	9	0	17-20 °C, fine, calm
14/03/23	Diurnal	0.5	2	1	1	16-19°C, sunny
15/03/23	Diurnal	0.5	2	1	0	16-20°C, sunny
16/03/23	Diurnal	0.5	2	1	0	15-18°C, overcast
20/03/23	Nocturnal	3	2	6	0	19-20 °C, fine, windy

Table 3. Results of lizard survey.

#	Species	Date	Age class	Survey method	ACO # or nearest ACO
1	Northern grass skink	26/01/23	Adult	Diurnal search	1a
2	Northern grass skink	26/01/23	Adult	Diurnal search	1a
3	Northern grass skink	26/01/23	Adult	Diurnal search	1c
4	Northern grass skink	26/01/23	Adult	Diurnal search	1c
5	Northern grass skink	14/01/23	Adult	Diurnal search	1b
6	Northern grass skink	14/01/23	Adult	ACO	1b
7	Northern grass skink	14/01/23	Adult	ACO	19b
8	Unidentified skink	15/01/23	Adult	ACO	20c
9	Northern grass skink	16/01/23	Adult	ACO	22b
10	Northern grass skink	16/01/23	Adult	ACO	22b
11	Northern grass skink	28/03/23	Adult	ACO	1a

Plate 6. A captured northern grass skink.

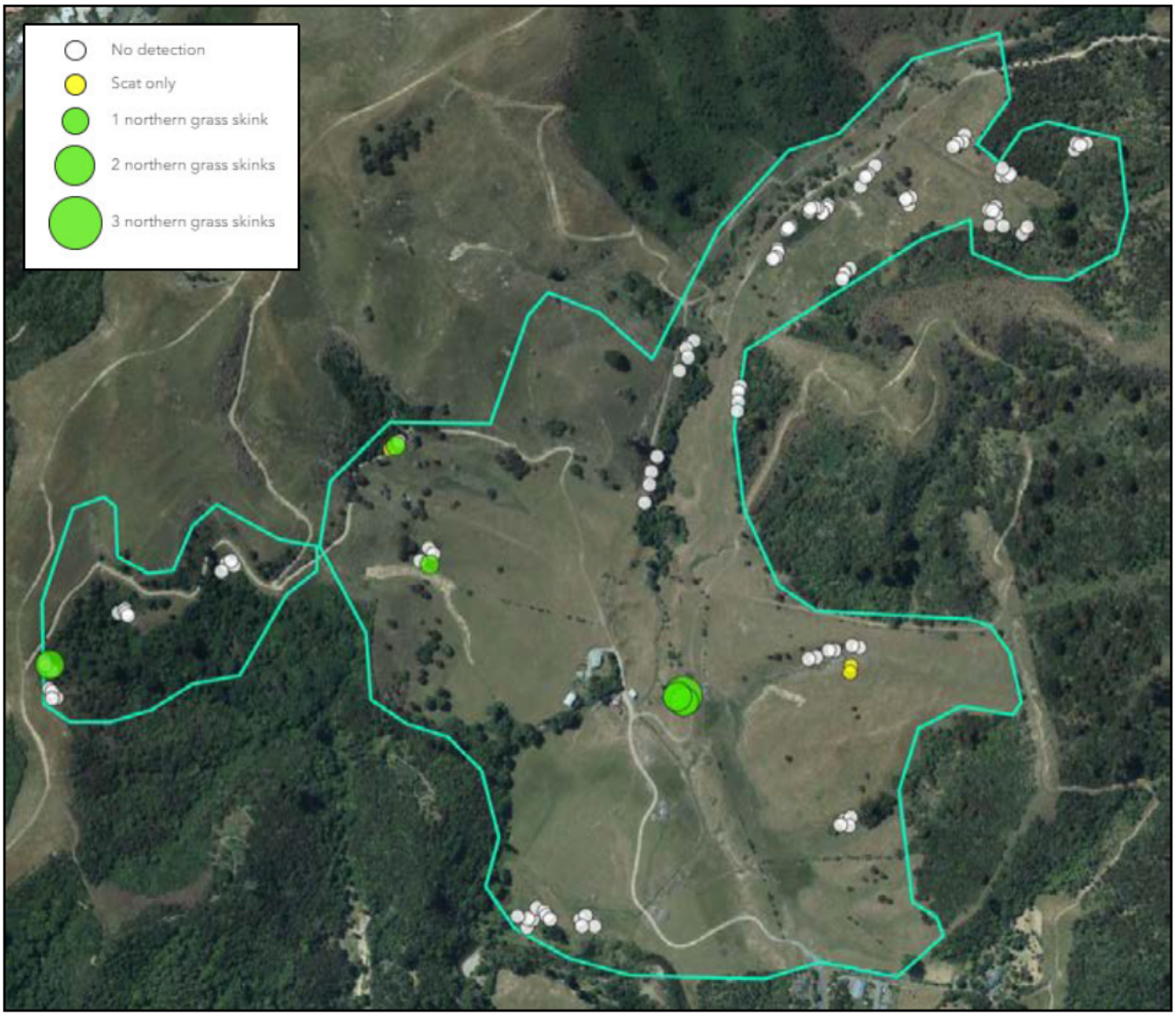

Figure 4. Results of lizard survey.

5. Conclusion and recommendations

While there are several lizard species that are known to be present within the general vicinity of the site, the history of vegetation clearance and agricultural activities has likely depleted the diversity and abundance of lizards at the site. Presently, there is a low-density population of northern grass skinks at the site despite there being plentiful suitable habitat. It is possible that predation by exotic pest animals is a limiting factor.

Northern grass skinks were found to be inhabiting:

- Sunny steep slopes that were unlikely to be grazed and which had rank grass and alternative refuge in the form of scrub or a thicket of blackberry and pōhuehue; and
- Debris (such as scattered wood, disposed concrete and plywood) amongst rank grass.

No skinks were found:

- On the floodplain of the Maitai River or its tributary;
- Within scrub; or
- Amongst grazed pasture (**Figure 5**).

The findings of this survey indicate that northern grass skink is possibly the only species present at the site and that the population that exists there is likely to be at low density and not significant in terms of the range and total population of this species. The limitations of this survey are that only a sample of the site was surveyed; therefore, it is possible that other species or populations exist at the site.

The Wildlife Act 1953 requires that an Authority should be obtained where habitat that supports native lizards is disturbed, including where native lizards may be harmed or killed during the course of a site's development. Undertaking habitat clearance works where native lizards are known or suspected to be present is an offence under the Wildlife Act without a current Wildlife Act permit to salvage, relocate or kill.

As part of obtaining a Wildlife Act Authority, the Department of Conservation requires that the holder also provides a comprehensive Lizard Management Plan (LMP) that describes the methods that will be applied to safely salvage lizards, and the location at which they will be released, including provision to secure and protect the release site.

Information typically included in a Lizard Management Plan is:

1. The timing of the implementation of the LMP;
2. A description of the methodologies to be adopted for survey, salvage and relocation of lizards rescued;
3. The methods used to identify suitable relocation site(s);
4. The methods by which habitat clearance/transfer will be supervised;
5. A description of the relocation site;
6. A description of habitat enhancement at the relocation site;
7. Discussion of the protection mechanisms to ensure the relocation site is maintained; and,
8. Certification by a suitably qualified and experienced ecologist/herpetologist that the lizard related works have been carried out according to the LMP.

We recommend that a Lizard Management Plan is prepared for this site – given that native lizards have been confirmed to be present. The LMP should focus on the salvage of northern grass skinks from sunny ungrazed slopes of rank grass with nearby refuge, and debris amongst rank grass in localities that were identified during this survey as supporting skinks. Native kānuka trees proposed for clearance should be checked as part of felling and earthworks, at least initially, in order to confirm that apparent lack of lizards occupying these habitats.

We understand that recently, DOC has required that lizard salvage programmes include methods to 1) safeguard relocated individuals, and 2) provide compensation where not all individuals can be caught

from a site prior to the commencement of vegetation clearance and earthworks. This can take the form of a guarantee of pest control or other safeguard measures at the release site, relocation to a predator-free location, or a compensation payment that recognises the unavoidable losses that may result, irrespective of a well-planned and well-executed salvage operation.

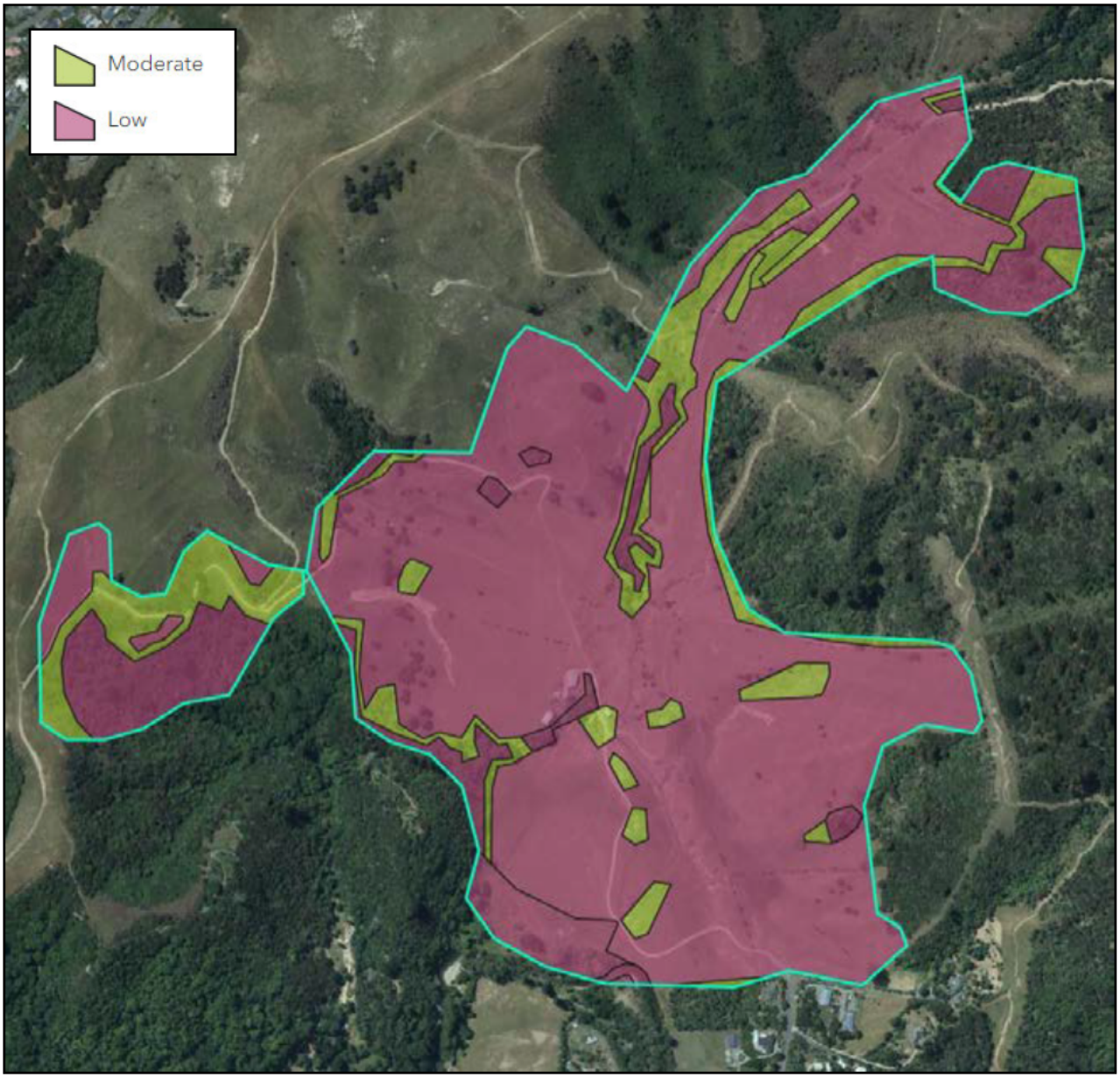

Figure 5. Likelihood of lizard presence based on the survey results.

The survey was undertaken in accordance with WAA Authority 91417-FAU. An ARDS Card with capture details has been submitted to DOC in accordance with the permit (**Appendix 1**).

We trust that this memorandum provides the information required to assist with the design of future land use change at the site and/or support a future resource consent application for development of the site. If you have any further questions, please contact Zac Milner[2].

Yours sincerely,

Zac Milner

Senior Ecologist

RMA Ecology Ltd[3]

g:\shared drives\rma ecology main drive\rma ecology ltd\active projects\2286 maitahi lizards nelson\working\2286_maitahi_lizard_survey_report_28march23_draft.docx

[2] Phone 021 0244 6966 or email zac.milner@rmaecology.co.nz

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Appendix 1: ARDS Card

comARDS CARD

NEW ZEALAND AMPHIBIAN/REPTILE DISTRIBUTION SCHEME
Herpetofauna Administrator, Department of Conservation, P.O. Box 644, Napier.

Bioweb-Herpetofauna Card No:

Observer: Z T (Initials) Milner (Surname)

Date: 29/03/2023

Alt (m) 120

Locality Name: Nelson, NZ

Address: 27 Iwa Street, Mapua

Affiliation: RMA Ecology Ltd

GPS: Easting | Northing

Series: BQ

Map No.: 26

Easting: 2559

Northing: 3164

Area Office: Nelson Conservancy: Nelson Ecol. District: Bryant

Species name	No.	Time	Habitat	Weather
~~Oligosoma polychroma~~	10	1100	5, 9	1, 2, 2

Voucher specimen(s) No Specify:

Photograph(s) No

Extra notes on reverse side No

Notes:
Survey of land proposed for development

Identified by: Z T Milner, RMA Ecology Ltd
Authority used: van Winkel *et al* 2018

Weather

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

Temperature
1 Hot
2 Warm
3 Moderate
4 Cool
5 Cold

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

Major Habitat Types

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

Micro habitats

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

Appendix E:

Cawthron Kaka Stream Water Quality Report

CAWTHRON

REPORT NO. 3728

KAKA STREAM WATER QUALITY MONITORING: 27 NOVEMBER 2020 – 26 OCTOBER 2021

KAKA STREAM WATER QUALITY MONITORING: 27 NOVEMBER 2020 – 26 OCTOBER 2021

CALUM MACNEIL

Prepared for CCKV Maitai Dev Co LP and Bayview Nelson Ltd

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1. INTRODUCTION

This report assesses the current state of water quality at two sites in the Kaka Stream (also known as Kaka Creek), a small, shallow stream located within the Kaka Valley, Nelson. The Kaka Stream is a tributary of the Maitai River (also known as the Mahitahi River).

Water samples were taken from Kaka Stream on a monthly basis at two sites from 27 November 2020 to 26 October 2021. One site (the lower catchment site), hereafter called Site A, was located just above the confluence with the Maitai River (173° 18’ 30.01956” E, 41° 16’ 13.32188” S; Figure 1). The second site (the upper catchment site), hereafter called Site B, was located above the proposed land use change where the valley transitions from farmland to scrubland (173° 18’ 50.06950” E, 41° 15’ 42.90321” S; Figure 2). The lower catchment Site A is located on land owned by CCKV Maitai Dev Co LP and the upper catchment Site B on land owned by Bayview Nelson Limited. Cattle were present in the vicinity of both sites on all eleven sampling visits. Waterfowl were also present on all sampling visits and feral goats were also seen on the ridges above the Kaka Stream on several sampling visits.

Figure 1. Kaka Stream Site A, located immediately upstream of confluence with Maitai (26 October 2021).

Figure 2. Kaka Stream Site B, located above proposed land-use change (26 October 2021).

Over the course of the year, it was observed during sampling visits that stream flow conditions at both sites changed markedly, which will have affected the dilution of contaminant run-off from the land and is reflected in water chemistry analysis results. The highest flow witnessed at both sites was on 23 July 2021 after several days of heavy rainfall (Figures 3 and 4).

Figure 3. Kaka Stream Site A, located immediately upstream of confluence with Maitai (23 July 2021).

Figure 4. Kaka Stream Site B, located above proposed land-use change (23 July 2021).

On this same sampling date of 23 July 2021, heavy discolouration of both Site A and Site B led to investigation of the area of land upstream of Site B. Several hundred metres above Site B a small slip was evident, with a large amount of muddy debris and sediment flowing down a hillside and ultimately into the Kaka Stream (Figure 5). These observations indicate that both sites can be currently subject to high sediment inputs, high suspended solid loads and discoloration.

Figure 5a. Hillside several hundred metres above Site B showing muddy sediment and debris coming downhill towards Kaka Stream (23 July 2021). View is looking uphill. Top right-hand side of picture shows route of sediment flow down hillside.

Figure 5b. Hillside several hundred metres above Site B showing muddy sediment and debris flowing downhill towards stream (23 July 2021). Downhill direction is left of the picture.

In contrast, very low flows were witnessed during other parts of the year. For instance, on 23 April 2021, flows at both sites were very low (Figures 6 and 7). Dried patches of streambed were evident in Site A and it is conceivable in very dry years that sections of the Kaka Stream could dry up completely. Stock hoof marks were evident in and around the section of stream at Site A. The flow was also very low at Site B but no dried patches of streambed were evident.

Figure 6. Kaka Stream at Site B, with dried up patches of streambed and stock hoof marks evident (23 April 2021).

Figure 7. Kaka Stream at Site B showing very low flow levels (23 April 2021).

2. STREAM SAMPLING AND ANALYSIS

2.1. Stream sample collection and results for selected water quality parameters

Water quality samples were collected from each site on the same day and within one hour of each other. Samples were sent within one hour of collection, to Hill Laboratories and analysed for a range of parameters including total suspended solids, turbidity, nitrate, nitrite, total nitrogen, total Kjeldahl nitrogen (TKN), ammonia, total phosphorus, dissolved reactive phosphorus (DRP) and *Escherichia coli* (*E. coli*). One year's worth of sampling data was achieved for consecutive months, except for August 2021, which was not possible due to covid-19 restrictions, giving a total of 11 samples per site.

Tables 1 and 2 show results of a selection of the water quality parameters obtained at both sites throughout the year. The full list of water quality results for the 11-month sampling regime is provided in Appendix 1.

Repeated sampling over the course of the year and in changing weather / seasonal conditions allowed a simple baseline assessment of water quality in the two sites and showed potential variation in relation to factors such as rainfall, land run-off and flow conditions. Appendix 2 shows the mean daily flow rate at the nearest Maitai flow recording station—the Maitai River at Avon Terrace, for the same dates as the Kaka Stream sampling. It should be noted that these flows range from 0.505 m^3/s up to 26.350 m^3/s, indicating the extremes of flow rate evident in the local area during the time of Kaka Stream sampling (https://www.tasman.govt.nz/my-region/environment/environmental-data/river-flow/maitai-at-avon-tce/).

Table 1. Selected water quality parameters from the Kaka Stream Site A immediately above the confluence with the Maitai River, November 2020–October 2021. (Note: *E. coli* samples marked * should be treated with caution as these may be based on statistically estimated counts and/or may have been received by Hill Laboratories outside the optimum temperature range for the methodology).

Date	Dissolved reactive phosphorus (g/m^3)	Ammonia (g/m^3)	Nitrate (g/m^3)	*Escherichia coli* (cfu/100 ml)	Suspended Solids (g/m^3)	Turbidity (NTU)
27/11/2020	0.007	< 0.010	1.32	2300*	6	5.1
11/12/2020	< 0.004	< 0.010	1.04	900*	5	3.4
27/01/2021	0.023	0.108	0.094	5,100	11	5.3
26/02/2021	0.010	0.024	1.04	5,400*	4	4.8
26/03/2021	0.023	0.030	0.023	8,900*	4	3.5
23/04/2021	0.005	0.014	2.00	1,210*	9	6.6
28/05/2021	0.004	< 0.010	2.30	330	< 3	2.9
25/06/2021	< 0004	< 0.010	3.20	380*	11	3.1
23/07/2021	0.005	0.019	5.40	520	67	36.0
August 2021	Sampling omitted due to covid-19 restrictions					
24/09/2021	< 0.004	< 0.010	2.80	400	21	6.8
26/10/2021	0.004	0.012	1.32	11,000*	7	6.5

Table 2. Selected water quality parameters from the Kaka Stream Site B above proposed land use change, November 2020–October 2021. (Note *E. coli* samples marked * should be treated with caution as these may be based on statistically estimated counts and/or may have been received by Hill Laboratories outside the optimum temperature range for the methodology).

Date	Dissolved reactive phosphorus (g/m^3)	Ammonia (g/m^3)	Nitrate (g/m^3)	*Escherichia coli* (cfu/100 ml)	Suspended Solids (g/m^3)	Turbidity (NTU)
27/11/2020	< 0.004	< 0.010	2.20	1800*	93	61.0
11/12/2020	< 0.004	< 0.010	1.72	270	6	2.5
27/01/2021	< 0.004	< 0.010	0.33	1,300	10	3.9
26/02/2021	< 0.004	< 0.010	1.88	3,700	40	16.3
25/03/2021	0.006	< 0.010	0.42	420*	31	17.1
23/04/2021	< 0.004	< 0.010	2.60	460	4	2.6
26/05/2021	0.005	< 0.010	2.90	71*	< 3	1.45
25/06/2021	< 0.004	< 0.010	3.80	80*	10	1.96
23/07/2021	< 0.004	< 0.010	4.90	220	46	20.0
August 2021	Sampling omitted due to covid-19 restrictions					
24/09/2021	< 0.004	< 0.010	2.90	320	34	14.5
26/10/2021	< 0.004	< 0.010	1.81	600*	6	1.91

2.2. Water quality parameters analysed in context of national guidelines and regional plan

The year-long data set was analysed in relation to the guidelines provided in the context of the national and regional guidelines; namely the National Policy Statement for Freshwater Management (NPS-FM) (MfE 2020), Nelson Resource Management Plan (2006) and ANZECC (2018) (see Table 3).

It is important to note that statistical calculations for comparison with the NPSFM (2020) and ANZECC (2018) values and bandings were based on all available data collected, regardless of flow. This was done deliberately as a conservative approach with regards to Kaka Stream water quality to show the worst-case scenarios for water quality that takes into account extremes of flow. An alternative approach would have been to only use baseflow data, which for parameters such as suspended solids and turbidity would have potentially placed the Kaka Stream in a different water quality category or banding, in relation to NPSFM attributes, ANZECC guidelines or in the NRP classes.

Table 3. Selected water quality parameters from Kaka Stream samples for which NPS-FM (2020) national bottom lines are available. The *E.coli* value given is for a 95th percentile for primary contact sites. Ammonia toxicity values are annual median and maximum and nitrate toxicity values are annual median and 95th percentile. Where NPS-FM bottom lines are not available (N/A), ANZECC 80th percentile 'trigger' values for rivers classified as 'Cool Dry, Low Elevation' are provided. Note: ANZECC refers to filterable reactive phosphorus which is called dissolved reactive phosphorus in New Zealand. NRP refers to Nelson Regional Plan and the turbidity value is provided for Class 'C' stream, based on a mean or median value.

Parameters	NPS-FM national bottom line	ANZECC trigger value
Dissolved reactive phosphorus (g/m^3)	N/A	0.008
Ammonia toxicity (g/m^3)	0.24 and 0.40 (median and maximum)	
Nitrate (g/m^3)	2.4 and 3.5 (median and 95th percentile)	
Escherichia coli (cfu/100 ml)	540	
Suspended solids (g/m^3)	N/A	2.1
Turbidity (NTU)	N/A	1.3 (3.0 NRP – mean or median)

2.2.1. Dissolved reactive phosphorus

The annual median dissolved reactive phosphorus was 0.005 g/m^3 and 0.002 g/m^3 for Sites A and B, respectively. These results need to be interpreted with caution as the NPS-FM (2020) recommends deriving the numeric attribute state from the median of monthly sampling over 5 years. However, sampling over 1 year will give an indication of existing levels of dissolved reactive phosphorus over the course of a year. The annual

95th percentile values for the sites were 0.023 g/m^3 for Site A and 0.006 g/m^3 for Site B. Under the NPS-FM (2020), the 95th percentile value for Site A places it in band B (ecological communities slightly impacted), even though the median value is higher than this attribute band. The median value and 95th percentile would place Site B in band A (ecosystems similar to reference conditions). In terms of the ANZECC trigger value, Site A would slightly exceed the trigger value (0.01 g/m^3) and Site B would be below it (0.002 g/m^3).

2.2.2. Ammonia and nitrate toxicity

Ammonia toxicity

The NPS-FM (2020) provides four ammonia attribute[1] value bands ranging from 'A' (no observable effects on species) to 'D' (approaching acute impact levels i.e. risk of death for sensitive species). The annual median ammonia was 0.012 g/m^3 and < 0.010 g/m^3 for Sites A and B, respectively and the annual maximum values were 0.030 g/m^3 and < 0.010 g/m^3 for Sites A and B, respectively. These sets of values would indicate numeric attribute state A for both sites, described as 99% species protection level and no observed effect on any species tested.

Nitrate toxicity

The NPS-FM (2020) provides four nitrate attribute (parameter) bands for the protection of ecosystem health, with the bands ranging from 'A' (no observable effects on species) to 'D' (starting to approach acute impact levels, i.e. risk of death for sensitive species). The annual median nitrate level was 1.32 g/m^3 and 2.20 g/m^3 for Sites A and B, respectively and the annual 95th percentile values were 4.9 g/m^3 and 5.4 g/m^3 for Sites A and B, respectively. While the annual median places both sites in band B (some growth effect on up to 5% of species) and meets the bottom line (annual median of 2.4 g/m^3), the annual 95th percentile values place the sites in band C (growth effect on up to 20% of species) and do not meet the bottom line (3.5 g/m^3). Taking the conservative approach, both sites should be regarded as band C for nitrate levels.

2.2.3. Bacteria – Escherichia coli (E.coli)

The NPS-FM (2020) provides five attribute bands describing the relative risk to humans of *Campylobacter* infection (based on *E. coli* indicator) by contact/exposure, ranging from 'A' (very low risk, i.e. for at least half the time the risk of infection is < 0.1%) to 'E' (reasonably high risk, i.e. for more than 30% of the time the risk of infection is > 5%). The NPS-FM *E. coli* attribute state of a river or stream is based in percentage exceedance of limits across multiple samples collected on a regular basis (i.e. a minimum of 60 samples collected over a period of 5 years). Because the numbers of *E. coli* samples collected from Kaka Stream to date are fewer than this, analyses with respect to the NPS-FM bands should be interpreted with caution. Although the Kaka Stream itself is not a bathing river / area, it is a tributary of the Maitai River, which has popular swimming areas (primary contact sites). It should be noted that for a limited number of samples

[1] An 'attribute' is equivalent to a water quality 'parameter'

during the hotter sampling months, samples were received by Hill Laboratories from the courier above the optimal temperature for accurate processing. Despite this, they are included and are still useful for comparative purposes with respect to the two sites.

For Site A, considering rivers and lakes and human contact in general, the annual median was 1210 cfu/100 ml and the 95th percentile was 5400 cfu/100 ml, the % exceedances over 540 cfu/100 ml was 64%, and the % exceedances over 260 cfu/100ml was 91%, classifying it as band E (red). For Site A, specifically for primary contact sites, the annual median was 1210 cfu/100 ml and the 95th percentile was 5400 cfu/100 ml, classifying it as poor.

For Site B, considering rivers and lakes and human contact in general, the annual median was 420 cfu/100ml and the 95th percentile was 1800 cfu/100ml, the % exceedances over 540 cfu/100 ml was 36%, and the % exceedances over 260 cfu/100 ml was 82%, classifying it as band E (red). For Site B, specifically for primary contact sites, the annual median was 420 cfu/100 ml and the 95th percentile was 1800 cfu/100 ml, classifying it as poor.

In summary, both sites were poor for *E. coli* whichever attribute (human contact in rivers / lakes or in terms of primary contact site) is considered under the NPS-FM.

2.2.4. Suspended solids and turbidity

Suspended solids

Under the ANZECC (2018) guidelines, the DGV (default guideline value or 'trigger value') for suspended solids, above which there is a potential risk of adverse effects at a site, for cool, dry, low-elevation rivers is 2.1 g/m^3. Both sites greatly exceeded this, with 80th percentile values of 24.8 g/m^3 at Site A and 56.2 g/m^3 at Site B.

Turbidity

The ANZECC (2018) DGV value for cool dry low-elevation rivers of 1.3 NTU was greatly exceeded at both sites, with 80th percentile values of 17.8 g/m^3 at Site A and 28.4 g/m^3 at Site B.

The Nelson Resource Management Plan (NRP 2006) states that for a class C stream/river turbidity should not exceed 3.0 NTU (mean or median). For site A, the mean was 6.88 NTU and the median was 5.1 NTU. For site B, the mean was 13.78 NTU and the median was 3.9 NTU. Both sites therefore exceed the class C turbidity designation.

2.3 Qualitative assessment of sediment deposition – the Shuffle Index

Repeated sampling over the course of the year and in changing weather / seasonal conditions allowed a simple baseline assessment of water quality in the two sites and

showed potential variation in relation to factors such as rainfall, land run-off and flow conditions.

To supplement this water quality assessment, on selected sampling visits, after water quality samples had been taken, a rapid qualitative assessment of the amount of total suspendible solids deposited on the streambed, using the Shuffle Index (Sediment Assessment Method 5 – Resuspendible sediment; Clapcott et al. 2011). This method is best applied to an area where the water depth is between 20 and 50 cm and the flow is between 0.2 and 0.6 m/s, both of which can be estimated and are mainly noted to ensure comparability in conditions between sites. The index was applied to sites on visits where it was judged these depth and flow conditions were present and comparability between sites was possible. Figure 8 shows this method being applied to the two sites on 26 October 2021. A score of 1–5 is assigned to a site based on: the sediment plume created in the streambed by a shuffling motion, the degree to which this obscures a white tile placed on the streambed and then how fast this plume clears. A score of 1 equals little or no sediment, no plume and no obscuring of the tile, while 5 indicates excessive sediment, with the plume fully obscuring the tile and persisting even after shuffling ceases. Score 2-4 are conditions between these two extremes.

(a) (b)

Figure 8. Shuffle index being assessed in Kaka Stream sites on 26 October 2021 with; (a) Site A showing white tile completely visible and negligible plume immediately after disturbance and (b) site B showing white tile being partially obscured after disturbance.

Table 4 shows index scores from the two sites on 7 sampling occasions. On other dates this method was not possible either due to very low or very high flows at one or both sites. Index scores fluctuated constantly between extremes of 1 and 4. This probably reflects the highly patchy nature of fine sediment on the stream bed due to the delivery and flushing of sediment by variable flows. Overall, the scores were very similar at both sites with mean index values of 1.9 and 2.0 for Site A and Site B, respectively, indicating similar sedimentation level at both sites. While this is a coarse qualitative method of assessing sediment deposition, the results do follow the same general pattern as the suspended solids and turbidity analysis, with both Site A and B displaying similar 'sedimentation regimes' but with slightly higher levels at Site B in the upper catchment.

Table 4. Shuffle Index scores at Kaka Stream sites.

Sampling date	Site A	Site B
26/02/2021	4	3
27/03/2021	1	4
23/04/2021	4	1
28/05/2021	1	1
25/06/2021	1	1
24/09/2021	1	1
26/10/2021	1	3

3. SUMMARY

The two sites, one immediately above the confluence with the Maitai River (Site A) and the other above the proposed land-use change (Site B) are very similar in terms of the physico-chemical parameters measured. Based on comparison of the Kaka Stream water quality dataset against current national guidelines (i.e. NPS-FM (2020) ANZECC (2018)) and water quality classes in the NRP, some parameters indicated good water quality at both sites (i.e. dissolved reactive phosphorus and ammonia), while others indicate very poor quality (i.e. *E. coli*, suspended solids and turbidity). The water quality at both sites reflects the current land use, including the presence of farmed and wild animals.

4. ACKNOWLEDGEMENTS

Thanks to Neil Donaldson for facilitating access to sampling sites throughout the sampling period. Thanks to Karen Shearer of the Cawthron Institute for advice on sediment deposition assessment.

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6. APPENDICES

A1. MONTHLY CHEMISTRY RESULTS FROM WATER SAMPLES TAKEN FROM TWO SITES ON THE KAKA STREAM

(November 2020 – October 2021 inclusive; August sampling omitted due to covid-19 restrictions). Samples were processed by Hill Laboratories. (Note for *E.coli* results marked with *[1] and *[2] should be treated with a degree of caution, as these are may have been received by the laboratory above 10 °C by the laboratory and/or may be based on statistically estimated counts based on the theoretical countable range for the stated method).

November 2020

Sample Type: Aqueous			
Sample Name:		Kaka Stream Just Before Confluence 27-Nov-2020 8:25 am	Kaka Stream Upper Reaches 27-Nov-2020 8:45 am
Lab Number:		2482859.1	2482859.2
Individual Tests			
Turbidity	NTU	5.1	61
Total Suspended Solids	g/m³	6	93
Total Nitrogen	g/m³	1.50	2.7
Total Kjeldahl Nitrogen (TKN)	g/m³	0.18	0.52
Total Phosphorus	g/m³	0.014	0.121
Escherichia coli	cfu / 100mL	2,300 #1	1,800 #1
Nutrient Profile			
Total Ammoniacal-N	g/m³	< 0.010	< 0.010
Nitrite-N	g/m³	0.004	0.003
Nitrate-N	g/m³	1.32	2.2
Nitrate-N + Nitrite-N	g/m³	1.32	2.2
Dissolved Reactive Phosphorus	g/m³	0.007	< 0.004

December 2020

Sample Name:		Kaka Stream U/S Confluence 11-Dec-2020 8:45 am	Kaka Stream Upper Reaches 11-Dec-2020 9:00 am
Lab Number:		2492660.1	2492660.2
Individual Tests			
Turbidity	NTU	3.4	2.5
Total Suspended Solids	g/m³	5	6
Total Nitrogen	g/m³	1.31	1.96
Total Kjeldahl Nitrogen (TKN)	g/m³	0.27	0.24
Total Phosphorus	g/m³	0.011	0.006
Escherichia coli	cfu / 100mL	900 #1	270
Nutrient Profile			
Total Ammoniacal-N	g/m³	< 0.010	< 0.010
Nitrite-N	g/m³	0.004	0.002
Nitrate-N	g/m³	1.04	1.72
Nitrate-N + Nitrite-N	g/m³	1.04	1.72
Dissolved Reactive Phosphorus	g/m³	< 0.004	< 0.004

January 2021

Sample Type: Aqueous				
Sample Name:		Kaua Stream Just Before Confluence 27-Jan-2021 8:10 am	Kaua Stream Above Land Use Chance 27-Jan-2021 8:45 am	
Lab Number:		2516084.1	2516084.2	
Individual Tests				
Turbidity	NTU	5.3	3.9	-
Total Suspended Solids	g/m³	11	10	-
Total Nitrogen	g/m³	0.64	0.55	-
Total Kjeldahl Nitrogen (TKN)	g/m³	0.54	0.21	-
Total Phosphorus	g/m³	0.063	0.010	-
Escherichia coli	cfu / 100mL	5,100	1,300	-
Nutrient Profile				
Total Ammoniacal-N	g/m³	0.108	< 0.010	-
Nitrite-N	g/m³	0.010	< 0.002	-
Nitrate-N	g/m³	0.094	0.33	-
Nitrate-N + Nitrite-N	g/m³	0.104	0.34	-
Dissolved Reactive Phosphorus	g/m³	0.023	< 0.004	-

February 2021

Sample Type: Aqueous				
Sample Name:		Kaka Stream Just Above Matai Confluence 26-Feb-2021 8:45 am	Kaka Stream Above Land Use Change 26-Feb-2021 9:10 am	
Lab Number:		2540993.1	2540993.2	
Individual Tests				
Turbidity	NTU	4.8	16.3	-
Total Suspended Solids	g/m³	4	40	-
Total Nitrogen	g/m³	1.50	2.3	-
Total Kjeldahl Nitrogen (TKN)	g/m³	0.46	0.40	-
Total Phosphorus	g/m³	0.023	0.031	-
Escherichia coli	cfu / 100mL	5,400 #1	3,700	-
Nutrient Profile				
Total Ammoniacal-N	g/m³	0.024	< 0.010	-
Nitrite-N	g/m³	0.010	0.009	-
Nitrate-N	g/m³	1.04	1.88	-
Nitrate-N + Nitrite-N	g/m³	1.05	1.89	-
Dissolved Reactive Phosphorus	g/m³	0.010	< 0.004	-

March 2021

Sample Type: Aqueous				
Sample Name:		Kaka Stream Just above Confluence with Maitai 26-Mar-2021 8:45 am	Kaka Stream Upper Reaches above Land Use Change 26-Mar-2021 9:05 am	
Lab Number:		2569538.1	2569538.2	
Individual Tests				
Turbidity	NTU	3.5	17.1	-
Total Suspended Solids	g/m³	4	31	-
Total Nitrogen	g/m³	0.44	0.62	-
Total Kjeldahl Nitrogen (TKN)	g/m³	0.41	0.19	-
Total Phosphorus	g/m³	0.042	0.022	-
Escherichia coli	cfu / 100mL	8,900 #1	420 #1	-
Nutrient Profile				
Total Ammoniacal-N	g/m³	0.030	< 0.010	-
Nitrite-N	g/m³	0.003	< 0.002	-
Nitrate-N	g/m³	0.023	0.42	-
Nitrate-N + Nitrite-N	g/m³	0.026	0.42	-
Dissolved Reactive Phosphorus	g/m³	0.023	0.006	-

April 2021

Sample Type: Aqueous				
Sample Name:		Kaka Stream Above Maitai Confluence 23-Apr-2021 8:30 am	Kaka Stream Above Land Use Change 23-Apr-2021 8:50 am	
Lab Number:		2594306.1	2594306.2	
Individual Tests				
Turbidity	NTU	6.6	2.6	
Total Suspended Solids	g/m³	9	4	
Total Nitrogen	g/m³	2.4	2.8	
Total Kjeldahl Nitrogen (TKN)	g/m³	0.34	0.21	
Total Phosphorus	g/m³	0.011	0.005	
Escherichia coli	cfu / 100mL	1,210 #1	450	
Nutrient Profile				
Total Ammoniacal-N	g/m³	0.014	< 0.010	
Nitrite-N	g/m³	0.003	0.002	
Nitrate-N	g/m³	2.0	2.6	
Nitrate-N + Nitrite-N	g/m³	2.0	2.6	
Dissolved Reactive Phosphorus	g/m³	0.005	< 0.004	

May 2021

Sample Type: Aqueous				
Sample Name:		Kaka Stream Just Upstream of Confluence 28-May-2021 8:45 am	Kaka Stream above Land Use Change 28-May-2021 9:10 am	
Lab Number:		2624554.1	2624554.2	
Individual Tests				
Turbidity	NTU	2.9	1.45	-
Total Suspended Solids	g/m³	< 3	< 3	-
Total Nitrogen	g/m³	2.5	3.1	-
Total Kjeldahl Nitrogen (TKN)	g/m³	0.22	0.21	-
Total Phosphorus	g/m³	0.007	0.005	-
Escherichia coli	cfu / 100mL	330	71 #1	-
Nutrient Profile				
Total Ammoniacal-N	g/m³	< 0.010	< 0.010	-
Nitrite-N	g/m³	0.004	0.002	-
Nitrate-N	g/m³	2.3	2.9	-
Nitrate-N + Nitrite-N	g/m³	2.3	2.9	-
Dissolved Reactive Phosphorus	g/m³	0.004	0.005	-

June 2021

Sample Type: Aqueous				
Sample Name:		Kaka Stream Upstream Confluence 25-Jun-2021 9:05 am	Kaka Stream Upstream Land Use 25-Jun-2021 10:00 am	
Lab Number:		2644306.1	2644306.2	
Individual Tests				
Turbidity	NTU	3.1	1.96	
Total Suspended Solids	g/m³	11	10	
Total Nitrogen	g/m³	3.4	4.0	
Total Kjeldahl Nitrogen (TKN)	g/m³	0.23	0.19	
Total Phosphorus	g/m³	0.009	0.006	
Escherichia coli	cfu / 100mL	380 #1	80 #2	
Nutrient Profile				
Total Ammoniacal-N	g/m³	< 0.010	< 0.010	
Nitrite-N	g/m³	0.004	0.003	
Nitrate-N	g/m³	3.2	3.8	
Nitrate-N + Nitrite-N	g/m³	3.2	3.8	
Dissolved Reactive Phosphorus	g/m³	< 0.004	< 0.004	

July 2021

Sample Type: Aqueous				
Sample Name:		Kaka Stream Above Land Use Change 23-Jul-2021 9:10 am	Kaka Stream Above Confluence With Maitai 23-Jul-2021 8:40 am	
Lab Number:		2663255.1	2663255.2	
Individual Tests				
Turbidity	NTU	20	36	
Total Suspended Solids	g/m³	46	67	
Total Nitrogen	g/m³	5.5	6.0	
Total Kjeldahl Nitrogen (TKN)	g/m³	0.64	0.56	
Total Phosphorus	g/m³	0.023	0.050	
Escherichia coli	cfu / 100mL	220	520	
Nutrient Profile				
Total Ammoniacal-N	g/m³	< 0.010	0.019	
Nitrite-N	g/m³	0.004	0.006	
Nitrate-N	g/m³	4.9	5.4	
Nitrate-N + Nitrite-N	g/m³	4.9	5.4	
Dissolved Reactive Phosphorus	g/m³	< 0.004	0.005	

September 2021

Sample Type: Aqueous				
Sample Name:		Kaka Stream U/S Land Use Change 24-Sep-2021 9:30 am	Kaka Stream Immedietely Upstream of Confluence 24-Sep-2021 9:00 am	
Lab Number:		2715479.1	2715479.2	
Individual Tests				
Turbidity	NTU	14.5	6.8	
Total Suspended Solids	g/m³	34	21	
Total Nitrogen	g/m³	3.2	3.3	
Total Kjeldahl Nitrogen (TKN)	g/m³	0.33	0.43	
Total Phosphorus	g/m³	0.026	0.021	
Escherichia coli	cfu / 100mL	320	400	
Nutrient Profile				
Total Ammoniacal-N	g/m³	< 0.010	< 0.010	
Nitrite-N	g/m³	0.002	0.003	
Nitrate-N	g/m³	2.9	2.8	
Nitrate-N + Nitrite-N	g/m³	2.9	2.8	
Dissolved Reactive Phosphorus	g/m³	< 0.004	< 0.004	

October 2021

Sample Type: Aqueous				
Sample Name:		Kaka Stream Immediately Upstream Of Maitai Confluence 26-Oct-2021 11:10 am	Kaka Stream Upstream Of Land Use Change 26-Oct-2021 11:30 am	
Lab Number:		2745863.1	2745863.2	
Individual Tests				
Turbidity	NTU	6.5	1.91	
Total Suspended Solids	g/m³	7	6	
Total Nitrogen	g/m³	1.70	2.1	
Total Kjeldahl Nitrogen (TKN)	g/m³	0.37	0.31	
Total Phosphorus	g/m³	0.015	0.007	
Escherichia coli	cfu / 100mL	11,000 #1	600 #1	
Nutrient Profile				
Total Ammoniacal-N	g/m³	0.012	< 0.010	
Nitrite-N	g/m³	0.005	< 0.002	
Nitrate-N	g/m³	1.32	1.81	
Nitrate-N + Nitrite-N	g/m³	1.32	1.82	
Dissolved Reactive Phosphorus	g/m³	0.004	< 0.004	

A2. DAILY FLOW RATES RECORDED AT THE MAITAI FLOW RECORDING STATION AT AVON TERRACE ON THE SAME DAYS AS THE KAKA STREAM SAMPLING.

Date	Daily flow rate (m^3/s)
27/11/2020	1.777
11/12/2020	1.586
27/01/2021	0.505
26/02/2021	7.816
26/03/2021	0.693
23/04/2021	1.446
28/05/2021	1.301
25/06/2021	2.394
23/07/2021	14.179
24/09/2021	26.350
26/10/2021	1.850

Appendix F:

Stark Environmental Macroinvertebrate Community Results

Field Record Form: Macroinvertebrates

Programme Name CCKV - Maitahi Village

Stream Name Kaka Hill Tributary

Site Name Impact Reach A

Site Code KHT1 **Sample No.** KIR-A1

Reach Length 100 m

GPS Location (midpoint of reach) Easting 1626046 Northing 5431266

Date 9/10/23 **Time (NZST)** 1100

Field Personnel BR / CS

Visit Metadata

Weather ○ Fine ☑ Overcast ○ Drizzle ○ Rain Rain in last 24 hours? ○ Y ☑ N

Wind Direction ○ NW ○ N ○ NE ○ SE ○ S ○ SW Digital Photos ☑ Y ○ N

Wind Speed ☑ Calm ○ Light ○ Moderate ○ Strong

Water Appearanc ○ Clear ○ Turbid ○ Other _____

Stream Level ○ Low ☑ Normal ○ High ○ Other _____ m Odour ○ Y ○ N

Comments *(e.g. stock on banks/in water, scums, wildfowl, local bank erosion, new hazards, etc.)*

Refer SQV/RHA assessment in report

Collection Details

Method ☑ Kick-net ○ Other (describe) _____

Net Width 30 cm Mesh size ☑ 0.5 mm ○ Other _____ mm

Habitats Sampled (e.g. riffle 30%, run 30%) run 60%, riffle 40%

All Habitats Sampled in Proporton to Abundance? ☑ Yes ○ No

Streambed Area Sampled m^2 0.8 No. of kicks 8

Preservative Type Ethanol

Supporting Measurements

Habitat Assessment? ☑ Yes Method: Clapcott (2015) ○ No

In-situ Water Quality Measurements? ☑ Yes Variables: Turbidity (continuous) ○ No

Flow Measurement? ○ Yes _____ L/s ☑ No

Other _____

Other Notes *(e.g. deviation from protocols, QA/QC, courier assignment no.)*

Field Record Form: Macroinvertebrates

Programme Name Per KHT1 for all missing fields

Stream Name _____

Site Name _____

Site Code KHT2 **Sample No.** KIR-B1

Reach Length _____ m

GPS Location (midpoint of reach) Easting 1676110 Northing 5431366

Date 9/10/23 **Time (NZST)** 1130

Field Personnel _____

Visit Metadata

Weather ○ Fine ○ Overcast ○ Drizzle ○ Rain Rain in last 24 hours? ○ Y ○ N

Wind Direction ○ NW ○ N ○ NE ○ SE ○ S ○ SW Digital Photos ○ Y ○ N

Wind Speed ○ Calm ○ Light ○ Moderate ○ Strong

Water Appearanc ○ Clear ○ Turbid ○ Other _____

Stream Level ○ Low ○ Normal ○ High ○ Other _____ m Odour ○ Y ○ N

Comments *(e.g. stock on banks/in water, scums, wildfowl, local bank erosion, new hazards, etc.)*

Collection Details

Method ○ Kick-net ○ Other (describe) _____

Net Width _____ cm Mesh size ○ 0.5 mm ○ Other _____ mm

Habitats Sampled run 100%
(e.g. riffle 30%, run 30%)

All Habitats Sampled in Proporton to Abundance? ✓ Yes ○ No

Streambed Area Sampled m^2 0.8 No. of kicks 8

Preservative Type _____

Supporting Measurements

Habitat Assessment? ○ Yes Method: _____ ○ No

In-situ Water Quality Measurements? ○ Yes Variables: _____ ○ No

Flow Measurement? ○ Yes _____ L/s ○ No

Other _____

Other Notes *(e.g. deviation from protocols, QA/QC, courier assignment no.)*

Field Record Form: Macroinvertebrates

Programme Name Per KHT1, for all missing fields

Stream Name _____

Site Name _____

Site Code KHT3 **Sample No.** KIR-C1

Reach Length _____ m

GPS Location (midpoint of reach) Easting 1626068 Northing 5431561

Date 9/10/23 **Time (NZST)** 1200

Field Personnel _____

Visit Metadata

Weather ○ Fine ○ Overcast ○ Drizzle ○ Rain Rain in last 24 hours? ○ Y ○ N

Wind Direction ○ NW ○ N ○ NE ○ SE ○ S ○ SW Digital Photos ○ Y ○ N

Wind Speed ○ Calm ○ Light ○ Moderate ○ Strong

Water Appearanc ○ Clear ○ Turbid ○ Other _____

Stream Level ○ Low ○ Normal ○ High ○ Other _____ m Odour ○ Y ○ N

Comments *(e.g. stock on banks/in water, scums, wildfowl, local bank erosion, new hazards, etc.)*

Collection Details

Method ○ Kick-net ○ Other (describe) _____

Net Width _____ cm Mesh size ○ 0.5 mm ○ Other _____ mm

Habitats Sampled run 90%, riffle 10% (e.g. riffle 30%, run 30%)

All Habitats Sampled in Proporton to Abundance? ✓ Yes ○ No

Streambed Area Sampled m^2 0.8 No. of kicks 8

Preservative Type _____

Supporting Measurements

Habitat Assessment? ○ Yes Method: _____ ○ No

In-situ Water Quality Measurements? ○ Yes Variables: _____ ○ No

Flow Measurement? ○ Yes _____ L/s ○ No

Other _____

Other Notes *(e.g. deviation from protocols, QA/QC, courier assignment no.)*

Field Record Form: Macroinvertebrates

Programme Name Per KHT1 for all missing fields

Stream Name _____

Site Name _____

Site Code KHT4 **Sample No.** KER-D1

Reach Length _____ m

GPS Location (midpoint of reach) Easting 1625857 Northing 5431604

Date 9/10/23 **Time (NZST)** 1230

Field Personnel _____

Visit Metadata

Weather ○ Fine ○ Overcast ○ Drizzle ○ Rain Rain in last 24 hours? ○ Y ○ N

Wind Direction ○ NW ○ N ○ NE ○ SE ○ S ○ SW Digital Photos ○ Y ○ N

Wind Speed ○ Calm ○ Light ○ Moderate ○ Strong

Water Appearanc ○ Clear ○ Turbid ○ Other _____

Stream Level ○ Low ○ Normal ○ High ○ Other _____ m Odour ○ Y ○ N

Comments *(e.g. stock on banks/in water, scums, wildfowl, local bank erosion, new hazards, etc.)*

Collection Details

Method ○ Kick-net ○ Other (describe) _____

Net Width _____ cm Mesh size ○ 0.5 mm ○ Other _____ mm

Habitats Sampled run 60%, 40% riffles
(e.g. riffle 30%, run 30%)

All Habitats Sampled in Proporton to Abundance? ✓ Yes ○ No

Streambed Area Sampled m^2 No. of kicks _____

Preservative Type _____

Supporting Measurements

Habitat Assessment? ○ Yes Method: _____ ○ No

In-situ Water Quality Measurements? ○ Yes Variables: _____ ○ No

Flow Measurement? ○ Yes _____ L/s ○ No

Other _____

Other Notes *(e.g. deviation from protocols, QA/QC, courier assignment no.)*

Robertson Environmental Ltd			2	3	4	5
Site Name			**CCKV-Maitahi Kaka Hil trib. Maitai Valley KIR-A1**	**CCKV-Maitahi Kaka Hil trib. Maitai Valley KIR-B1**	**CCKV-Maitahi Kaka Hil trib. Maitai Valley KIR-C1**	**CCKV-Maitahi Kaka Hil trib. Maitai Valley KIR-D1**
Collector			**Ben Robertson**	**Ben Robertson**	**Ben Robertson**	**Ben Robertson**
Processing			**P2**	**P2**	**P2**	**P2**
Date sampled			**9-Oct-23**	**9-Oct-23**	**9-Oct-23**	**9-Oct-23**
	MCI Score	**MCI-sb Score**				
Mayflies						
Deleatidium	8	5.6	1	-	-	-
Neozephlebia	7	7.6	1	-	1	-
Zephlebia	7	8.8	1	-	-	-
Water Bugs						
Microvelia	5	4.6	-	1	-	1
Sigara	5	2.4	1	1	-	-
Beetles						
Liodessus	5	4.9	1	1	1	-
True Flies						
Austrosimulium	3	3.9	3	1	1	-
Chironomus	1	3.4	-	-	-	1
Corynoneura	2	1.7	-	1	-	-
Culicidae	3	1.2	-	1	-	-
Hexatomini	5	6.7	1	-	2	-
Molophilus	5	6.3	-	-	-	1
Nothodixa	4	9.3	1	-	1	-
Orthocladiinae	2	3.2	59	7	3	11
Paradixa	4	8.5	-	4	3	2
Paralimnophila	6	7.4	-	3	5	1

Robertson Environmental Ltd			2	3	4	5
Site Name			**CCKV-Maitahi Kaka Hil trib. Maitai Valley**	**CCKV-Maitahi Kaka Hil trib. Maitai Valley**	**CCKV-Maitahi Kaka Hil trib. Maitai Valley**	**CCKV-Maitahi Kaka Hil trib. Maitai Valley**
			KIR-A1	**KIR-B1**	**KIR-C1**	**KIR-D1**
Collector			**Ben Robertson**	**Ben Robertson**	**Ben Robertson**	**Ben Robertson**
Processing			**P2**	**P2**	**P2**	**P2**
Date sampled			**9-Oct-23**	**9-Oct-23**	**9-Oct-23**	**9-Oct-23**
Tanypodinae	5	6.5	4	1	1	1
Tanytarsus	3	4.5	2	-	-	-
Caddisflies						
Hudsonema	6	6.5	1	-	-	-
Hydrobiosis	5	6.7	1	-	-	-
Oxyethira	2	1.2	7	1	1	1
Polyplectropus	8	8.1	1	-	-	-
Psilochorema	8	7.8	-	1	4	1
Crustacea						
Amphipoda	5	5.5	64	1	106	110
Copepoda	5	2.4	-	-	-	1
Ostracoda	3	1.9	5	107	41	60
Worms	1	3.8	3	7	4	1
Nematodes	3	3.1	-	1	-	-
Springtails	6	5.3	-	1	-	-
Snails						
Gyraulus	3	6.7	-	29	-	-
Physa	3	0.1	-	37	-	-
Potamopyrgus	4	2.1	55	24	30	22
Mites	5	5.2	-	-	1	1
Percentage Counted			2.0	0.5	20.0	10.0

Robertson Environmental Ltd	2	3	4	5
Site Name	**CCKV-Maitahi Kaka Hil trib. Maitai Valley**	**CCKV-Maitahi Kaka Hil trib. Maitai Valley**	**CCKV-Maitahi Kaka Hil trib. Maitai Valley**	**CCKV-Maitahi Kaka Hil trib. Maitai Valley**
	KIR-A1	**KIR-B1**	**KIR-C1**	**KIR-D1**
Collector	**Ben Robertson**	**Ben Robertson**	**Ben Robertson**	**Ben Robertson**
Processing	**P2**	**P2**	**P2**	**P2**
Date sampled	**9-Oct-23**	**9-Oct-23**	**9-Oct-23**	**9-Oct-23**
Number of taxa (including rare taxa)	19	20	16	15
Number of rare taxa	6	8	3	6
Number of animals	212	230	205	215
MCI	93	78	86	81
QMCI	3.70	3.14	4.38	4.14
MCI-sb	104	82	107	93
QMCI-sb	3.77	2.63	4.36	4.03
%EPTtaxa (excluding Hydroptilidae*)*	31.58	5.00	12.50	6.67
%EPT abundance (exclduing Hydroptilidae)	2.83	0.43	2.44	0.47
ASPM	0.23	0.14	0.17	0.15

Samples processed by John Stark

Data entry and index calculation by John Stark (Stark Environmental Ltd)

Rare Taxa

10 in vial unless stated otherwise in cell comment

Appendix G:

Olleyecology Ltd Freshwater Fish Community Results

Kaka Stream Fish Surveys

- Report -

Olleycology Limited

21st December 2023

Contents

Scope

Undertake fish surveys on Kaka Stream and a tributary of Kaka Stream.

Survey Sites

- Kaka Stream
- Kaka Stream tributary

Kaka Stream

Site location

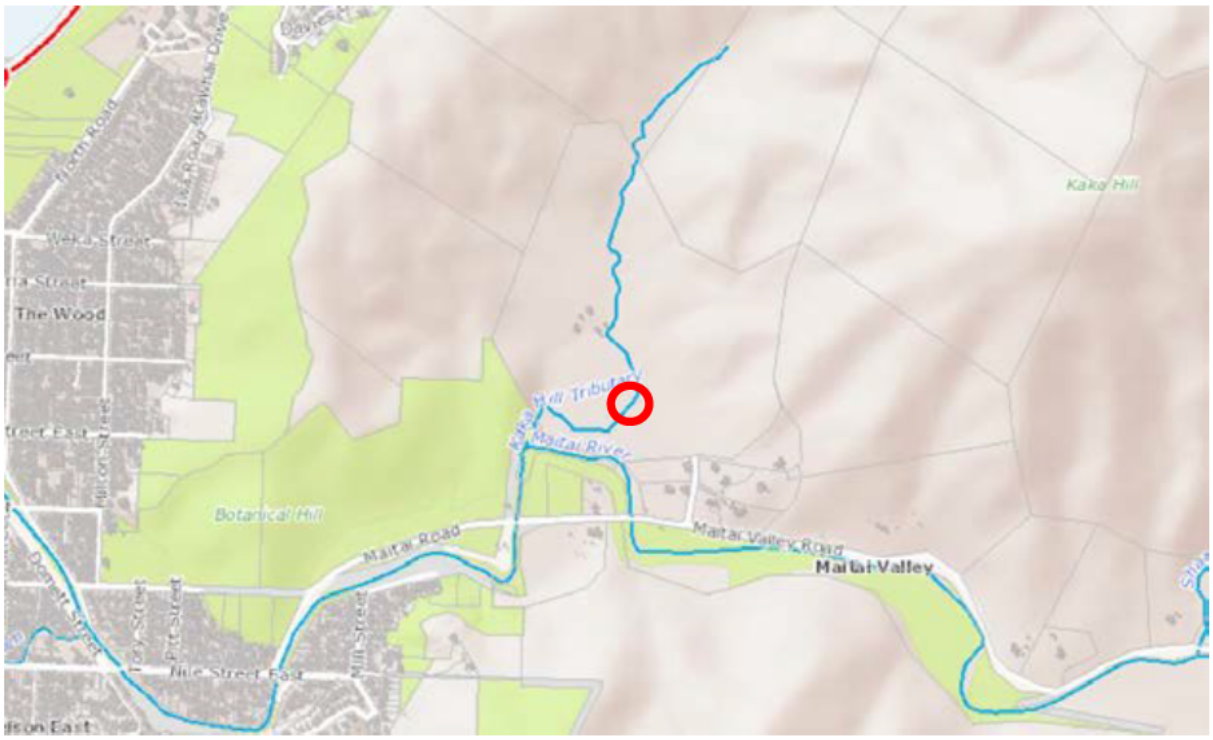


Figure 1. Site location for the fish surveys on Kaka Stream.

Site information

Kaka Stream is a tributary of the Maitai River.

The survey site was located approximately 400m from its confluence with the Maitai River (Figures 1 & 2).

A 150m protocol (Joy et al 2013) electric fishing fish surveys was undertaken at this site on the 11th of December 2023.

A 150m protocol (Joy et al 2013) spotlight survey was undertaken at the same site on the 13th of December 2023.

The New Zealand Freshwater Fish Data Base was interrogated to check for any previous surveys within the Kaka Stream catchment. No surveys appear to have been undertaken.

Survey extent

Figure 2. Yellow dotted line indicating the 150m survey extent for the fish surveys on Kaka Stream

Results

Eight shortfin eels, three inanga, six koura and two unidentified eels were observed during the electric fishing survey.

The size range for the shortfin eels was 150-280mm, inanga 60mm, koura 60-110mm and unidentified eels 70-80mm.

Three shortfin eels, two inanga, six koura and five kaharore bullies were observed during the spotlight fish survey.

The size range for the shortfin eels was 120-300mm, inanga 70mm, koura 40-100mm and kaharore bullies 40-60mm.

Field notes

Stream flows were low at the time of the electric fishing survey.

Flows had ceased two days later when the spotlight survey was undertaken and only residual pools remained.

Stream likely ephemeral in dry years, but may hold perennial flow in wet years. Residual pools may remain, especially in the scour pool downstream of the upper culvert.

Minimal pool habitat throughout the survey reach.

Streambed generally comprises of coarse gravel with some sand and cobbles.

Riparian vegetation 100% rank grass.

Water quality from upstream catchment likely generally OK during stable flow periods.

High sediment loads probable however during high flows resulting from erosion scars during recent large floods.

High temperature during summer months a result of low flows and minimal shading as riparian vegetation restricted to long grass (Figure 4).

Stock access to a large proportion of the reach resulting in bank erosion and instream disturbance (Figures 3, 4 and 5).

Fish communities as expected. Unlikely to be migration barriers downstream as inanga observed.

Crayfish and kaharore bullies will likely be recruiting from stable populations upstream.

Kaka Stream scored low on the Rapid Habitat Assessment (34/100) indicating the habitat is poor for freshwater fauna.

Reconstruction should aim to maintain summer low flows, create multiple deep pools, with in pool cover (wood debris etc) and robust riparian vegetation.

Figure 3. Run and riffle habitat in Kaka Stream

Figure 4. Extent of riparian vegetation in Kaka Stream

Figure 5. Pugging in the Kaka Stream bed where stock has not been excluded.

Figure 6. Pool habitat in Kaka Stream

Figure 7. Inanga caught during the electric fishing survey in Kaka Stream

Kaka Stream tributary

Site location

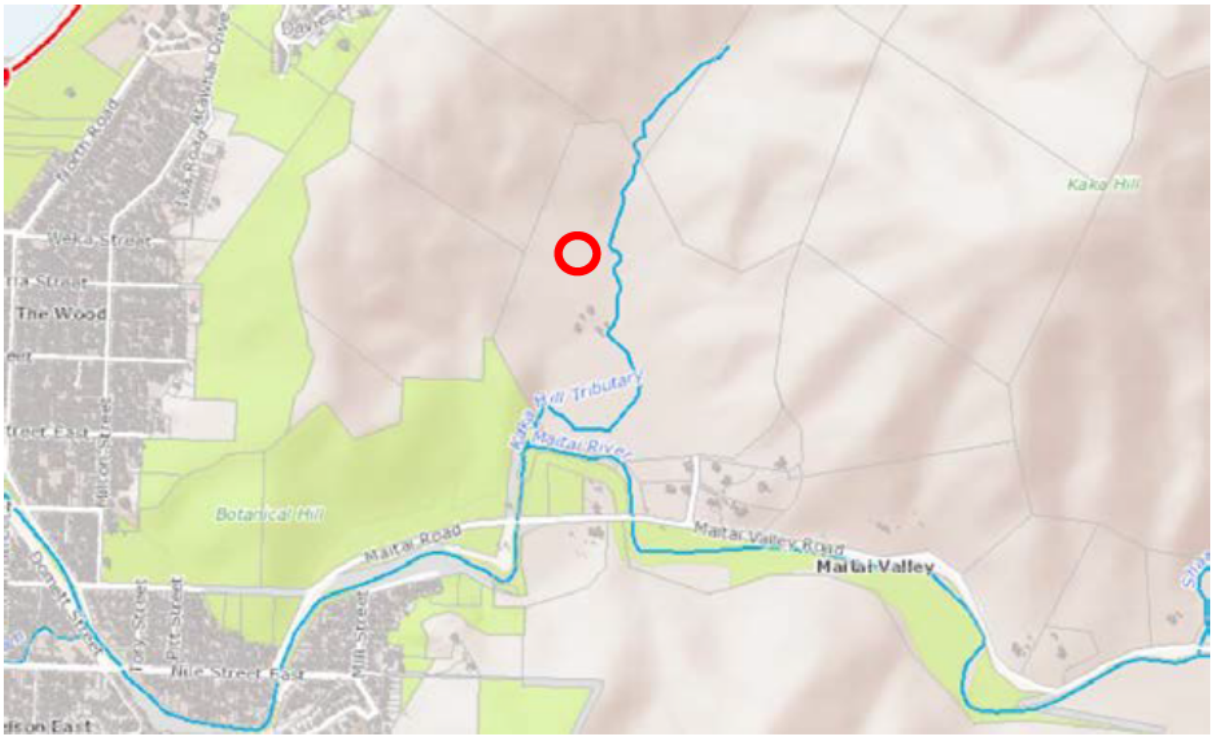


Figure 8. Site location for the fish surveys on Kaka Stream tributary.

Site information

The Kaka Stream tributary flows into Kaka Stream approximately 700m up from the Kaka Stream / Maitai River confluence.

The survey site started at the tributaries confluence with Kaka Stream and finished where the waterway forks and no channelised flow was visible. The reach was split into three areas; downstream of the fence (Reach A), upstream of the fence (Reach B), and upstream of the culvert (Reach C) (Figures 7 and 8).

A spotlight fish survey was undertaken on the 13th of December 2023. Note that given the low flow within the waterway, spotlighting was the only practicable survey method.

Survey extent

Figure 9. Survey extent for the spotlight fish survey on the Kaka Stream tributary. The yellow dotted line indicates the reach downstream of the fence (Reach A), the blue dotted line indicates the reach upstream of the fence (Reach B), and the orange dotted line indicates the reach upstream of the culvert (Reach C)

Results

One shortfin eel was observed in Reach A measuring 200mm in length. Reach A also had three koura with a size range of 60-110mm.

One koura was observed in Reach B measuring 70mm in length.

Two koura were observed in Reach C measuring 70mm and 80mm in length.

Field notes

Stream had surface flow through the top 30m of reach C. Downstream of that point the stream ceased flowing and only residual flows remained.

Significant scouring following recent large floods evident. Resulting pools may be ephemeral in dry years, however wetland seepage from top of catchment likely perennial (Figures 10 and 11).

Streambed comprises of mostly coarse gravel with a few cobbles.

Crayfish and eels present in low numbers, sizes would suggest some pool habitat remains at least during non-drought years.

An eel was observed during a daytime visit attempting to climb out of a residual pool.

Stock access limited due to depth of scouring, which also offers some shading minimising water heating.

The culvert between Reaches B and C is likely a barrier to migrating fish.

The Kaka Stream tributary scored very low on the Rapid Habitat Assessment (19/100) indicating the habitat is poor for freshwater fauna.

Figure 10. Significant scouring in the lower Kaka Stream tributary (Reach A)

Figure 11. Small pool in the Kaka Stream tributary

Figure 12. Eel observed climbing out of a residual pool during the daytime site visit in Reach B

Figure 13. Extent of the Kaka Stream tributary upstream of the culvert (Reach C)

Appendix

Fish collection form - Wadeable streams / rivers

Reviewed by (Initials) _____

Team members: Tim Olley, Ricky Olley

Lat/Long (GPS bottom): -41.270135, 173.311024

Lat/Long (GPS top): -41.269092, 173.310607

Site ID: Kaka Stream Date: 11 / 12 / 2023 Page ___ of ___

○ not fished other ○ fished none collected ◉ fished all 10 subreaches ○ fished 5-9 subreaches ○ fished <5 subreaches ☐ flag for fished/not fished

Fish sample ID: _____ Total shock (button) time (min): 1.0 Fishing time: start 1.000, finish 1.200 Sample distance (m): 150 Area Fished (m²): _____

Sampling gear: ○ spotlight ◉ EFM ○ netting net type _____ net No. _____ net type _____ net No. _____

Water visibility: ◉ good ○ average ○ poor Water temp. (°C) 19.5 Cond (uS) 336

EFM Volts (x100): 200 Spotlight (watts): _____ Pulse Rate (pps or Hz): _____ EFM Pulse Width (ms): _____ EFM anode ○ big ◉ small DO _____ mg/L _____ %

Common Name	Subreach Tally A	B	C	D	E	F	G	H	I	J	Total count	Anom. count	Vouch. count	LENGTH (mm) Minimum	LENGTH (mm) Maximum	Mortality count	Flag
Shortfin eel				I	IIII		I										
Koura				II	II					II							
Inanga					III												
Uni eel								I		I							

Flag	Comment	Flag	Comment

Waikato Regional Council

Subreach size class information (mm)

☐ Actual length ☐ Category lengths

Common Name	A	B	C	D	E	F	G	H	I	J
Shortfin eel				250	250, 180, 150, 150, 240, 135		280			
Koura				110, 60	110, 80					100, 70
Inanga					60, 60, 60					
Uni eel	—							N/A		N/A
Silt %										
Pool %	5	5			60		30			5
Run %	65	15	40	40	40	20	20	90	20	50
Riffle %	30	80	60	60		80	50	50	80	45
Undishable %										
Densiometer		US R DS L		US R DS L		US R DS L		US R DS L		US R DS L
Wet width (m)	1.1	0.5	0.4	0.5	1.4	0.3	0.7	0.3	0.5	0.9
Gradient Depth (cm)	10	5	6	6	50	5	5	6	4	14

NZ FRESHWATER FISH DATABASE FORM	PLEASE RETURN TO:	FRESHWATER FISH DATABASE NIWA PO BOX 11-115, HAMILTON	
Date 11/12/2023	Catchment system Maitai River		Catchment number 573
Time 1000	Sampling locality Kaka Stream		
Observer Olley	Access notes		Altitude (m) 20
Organisation Olley	NZMS260 map	Coordinates 1626474 5430621	Inland distance (km)
Fishing method EFM	Area fished (m^2) or Number of nets used 150m lineal length	Number of electric fishing passes 1	Tidal yes/no/unknown

HABITAT DATA

Water	Colour blue/green/teal/uncoloured/other:			Clarity clear/milky/dirty		Temp 17.5	pH
	Average width (m) 0.66	Average depth (m) 0.11		Maximum depth (m) 0.5		Conductivity (ms/m) 33.5	
Habitat type (%)	Still	Backwater	Pool 11	Run 36	Riffle 53	Rapid	Cascade
Substrate type (%)	Mud	Sand 30	Fine gravel	Coarse gravel 50	Cobble 20	Boulder	Bedrock
Fish cover (yes/no)	Weed Algae yes	Instream debris no	Undercut banks no	Bank vegetation yes			
Catchment vegetation (%)	Native forest	Exotic forest	Farming 100	Urban area	Scrub	Swamp land	Other
Riparian vegetation (%)	Native forest	Exotic forest	Grass Tussock 100	Exposed bed	Scrub Willow	Raupo Flax	Other

Type of river/stream/lake

Water level low/normal/high/unknown	Downstream blockage yes/no/unknown	Pollution nil/low/moderate/high
Large invertebrate fauna	Koura abundant/common/occasional/rare/nil/unknown or numbers observed	
	Paratya shrimp abundant/common/occasional/rare/nil/unknown	Freshwater mussels nil/present/unknown
Small benthic invertebrate fauna low/moderate/high/unknown	Predominant species mayflies/caddis/snails/combination/other	Permanent water yes/no/unknown

Purpose of work Electric fishing survey

FISH DATA

Species and life stage	Abundance*	Length data	Habitat/comments
Shortfin eel	n=8	150, 130, 180, 150, 150, 130, 230, 180	
Koura	n=6	110, 60, 110, 80, 100, 70	
Inanga	n=3	60 60 60	
unidentified eel	n=2	N/A	

Comments

*Use numbers observed or abundant/common/occasional/rare

Fish collection form - Wadeable streams / rivers

Reviewed by (Initials)________

Team members: Tim Olley, Ricky Olley

Lat/Long (GPS bottom): -41.270185 / 173.311024

Lat/Long (GPS top): -41.269092 / 173.310607

Site ID: Kaka Stream | Date 13 / 12 / 2023 | Page ___ of ___

○ not fished other ○ fished none collected ○ fished all 10 subreaches ○ fished 5-9 subreaches ☑ fished <5 subreaches ☐ flag for fished/not fished

Fish sample ID ______ | Total shock (button) time (min) ____ | Fishing time start 2200 finish 2230 | Sample distance (m) 150 | Area Fished (m²) ____

Sampling gear: ☑ spotlight ○ EFM ○ netting | net type ____ net No. ____ | net type ____ net No. ____

Water visibility: ○ good ☑ average ○ poor | Water temp. (°C) 19.2 | Cond (uS) 40.8

EFM Volts (x100) ____ | Spotlight (watts) ____ | Pulse Rate (pps or Hz) ____ | EFM Pulse Width (ms) ____ | EFM anode ○ big ○ small | DO ____ mg/L ____ %

Common Name	A	B	C	D	E	F	G	H	I	J	Total count	Anom. count	Vouch. count	Length (mm) Minimum	Length (mm) Maximum	Mortality count	Flag
Shortfin eel					1		11										
Koura					1	1	1111										
Kakacore bully					111		11										
Inanga							11										

Flag	Comment	Flag	Comment

Waikato Regional Council

Flag codes: K = No measurement made U = Suspect measurement F1,F2 etc = flags assigned by each field crew. Explain all flags in comments. DEATH* - Enter single fish as minimum

Subreach size class information (mm) ☐ Actual length ☐ Category lengths

Common Name	A	B	C	D	E	F	G	H	I	J
Shortfin eel					300		170, 180			
Koura					100	50	60, 40, 60, 50			
Kelvecore bully					40, 40, 50		60, 60			
Inanga							70, 70			
Still %										
Pool %					60		30			
Run %					40	20	20			
Riffle %						80	50			
Unfishable %	100	100	100	100				100	100	100
Densiometer		US R DS L		US R DS L		US R DS L		US R DS L		US R DS L
Wet width (m)					1.4	0.3	0.7			
Gradient Depth (m)					50	5	5			

NZ FRESHWATER FISH DATABASE FORM	PLEASE RETURN TO:	FRESHWATER FISH DATABASE NIWA PO BOX 11-115, HAMILTON	
Date 13/12/2023	Catchment system Maitai River		Catchment number 578
Time 2200	Sampling locality Kaka Stream		
Observer olley	Access notes		Altitude (m) 20
Organisation olley	NZMS260 map	Coordinates 1626939 5430621	Inland distance (km)
Fishing method SPO	Area fished (m^2) or Number of nets used 150 line.l length	Number of electric fishing passes	Tidal yes/no/unknown

HABITAT DATA

Water	Colour blue/green/tea/uncoloured/other			Clarity clear/milky/dirty		Temp. 19.2	pH
	Average width (m) 0.24	Average depth (m) 0.06		Maximum depth (m) 0.50		Conductivity (ms/m) 403	
Habitat type (%)	Still/pry 70	Backwater	Pool 9	Run 8	Riffle 13	Rapid	Cascade
Substrate type (%)	Mud	Sand 30	Fine gravel	Coarse gravel 50	Cobble 20	Boulder	Bedrock
Fish cover (yes/no)	Weed Algae yes	Instream debris No	Undercut banks No	Bank vegetation yes			
Catchment vegetation (%)	Native forest	Exotic forest	Farming 100	Urban area	Scrub	Swamp land	Other
Riparian vegetation (%)	Native forest	Exotic forest	Grass Tussock 100	Exposed bed	Scrub Willow	Raupo Flax	Other

Type of river/stream/lake

Water level low/normal/high/unknown	Downstream blockage yes/no/unknown	Pollution nil/low/moderate/high	
Large invertebrate fauna	Koura abundant/common/occasional/rare/nil/unknown or numbers observed		
	Paratya shrimp abundant/common/occasional/rare/nil/unknown	Freshwater mussels nil/present/unknown	
Small benthic invertebrate fauna low/moderate/high/unknown	Predominant species mayflies/caddis/snails/combination/other	Permanent water yes/no/unknown	

Purpose of work Spotlight fish survey

FISH DATA

Species and life stage	Abundance*	Length data	Habitat/comments
Shortfin eel	n = 3	300, 120, 290	
Koura	n = 6	100, 50, 60, 40, 60, 50	
Kaharoro bully	n = 5	40, 40, 50, 60, 60	
Inanga	n = 2	70, 70	

Comments

*Use numbers observed or abundant/common/occasional/rare

Kaka Stream 11/12/2023

Habitat parameter	Condition category										SCORE
1. Deposited sediment	*The percentage of the stream bed covered by fine sediment.*										
	0	*5*	*10*	*15*	*20*	*30*	*40*	*50*	*60*	*≥ 75*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
2. Invertebrate habitat diversity	*The number of different substrate types such as boulders, cobbles, gravel, sand, wood, leaves, root mats, macrophytes, periphyton. Presence of interstitial space score higher.*										
	≥ 5	*5*	*5*	*4*	*4*	*3*	*3*	*2*	*2*	*1*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
3. Invertebrate habitat abundance	*The percentage of substrate favourable for EPT colonisation, for example flowing water over gravel-cobbles clear of filamentous algae/macrophytes.*										
	95	*75*	*70*	*60*	*50*	*40*	*30*	*25*	*15*	*5*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
4. Fish cover diversity	*The number of different substrate types such as woody debris, root mats, undercut banks, overhanging/encroaching vegetation, macrophytes, boulders, cobbles. Presence of substrates providing spatial complexity score higher.*										
	≥ 5	*5*	*5*	*4*	*4*	*3*	*3*	*2*	*2*	*1*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
5. Fish cover abundance	*The percentage of fish cover available.*										
	95	*75*	*60*	*50*	*40*	*30*	*20*	*10*	*5*	*0*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
6. Hydraulic heterogeneity	*The number of of hydraulic components such as pool, riffle, fast run, slow run, rapid, cascade/waterfall, turbulance, backwater. Presence of deep pools score higher.*										
	≥ 5	*5*	*4*	*4*	*3*	*3*	*2*	*2*	*2*	*1*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
7. Bank erosion	*The percentage of the stream bank recently/actively eroding due to scouring at the water line, slumping of the bank or stock pugging.*										
Left bank	*0*	*≤ 5*	*5*	*15*	*25*	*35*	*50*	*65*	*75*	*> 75*	
Right bank	*0*	*≤ 5*	*5*	*15*	*25*	*35*	*50*	*65*	*75*	*> 75*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
8. Bank vegetation	*The maturity, diversity and naturalness of bank vegetation.*										
Left bank AND Right bank	*Mature native trees with diverse and intact understorey*		*Regenerating native or flaxes/sedges/tussock > dense exotic*			*Mature shrubs, sparse tree cover > young exotic, long grass*			*Heavily grazed or mown grass > bare/impervious ground*		
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
9. Riparian width	*The width (m) of the riparian buffer constrained by vegetation, fence or other structure(s).*										
Left bank	*≥ 30*	*15*	*10*	*7*	*5*	*4*	*3*	*2*	*1*	*0*	
Right bank	*≥ 30*	*15*	*10*	*7*	*5*	*4*	*3*	*2*	*1*	*0*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
10. Riparian shade	*The percentage of shading of the stream bed throughout the day due to vegetation, banks or other structure(s).*										
	≥ 90	*80*	*70*	*60*	*50*	*40*	*25*	*15*	*10*	*≤ 5*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
TOTAL	(Sum of parameters 1-10)										34

Figure 21. Recommended rapid habitat quality assessment field sheet.

NZ FRESHWATER FISH DATABASE FORM	PLEASE RETURN TO:	FRESHWATER FISH DATABASE NIWA PO BOX 11-115, HAMILTON	
Date 13/11/2023	Catchment system Maitai River		Catchment number 578
Time 2245	Sampling locality Kaka Stream tributary		
Observer Olley	Access notes		Altitude (m) 40
Organisation Olley	NZMS260 map	Coordinates 1625848E 5431551N	Inland distance (km)
Fishing method SPD	Area fished (m²) or Number of nets used 350 lineal metres	Number of electric fishing passes	Tidal yes/no/unknown

HABITAT DATA

Water	Colour blue/green/tea/uncoloured/other:		Clarity clear/milky/dirty		Temp. 17	pH	
	Average width (m) 0.2	Average depth (m)	Maximum depth (m) 0.3		Conductivity (ms/m) 23.5		
Habitat type (%)	Still	Backwater	Pool 10	Run 20	Riffle 70	Rapid	Cascade
Substrate type (%)	Mud	Sand	Fine gravel	Coarse gravel 95	Cobble 5	Boulder	Bedrock
Fish cover (yes/no)	Weed Algae No	Instream debris No	Undercut banks No	Bank vegetation No			
Catchment vegetation (%)	Native forest	Exotic forest	Farming 100	Urban area	Scrub	Swamp land	Other
Riparian vegetation (%)	Native forest	Exotic forest	Grass Tussock 100	Exposed bed	Scrub Willow	Raupo Flax	Other

Type of river/stream/lake		
Water level low/normal/high/unknown	Downstream blockage yes/no/unknown	Pollution nil/low/moderate/high
Large invertebrate fauna	Koura abundant/common/occasional/rare/nil/unknown or numbers observed	
	Paratya shrimp abundant/common/occasional/rare/nil/unknown	Freshwater mussels present/unknown
Small benthic invertebrate fauna low/moderate/high/unknown	Predominant species mayflies/caddis/snails/combination/other	Permanent water yes/no/unknown
Purpose of work		

FISH DATA

Species and life stage	Abundance*	Length data	Habitat/comments
Shortfin eel	n=1	200	
Koura	n=6	60, 80, 110, 70, 90, 70	

Comments

*Use numbers observed or abundant/common/occasional/rare

Kaka Stream tributary 11/12/2023

Habitat parameter	Condition category										SCORE
1. Deposited sediment	*The percentage of the stream bed covered by fine sediment.*										
	0	*5*	*10*	*15*	*20*	*30*	*40*	*50*	*60*	*≥ 75*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
2. Invertebrate habitat diversity	*The number of different substrate types such as boulders, cobbles, gravel, sand, wood, leaves, root mats, macrophytes, periphyton. Presence of interstitial space score higher.*										
	≥ 5	*5*	*5*	*4*	*4*	*3*	*3*	*2*	*2*	*1*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
3. Invertebrate habitat abundance	*The percentage of substrate favourable for EPT colonisation, for example flowing water over gravel-cobbles clear of filamentous algae/macrophytes.*										
	95	*75*	*70*	*60*	*50*	*40*	*30*	*25*	*15*	*5*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
4. Fish cover diversity	*The number of different substrate types such as woody debris, root mats, undercut banks, overhanging/encroaching vegetation, macrophytes, boulders, cobbles. Presence of substrates providing spatial complexity score higher.*										
	≥ 5	*5*	*5*	*4*	*4*	*3*	*3*	*2*	*2*	*1*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
5. Fish cover abundance	*The percentage of fish cover available.*										
	95	*75*	*60*	*50*	*40*	*30*	*20*	*10*	*5*	*0*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
6. Hydraulic heterogeneity	*The number of of hydraulic components such as pool, riffle, fast run, slow run, rapid, cascade/waterfall, turbulance, backwater. Presence of deep pools score higher.*										
	≥ 5	*5*	*4*	*4*	*3*	*3*	*2*	*2*	*2*	*1*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
7. Bank erosion	*The percentage of the stream bank recently/actively eroding due to scouring at the water line, slumping of the bank or stock pugging.*										
Left bank	*0*	*≤ 5*	*5*	*15*	*25*	*35*	*50*	*65*	*75*	*> 75*	
Right bank	*0*	*≤ 5*	*5*	*15*	*25*	*35*	*50*	*65*	*75*	*> 75*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
8. Bank vegetation	*The maturity, diversity and naturalness of bank vegetation.*										
Left bank AND Right bank	*Mature native trees with diverse and intact understorey*		*Regenerating native or flaxes/sedges/tussock > dense exotic*			*Mature shrubs, sparse tree cover > young exotic, long grass*			*Heavily grazed or mown grass > bare/impervious ground*		
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
9. Riparian width	*The width (m) of the riparian buffer constrained by vegetation, fence or other structure(s).*										
Left bank	*≥ 30*	*15*	*10*	*7*	*5*	*4*	*3*	*2*	*1*	*0*	
Right bank	*≥ 30*	*15*	*10*	*7*	*5*	*4*	*3*	*2*	*1*	*0*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
10. Riparian shade	*The percentage of shading of the stream bed throughout the day due to vegetation, banks or other structure(s).*										
	≥ 90	*80*	*70*	*60*	*50*	*40*	*25*	*15*	*10*	*≤ 5*	
SCORE	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
TOTAL	(Sum of parameters 1-10)										19

Figure 21. Recommended rapid habitat quality assessment field sheet.

25

Appendix H:

Wilderlabs In-Stream eDNA Results

Wilderlab Sample Batch Metadata

JobID:	603872
SubmissionDate:	2023-03-08
AccountName:	Robertson Environmental
AccountNumber:	OLO001
ContactName:	Ben Robertson
ContactEmail:	[redacted]
ContactPhone:	
PurchaseOrder:	
JobReference:	
JobNotes:	
NumberOfSamples:	1
TestsRequired:	Comprehensive multispecies
MakeDataPublic:	FALSE
InvoiceNo:	INV2028
Region:	01

UID	ClientSampleID	CollectedBy	CollectionDate	Latitude	Longitude	VolumeFilteredML
411850	Site A	Ben Robertson	2023-03-07	-41.27037	173.30833	

DeploymentDuration	EnvironmentType	ClientNotes
24	River/Stream	

ScientificName	Rank	TaxID	CommonName	Group	411850
Porphyrio melanotus	species	72013	Pukeko	Birds	1514
Lumbriculus variegatus	species	61662	Blackworm	Worms	768
Lumbricus rubellus	species	35632	Red earthworm	Worms	694
Hydra vulgaris	species	6087	Hydra	Cnidarians	418
Anguilla australis	species	7940	Shortfin eel	Fish	387
Galaxias maculatus	species	61620	Inanga	Fish	350
Chaetogaster diaphanus	species	212246	Oligochaete worm	Worms	208
Ovis aries	species	9940	Sheep	Mammals	88
Dermatophagoides pteronyssinus	species	6956	House dust mite; Dust mite	Mites and ti	80
Cochliopodium kieliense	species	1512276	Amoeba	Amoebae	65
Physella acuta	species	109671	Left handed sinistral snail	Molluscs	63
Chaetogaster diastrophus	species	74727	Oligochaete worm	Worms	52
Potamopyrgus antipodarum	species	145637	Mud Snail	Molluscs	42
Paratanytarsus grimmii	species	288873	Chironomid	Insects	40
Aulacorthum solani	species	202456	Foxglove aphid	Insects	35
Cladosporium tenuissimum	species	70808		Fungi	27
Cavariella aegopodii	species	330421	Willow carrot aphid	Insects	24
Poteriospumella lacustris	species	1117027	Protist	Heterokont a	22
Gyraulus corinna	species	10000037	NZ freshwater snail	Molluscs	19
Ranunculus	genus	3445	Buttercups; spearworts; water crowf	Plants	3381
Holcus	genus	15560	Soft-grasses; velvet grasses	Plants	969
Potamopyrgus	genus	145636	Mud snails	Molluscs	779
Histriculus	genus	47667		Ciliates	675
Spirogyra	genus	3179		Other	314
Veronica	genus	4173	Brooklimes	Plants	213
Aspergillus	genus	5052		Fungi	194
Lotus	genus	3867		Plants	160
Acyrthosiphon	genus	7028		Insects	101
Cocconeis	genus	216715	Diatom	Diatoms	94
Plantago	genus	26867	Plaintains; fleaworts	Plants	91

Veronica subgen. Beccabunga	subgenus	1461652		Plants	77
Chaetonotus	genus	68038	Gastrotrich	Other	53
Pseudomonas	genus	286		Bacteria	48
Rumex	genus	3618	Docks; sorrels	Plants	44
Chaetopeltis	genus	56001	Green alga	Green algae	41
Litonotus	genus	346246		Ciliates	39
Chrysamoeba	genus	98047		Heterokont a	28
Persicaria	genus	61508	Knotweeds; Smartweeds	Plants	26
Novosphingobium	genus	165696		Bacteria	20
Puccinia	genus	5296		Fungi	16
Lacrymaria	genus	185694		Ciliates	15
Flavobacterium	genus	237		Bacteria	13
Ovis	genus	9935	Sheep; Ovine	Mammals	12
Bullera	genus	4970		Fungi	11
Allantion	genus	188942		Other	11
Vishniacozyma	genus	1891946		Fungi	10
Vannella	genus	95228	Amoeba	Amoebae	8
Neobodo	genus	312470		Other	8
Aeromonas	genus	642		Bacteria	7
Trifolium	genus	3898	Clover; trefoil	Plants	7
Chilodonella	genus	151076		Ciliates	6
Poterioochromonas	genus	88166	Mixotrophic flagellate	Heterokont a	5
Opitutus	genus	178440		Bacteria	5
Tilletiopsis	genus	1500560		Fungi	4
Bovidae	family	9895	Even-toed ungulates	Mammals	608
Solanoideae	subfamily	424551		Plants	501
Solanaceae	family	4070	Nightshade family	Plants	227
Comamonadaceae	family	80864		Bacteria	188
Apiaceae	family	4037	Carrot family	Plants	93
Sphingomonadaceae	family	41297		Bacteria	66

Pooideae	subfamily	147368		Plants	63
Caprinae	subfamily	9963		Mammals	57
Rhodobacteraceae	family	31989		Bacteria	43
Litonotidae	family	197908	Ciliates	Ciliates	34
Stentoridae	family	219169		Ciliates	34
Lauraceae	family	3433	Laurel family	Plants	18
Moraxellaceae	family	468		Bacteria	16
Poaceae	family	4479	Grass family	Plants	16
Vorticellidae	family	85904		Ciliates	15
Tokophryidae	family	168137		Ciliates	15
Culicinae	subfamily	43817		Insects	13
Flavobacteriaceae	family	49546		Bacteria	11
Chitinophagaceae	family	563835		Bacteria	5
Musaceae	family	4637	Banana family	Plants	4
Cercomonadidae	family	45108	Flagellate	Other	4
root	no rank	1	Unidentified	Other	7400
Metazoa	kingdom	33208	Metazoans	Other	3031
Eurotatoria	class	2816136		Rotifers	1655
Zygnemophyceae	class	131209	Gamophytes	Other	1295
Choreotrichia	subclass	141411		Ciliates	522
Choreotrichida	order	200605		Ciliates	499
Insecta	class	50557	Insects	Other	397
Burkholderiales	order	80840		Bacteria	268
Eukaryota	superkingdo	2759	Eucaryotes	Other	211
Lepidoptera	order	7088	Butterflies and moths	Insects	196
Stichotrichia	subclass	194286		Ciliates	171
Proteobacteria	phylum	1224	Purple bacteria and relatives	Bacteria	137
Florideophyceae	class	2806		Red algae	106
Metakinetoplastina	subclass	2704647		Other	104
Chromulinales	order	96792		Heterokont a	103

Litostomatea	class	5988		Ciliates	101
Pentapetalae	clade	1437201		Plants	92
Chromadorea	class	119089		Other	80
Oomycota	phylum	4762		Heterokont a	70
Pleosporales	order	92860		Fungi	63
Stramenopiles	clade	33634	Heterokonts	Other	61
Heterotrichida	order	5957		Ciliates	52
Gastropoda	class	6448	Gastropods	Molluscs	51
Chordata	phylum	7711	Chordates	Other	51
Chrysophyceae	class	2825	Chrysomonads	Heterokont a	50
Ciliophora	phylum	5878	Ciliates	Other	49
Tetrahymenina	suborder	37093	Ciliates	Ciliates	45
Caenogastropoda	subclass	69555		Molluscs	39
Kinetoplastea	class	5653	Kinetoplastids	Other	37
Xanthophyceae	class	2833	Yellow-green algae	Heterokont a	32
Magnoliopsida	class	3398	Angiosperms	Plants	32
Sessilida	order	1974272		Ciliates	30
Bigyra	class	2683628		Heterokont a	30
PACMAD clade	clade	147370		Plants	25
Betaproteobacteria	class	28216		Bacteria	23
Fungi	kingdom	4751		Other	22
Ochrophyta	clade	2696291		Heterokont a	22
Gammaproteobacteria	class	1236		Bacteria	21
Chlamydomonadales	order	3042		Green algae	21
Poeae	tribe	147387		Plants	21
Neobodonida	order	2704648		Other	20
Arthropoda	phylum	6656	Arthropods	Other	19
Bacteroidetes	phylum	976	Bacteroides-Cytophaga-Flexibacter g	Bacteria	18
Streptophyta	phylum	35493		Other	15
Thecofilosea	class	1004930		Other	11

Zingiberales	order	4618		Plants	9
Ascomycota	phylum	4890	Ascomycetes	Fungi	9
Ulotrichales	order	31306		Green algae	8
Rhodocyclales	order	206389		Bacteria	8
Chytridiomycota	phylum	4761		Fungi	7
Basidiomycota	phylum	5204	Basidiomycetes	Fungi	7
Desulfuromonadales	order	69541		Bacteria	7
Rhizophydiales	order	451442		Fungi	7
Alphaproteobacteria	class	28211		Bacteria	6
Verrucomicrobia	phylum	74201		Bacteria	5
Sphingomonadales	order	204457		Bacteria	5
Cercozoa	phylum	136419		Other	4
Planctomycetes	phylum	203682		Bacteria	4

Sequence	Target	ScientificName	Rank	TaxID	CommonName	Group	411850
TTAAAAACC	WV	Porphyrio melanotus	species	72013	Pukeko	Birds	941
TTTACTCTA/	WV	Lumbriculus variegatus	species	61662	Blackworm	Worms	768
TTAATTTAA/	WV	Lumbricus rubellus	species	35632	Red earthworm	Worms	694
TTGGCCCTA	RV	Porphyrio melanotus	species	72013	Pukeko	Birds	529
TTTACTATA/	WV	Hydra vulgaris	species	6087	Hydra	Cnidarians	418
TTTAGACGC	WV	Galaxias maculatus	species	61620	Inanga	Fish	350
TTTAGACAA	WV	Anguilla australis	species	7940	Shortfin eel	Fish	306
TTTATTTTTA	WV	Chaetogaster diaphanus	species	212246	Oligochaete worm	Worms	208
TTTAACTAA(	WV	Ovis aries	species	9940	Sheep	Mammals	88
TCTAGCTGG	CI	Anguilla australis	species	7940	Shortfin eel	Fish	81
TCTTTCTAAT	CI	Dermatophagoides pteronyssinus	species	6956	House dust mite; Dust mite	Mites and ti(	80
ATTATCAGG	CI	Cochliopodium kieliense	species	1512276	Amoeba	Amoebae	65
TCTATCAGG	CI	Physella acuta	species	109671	Left handed sinistral snail	Molluscs	59
TCTATCTAG/	CI	Chaetogaster diastrophus	species	74727	Oligochaete worm	Worms	52
ACTAGCAGG	CI	Porphyrio melanotus	species	72013	Pukeko	Birds	44
TCTATCATC1	CI	Paratanytarsus grimmii	species	288873	Chironomid	Insects	40
TTTATCAAA	CI	Aulacorthum solani	species	202456	Foxglove aphid	Insects	35
ATTATCAGG	CI	Potamopyrgus antipodarum	species	145637	Mud Snail	Molluscs	31
ATTGTCAGG	CI	Cladosporium tenuissimum	species	70808		Fungi	27
ACTATCTAA	CI	Cavariella aegopodii	species	330421	Willow carrot aphid	Insects	24
ACTAAGTAG	CI	Poteriospumella lacustris	species	1117027	Protist	Heterokont a	22
TTTAAGTAG	CI	Gyraulus corinna	species	10000037	NZ freshwater snail	Molluscs	19
ATTATCAGG	CI	Potamopyrgus antipodarum	species	145637	Mud Snail	Molluscs	11
CGCCCGTCG	BE	Physella acuta	species	109671	Left handed sinistral snail	Molluscs	4
ATCCTGCTT1	TP	Ranunculus	genus	3445	Buttercups; spearworts; water crowf	Plants	2570
TTAAAAAAA	WV	Potamopyrgus	genus	145636	Mud snails	Molluscs	779
GTTGAGGA(	MZ	Ranunculus	genus	3445	Buttercups; spearworts; water crowf	Plants	721
ATCCGTGTT	TP	Holcus	genus	15560	Soft-grasses; velvet grasses	Plants	653
CGCCCGTCG	BE	Histriculus	genus	47667		Ciliates	369
GCTGAGGA(	MZ	Holcus	genus	15560	Soft-grasses; velvet grasses	Plants	316

GTCGCTCCT	BU	Histriculus	genus	47667	Ciliates	306
GTTGAGGAC	MZ	Spirogyra	genus	3179	Other	296
ATCCTGTCTT	TP	Veronica	genus	4173	Brooklimes	Plants	213
ATCCTGCTTT	TP	Lotus	genus	3867	Plants	160
CGCCCGTCG	BE	Aspergillus	genus	5052	Fungi	148
TTTATCAAAT	CI	Acyrthosiphon	genus	7028	Insects	101
GCTGAGGAC	MZ	Veronica subgen. Beccabunga	subgenus	1461652	Plants	77
CGCCCGTCG	BE	Cocconeis	genus	216715	Diatom	Diatoms	53
ATCCTGTCTT	TP	Plantago	genus	26867	Plaintains; fleaworts	Plants	50
CGCCCGTCG	BE	Ranunculus	genus	3445	Buttercups; spearworts; water crowf	Plants	49
GTCGCTACT	BU	Aspergillus	genus	5052	Fungi	46
CTCCTCCTTT	TP	Rumex	genus	3618	Docks; sorrels	Plants	44
GTTGTGGAC	MZ	Plantago	genus	26867	Plaintains; fleaworts	Plants	41
GTCGCTCCT	BU	Ranunculus	genus	3445	Buttercups; spearworts; water crowf	Plants	41
GTCGCACCT	BU	Cocconeis	genus	216715	Diatom	Diatoms	41
CGCCCGTCG	BE	Litonotus	genus	346246	Ciliates	39
GTCCACGCC	UM	Pseudomonas	genus	286	Bacteria	36
GTCGCTACT	BU	Chaetonotus	genus	68038	Gastrotrich	Other	34
CGCCCGTCG	BE	Chaetopeltis	genus	56001	Green alga	Green algae	33
CGCCCGTCG	BE	Chrysamoeba	genus	98047	Heterokont a	28
CTCCTGCTTT	TP	Persicaria	genus	61508	Knotweeds; Smartweeds	Plants	26
GTCCACGCC	UM	Novosphingobium	genus	165696	Bacteria	20
CGCCCGTCG	BE	Chaetonotus	genus	68038	Gastrotrich	Other	19
GTCGCTCCT	BU	Spirogyra	genus	3179	Other	18
CGCCCGTCG	BE	Lacrymaria	genus	185694	Ciliates	15
GTCCACGCC	UM	Flavobacterium	genus	237	Bacteria	13
CATCATACTA	LG	Ovis	genus	9935	Sheep; Ovine	Mammals	12
GTCACACCA	BU	Pseudomonas	genus	286	Bacteria	12
GTCGCTACT	BU	Bullera	genus	4970	Fungi	11
CGCCCGTCG	BE	Allantion	genus	188942	Other	11

CGCCCGTCG	BE	Puccinia	genus	5296		Fungi	11
CGCCTGTCG	BE	Vishniacozyma	genus	1891946		Fungi	10
GTCGCTCCT/	BU	Chaetopeltis	genus	56001	Green alga	Green algae	8
GTCGTTGTT	BU	Neobodo	genus	312470		Other	8
TTTATCAAG	CI	Vannella	genus	95228	Amoeba	Amoebae	8
ATCCTTCTTT	TP	Trifolium	genus	3898	Clover; trefoil	Plants	7
GTCCACGCC	UM	Aeromonas	genus	642		Bacteria	7
GTCGCTCCT/	BU	Chilodonella	genus	151076		Ciliates	6
GTCGCTACT/	BU	Puccinia	genus	5296		Fungi	5
GTCACGTCA	BU	Opitutus	genus	178440		Bacteria	5
TTTATCTAG	CI	Poterioochromonas	genus	88166	Mixotrophic flagellate	Heterokont a	5
CGCCTGTCG	BE	Tilletiopsis	genus	1500560		Fungi	4
ATCCTGTTT	TP	Solanoideae	subfamily	424551		Plants	501
TTTAACTAA(	WV	Bovidae	family	9895	Even-toed ungulates	Mammals	381
TTTAACTAA(	WV	Bovidae	family	9895	Even-toed ungulates	Mammals	227
GTTGAGGAC	MZ	Solanaceae	family	4070	Nightshade family	Plants	227
GTCCACGCC	UM	Comamonadaceae	family	80864		Bacteria	188
ATCCTATTTT	TP	Apiaceae	family	4037	Carrot family	Plants	69
TTAGCCCTA/	RV	Caprinae	subfamily	9963		Mammals	57
GTCCACGCC	UM	Rhodobacteraceae	family	31989		Bacteria	43
GCTGAGGAC	MZ	Pooideae	subfamily	147368		Plants	40
GTCCACGCC	UM	Sphingomonadaceae	family	41297		Bacteria	37
GTCGCTCCT/	BU	Litonotidae	family	197908	Ciliates	Ciliates	34
CGCCCGTCG	BE	Stentoridae	family	219169		Ciliates	34
GTTGAGGAC	MZ	Apiaceae	family	4037	Carrot family	Plants	24
ATCCGTGTT	TP	Pooideae	subfamily	147368		Plants	23
GTTGAGGAC	MZ	Lauraceae	family	3433	Laurel family	Plants	18
GTCGCTCCT/	BU	Poaceae	family	4479	Grass family	Plants	16
GTCACACCA	BU	Sphingomonadaceae	family	41297		Bacteria	16
GTCGCTTTT/	BU	Vorticellidae	family	85904		Ciliates	15

GTCACACCA	BU	Sphingomonadaceae	family	41297		Bacteria	13
ACTAGCAGC	CI	Culicinae	subfamily	43817		Insects	13
GTCCACGCC	UM	Flavobacteriaceae	family	49546		Bacteria	11
GTCCATGCT	UM	Moraxellaceae	family	468		Bacteria	10
CGCCCGCCG	BE	Tokophryidae	family	168137		Ciliates	9
GCCGCTCCC	BU	Tokophryidae	family	168137		Ciliates	6
GTCACACCA	BU	Moraxellaceae	family	468		Bacteria	6
GTCCACGCC	UM	Chitinophagaceae	family	563835		Bacteria	5
ATCCTTATTT	TP	Musaceae	family	4637	Banana family	Plants	4
CGCCCGTCG	BE	Cercomonadidae	family	45108	Flagellate	Other	4
TTGTCTAATT	CI	Eurotatoria	class	2816136		Rotifers	1605
GCTGAGGAC	MZ	Zygnemophyceae	class	131209	Gamophytes	Other	1295
CGAAGCAAT	WV	Metazoa	kingdom	33208	Metazoans	Other	1114
ATTAAGTGG	CI	root	no rank	1	Unidentified	Other	542
CGCCCGTCG	BE	Choreotrichia	subclass	141411		Ciliates	522
AAGACACAA	XG	root	no rank	1	Unidentified	Other	517
GTCGCTCCT	BU	Choreotrichida	order	200605		Ciliates	499
ATTTTTTCTT	TP	root	no rank	1	Unidentified	Other	472
ATTAAGTGG	CI	root	no rank	1	Unidentified	Other	439
TTTATTTATA	WV	root	no rank	1	Unidentified	Other	364
TCTTTCTTCA	CI	Insecta	class	50557	Insects	Other	307
CCTGTCAGG	CI	Metazoa	kingdom	33208	Metazoans	Other	302
GTCCACGCC	UM	Burkholderiales	order	80840		Bacteria	244
CTGCAGGGA	WV	Metazoa	kingdom	33208	Metazoans	Other	237
TTTAGCATC	CI	Metazoa	kingdom	33208	Metazoans	Other	230
TTTTTATCGC	CI	root	no rank	1	Unidentified	Other	219
ACTTTCATCT	CI	Lepidoptera	order	7088	Butterflies and moths	Insects	196
AAGAGCGCA	WV	root	no rank	1	Unidentified	Other	164
TTTAGCTGG	CI	root	no rank	1	Unidentified	Other	163
TTTATTTATA	WV	root	no rank	1	Unidentified	Other	158

ATTGTCATC/ CI	Metazoa	kingdom	33208	Metazoans	Other	137
GTTGTCAAC CI	root	no rank	1	Unidentified	Other	135
ATTATCAGC/ CI	root	no rank	1	Unidentified	Other	125
TTTAAGTAG CI	root	no rank	1	Unidentified	Other	123
TTTAAGTGG CI	root	no rank	1	Unidentified	Other	118
ATTATCGAG CI	root	no rank	1	Unidentified	Other	102
ACTTAGTGA CI	root	no rank	1	Unidentified	Other	101
AAGTCAACA XG	root	no rank	1	Unidentified	Other	98
CGCCCGTCG BE	Metakinetoplastina	subclass	2704647		Other	97
GTCCACGCC UM	Proteobacteria	phylum	1224	Purple bacteria and relatives	Bacteria	94
GTTGAGGAC MZ	Pentapetalae	clade	1437201		Plants	92
TTTAAGTAG CI	root	no rank	1	Unidentified	Other	92
ACTATCAGC CI	Insecta	class	50557	Insects	Other	90
ACTAAGTAC CI	root	no rank	1	Unidentified	Other	89
CTATTCTGC/ WV	Metazoa	kingdom	33208	Metazoans	Other	87
ATTATCTGG CI	root	no rank	1	Unidentified	Other	82
TTTAAGAAC CI	Chromadorea	class	119089		Other	80
CGCCCGTCG BE	Litostomatea	class	5988		Ciliates	79
CGCAAAGTC XG	root	no rank	1	Unidentified	Other	72
TTGATTTTG(EA	root	no rank	1	Unidentified	Other	71
TTAGCAGGC CI	Metazoa	kingdom	33208	Metazoans	Other	71
TTGAAGAAC WV	Metazoa	kingdom	33208	Metazoans	Other	70
TTCTACAGA/ WV	Metazoa	kingdom	33208	Metazoans	Other	68
ACTAAGCGC CI	root	no rank	1	Unidentified	Other	68
ATTATCAAG CI	root	no rank	1	Unidentified	Other	67
TTTAGCTGG CI	root	no rank	1	Unidentified	Other	67
TCGGGTGAT WV	Metazoa	kingdom	33208	Metazoans	Other	66
TCTTTCTTCC CI	root	no rank	1	Unidentified	Other	66
TCTAAGTAG CI	root	no rank	1	Unidentified	Other	65
TCTTTCAAG CI	root	no rank	1	Unidentified	Other	65

ATTATCATC/	CI	Eukaryota	superkingdo	2759	Eucaryotes	Other	62
ATTATCGAG	CI	root	no rank	1	Unidentified	Other	61
CGCCCGTCG	BE	Stramenopiles	clade	33634	Heterokonts	Other	61
TCTAAGTGC	CI	root	no rank	1	Unidentified	Other	59
TCTTTCAAG/	CI	root	no rank	1	Unidentified	Other	59
TCGCACCCG	WV	root	no rank	1	Unidentified	Other	56
TTTGGCAGG	CI	root	no rank	1	Unidentified	Other	56
TTTGAGTGC	CI	root	no rank	1	Unidentified	Other	55
TTTAAGTAC/	CI	root	no rank	1	Unidentified	Other	54
CGCCCGTCG	BE	Eukaryota	superkingdo	2759	Eucaryotes	Other	53
CGCCCGTCG	BE	Chromulinales	order	96792		Heterokont a	53
GTCGCTCCT/	BU	Heterotrichida	order	5957		Ciliates	52
GTCGGAAAC	WV	Metazoa	kingdom	33208	Metazoans	Other	51
TTTAAGTTC/	CI	Florideophyceae	class	2806		Red algae	51
ATTAGCTAG	CI	root	no rank	1	Unidentified	Other	51
TTTATCAAG	CI	root	no rank	1	Unidentified	Other	51
CGCCCGTCG	BE	Gastropoda	class	6448	Gastropods	Molluscs	51
GTCGCACCT	BU	Chromulinales	order	96792		Heterokont a	50
ACTGTCTTC/	CI	root	no rank	1	Unidentified	Other	50
CGCCCGTCG	BE	Chrysophyceae	class	2825	Chrysomonads	Heterokont a	50
TTTAAGTAG	CI	root	no rank	1	Unidentified	Other	48
TTTAGCTTC1	CI	root	no rank	1	Unidentified	Other	47
CGCCCGTCG	BE	root	no rank	1	Unidentified	Other	47
TTTGTCATC/	CI	root	no rank	1	Unidentified	Other	46
TTTAAGTAG	CI	root	no rank	1	Unidentified	Other	46
TGACGGCGC	WV	Metazoa	kingdom	33208	Metazoans	Other	45
TTTGGCTTC(	CI	root	no rank	1	Unidentified	Other	45
CGCCCGTCA	BE	root	no rank	1	Unidentified	Other	44
TTATCAGCT(	CI	root	no rank	1	Unidentified	Other	42
TCCGTCCAG	XG	root	no rank	1	Unidentified	Other	41

ACTTTCAAG	CI	root	no rank	1	Unidentified	Other	41
CAGGCCGCC	WV	root	no rank	1	Unidentified	Other	40
TTTGTCTAA	CI	Metazoa	kingdom	33208	Metazoans	Other	40
ACTCAGTAA	CI	Metazoa	kingdom	33208	Metazoans	Other	40
CGCCCGTCG	BE	Stichotrichia	subclass	194286		Ciliates	40
GTCGCTACT	BU	Caenogastropoda	subclass	69555		Molluscs	39
GTCGCTACT	BU	Eukaryota	superkingdo	2759	Eucaryotes	Other	38
ATTAAGTAG	CI	root	no rank	1	Unidentified	Other	38
GCACTTAAC	CI	Metazoa	kingdom	33208	Metazoans	Other	37
GTCACTACT	BU	root	no rank	1	Unidentified	Other	36
GTCGCACCT	BU	root	no rank	1	Unidentified	Other	36
ATTATCAGG	CI	root	no rank	1	Unidentified	Other	36
ATTAGCAGG	CI	root	no rank	1	Unidentified	Other	36
ATTATCATC	CI	Florideophyceae	class	2806		Red algae	35
TTATCATCA	CI	root	no rank	1	Unidentified	Other	35
TTTAGCTGG	CI	root	no rank	1	Unidentified	Other	35
CGCCCGT G	BE	Stichotrichia	subclass	194286		Ciliates	35
GCGCCTCAA	WV	root	no rank	1	Unidentified	Other	34
AAATAAATC	XG	root	no rank	1	Unidentified	Other	34
ATTAAGTTC	CI	root	no rank	1	Unidentified	Other	34
ATTATCTAG	CI	root	no rank	1	Unidentified	Other	34
TTTAGCGAG	CI	root	no rank	1	Unidentified	Other	34
ATTATCATC	CI	root	no rank	1	Unidentified	Other	34
TGGCCTTAT	WV	Metazoa	kingdom	33208	Metazoans	Other	33
ATTATCTAG	CI	root	no rank	1	Unidentified	Other	33
ATTATCGTC	CI	root	no rank	1	Unidentified	Other	33
GTTGAGGAC	MZ	Magnoliopsida	class	3398	Angiosperms	Plants	32
GTCGCTCCT	BU	Stichotrichia	subclass	194286		Ciliates	32
TTTAAGTGG	CI	root	no rank	1	Unidentified	Other	32
ATTAAGTAG	CI	root	no rank	1	Unidentified	Other	32

ATTAAGTGC	CI	Metazoa	kingdom	33208	Metazoans	Other	32
CGCCCGTCG	BE	Xanthophyceae	class	2833	Yellow-green algae	Heterokont a	32
GTCGCTACT	BU	Pleosporales	order	92860		Fungi	31
GTCGCTCCT	BU	Ciliophora	phylum	5878	Ciliates	Other	31
GTCCACGCC	UM	Proteobacteria	phylum	1224	Purple bacteria and relatives	Bacteria	31
GTCGCTTTT	BU	Sessilida	order	1974272		Ciliates	30
GTCGCTCCT	BU	Stichotrichia	subclass	194286		Ciliates	30
TCTATCCTC	CI	Metazoa	kingdom	33208	Metazoans	Other	29
CGCCCGTCG	BE	Oomycota	phylum	4762		Heterokont a	29
TTAGCCCTA	RV	Chordata	phylum	7711	Chordates	Other	28
TTTGAGTGG	CI	root	no rank	1	Unidentified	Other	28
TGGTTGCCG	WV	Metazoa	kingdom	33208	Metazoans	Other	26
TCTCAGTTC	CI	root	no rank	1	Unidentified	Other	26
ATCCCTTTTT	TP	PACMAD clade	clade	147370		Plants	25
GTCGCTACT	BU	Eurotatoria	class	2816136		Rotifers	25
TTTATCATC	CI	root	no rank	1	Unidentified	Other	25
ATTAGCTAG	CI	root	no rank	1	Unidentified	Other	25
TTTAAGTAG	CI	root	no rank	1	Unidentified	Other	25
TTTAGCGAG	CI	root	no rank	1	Unidentified	Other	25
CGCCCGTCG	BE	Eurotatoria	class	2816136		Rotifers	25
GTCCACGCC	UM	Burkholderiales	order	80840		Bacteria	24
CTTAAGTAA	CI	root	no rank	1	Unidentified	Other	24
TTCAAGGCA	XG	root	no rank	1	Unidentified	Other	23
GTCGCTTGT	BU	Tetrahymenina	suborder	37093	Ciliates	Ciliates	23
GTCCACGCC	UM	Betaproteobacteria	class	28216		Bacteria	23
TTTAAGTTC	CI	Eukaryota	superkingdo	2759	Eucaryotes	Other	23
GTCGCTACT	BU	root	no rank	1	Unidentified	Other	22
GTCGCTCCT	BU	Litostomatea	class	5988		Ciliates	22
ACTTAGTGG	CI	root	no rank	1	Unidentified	Other	22
GATCCAGCT	CI	root	no rank	1	Unidentified	Other	22

ATTAAGTGC	CI	root	no rank	1	Unidentified	Other	22
ATTGTCTGG	CI	root	no rank	1	Unidentified	Other	22
CGCCCGTCG	BE	Tetrahymenina	suborder	37093	Ciliates	Ciliates	22
CGCCCGTCG	BE	Ochrophyta	clade	2696291		Heterokont a	22
ATCCGTGTT	TP	Poeae	tribe	147387		Plants	21
GTCAACTCA	BU	root	no rank	1	Unidentified	Other	21
TTTATCTTCT	CI	root	no rank	1	Unidentified	Other	21
TTTATCTGCT	CI	Metazoa	kingdom	33208	Metazoans	Other	21
ATTAGCTGG	CI	root	no rank	1	Unidentified	Other	21
ATTAGCAGG	CI	Eukaryota	superkingdo	2759	Eucaryotes	Other	21
TTAAGTAAC	CI	root	no rank	1	Unidentified	Other	21
CGCCCGTCG	BE	Chlamydomonadales	order	3042		Green algae	21
ACTGCCTCT	WV	Metazoa	kingdom	33208	Metazoans	Other	20
GTCGTTGTT	BU	Neobodonida	order	2704648		Other	20
TTTAAGTTC	CI	Florideophyceae	class	2806		Red algae	20
AACCGGTTT	CI	Metazoa	kingdom	33208	Metazoans	Other	20
CGCCCGTCG	BE	Stichotrichia	subclass	194286		Ciliates	20
CGCCCGTCG	BE	Pleosporales	order	92860		Fungi	20
TTGAATTGG	WV	Metazoa	kingdom	33208	Metazoans	Other	19
TTCCTCCTTT	TP	root	no rank	1	Unidentified	Other	19
ATTAGCAAG	CI	Oomycota	phylum	4762		Heterokont a	19
TTTAAGCAG	CI	root	no rank	1	Unidentified	Other	19
ATTATCTAA	CI	Metazoa	kingdom	33208	Metazoans	Other	19
ATTATCAGC	CI	Arthropoda	phylum	6656	Arthropods	Other	19
GTCGTTGTT	BU	Kinetoplastea	class	5653	Kinetoplastids	Other	18
GTCGCTCCT	BU	Ciliophora	phylum	5878	Ciliates	Other	18
TTTAGCTGG	CI	root	no rank	1	Unidentified	Other	18
TTTACTATA	WV	Metazoa	kingdom	33208	Metazoans	Other	17
TTGTCCTTG	CI	Metazoa	kingdom	33208	Metazoans	Other	17
TTATCATCA	CI	root	no rank	1	Unidentified	Other	17

GACATCGTG	WV	Metazoa	kingdom	33208	Metazoans	Other	16
TCTATCAGG	CI	root	no rank	1	Unidentified	Other	16
CGCCCGTCG	BE	Bigyra	class	2683628		Heterokont a	16
GTTGAGGAC	MZ	Streptophyta	phylum	35493		Other	15
TTTGTCTTCT	CI	root	no rank	1	Unidentified	Other	15
ATTAAGTAG	CI	root	no rank	1	Unidentified	Other	15
TTTATCAAG	CI	root	no rank	1	Unidentified	Other	15
TTCTGCCTTC	CI	Metazoa	kingdom	33208	Metazoans	Other	15
GGTCGATCC	WV	Metazoa	kingdom	33208	Metazoans	Other	14
AGTACCGCC	XG	root	no rank	1	Unidentified	Other	14
GTCGCTCCTA	BU	Stichotrichia	subclass	194286		Ciliates	14
GTCGCACCT	BU	Eukaryota	superkingdo	2759	Eucaryotes	Other	14
TTTGAGTGG	CI	root	no rank	1	Unidentified	Other	14
ATTATCTGG	CI	root	no rank	1	Unidentified	Other	14
TTTAAGTGC	CI	root	no rank	1	Unidentified	Other	14
CGCCCGTCG	BE	Kinetoplastea	class	5653	Kinetoplastids	Other	14
ATCAAACTG	EA	root	no rank	1	Unidentified	Other	13
CGACGCTCT	XG	root	no rank	1	Unidentified	Other	13
GTCTAACTA	TP	root	no rank	1	Unidentified	Other	13
ATTATCAAG	CI	root	no rank	1	Unidentified	Other	13
ATTAGCTTC	CI	root	no rank	1	Unidentified	Other	13
CGCCCGTCG	BE	Oomycota	phylum	4762		Heterokont a	13
CGCCCGTCG	BE	root	no rank	1	Unidentified	Other	13
TACAAATAA	WV	root	no rank	1	Unidentified	Other	12
GCGCGATGC	WV	root	no rank	1	Unidentified	Other	12
TTTACTATAT	WV	root	no rank	1	Unidentified	Other	12
TGGAAGCGC	XG	root	no rank	1	Unidentified	Other	12
GTCGCTCCTA	BU	root	no rank	1	Unidentified	Other	12
CATTGCATA	CI	Metazoa	kingdom	33208	Metazoans	Other	12
CTTGGCTAG	CI	root	no rank	1	Unidentified	Other	12

TTTAGCTGG	CI	root	no rank	1	Unidentified	Other	12
TTTATCTGG	CI	root	no rank	1	Unidentified	Other	12
TTTCGTCAA	CI	root	no rank	1	Unidentified	Other	12
CGCCCGTCG	BE	root	no rank	1	Unidentified	Other	12
CGCCCGTCG	BE	Pleosporales	order	92860		Fungi	12
CGGGCCTTG	WV	Metazoa	kingdom	33208	Metazoans	Other	11
GCTTCTGGT	WV	Metazoa	kingdom	33208	Metazoans	Other	11
ACTTTACAT	XG	root	no rank	1	Unidentified	Other	11
GTCACACCA	BU	Gammaproteobacteria	class	1236		Bacteria	11
ATTAGCAGG	CI	root	no rank	1	Unidentified	Other	11
ACTTTCGAT	CI	Metazoa	kingdom	33208	Metazoans	Other	11
ATTATCAAG	CI	root	no rank	1	Unidentified	Other	11
CTTATCAGC	CI	root	no rank	1	Unidentified	Other	11
TTTAAGCGC	CI	root	no rank	1	Unidentified	Other	11
GACCGTGGC	WV	root	no rank	1	Unidentified	Other	10
GATGATCTT	YG	Chordata	phylum	7711	Chordates	Other	10
GTCGCACCT	BU	Bigyra	class	2683628		Heterokont a	10
GTCACACCA	BU	Gammaproteobacteria	class	1236		Bacteria	10
GTTAAGTTC	CI	root	no rank	1	Unidentified	Other	10
TTTAGCAGG	CI	root	no rank	1	Unidentified	Other	10
TTTCTCGCC	WV	root	no rank	1	Unidentified	Other	9
GTTGAGGAC	MZ	Zingiberales	order	4618		Plants	9
GTCGCTACT	BU	Ascomycota	phylum	4890	Ascomycetes	Fungi	9
GTCGCACCT	BU	Oomycota	phylum	4762		Heterokont a	9
GTCGTTACT	BU	Fungi	kingdom	4751		Other	9
GTCCACGCC	UM	Bacteroidetes	phylum	976	Bacteroides-Cytophaga-Flexibacter g	Bacteria	9
ATTATCAGG	CI	root	no rank	1	Unidentified	Other	9
ATTATCTAG	CI	root	no rank	1	Unidentified	Other	9
ATCCGTTGT	CI	root	no rank	1	Unidentified	Other	9
CGCCCGTCG	BE	Fungi	kingdom	4751		Other	9

ATGATGATA WV	Metazoa	kingdom	33208	Metazoans	Other	8
TTCTGAACG XG	root	no rank	1	Unidentified	Other	8
GTCCATGCC UM	root	no rank	1	Unidentified	Other	8
GTCCACGCC UM	Rhodocyclales	order	206389		Bacteria	8
ACTTGCAAG CI	Metazoa	kingdom	33208	Metazoans	Other	8
TCTATCTAG/ CI	Metazoa	kingdom	33208	Metazoans	Other	8
ATTGTCTTC/ CI	Metazoa	kingdom	33208	Metazoans	Other	8
GCTGTCTGT CI	Metazoa	kingdom	33208	Metazoans	Other	8
TTTATCTTCT CI	Metazoa	kingdom	33208	Metazoans	Other	8
TTCTATCAG/ CI	root	no rank	1	Unidentified	Other	8
CGCCCGTCG BE	Ulotrichales	order	31306		Green algae	8
CGACCCCAA WV	Metazoa	kingdom	33208	Metazoans	Other	7
GAAAGAGTC LG	root	no rank	1	Unidentified	Other	7
ATCGATGAA XG	root	no rank	1	Unidentified	Other	7
GTCACACCA BU	Proteobacteria	phylum	1224	Purple bacteria and relatives	Bacteria	7
GTCCACGCC UM	Desulfuromonadales	order	69541		Bacteria	7
TTTATCAGG CI	root	no rank	1	Unidentified	Other	7
TCTAGCAGG CI	Chordata	phylum	7711	Chordates	Other	7
AATATCAAG CI	root	no rank	1	Unidentified	Other	7
CGCCCGTCG BE	root	no rank	1	Unidentified	Other	7
CGCCCGTCG BE	Chytridiomycota	phylum	4761		Fungi	7
CGCCCGTCG BE	Metakinetoplastina	subclass	2704647		Other	7
CGCCCGTCG BE	Thecofilosea	class	1004930		Other	7
CGCCTGTCG BE	Basidiomycota	phylum	5204	Basidiomycetes	Fungi	7
CGCCCGTCG BE	Rhizophydiales	order	451442		Fungi	7
CATCCAGCC EA	root	no rank	1	Unidentified	Other	6
TTCCGAGGG WV	Metazoa	kingdom	33208	Metazoans	Other	6
AGCATCGAA WV	root	no rank	1	Unidentified	Other	6
AGTGCACCA WV	Metazoa	kingdom	33208	Metazoans	Other	6
GAAAGAGTC LG	Chordata	phylum	7711	Chordates	Other	6

ATCTTGTTTT TP	root	no rank	1	Unidentified	Other	6
GTCGCTTGA BU	root	no rank	1	Unidentified	Other	6
GTCACACCA BU	Alphaproteobacteria	class	28211		Bacteria	6
GTCAAGTCA BU	root	no rank	1	Unidentified	Other	6
GTCGCTCCT/ BU	root	no rank	1	Unidentified	Other	6
GTTAAGTGG CI	root	no rank	1	Unidentified	Other	6
TTTATCTGG CI	root	no rank	1	Unidentified	Other	6
ATTAGCTAG CI	root	no rank	1	Unidentified	Other	6
ATTATCAAA CI	root	no rank	1	Unidentified	Other	6
TTTAGCTAT CI	root	no rank	1	Unidentified	Other	6
ACTAAGTAG CI	root	no rank	1	Unidentified	Other	6
AGACCGGCC EA	root	no rank	1	Unidentified	Other	5
TGGAAAGTC WV	root	no rank	1	Unidentified	Other	5
CGGAGGCG/ WV	Metazoa	kingdom	33208	Metazoans	Other	5
AGGCGAGA(XG	root	no rank	1	Unidentified	Other	5
GTCACATCA BU	Verrucomicrobia	phylum	74201		Bacteria	5
GTCGCTGCT BU	root	no rank	1	Unidentified	Other	5
GTCACGCCA BU	Sphingomonadales	order	204457		Bacteria	5
GTCGTTGTT BU	Kinetoplastea	class	5653	Kinetoplastids	Other	5
GTCACATCA BU	root	no rank	1	Unidentified	Other	5
GTCCGCACT UM	Bacteroidetes	phylum	976	Bacteroides-Cytophaga-Flexibacter g	Bacteria	5
GTCCACGCT UM	Proteobacteria	phylum	1224	Purple bacteria and relatives	Bacteria	5
TTTGTCTGG CI	root	no rank	1	Unidentified	Other	5
TCTAAGTGG CI	root	no rank	1	Unidentified	Other	5
TCAGTATTT CI	root	no rank	1	Unidentified	Other	5
GAGCAAACC CI	root	no rank	1	Unidentified	Other	5
ATTATCTAA CI	Metazoa	kingdom	33208	Metazoans	Other	5
TAATAGATA CI	root	no rank	1	Unidentified	Other	5
TTTAAGTTC/ CI	root	no rank	1	Unidentified	Other	5
CGCCCGTCG BE	root	no rank	1	Unidentified	Other	5

CTTCGAGCA	WV	Metazoa	kingdom	33208	Metazoans	Other	4
CCTGAGCGA	WV	Metazoa	kingdom	33208	Metazoans	Other	4
GTCAAGTCA	BU	root	no rank	1	Unidentified	Other	4
GTCGCTACT	BU	root	no rank	1	Unidentified	Other	4
GTCGCTACT	BU	Fungi	kingdom	4751		Other	4
GTCGCACCT	BU	Bigyra	class	2683628		Heterokont a	4
GTCGCTCCT	BU	root	no rank	1	Unidentified	Other	4
GTCGCTACT	BU	Thecofilosea	class	1004930		Other	4
GTCCGCACA	UM	Bacteroidetes	phylum	976	Bacteroides-Cytophaga-Flexibacter g	Bacteria	4
GTCTTGGCC	UM	Planctomycetes	phylum	203682		Bacteria	4
TTTAAGCTC	CI	root	no rank	1	Unidentified	Other	4
TCTAAGTAG	CI	root	no rank	1	Unidentified	Other	4
GCTTTCGAG	CI	Metazoa	kingdom	33208	Metazoans	Other	4
TTTATCTAG	CI	root	no rank	1	Unidentified	Other	4
GCTTTCCGT	CI	Metazoa	kingdom	33208	Metazoans	Other	4
CGCCCGTCG	BE	root	no rank	1	Unidentified	Other	4
CGCCCGTCG	BE	root	no rank	1	Unidentified	Other	4
CGCCCGTCG	BE	Cercozoa	phylum	136419		Other	4
CGCCCGTCA	BE	root	no rank	1	Unidentified	Other	4

UID	TICI_version	TICI_value	TICI_rating	TICI_quantile	TICI_nseqs	TICI_reliability
411850	Riverine V1	82.57	Poor	0.18	146	Low

Wilderlab Sample Batch Metadata

JobID:	603822
SubmissionDate:	2023-02-22
AccountName:	Robertson Environmental
AccountNumber:	OLO001
ContactName:	Ben Robertson
ContactEmail:	ben.robertson@robertsonenviro.co.nz
ContactPhone:	
PurchaseOrder:	
JobReference:	
JobNotes:	
NumberOfSamples:	1
TestsRequired:	Comprehensive multispecies
MakeDataPublic:	FALSE
InvoiceNo:	INV2028
Region:	01

UID	ClientSampleID	CollectedBy	CollectionDate	Latitude	Longitude	VolumeFilteredML
411851	Site B	Ben Robertson	2023-02-22	-41.26192	173.31390	

DeploymentDuration	EnvironmentType	ClientNotes
24	River/Stream	

ScientificName	Rank	TaxID	CommonName	Group	411851
Chaetogaster diastrophus	species	74727	Oligochaete worm	Worms	22609
Closterium baillyanum	species	1416941	Charophyte green algae	Other	1841
Anguilla australis	species	7940	Shortfin eel	Fish	1807
Paranephrops planifrons	species	99774	Koura; freshwater crayfish	Crustaceans	203
Nais elinguis	species	74736	Sludgeworm	Worms	162
Clematis terniflora	species	231663	Clematis	Plants	129
Capra hircus	species	9925	Goat	Mammals	122
Aoteapsyche colonica	species	177870	NZ caddisfly	Insects	100
Lumbricus rubellus	species	35632	Red earthworm	Worms	84
Limnodrilus hoffmeisteri	species	76587	Redworm	Worms	38
uncultured Pythium	species	205931		Oomycetes	29
Cochliopodium kieliense	species	1512276	Amoeba	Amoebae	25
Eiseniella tetraedra	species	1302610	Squaretail worm	Worms	21
Psilochorema bidens	species	1968986	NZ caddisfly	Insects	16
Cricotopus sp. NZeP20	species	1667446	NZ mining midge	Insects	13
Bos taurus	species	9913	Cattle	Mammals	9
Nitzschia acidoclinata	species	1302829	Diatom	Diatoms	6
Vannella simplex	species	197532	Amoeba	Amoebae	5
Polygonum	genus	46786		Plants	303
Trifolium	genus	3898	Clover; trefoil	Plants	178
Cocconeis	genus	216715	Diatom	Diatoms	153
Gomphonema	genus	97226	Diatom	Diatoms	150
Cymbella	genus	216744	Diatom	Diatoms	122
Stentor	genus	5962		Ciliates	107
Nais	genus	74730	Sludgeworm	Worms	101
Erythranthe	genus	1502711	Monkey-flowers; musk-flowers	Plants	91
Acer	genus	4022	Maple	Plants	88
Oedogonium	genus	55993	Filamentous green alga	Green algae	76
Cicer	genus	3826	Legume	Plants	71
Berberis	genus	22774	Barberries	Plants	70

Trithigmostoma	genus	37473		Ciliates	68
Pseudomonas	genus	286		Bacteria	67
Navicula	genus	50949	Diatom	Diatoms	58
Aspergillus	genus	5052		Fungi	57
Aeromonas	genus	642		Bacteria	56
Anguilla	genus	7935	Eels	Fish	51
Chilodonella	genus	151076		Ciliates	49
Cryptomonas	genus	3030		Cryptomona	47
Parablechnum	genus	1905745		Plants	42
Neobodo	genus	312470		Other	36
Flavobacterium	genus	237		Bacteria	35
Tetrahymena	genus	5890		Ciliates	33
Acinetobacter	genus	469		Bacteria	32
Nitzschia	genus	2857	Pennate diatom	Diatoms	28
Sphingorhabdus	genus	1434046		Bacteria	20
Lacrymaria	genus	185694		Ciliates	19
Deleatidium	genus	551873	NZ mayfly	Insects	19
Cochliopodium	genus	313557	Amoeba	Amoebae	18
Silanimonas	genus	292713		Bacteria	17
Sellaphora	genus	216740	Diatom	Diatoms	16
Arcicella	genus	217140		Bacteria	13
Cladophora	genus	34125	Green alga	Green algae	10
Goniomonas	genus	31324		Cryptomona	9
Pararheinheimera	genus	2071980		Bacteria	9
Herpetocypris	genus	1473179		Crustaceans	8
Sphingopyxis	genus	165697		Bacteria	7
Pisidium	genus	98305		Molluscs	6
Drepanosiphum	genus	136352		Insects	5
Saprolegnia	genus	4769	Cotton mould; water mould	Oomycetes	4
Melosira	genus	35124	Diatom	Diatoms	4

Pooideae	subfamily	147368		Plants	597
Naididae	family	2109251	Sludgeworms	Worms	449
Rosoideae	subfamily	171638		Plants	392
Chaetonotidae	family	41372		Other	379
Pedaliaceae	family	4180	Sesame family	Plants	319
Comamonadaceae	family	80864		Bacteria	296
Pinaceae	family	3318	Pine family	Plants	188
Cryptomonadaceae	family	2896		Cryptomona	65
Chitinophagaceae	family	563835		Bacteria	24
Moraxellaceae	family	468		Bacteria	21
Rhodobacteraceae	family	31989		Bacteria	16
Ilyocyprididae	family	182490		Crustaceans	9
Chromatiaceae	family	1046	Purple sulfur bacteria	Bacteria	6
Scytosiphonaceae	family	2891		Heterokont a	5
Lewinellaceae	family	1937960		Bacteria	5
Scytomonadidae	family	2570650		Other	4
root	no rank	1	Unidentified	Other	6681
Eukaryota	superkingdo	2759	Eucaryotes	Other	911
Metazoa	kingdom	33208	Metazoans	Other	640
Bdelloidea	subclass	44578		Rotifers	514
Choreotrichia	subclass	141411		Ciliates	457
Burkholderiales	order	80840		Bacteria	422
Choreotrichida	order	200605		Ciliates	388
Polygoneae	tribe	1110385		Plants	285
Magnoliopsida	class	3398	Angiosperms	Plants	281
Saccharomycetales	order	4892		Fungi	265
Florideophyceae	class	2806		Red algae	185
Eurotatoria	class	2816136		Rotifers	171
Proteobacteria	phylum	1224	Purple bacteria and relatives	Bacteria	139
Rosales	order	3744		Plants	121

Chordata	phylum	7711	Chordates	Other	115
Ochrophyta	clade	2696291		Heterokont a	95
Viridiplantae	kingdom	33090	Green plants	Other	91
Chlamydomonadales	order	3042		Green algae	83
Mesangiospermae	clade	1437183		Plants	82
Chrysophyceae	class	2825	Chrysomonads	Heterokont a	74
Betaproteobacteria	class	28216		Bacteria	62
Arthropoda	phylum	6656	Arthropods	Other	60
Bacillariophyta	phylum	2836	Diatoms	Heterokont a	53
Chlorophyta	phylum	3041	Green algae	Other	48
Myrtales	order	41944		Plants	48
Fungi	kingdom	4751		Other	46
Cryptophyceae	class	3027	Cryptomonads	Other	44
Kinetoplastea	class	5653	Kinetoplastids	Other	41
Bacteroidetes	phylum	976	Bacteroides-Cytophaga-Flexibacter g	Bacteria	40
Chromulinales	order	96792		Heterokont a	36
Alphaproteobacteria	class	28211		Bacteria	30
Stramenopiles	clade	33634	Heterokonts	Other	25
Stichotrichia	subclass	194286		Ciliates	24
Poales	order	38820		Plants	23
unclassified Chlamydomonas	no rank	2034146		Green algae	23
Tetrahymenina	suborder	37093	Ciliates	Ciliates	17
Cercozoa	phylum	136419		Other	13
Neobodonida	order	2704648		Other	12
Chytridiomycetes	class	451435		Fungi	11
Thecofilosea	class	1004930		Other	11
Naviculales	order	38748		Diatoms	10
unclassified Chloromonas	no rank	2060747		Green algae	10
Phaeophyceae	class	2870	Brown algae	Heterokont a	9
Chlorophyceae	class	3166		Green algae	9

Insecta	class	50557	Insects	Other	9
unclassified Chlamydomonadales	no rank	120853		Green algae	9
Rhodophyta	phylum	2763	Red algae	Other	8
Centroplasthelida	class	193537	Centrohelids	Other	8
Deltaproteobacteria	class	28221		Bacteria	7
Streptophyta	phylum	35493		Other	7
unclassified Saprolegnia	no rank	372087		Oomycetes	7
Heterolobosea	phylum	5752		Other	6
Euglenales	order	86650		Other	5
Oomycota	phylum	4762		Heterokont a	4

Sequence	Target	ScientificName	Rank	TaxID	CommonName	Group	411851
TTTATTTATA	WV	Chaetogaster diastrophus	species	74727	Oligochaete worm	Worms	19954
TCTATCAAG	CI	Chaetogaster diastrophus	species	74727	Oligochaete worm	Worms	2655
ATCCTATGA	TP	Closterium baillyanum	species	1416941	Charophyte green algae	Other	1841
TCAACCTTA	RV	Anguilla australis	species	7940	Shortfin eel	Fish	1585
ATCTCCCTA	ZP	Paranephrops planifrons	species	99774	Koura; freshwater crayfish	Crustaceans	203
TTTAGACAA	WV	Anguilla australis	species	7940	Shortfin eel	Fish	156
TTTATTTTTA	WV	Nais elinguis	species	74736	Sludgeworm	Worms	155
ATCCTTTTTT	TP	Clematis terniflora	species	231663	Clematis	Plants	129
TTAGCCCTA	RV	Capra hircus	species	9925	Goat	Mammals	122
ACTCTCTTC	CI	Aoteapsyche colonica	species	177870	NZ caddisfly	Insects	100
TTAATTTAA	WV	Lumbricus rubellus	species	35632	Red earthworm	Worms	84
TCTAGCTGG	CI	Anguilla australis	species	7940	Shortfin eel	Fish	62
TTTACCATA	WV	Limnodrilus hoffmeisteri	species	76587	Redworm	Worms	38
TTTATCAAG	CI	uncultured Pythium	species	205931		Oomycetes	29
ATTATCAGG	CI	Cochliopodium kieliense	species	1512276	Amoeba	Amoebae	25
TTAATTCTA	WV	Eiseniella tetraedra	species	1302610	Squaretail worm	Worms	21
CCTTTCTTC	CI	Psilochorema bidens	species	1968986	NZ caddisfly	Insects	16
ACTATCTTC	CI	Cricotopus sp. NZeP20	species	1667446	NZ mining midge	Insects	13
TTTAACTAA	WV	Bos taurus	species	9913	Cattle	Mammals	9
ATTATCAAG	CI	Nais elinguis	species	74736	Sludgeworm	Worms	7
TCTTTCGGG	CI	Nitzschia acidoclinata	species	1302829	Diatom	Diatoms	6
TTTATCAAG	CI	Vannella simplex	species	197532	Amoeba	Amoebae	5
AAACAAATA	LG	Anguilla australis	species	7940	Shortfin eel	Fish	4
GTTGAGGAC	MZ	Polygonum	genus	46786		Plants	303
ATCCTTCTTT	TP	Trifolium	genus	3898	Clover; trefoil	Plants	178
CGCCCGTCG	BE	Cocconeis	genus	216715	Diatom	Diatoms	102
ATCCTCTTTT	TP	Erythranthe	genus	1502711	Monkey-flowers; musk-flowers	Plants	91
ATCCTGTTTT	TP	Acer	genus	4022	Maple	Plants	88
CGCCCGTCG	BE	Cymbella	genus	216744	Diatom	Diatoms	83
CGCCCGTCG	BE	Gomphonema	genus	97226	Diatom	Diatoms	79

GTTGTGGAC	MZ	Oedogonium	genus	55993	Filamentous green alga	Green algae	76
ATCCTGCTT	TP	Cicer	genus	3826	Legume	Plants	71
ATCCTGTTT	TP	Berberis	genus	22774	Barberries	Plants	70
CGCCCGTCG	BE	Trithigmostoma	genus	37473		Ciliates	63
CGCCCGTCG	BE	Stentor	genus	5962		Ciliates	61
GTCCACGCC	UM	Aeromonas	genus	642		Bacteria	56
TCAACCTTA	RV	Anguilla	genus	7935	Eels	Fish	51
GTCGCACCT	BU	Cocconeis	genus	216715	Diatom	Diatoms	51
CGCCCGTCG	BE	Aspergillus	genus	5052		Fungi	48
GTCGCTCCT	BU	Cryptomonas	genus	3030		Cryptomona	47
GTCGCACCT	BU	Gomphonema	genus	97226	Diatom	Diatoms	47
TTTATTTTTA	WV	Nais	genus	74730	Sludgeworm	Worms	46
GTCGCTCCT	BU	Stentor	genus	5962		Ciliates	46
ATCTCCTAT	TP	Parablechnum	genus	1905745		Plants	42
GTCCACGCC	UM	Pseudomonas	genus	286		Bacteria	42
GTCGCACCT	BU	Cymbella	genus	216744	Diatom	Diatoms	39
GTCCATGCC	UM	Acinetobacter	genus	469		Bacteria	32
CGCCCGTCG	BE	Navicula	genus	50949	Diatom	Diatoms	31
TCTATCAAG	CI	Nais	genus	74730	Sludgeworm	Worms	28
ATTATCTGG	CI	Nitzschia	genus	2857	Pennate diatom	Diatoms	28
TTTATTTTTA	WV	Nais	genus	74730	Sludgeworm	Worms	27
CGCCCGTCG	BE	Chilodonella	genus	151076		Ciliates	26
GTCGCTTGT	BU	Tetrahymena	genus	5890		Ciliates	25
GTCGCACCT	BU	Gomphonema	genus	97226	Diatom	Diatoms	24
GTCGCTCCT	BU	Chilodonella	genus	151076		Ciliates	23
GTCCACGCC	UM	Flavobacterium	genus	237		Bacteria	21
GTCCACGCC	UM	Sphingorhabdus	genus	1434046		Bacteria	20
CGCCCGTCG	BE	Neobodo	genus	312470		Other	20
TTTATCCGC	CI	Deleatidium	genus	551873	NZ mayfly	Insects	19
CGCCCGTCG	BE	Lacrymaria	genus	185694		Ciliates	19

ATTATCTGG	CI	Cochliopodium	genus	313557	Amoeba	Amoebae	18
GTCCACGCC	UM	Silanimonas	genus	292713		Bacteria	17
GTCGTTGTT	BU	Neobodo	genus	312470		Other	16
GTCGCACCT	BU	Navicula	genus	50949	Diatom	Diatoms	15
GTCACACCA	BU	Pseudomonas	genus	286		Bacteria	15
GTCCACGCC	UM	Flavobacterium	genus	237		Bacteria	14
GTCCACACT	UM	Arcicella	genus	217140		Bacteria	13
GTCGCACCT	BU	Navicula	genus	50949	Diatom	Diatoms	12
GTCCACGCC	UM	Pseudomonas	genus	286		Bacteria	10
GTCGCTACT	BU	Aspergillus	genus	5052		Fungi	9
GTCCACGCC	UM	Pararheinheimera	genus	2071980		Bacteria	9
ATTATCAGG	CI	Sellaphora	genus	216740	Diatom	Diatoms	9
CGCCCGTCG	BE	Goniomonas	genus	31324		Cryptomona	9
TTTGTCAAG	CI	Herpetocypris	genus	1473179		Crustaceans	8
CGCCCGTCG	BE	Tetrahymena	genus	5890		Ciliates	8
GTCCACGCC	UM	Sphingopyxis	genus	165697		Bacteria	7
GTTAGCAGC	CI	Sellaphora	genus	216740	Diatom	Diatoms	7
TTTAAGCAA	CI	Pisidium	genus	98305		Molluscs	6
GTCGCTCCT	BU	Trithigmostoma	genus	37473		Ciliates	5
GTCGCTCCT	BU	Cladophora	genus	34125	Green alga	Green algae	5
TCTATCTAA	CI	Drepanosiphum	genus	136352		Insects	5
CGCCCGTCG	BE	Cladophora	genus	34125	Green alga	Green algae	5
GTCGCACCT	BU	Melosira	genus	35124	Diatom	Diatoms	4
CGCCCGTCG	BE	Saprolegnia	genus	4769	Cotton mould; water mould	Oomycetes	4
ATCCGTGTT	TP	Pooideae	subfamily	147368		Plants	567
ATCCCGTTT	TP	Rosoideae	subfamily	171638		Plants	392
ATCCTGTTT	TP	Pedaliaceae	family	4180	Sesame family	Plants	319
GTCCACGCC	UM	Comamonadaceae	family	80864		Bacteria	296
CGCCCGTCG	BE	Naididae	family	2109251	Sludgeworms	Worms	240
GTCGCTACT	BU	Naididae	family	2109251	Sludgeworms	Worms	209

CGCCCGTCG	BE	Chaetonotidae	family	41372		Other	200
GTTGAGGAC	MZ	Pinaceae	family	3318	Pine family	Plants	188
GTCGCTACT	BU	Chaetonotidae	family	41372		Other	179
CGCCCGTCG	BE	Cryptomonadaceae	family	2896		Cryptomona	48
GCTGAGGAC	MZ	Pooideae	subfamily	147368		Plants	30
GTCACACCA	BU	Moraxellaceae	family	468		Bacteria	21
GTCCACGCC	UM	Chitinophagaceae	family	563835		Bacteria	18
GTCGCTCCT	BU	Cryptomonadaceae	family	2896		Cryptomona	17
GTCCACGCC	UM	Rhodobacteraceae	family	31989		Bacteria	16
GTCGCTACT	BU	Ilyocyprididae	family	182490		Crustaceans	9
GTCCACGCC	UM	Chitinophagaceae	family	563835		Bacteria	6
GTCCACGCC	UM	Chromatiaceae	family	1046	Purple sulfur bacteria	Bacteria	6
GTCCACGCC	UM	Lewinellaceae	family	1937960		Bacteria	5
GTTAAGTGG	CI	Scytosiphonaceae	family	2891		Heterokont a	5
GTCGTTGCC	BU	Scytomonadidae	family	2570650		Other	4
GTTATCTGG	CI	Eukaryota	superkingdo	2759	Eucaryotes	Other	817
CTCCTAGAA	TP	root	no rank	1	Unidentified	Other	655
TTTGTCTAG	CI	root	no rank	1	Unidentified	Other	625
TCTAGCTGG	CI	root	no rank	1	Unidentified	Other	526
AAGAGCGCA	WV	root	no rank	1	Unidentified	Other	499
TTTATCTAAT	CI	Bdelloidea	subclass	44578		Rotifers	489
CGCCCGTCG	BE	Choreotrichia	subclass	141411		Ciliates	457
GTCGCTCCT	BU	Choreotrichida	order	200605		Ciliates	388
GTCCACGCC	UM	Burkholderiales	order	80840		Bacteria	376
TTGATTTTG	EA	root	no rank	1	Unidentified	Other	361
GTCACGCTT	XG	root	no rank	1	Unidentified	Other	356
CTCCTTCTTT	TP	Polygoneae	tribe	1110385		Plants	285
GTTGAGGAC	MZ	Magnoliopsida	class	3398	Angiosperms	Plants	281
TGGTTGCCG	WV	Metazoa	kingdom	33208	Metazoans	Other	264
TTTGTCTAAT	CI	Eurotatoria	class	2816136		Rotifers	171

CGCCCGTCG	BE	Saccharomycetales	order	4892		Fungi	163
CAAGTACTT	XG	root	no rank	1	Unidentified	Other	159
TTTAAGTAG	CI	Florideophyceae	class	2806		Red algae	146
ATCCTGTTTT	TP	root	no rank	1	Unidentified	Other	136
GTCCACGCC	UM	Proteobacteria	phylum	1224	Purple bacteria and relatives	Bacteria	134
ATCCTGTTTT	TP	Rosales	order	3744		Plants	121
GTTGTCAAC	CI	root	no rank	1	Unidentified	Other	112
ATTATCAGG	CI	root	no rank	1	Unidentified	Other	109
GTCGTTACT	BU	Saccharomycetales	order	4892		Fungi	102
GTTATCGTC	CI	root	no rank	1	Unidentified	Other	100
TTACGATTG	EA	root	no rank	1	Unidentified	Other	97
GAAAGAGTC	LG	root	no rank	1	Unidentified	Other	96
ATTAAGTAG	CI	Ochrophyta	clade	2696291		Heterokont a	95
TTTAAGTAG	CI	root	no rank	1	Unidentified	Other	94
GCTGAGGAC	MZ	Viridiplantae	kingdom	33090	Green plants	Other	91
CGACGCTCT	XG	root	no rank	1	Unidentified	Other	88
ATCACGTTT	TP	Mesangiospermae	clade	1437183		Plants	82
TTTAAGTAG	CI	root	no rank	1	Unidentified	Other	79
ACTCTCTAG	CI	Metazoa	kingdom	33208	Metazoans	Other	79
ATTATCTGG	CI	root	no rank	1	Unidentified	Other	77
ATTATCCGG	CI	root	no rank	1	Unidentified	Other	72
GCTATCTGG	CI	root	no rank	1	Unidentified	Other	67
GATGTAGTC	YG	Chordata	phylum	7711	Chordates	Other	58
ATTAAGCAG	CI	root	no rank	1	Unidentified	Other	57
ATTGGCTTC	CI	root	no rank	1	Unidentified	Other	57
GCTTCTTAC	XG	root	no rank	1	Unidentified	Other	56
TTTAAGTAG	CI	root	no rank	1	Unidentified	Other	55
TTTATCTGG	CI	root	no rank	1	Unidentified	Other	53
GTCCACGCC	UM	Betaproteobacteria	class	28216		Bacteria	52
TTTAAGTTC	CI	root	no rank	1	Unidentified	Other	52

ATTATCAGC	CI	root	no rank	1	Unidentified	Other	49
ATCCTGGTT	TP	Myrtales	order	41944		Plants	48
TTTAAGTAG	CI	root	no rank	1	Unidentified	Other	47
GGTAAATCT	RV	root	no rank	1	Unidentified	Other	46
GTCCACGCC	UM	Burkholderiales	order	80840		Bacteria	46
TTAGCTAGC	CI	root	no rank	1	Unidentified	Other	45
CGCCCGTCG	BE	Cryptophyceae	class	3027	Cryptomonads	Other	44
ATTAGCTGG	CI	root	no rank	1	Unidentified	Other	42
ACTTTCAAG	CI	Bacillariophyta	phylum	2836	Diatoms	Heterokont a	42
GTCTGGCCT	LG	Chordata	phylum	7711	Chordates	Other	38
CGCGCCTTG	XG	root	no rank	1	Unidentified	Other	38
GCTTGGACG	EA	root	no rank	1	Unidentified	Other	37
TTTAAGTTC	CI	Eukaryota	superkingdo	2759	Eucaryotes	Other	37
GTCGCACCT	BU	Chromulinales	order	96792		Heterokont a	36
CGCCCGTCG	BE	Chrysophyceae	class	2825	Chrysomonads	Heterokont a	36
TTTATAAGT	WV	Metazoa	kingdom	33208	Metazoans	Other	33
AGCAAACTG	XG	root	no rank	1	Unidentified	Other	33
TTTAGCAAG	CI	root	no rank	1	Unidentified	Other	33
TCTTTCTAG	CI	root	no rank	1	Unidentified	Other	33
ATTAGCACA	CI	root	no rank	1	Unidentified	Other	32
GCTTTCAGG	CI	root	no rank	1	Unidentified	Other	32
ATTATCAGG	CI	root	no rank	1	Unidentified	Other	32
ATTAGCAGG	CI	Eukaryota	superkingdo	2759	Eucaryotes	Other	32
ATTAGCTGG	CI	root	no rank	1	Unidentified	Other	32
ATTGTCTAG	CI	root	no rank	1	Unidentified	Other	31
TTTATCAGC	CI	root	no rank	1	Unidentified	Other	30
TGGGTTTCT	XG	root	no rank	1	Unidentified	Other	29
TCTATCATC	CI	Arthropoda	phylum	6656	Arthropods	Other	29
ATTAAGTAG	CI	root	no rank	1	Unidentified	Other	29
CGCCCGTCG	BE	Chrysophyceae	class	2825	Chrysomonads	Heterokont a	29

CGCCCGTCG BE	Chlorophyta	phylum	3041	Green algae	Other	27
ATGACGGTC EA	root	no rank	1	Unidentified	Other	26
AAACGGAG/ WV	Metazoa	kingdom	33208	Metazoans	Other	26
GGTGAGGTT TP	root	no rank	1	Unidentified	Other	25
ATTATCTGG CI	root	no rank	1	Unidentified	Other	25
TTTGGCAGG CI	root	no rank	1	Unidentified	Other	25
TTTAGCAAG CI	root	no rank	1	Unidentified	Other	25
CGCCCGTCG BE	Stramenopiles	clade	33634	Heterokonts	Other	25
GTTGAGGAC MZ	Poales	order	38820		Plants	23
TTTATCATC/ CI	root	no rank	1	Unidentified	Other	23
TTTAAGTTC/ CI	Florideophyceae	class	2806		Red algae	23
ATTATCAAG CI	root	no rank	1	Unidentified	Other	23
CGCCCGTCG BE	Chlamydomonadales	order	3042		Green algae	23
CGCCCGTCG BE	unclassified Chlamydomonas	no rank	2034146		Green algae	23
AATTGCATC CI	root	no rank	1	Unidentified	Other	22
CGCCCGTCG BE	Fungi	kingdom	4751		Other	22
CCATTGACC YG	root	no rank	1	Unidentified	Other	21
CACCGAGAT XG	root	no rank	1	Unidentified	Other	21
ATTATCATC/ CI	Eukaryota	superkingdo	2759	Eucaryotes	Other	21
TTTATCAGG CI	root	no rank	1	Unidentified	Other	21
ATTATCTGC(CI	root	no rank	1	Unidentified	Other	21
ATTATCTGG. CI	root	no rank	1	Unidentified	Other	21
CGCCCGTCG BE	Chlamydomonadales	order	3042		Green algae	21
TCCCTCGCC XG	root	no rank	1	Unidentified	Other	20
GTCCACGCC UM	Bacteroidetes	phylum	976	Bacteroides-Cytophaga-Flexibacter g	Bacteria	20
GTTGTCAAC CI	root	no rank	1	Unidentified	Other	20
ACTATAACG WV	Metazoa	kingdom	33208	Metazoans	Other	19
GTTATCTAG CI	root	no rank	1	Unidentified	Other	19
ATTAAGTGC CI	root	no rank	1	Unidentified	Other	19
ATTATCTGC/ CI	root	no rank	1	Unidentified	Other	19

CGCCCGTCG BE	Fungi	kingdom	4751		Other	19
TCAAAGACC XG	root	no rank	1	Unidentified	Other	18
TTTAGCTTC1 CI	root	no rank	1	Unidentified	Other	18
TGCACCACA XG	root	no rank	1	Unidentified	Other	17
GTTAAGTAG CI	root	no rank	1	Unidentified	Other	17
ATTATCTGG CI	root	no rank	1	Unidentified	Other	17
ATTATCATC/ CI	root	no rank	1	Unidentified	Other	17
CGCCCGTCG BE	Tetrahymenina	suborder	37093	Ciliates	Ciliates	17
CGCCCGTCG BE	Chlamydomonadales	order	3042		Green algae	17
CGCTCTTCC(XG	root	no rank	1	Unidentified	Other	16
CGGCGAGA(MZ	root	no rank	1	Unidentified	Other	16
ACTTTCAAG CI	root	no rank	1	Unidentified	Other	16
TTTATCAGA CI	Metazoa	kingdom	33208	Metazoans	Other	16
TCTTTCTGG(CI	root	no rank	1	Unidentified	Other	16
ACTATCTGG CI	root	no rank	1	Unidentified	Other	15
TTTAAGTAG CI	root	no rank	1	Unidentified	Other	15
TTTGAGTAA CI	root	no rank	1	Unidentified	Other	15
TTTATCATC/ CI	root	no rank	1	Unidentified	Other	15
TTTAAGCTC1 CI	root	no rank	1	Unidentified	Other	15
GTTGTCACA CI	root	no rank	1	Unidentified	Other	15
CGCCCGTCG BE	Kinetoplastea	class	5653	Kinetoplastids	Other	15
ACATGGTCC WV	Metazoa	kingdom	33208	Metazoans	Other	14
TCGATTGAC XG	root	no rank	1	Unidentified	Other	14
ATTATCATC1 CI	Arthropoda	phylum	6656	Arthropods	Other	14
TTTATCAGG CI	root	no rank	1	Unidentified	Other	14
TCTGTCTGG CI	root	no rank	1	Unidentified	Other	14
ATTATCTGC/ CI	root	no rank	1	Unidentified	Other	14
GTCGCTCCT BU	Stichotrichia	subclass	194286		Ciliates	13
TCTATCATC1 CI	Arthropoda	phylum	6656	Arthropods	Other	13
TTTGTCATC/ CI	root	no rank	1	Unidentified	Other	13

ATTGTCTGG	CI	root	no rank	1	Unidentified	Other	13
GCTTTCGTC	CI	root	no rank	1	Unidentified	Other	13
AATCCGGCA	WV	Metazoa	kingdom	33208	Metazoans	Other	12
TGGCCTTAT	WV	Metazoa	kingdom	33208	Metazoans	Other	12
ACGAATCAC	YG	Metazoa	kingdom	33208	Metazoans	Other	12
GATTGCCAT	YG	Chordata	phylum	7711	Chordates	Other	12
TGCGCGCCA	XG	root	no rank	1	Unidentified	Other	12
ATCCGTATC	XG	root	no rank	1	Unidentified	Other	12
GTCACACCA	BU	Alphaproteobacteria	class	28211		Bacteria	12
GTCGCTCCT	BU	root	no rank	1	Unidentified	Other	12
GTCGCTCCT	BU	Chlamydomonadales	order	3042		Green algae	12
ATTAGCTGG	CI	root	no rank	1	Unidentified	Other	12
ATTATCAAG	CI	root	no rank	1	Unidentified	Other	12
ATTAAGTGG	CI	root	no rank	1	Unidentified	Other	12
TTTATCTGG	CI	root	no rank	1	Unidentified	Other	12
CGCCCGTCG	BE	Neobodonida	order	2704648		Other	12
GCCCGTCGT	BE	Kinetoplastea	class	5653	Kinetoplastids	Other	12
CTTCGAGCA	WV	Metazoa	kingdom	33208	Metazoans	Other	11
CGAAGCAAT	WV	Metazoa	kingdom	33208	Metazoans	Other	11
GTCGCTACT	BU	Bdelloidea	subclass	44578		Rotifers	11
GTCGCACCT	BU	Bacillariophyta	phylum	2836	Diatoms	Heterokont a	11
GTTGTCTAG	CI	root	no rank	1	Unidentified	Other	11
ATTAAGCAG	CI	root	no rank	1	Unidentified	Other	11
ATTAGCTTC	CI	root	no rank	1	Unidentified	Other	11
TCTTTCAGG	CI	root	no rank	1	Unidentified	Other	11
ACTAAGCGC	CI	root	no rank	1	Unidentified	Other	11
TTTAAGTAC	CI	root	no rank	1	Unidentified	Other	11
ATTATCTTC	CI	root	no rank	1	Unidentified	Other	11
CGCCCGTCG	BE	Stichotrichia	subclass	194286		Ciliates	11
CAAGCATCT	WV	Metazoa	kingdom	33208	Metazoans	Other	10

CGCTACGTT	XG	root	no rank	1	Unidentified	Other	10
GTTGTGGAC	MZ	unclassified Chloromonas	no rank	2060747		Green algae	10
GTCGCTCCT	BU	Chlamydomonadales	order	3042		Green algae	10
GTCGCTCCT	BU	Chlorophyta	phylum	3041	Green algae	Other	10
GTCACACCA	BU	Alphaproteobacteria	class	28211		Bacteria	10
GTCCACGCC	UM	Betaproteobacteria	class	28216		Bacteria	10
TTTATCTGG	CI	root	no rank	1	Unidentified	Other	10
TTTATCAAG	CI	Metazoa	kingdom	33208	Metazoans	Other	10
ATTATCAGG	CI	Naviculales	order	38748		Diatoms	10
TTATCTAGA	CI	Metazoa	kingdom	33208	Metazoans	Other	10
ATTAAGTAG	CI	root	no rank	1	Unidentified	Other	10
ATTAGCTGG	CI	root	no rank	1	Unidentified	Other	10
TTTAGCAGG	CI	root	no rank	1	Unidentified	Other	10
ATTATCTAG	CI	root	no rank	1	Unidentified	Other	10
TCTTTCTTCA	CI	root	no rank	1	Unidentified	Other	10
ATTATCATC	CI	Florideophyceae	class	2806		Red algae	10
TTTAAGTAG	CI	root	no rank	1	Unidentified	Other	10
ATTATCTAG	CI	root	no rank	1	Unidentified	Other	10
TTAAGCTCT	CI	root	no rank	1	Unidentified	Other	10
ATTAGCTTC	CI	root	no rank	1	Unidentified	Other	10
GTCGCTCCT	BU	Chlorophyceae	class	3166		Green algae	9
TTTAAGTAG	CI	Phaeophyceae	class	2870	Brown algae	Heterokont a	9
TCTATCCGC	CI	Insecta	class	50557	Insects	Other	9
TTTAAGTGC	CI	root	no rank	1	Unidentified	Other	9
ATTATCTTC	CI	root	no rank	1	Unidentified	Other	9
TTTAAGTAG	CI	root	no rank	1	Unidentified	Other	9
CGCCCGTCG	BE	unclassified Chlamydomonadales	no rank	120853		Green algae	9
CGCCCGTCG	BE	Chrysophyceae	class	2825	Chrysomonads	Heterokont a	9
CGCCCGTCG	BE	root	no rank	1	Unidentified	Other	9
CGCCCGTCG	BE	root	no rank	1	Unidentified	Other	9

CCTGCGTAA	WV	Metazoa	kingdom	33208	Metazoans	Other	8
TTGACGCAT	WV	Metazoa	kingdom	33208	Metazoans	Other	8
GTCGCTACT	BU	Bdelloidea	subclass	44578		Rotifers	8
GTCGCACCT	BU	root	no rank	1	Unidentified	Other	8
GTCGCTCCT	BU	Centroplasthelida	class	193537	Centrohelids	Other	8
GTCACACCA	BU	Alphaproteobacteria	class	28211		Bacteria	8
GTCGCTGCC	BU	root	no rank	1	Unidentified	Other	8
GTCGTTGTT	BU	Kinetoplastea	class	5653	Kinetoplastids	Other	8
TTTAAGTGG	CI	root	no rank	1	Unidentified	Other	8
ACTAAGTGC	CI	root	no rank	1	Unidentified	Other	8
ATTAGCAAG	CI	root	no rank	1	Unidentified	Other	8
TTTAAGTTC	CI	Rhodophyta	phylum	2763	Red algae	Other	8
ATTATCAAG	CI	root	no rank	1	Unidentified	Other	8
TTTAAGTAG	CI	root	no rank	1	Unidentified	Other	8
ATTATCAGC	CI	root	no rank	1	Unidentified	Other	8
ATTGTCATC	CI	Metazoa	kingdom	33208	Metazoans	Other	8
CGCCCGTCG	BE	root	no rank	1	Unidentified	Other	8
CGCCCGTCG	BE	root	no rank	1	Unidentified	Other	8
CATGAACGC	WV	Metazoa	kingdom	33208	Metazoans	Other	7
TTGTAGCGT	WV	Metazoa	kingdom	33208	Metazoans	Other	7
AGATGGCAA	WV	root	no rank	1	Unidentified	Other	7
GGCTTCAAG	WV	root	no rank	1	Unidentified	Other	7
TAACATCGT	WV	Chordata	phylum	7711	Chordates	Other	7
GTTGAGGAC	MZ	Streptophyta	phylum	35493		Other	7
GTCGCTACT	BU	Cercozoa	phylum	136419		Other	7
GTCCACGCT	UM	Deltaproteobacteria	class	28221		Bacteria	7
ATTGTCATC	CI	Metazoa	kingdom	33208	Metazoans	Other	7
ATTAGCAGC	CI	root	no rank	1	Unidentified	Other	7
ATTATCTGC	CI	root	no rank	1	Unidentified	Other	7
ATTAGCTAG	CI	root	no rank	1	Unidentified	Other	7

ACTCGTCGT CI	Metazoa	kingdom	33208	Metazoans	Other	7
CGCCCGTCG BE	Thecofilosea	class	1004930		Other	7
CGCCCGTCG BE	unclassified Saprolegnia	no rank	372087		Oomycetes	7
CGCCCGTCG BE	root	no rank	1	Unidentified	Other	7
CGCCCGTCG BE	Chytridiomycetes	class	451435		Fungi	7
TTGGTTTTTC EA	root	no rank	1	Unidentified	Other	6
CAGGGGCCC WV	root	no rank	1	Unidentified	Other	6
GACCATGCA WV	root	no rank	1	Unidentified	Other	6
GCCCGCCGA TP	root	no rank	1	Unidentified	Other	6
GTTGAGGAC MZ	Chlorophyta	phylum	3041	Green algae	Other	6
ATCACGCTC BU	root	no rank	1	Unidentified	Other	6
GTCCACGCC UM	Bacteroidetes	phylum	976	Bacteroides-Cytophaga-Flexibacter g	Bacteria	6
GTCCACGCC UM	Bacteroidetes	phylum	976	Bacteroides-Cytophaga-Flexibacter g	Bacteria	6
TTTAAGTTC1 CI	Florideophyceae	class	2806		Red algae	6
TTTAAGTAG CI	root	no rank	1	Unidentified	Other	6
AATAGCAAC CI	root	no rank	1	Unidentified	Other	6
GCTTTCAGG CI	root	no rank	1	Unidentified	Other	6
GCTATCGAG CI	root	no rank	1	Unidentified	Other	6
GTTAAGTAG CI	root	no rank	1	Unidentified	Other	6
TCTCAGCAC CI	Metazoa	kingdom	33208	Metazoans	Other	6
ACTCGTCGT CI	Metazoa	kingdom	33208	Metazoans	Other	6
TTTAGCTAG CI	root	no rank	1	Unidentified	Other	6
ATTAGCAGG CI	Metazoa	kingdom	33208	Metazoans	Other	6
TCTTTCAGG CI	root	no rank	1	Unidentified	Other	6
CGCCCGTCG BE	Heterolobosea	phylum	5752		Other	6
CGCCCGTCG BE	root	no rank	1	Unidentified	Other	6
CGCCCGTCG BE	Kinetoplastea	class	5653	Kinetoplastids	Other	6
CGCCCGTCG BE	Bdelloidea	subclass	44578		Rotifers	6
CGCCCGTCG BE	Cercozoa	phylum	136419		Other	6
CAACGTCAT EA	root	no rank	1	Unidentified	Other	5

GTTATCAAG EA	root	no rank	1	Unidentified	Other	5
ACGCGATGC WV	Metazoa	kingdom	33208	Metazoans	Other	5
GATCACAGC WV	Metazoa	kingdom	33208	Metazoans	Other	5
GCACTTCAT(XG	root	no rank	1	Unidentified	Other	5
AC ACCGAG XG	root	no rank	1	Unidentified	Other	5
CGCGGCGG(XG	root	no rank	1	Unidentified	Other	5
GTTGTGGAC MZ	Chlorophyta	phylum	3041	Green algae	Other	5
GTCGTTGCC BU	root	no rank	1	Unidentified	Other	5
GTCGCTACT BU	root	no rank	1	Unidentified	Other	5
GTCGTTGCT BU	Euglenales	order	86650		Other	5
GTCGATACT BU	Fungi	kingdom	4751		Other	5
GTCCACGCC UM	Proteobacteria	phylum	1224	Purple bacteria and relatives	Bacteria	5
GTCCACGCC UM	root	no rank	1	Unidentified	Other	5
TTAAGTAAT CI	root	no rank	1	Unidentified	Other	5
ATTATCAAG CI	root	no rank	1	Unidentified	Other	5
ATTATCTTTA CI	root	no rank	1	Unidentified	Other	5
GTACAGCAT CI	Metazoa	kingdom	33208	Metazoans	Other	5
CGCCCGTCG BE	root	no rank	1	Unidentified	Other	5
CATCCAGCC EA	root	no rank	1	Unidentified	Other	4
TGTCAGTAA EA	root	no rank	1	Unidentified	Other	4
AAGGGTTTT EA	root	no rank	1	Unidentified	Other	4
GGTTAGTTC WV	Metazoa	kingdom	33208	Metazoans	Other	4
AGTACAACG WV	Metazoa	kingdom	33208	Metazoans	Other	4
GTCGCTACT BU	Thecofilosea	class	1004930		Other	4
GTCACACCA BU	root	no rank	1	Unidentified	Other	4
GTCGCACCT BU	root	no rank	1	Unidentified	Other	4
GTCGCACCT BU	Oomycota	phylum	4762		Heterokont a	4
GTCAAGCCA BU	root	no rank	1	Unidentified	Other	4
GTCGCTAGT BU	Chytridiomycetes	class	451435		Fungi	4
GTCGCTCCT/ BU	root	no rank	1	Unidentified	Other	4

GTCGCTATT	BU	Eukaryota	superkingdo	2759	Eucaryotes	Other	4
GTCCACACT	UM	Bacteroidetes	phylum	976	Bacteroides-Cytophaga-Flexibacter g	Bacteria	4
GTCCACGCC	UM	Bacteroidetes	phylum	976	Bacteroides-Cytophaga-Flexibacter g	Bacteria	4
TTTGAGTGG	CI	root	no rank	1	Unidentified	Other	4
ATTATCAGC	CI	root	no rank	1	Unidentified	Other	4
TTTAAGTGC	CI	root	no rank	1	Unidentified	Other	4
TTTAAGTAG	CI	root	no rank	1	Unidentified	Other	4
ATTGTCTGC	CI	root	no rank	1	Unidentified	Other	4
TCTCAGTTC	CI	Metazoa	kingdom	33208	Metazoans	Other	4
TCTCAGTAA	CI	Metazoa	kingdom	33208	Metazoans	Other	4
ATTAAGTAG	CI	root	no rank	1	Unidentified	Other	4
TTTATCTGG	CI	root	no rank	1	Unidentified	Other	4
ATTAGCAGG	CI	root	no rank	1	Unidentified	Other	4
ATTATCAGG	CI	root	no rank	1	Unidentified	Other	4
ATTAAGTGC	CI	root	no rank	1	Unidentified	Other	4
CGCCCGTCG	BE	Arthropoda	phylum	6656	Arthropods	Other	4

UID	TICI_version	TICI_value	TICI_rating	TICI_quantile	TICI_nseqs	TICI_reliability
411851	Riverine V1	94.06	Average	0.38	177	Average

Appendix I:

Wetland Delineation Plot Results

NEW ZEALAND WETLAND DELINEATION DATA FORM: PASTURE TEST

SECTION A – SITE INFORMATION

Site: Maitahi Village | Region: Nelson (Bryant) | Sampling point/ID: Wetland 1 (Plot A)

Owner/address: CCKV | Date: 2 May 2024 | Land use: Grazed pasture

Landform: LL Hillslope gully floor | Local relief: Rolling 8-15° | Land cover: Exotic pasture grassland

Is the land drained? YES ✓ NO ___ UNKNOWN ___ | Investigator(s): BR/IBR | Slope°: 8-15°

GPS (NZTM): 1625993 5431861 | Altitude m: | Photo Nos:

Are climatic/hydrologic conditions on the site typical for this time of year? YES ✓ NO ___ (if NO explain in Remarks)

Are Vegetation ✓ Soil ✓ or Hydrology X significantly disturbed? | Are 'Normal Circumstances' present? YES ✓ NO ___

Are Vegetation ___ Soil ___ or Hydrology ___ naturally problematic? | Explain answers in Remarks if needed

SUMMARY OF FINDINGS—Attach site map showing sampling point locations, transects, important features etc.

Pasture exclusion? YES ☐ NO ☐

Hydrophytic vegetation present? YES ✓ NO ☐

Hydric soils present? YES ✓ NO ☐

Wetland hydrology present? YES ✓ NO ☐

Is the sampled area within a wetland? YES ✓ NO ☐

SECTION B – VEGETATION

Use scientific names of plants.	Absolute % cover	Dominant Species?	Indicator Status	Pasture % cover
Tree Stratum (Plot size: ___)				
1.				
2.				
3.				
4.				
Total tree cover (TT) =		50%	20%	
Sapling/Shrub Stratum (Plot size: 10x10)				
1. SAL bab (e)	5		OBL	
2. LEPsco (N)	2		FACW	
3. ACE pse (e)	2		UPL	
4.				
5.				
Total sapling/shrub cover (TS) =		50%	20%	
Herb Stratum (Plot size: 2x2m)				
1. CAR sem (N)	45	Y	FACW	
2. AGR sto (e)	15	Y	FACW	
3. RAN rep (e)	10		FAC	
4. HOL lan (e) (p)	1		FAC	1
5. LOL per (e) (p)	1		FACW	1
6. RUM obt (e)	3		FAC	
7. JUN eff (e)	10		FACW	
8. JUN art (e)	5		FACW	
9. ULE eur (e)	3		FAC	
10. DAG pur (e)	2		FACU	
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
Total herb cover (TH) = 100		50%	20%	
			Total (P) = 2	
Total Vegetation Cover (TVC): TT+TS+TH =		50%		

Pasture Exclusion Test:

Pasture cover/Total vegetation cover (P/TVC) x100 = ___%

☐ Rapid Pasture Test

☐ Pasture Exclusion Test is >50%

Dominance Test:

No. Dominant Spp. OBL/FACW/FAC (A) 2

Tot. Dominant Spp. across strata (B) 2

% OBL/FACW/FAC (A/B) 100

Prevalence Index:

Total % cover of:		Multiply by:	
OBL	5	x 1 =	5
FACW	77	x 2 =	154
FAC	7	x 3 =	21
FACU	3	x 4 =	12
UPL	2	x 5 =	10
Total	94 (A)		202 (B)

Prevalence Index (B/A) = 2.15

Hydrophytic vegetation indicators:

☒ Rapid Test

✓ Dominance Test is >50%

✓ Prevalence Index is ≤3.0[1]

☒ Morphological adaptations[1] (supporting data in Remarks)

☒ Problematic hydrophytic vegetation[1]

Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present?

YES ✓ NO ☐ UNCERTAIN ☐

Remarks:

Evidence of significant disturbance from landslips during 2022 floods however, carex vegetation remains as does former topography. ∴ Natural Inland Wetland under NPS-FM.

NEW ZEALAND WETLAND DELINEATION DATA FORM: PASTURE TEST

SECTION A – SITE INFORMATION

Site: _____ Region: _____ Sampling point/ID: Wetland 1 (Plot A)

Owner/address: _____ Date: _____ Land use: _____

Landform: _____ Local relief: _____ Land cover: _____

Is the land drained? YES ___ NO ___ UNKNOWN ___ Investigator(s): _____ Slope°: _____

GPS (NZTM): 1625984 5431845 Altitude m: _____ Photo Nos: _____

Refer W1 Plot A sheet

Are climatic/hydrologic conditions on the site typical for this time of year? YES ✓ NO ___ (if NO explain in Remarks)

Are Vegetation ___ Soil ___ or Hydrology ___ significantly disturbed? Are 'Normal Circumstances' present? YES ✓ NO ___

Are Vegetation ___ Soil ___ or Hydrology ___ naturally problematic? Explain answers in Remarks if needed

SUMMARY OF FINDINGS—Attach site map showing sampling point locations, transects, important features etc.

Pasture exclusion? YES ☐ NO ☐

Hydrophytic vegetation present? YES ☐ NO ☐

Hydric soils present? YES ☐ NO ☐

Wetland hydrology present? YES ☐ NO ☐

Is the sampled area within a wetland? YES ☐ NO ☐

SECTION B – VEGETATION

Use scientific names of plants.	Absolute % cover	Dominant Species?	Indicator Status	Pasture % cover
Tree Stratum (Plot size: _____)				
1.				
2.				
3.				
4.				
Total tree cover (TT) =	_____	50% _____	20% _____	
Sapling/Shrub Stratum (Plot size: _____)				
1.				
2.				
3.				
4.				
5.				
Total sapling/shrub cover (TS) =	_____	50% _____	20% _____	
Herb Stratum (Plot size: 2×2m)				
1. PLA lan (p)(e)	20	Y	FACW	20
2. TRI rep (p)(e)	25	Y	FACW	25
3. POA pra (p)(e)	50	Y	FACW	50
4. LOL per (p)(e)	1		FACW	1
5. TAR off (e)	2		FACW	
6. DIG pu (e)	2		FACW	
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
Total herb cover (TH) =	_____	50% _____	20% _____	
			Total (P) =	_____
Total Vegetation Cover (TVC): TT+TS+TH =	_____	50% _____		

Pasture Exclusion Test:

Pasture cover/Total vegetation cover (P/TVC) x100 = _____%

☑ Rapid Pasture Test

☐ Pasture Exclusion Test is >50%

Dominance Test:

No. Dominant Spp. OBL/FACW/FAC (A) _____

Tot. Dominant Spp. across strata (B) _____

% OBL/FACW/FAC (A/B) _____

Prevalence Index:

Total % cover of:	Multiply by:
OBL _____	x 1 = _____
FACW _____	x 2 = _____
FAC _____	x 3 = _____
FACU _____	x 4 = _____
UPL _____	x 5 = _____
Total _____(A)	_____(B)

Prevalence Index (B/A) = _____

Hydrophytic vegetation indicators:

☐ Rapid Test

☐ Dominance Test is >50%

☐ Prevalence Index is ≤3.0[1]

☐ Morphological adaptations[1] (supporting data in Remarks)

☐ Problematic hydrophytic vegetation[1]

Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present?

YES ☐ NO ☐ UNCERTAIN ☐

Remarks:

Passes Rapid Pasture Ex. Test under NPS-FM

No further assessment required


WL1- Plot A


WL1- Plot B


WL1 - Overview


WL1 - Overview
Wetland 1

NEW ZEALAND WETLAND DELINEATION DATA FORM: PASTURE TEST

SECTION A – SITE INFORMATION

Site: Maitahi Village | Region: Nelson (Organs) | Sampling point/ID: Wetland 2 (Plot A)

Owner/address: CLKV | Date: 2 May 2024 | Land use: Grazed pasture

Landform: LL Hillslope gully floor | Local relief: Gentle slope | Land cover: Secondary Nat Scrub

Is the land drained? YES__ NO__ UNKNOWN__ | Investigator(s): | Slope°: 0-3°

GPS (NZTM): 1626322 5431628 | Altitude m: | Photo Nos:

Are climatic/hydrologic conditions on the site typical for this time of year? YES__ NO__ (if NO explain in Remarks)

Are Vegetation__ Soil__ or Hydrology__ significantly disturbed? | Are 'Normal Circumstances' present? YES__ NO__

Are Vegetation__ Soil__ or Hydrology__ naturally problematic? | Explain answers in Remarks if needed

SUMMARY OF FINDINGS—Attach site map showing sampling point locations, transects, important features etc.

Pasture exclusion? YES ☐ NO ☐

Hydrophytic vegetation present? YES ☑ NO ☐

Hydric soils present? YES ☑ NO ☐

Wetland hydrology present? YES ☑ NO ☐

Is the sampled area within a wetland? YES ☑ NO ☐

SECTION B – VEGETATION

Use scientific names of plants. Tree Stratum (Plot size:_____)	Absolute % cover	Dominant Species?	Indicator Status	Pasture % cover
1.				
2.				
3.				
4.				
Total tree cover (TT) =		50%_____	20%_____	
Sapling/Shrub Stratum (Plot size:_____)				
1.				
2.				
3.				
4.				
5.				
Total sapling/shrub cover (TS) =		50%_____	20%_____	
Herb Stratum (Plot size: 2x2m)				
1. JUNart (c)	30	Y	FACW	
2. CARsem (c)	20	Y	FACW	
3. AGRsto (c)	40	Y	FACW	
4. LOLper (c) (p)	1		FACU	1
5. HOLlan (c) (p)	2		FAC	2
6. JUNeff (c)	10		FACW	
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
Total herb cover (TH) =	103	50%_____	20%_____	
			Total (P) =	3
Total Vegetation Cover (TVC): TT+TS+TH =		50%_____		

Pasture Exclusion Test:

Pasture cover/Total vegetation cover (P/TVC) x100 = _____%

☐ Rapid Pasture Test

☐ Pasture Exclusion Test is >50%

Dominance Test:

No. Dominant Spp. OBL/FACW/FAC (A) 3

Tot. Dominant Spp. across strata (B) 3

% OBL/FACW/FAC (A/B) 100

Prevalence Index:

Total % cover of:		Multiply by:	
OBL	–	x 1 =	–
FACW	100	x 2 =	200
FAC	2	x 3 =	6
FACU	1	x 4 =	4
UPL	–	x 5 =	–
Total	103 (A)		210 (B)

Prevalence Index (B/A) = 2.04

Hydrophytic vegetation indicators:

☒ Rapid Test

☑ Dominance Test is >50%

☑ Prevalence Index is ≤3.0[1]

☒ Morphological adaptations[1] (supporting data in Remarks)

☒ Problematic hydrophytic vegetation[1]

Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present?

YES ☑ NO ☐ UNCERTAIN ☐

Remarks:

NEW ZEALAND WETLAND DELINEATION DATA FORM: PASTURE TEST

SECTION A – SITE INFORMATION

Site: _____ Region: _____ Sampling point/ID: _____

Owner/address: _____ Date: _____ Land use: _____

Landform: _____ Local relief: _____ Land cover: _____

Is the land drained? YES___NO___UNKNOWN___ Investigator(s): _____ Slope°: _____

GPS (NZTM): 1626321 5431621 Altitude m: _____ Photo Nos: _____

Refer Wetland 2 Plot A Sheet

Are climatic/hydrologic conditions on the site typical for this time of year? YES___NO___ (if NO explain in Remarks)

Are Vegetation___Soil___or Hydrology___ significantly disturbed? Are 'Normal Circumstances' present? YES___NO___

Are Vegetation___Soil___or Hydrology___ naturally problematic? Explain answers in Remarks if needed

SUMMARY OF FINDINGS—Attach site map showing sampling point locations, transects, important features etc.

Pasture exclusion? YES ☐ NO ☐

Hydrophytic vegetation present? YES ☐ NO ☐

Hydric soils present? YES ☐ NO ☐

Wetland hydrology present? YES ☐ NO ☐

Is the sampled area within a wetland? YES ☐ NO ☐

SECTION B – VEGETATION

Use scientific names of plants.	Absolute % cover	Dominant Species?	Indicator Status	Pasture % cover
Tree Stratum (Plot size:_____)				
1.				
2.				
3.				
4.				
Total tree cover (TT) =		50%_____	20%_____	
Sapling/Shrub Stratum (Plot size:_____)				
1.				
2.				
3.				
4.				
5.				
Total sapling/shrub cover (TS) =		50%_____	20%_____	
Herb Stratum (Plot size:_____)				
1. JUNart (e)	5		FACW	
2. RANrep (e)	10		FAC	
3. PLAlan (p)(e)	20	Y	FACW	20
4. TRIrep (p)(e)	25	Y	FACW	25
5. POA pra (p)(e)	65	Y	FACW	45
6. LOL per (p)(e)	2		FACW	
7. TAR off (e)	3		FACW	
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
Total herb cover (TH) =		50%_____	20%_____	
			Total (P) =	90
Total Vegetation Cover (TVC): TT+TS+TH =		50%_____		

Pasture Exclusion Test:

Pasture cover/Total vegetation cover (P/TVC) x100 = _____%

☑ Rapid Pasture Test

☐ Pasture Exclusion Test is >50%

Dominance Test:

No. Dominant Spp. OBL/FACW/FAC (A) _____

Tot. Dominant Spp. across strata (B) _____

% OBL/FACW/FAC (A/B) _____

Prevalence Index:

Total % cover of:		Multiply by:	
OBL	_____	x 1 =	_____
FACW	_____	x 2 =	_____
FAC	_____	x 3 =	_____
FACU	_____	x 4 =	_____
UPL	_____	x 5 =	_____
Total	_____(A)		_____(B)

Prevalence Index (B/A) = _____

Hydrophytic vegetation indicators:

☐ Rapid Test

☐ Dominance Test is >50%

☐ Prevalence Index is ≤3.0[1]

☐ Morphological adaptations[1] (supporting data in Remarks)

☐ Problematic hydrophytic vegetation[1]

Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

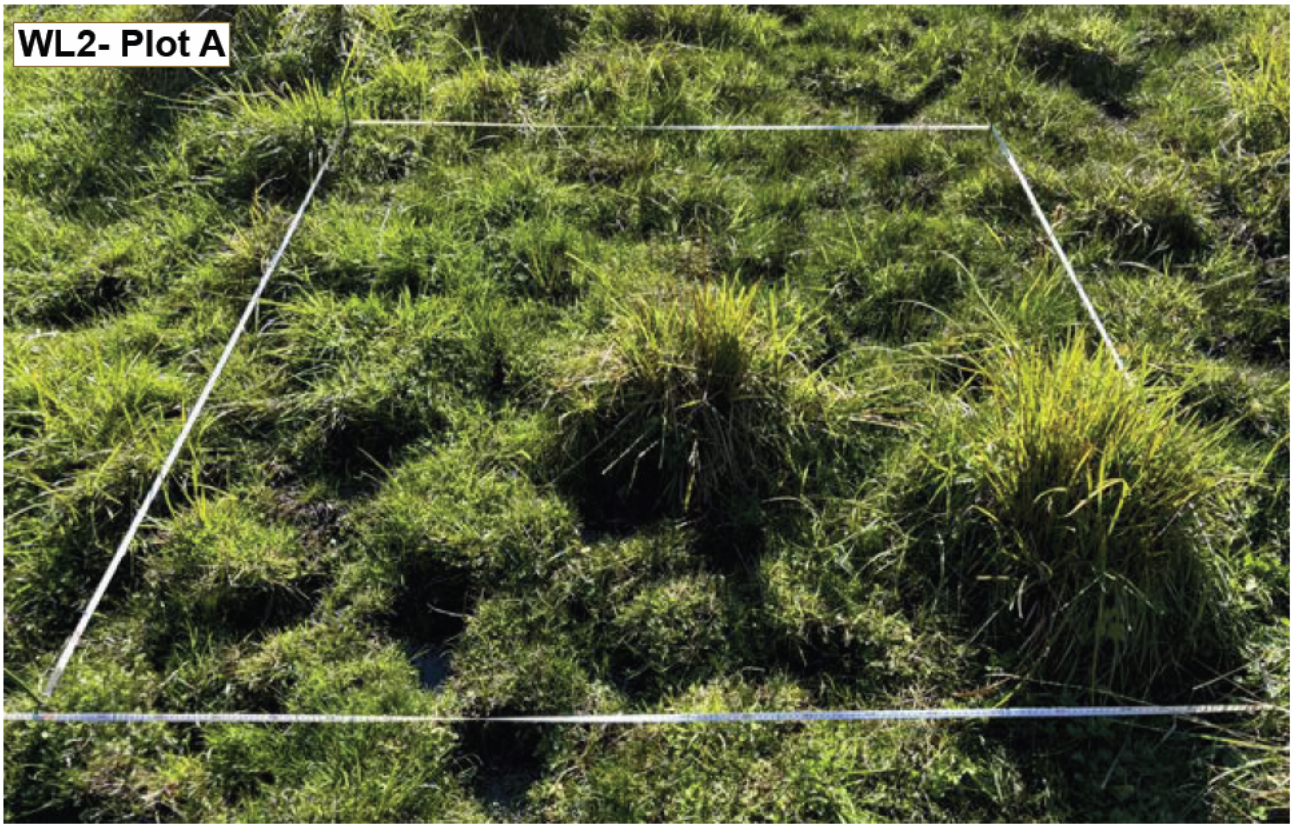
Hydrophytic vegetation present?

YES ☐ NO ☐ UNCERTAIN ☐

Remarks:

Passes Rapid Pasture Ex. Test under NPS-FM

No further assessment required.


WL2- Plot A


WL2- Plot B


WL2 - Overview


WL2 - Overview
Wetland 2

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