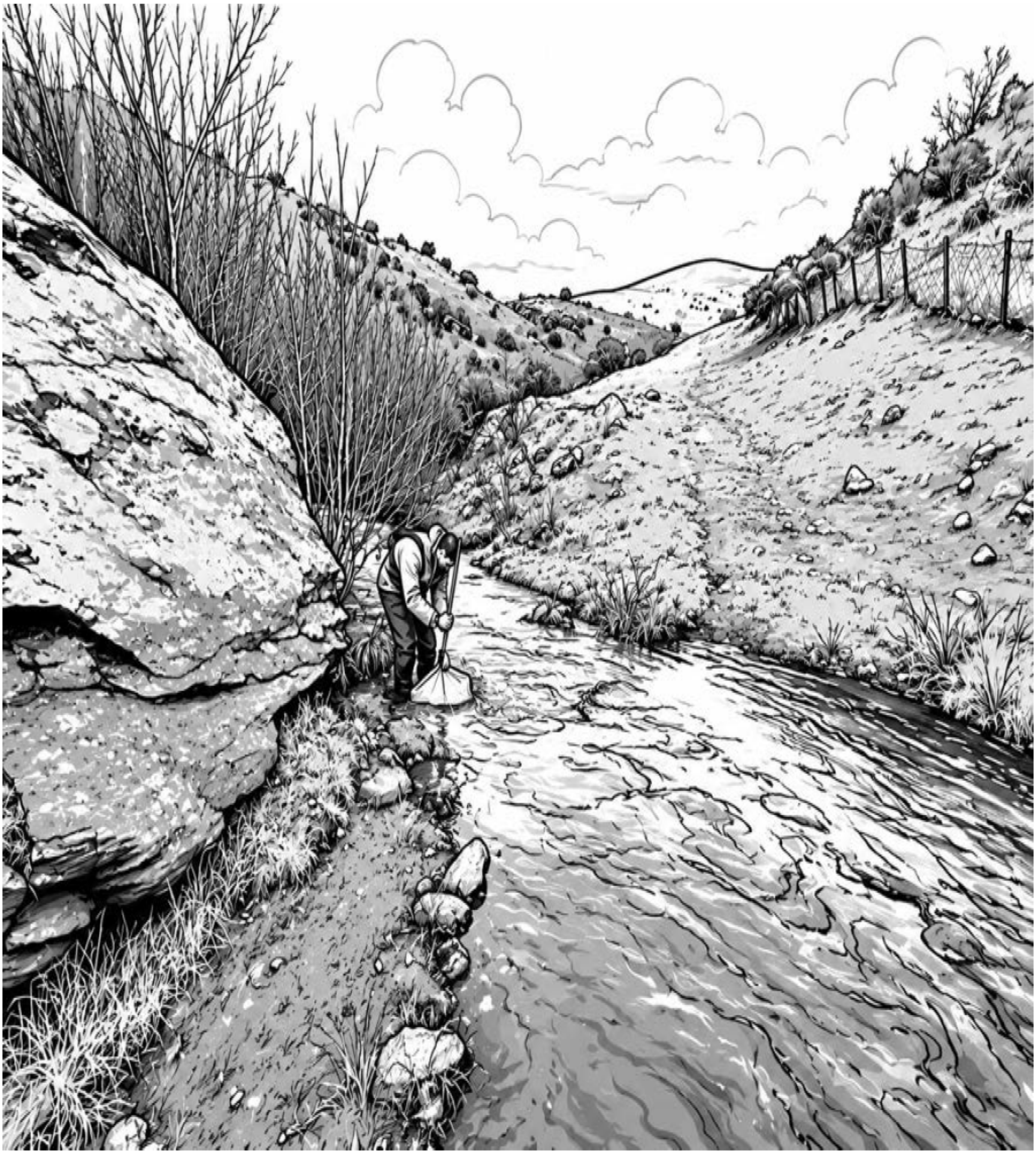
Boffa Miskell

Bendigo Ophir Gold Project

Lindis River and Bendigo Creek freshwater ecology survey
Prepared for Matakanui Gold Limited

5 August 2026



Boffa Miskell is proudly a
Toitū net carbonzero certified consultancy

Document Quality Assurance

This document may be cited as:
Boffa Miskell Limited 2026. *Bendigo Ophir Gold Project: Lindis River and Bendigo Creek freshwater ecology survey*. Report prepared by Boffa Miskell Limited for Matakanui Gold Limited.

For any information regarding this report please contact:
Ian Boothroyd | Ecologist | Partner [redacted]

Revision /version:	Issue date:	Prepared by:	Description:	Reviewed by:
Draft V1	28/07/2026	Chris Arbuckle | Ecologist | Principal Harrison Keesing | Ecologist | Graduate	Internal Review	Ian Boothroyd | Ecologist | Senior Principal | Partner
Draft / Final V7	29/07/2026	Chris Arbuckle | Ecologist | Principal Harrison Keesing | Ecologist | Graduate	Draft report issued to Matakanui Gold Limited	Ian Boothroyd | Ecologist | Senior Principal | Partner
Final	5/08/2026	Chris Arbuckle | Ecologist | Principal Harrison Keesing | Ecologist | Graduate	Final issued to Matakanui Gold Limited	Ian Boothroyd | Ecologist | Senior Principal | Partner

Approved for issue:
Ian Boothroyd | Ecology | Senior Principal | Partner | 5 August 2026

File name & Project number: [BM250590_001b_Bendigo_FW_Aquatic Survey_FInal_20260804.docx] BM250590

Template revision: 20250829 0000
Cover image: SW13 Bendigo Creek Survey site.

Executive Summary

In response to the Panel's Request for Information 11 (RFI 11), Matakanui Gold Limited commissioned this investigation to provide additional baseline information on the freshwater ecological values of proposed downstream monitoring sites within Bendigo Creek (SW13) and the Lindis River (SW14) for the Bendigo Ophir Gold Project (BOGP). The assessment draws on existing ecological information, field surveys undertaken in July 2026, freshwater fish records and environmental DNA (eDNA) analyses, with a particular focus on the ecological values and conservation status of fish and macroinvertebrate communities within the downstream receiving environment.

Overall Downstream Ecological Values

The downstream receiving environments of Bendigo Creek and the lower Lindis River support freshwater community characteristic of Central Otago waterways and are generally in fair-to-good ecological condition. Available evidence indicates these waterways support diverse fish and macroinvertebrate communities, including indigenous species of conservation significance and aquatic communities containing a strong representation of pollution-sensitive Ephemeroptera, Plecoptera and Trichoptera[1] (EPT) taxa.

The lower Lindis River has recognised fisheries and ecological values, including its role as a spawning and recruitment system for brown trout and rainbow trout associated with the wider Clutha River and Lake Dunstan catchment. The river also supports indigenous fish species including longfin eel, upland bully and galaxiids. Bendigo Creek similarly supports indigenous and introduced fish species and provides habitat for diverse macroinvertebrate communities associated with stable coarse-substrate stream habitats.

Ecological condition within both waterways is influenced by multiple interacting stressors, including hydrological variability, flood events, groundwater-surface water interactions, water abstraction, climatic variability and catchment land uses. Despite these influences, the downstream receiving environment continues to support ecological communities typical of Otago waterways and provides a robust baseline against which future ecological change can be assessed.

Conservation-Significant Fish Species

The New Zealand Threat Classification System identifies several freshwater fish taxa relevant to the downstream environment as conservation significant. Longfin eel (*Anguilla dieffenbachii*) and kōaro (*Galaxias*

[1] Ephemeroptera, Plecoptera and Trichoptera (EPT) taxa comprise mayflies, stoneflies and caddisflies respectively. These aquatic insect groups are generally sensitive to changes in water quality and habitat condition and are widely used as indicators of stream ecological health.

brevipinnis) are classified as At Risk - Declining, while upland bully (*Gobiomorphus breviceps*) is classified as At Risk - Naturally Uncommon.

Bendigo Creek - SW13

SW13 supports a diverse aquatic community typical of a Central Otago stream. Habitat quality was relatively good (RHA score 75), reflecting the presence of riffle, run and pool habitats, stable coarse substrates and suitable habitat for aquatic fauna. Macroinvertebrate communities contained a strong representation of pollution-sensitive EPT taxa, with an average Macroinvertebrate Community Index (MCI) score of 107 indicating good ecological condition.

Fish surveys confirmed brown trout, while eDNA detected kōaro and upland bully. The occurrence of kōaro (At Risk - Declining) and upland bully (At Risk - Naturally Uncommon) confirms the presence of indigenous fish species of conservation significance and reinforces the ecological value of Bendigo Creek within the wider freshwater network.

Lindis River - SW14

Direct biological sampling at SW14 was constrained by elevated winter flows. However, historical monitoring, fish records and eDNA results indicate that SW14 is representative of the wider lower Lindis River. Long-term ORC monitoring demonstrates persistent representation of sensitive EPT taxa and generally fair-to-good ecological condition, while eDNA confirmed the presence of brown trout, rainbow trout, upland bully and longfin eel.

The detection of longfin eel and upland bully confirms the continued presence of indigenous fish species of conservation significance within the lower Lindis River. These values occur within a river system that also supports recognised trout spawning and recruitment functions. Overall, SW14 appears biologically consistent with adjacent reaches, with observed variability most likely reflecting natural habitat and flow-related influences rather than a distinct ecological difference at the site

Conclusion

Based on the available evidence, Bendigo Creek and the lower Lindis River support aquatic communities typical of Central Otago waterways and are generally in fair-to-good ecological condition. The downstream receiving environment contains conservation-significant indigenous fish species, diverse macroinvertebrate communities with strong representation of pollution-sensitive EPT taxa, and recognised fisheries values, within the lower Lindis River.

The most significant conservation finding is the confirmed presence of longfin eel and kōaro (both At Risk - Declining) and upland bully (At Risk - Naturally Uncommon) within the surveyed waterways. No evidence was identified to indicate the presence of threatened macroinvertebrate species within the survey reaches.

Ecological condition within both waterways is influenced by multiple interacting stressors, including hydrological variability, water abstraction, climatic conditions and wider catchment land uses. Notwithstanding these influences, the available information provides a robust and representative baseline of downstream ecological values.

Overall, SW13 and SW14 are considered fit-for-purpose monitoring locations for assessing potential freshwater ecological effects of the Bendigo Ophir Gold Project and provide a robust framework for distinguishing natural environmental variability from potential project-related change over time.

CONTENTS

Appendices

Tables

Figures

1.0 Introduction

1.1 Background

Matakanui Gold Limited (MGL) have applied for approvals to undertake the Bendigo-Ophir Gold Project (BOGP) which, includes hard rock gold mining and processing primarily in the Shepherds Creek valley and, to a lesser extent, in the Rise and Shine Creek valley. The BOGP is sought under the provisions of the Fast Track Approvals Act 2024 (FTAA), and the BOGP Expert Panel (the Panel) has directed the Environmental Protection Authority (EPA) to request further information under s67 of the FTAA[2] on the baseline freshwater values of the proposed 'downstream' catchment's baseline environment.

1.2 Scope

This report will focus on the response to Q1b of the BOGP Panel request for further information. Accordingly, the scope of this work is to provide further information to understand the downstream (of the proposed BOGP) baseline environment.

Our approach has been to draw on existing information and collect fresh data from two sites. The selected locations for instream assessments sites are SW13 (Bendigo Creek) and SW14 (Lindis River). These sites are established as potential 'performance' monitoring sites for the BOGP and are outside the scope of the proposed body of works. Accordingly, we have surveyed these two sites in anticipation that these locations will continue as monitoring locations.

This report comprises:

- Desktop survey and assessment of existing ecological data from the Bendigo Creek and Lindis River (and other relevant catchments).
- Results of freshwater sampling of habitat, periphyton cover, aquatic macroinvertebrates and fish communities at sites SW13 (Bendigo Creek) and SW14 (Lindis River).
- Results of environmental DNA from samples taken from SW13 and SW14.
- A discussion and summary of the freshwater ecological values of the downstream environment.

[2] Request for Information, FTAA-2507-1089, dated 25 June 2026.

2.0 Methods

2.1 Approach

We used a combination of desktop review and field surveys; to gather information on the existing aquatic ecological values within Bendigo Creek and the Lindis River. Terrestrial ecology investigations (e.g., surveys of vegetation, lizards, and avifauna) did not form part of the scope of this work, and no terrestrial ecology investigations have been completed as part of this work.

2.2 Desktop Review

A desktop review was completed to identify existing information on the freshwater ecological values of the Bendigo Creek and Lindis River catchments. The review drew on published reports, environmental investigations, GIS datasets, and aerial imagery. Key information sources included:

- Regional council reports and previous environmental investigations.
- A freshwater ecological assessment prepared by E3 Scientific (2023).
- New Zealand Freshwater Fish Database (NZFFD) which provides records of freshwater fish distributions from previous surveys.
- Department of Conservation (DOC) threatened freshwater invertebrates and non-migratory fish distribution GIS spatial maps.
- Otago Regional Council Threatened species GIS spatial maps.
- Recorded fish and invertebrate species were assessed against the latest New Zealand Threat Classification System (DOC,2018, 2023).

2.3 Field surveys

Aquatic ecological assessments were undertaken to assess habitat condition, sediment deposition, periphyton abundance and productivity, and macroinvertebrate community composition. Survey methods were selected to align with nationally recognised protocols and standards to ensure consistency, repeatability and comparability through time. Survey parameters, methods and reporting metrics are summarised in Table 1.

Table 1. Freshwater ecological monitoring programme for Bendigo Creek and Lindis River (adapted from Boffa Miskell 2026).

Monitoring attribute	Method	Metrics
Habitat	Rapid Habitat Assessment (RHA)	Habitat Quality Score (HQS)
Settled sediment	Visual estimate of deposited sediment cover	Fine sediment cover (%)
Periphyton cover	Visual assessment of substrate cover	Bare substrate, films, mats and filaments (%)
Periphyton productivity	Chlorophyll-a analysis	Chlorophyll-a (mg/m²)
Macroinvertebrates	Quantitative benthic sampling	Taxa richness, MCI, QMCI, EPT richness, %EPT

2.4 Site locations

Freshwater ecology surveys were conducted at established sites at Bendigo Creek (SW13) and at Lindis River (SW14) for the survey programme. The location of each site is provided in Table 2. The locations of each site are shown in Figure 1.

Table 2. Site name, number, and co-ordinates of each of the sites surveyed.

Site Number	Location	Latitude	Longitude
SW13	Bendigo Creek – at the BSL Gauging Site (Bendigo Station)	44°55'42.31"S	169°22'39.94"E
SW14	Lindis River – at the Ardgour Road (Otago Regional Council (ORC) flow site – EM631)	44°53'7.30"S	169°22'52.43"E

2.5 Site Investigations

2.5.1 Overview

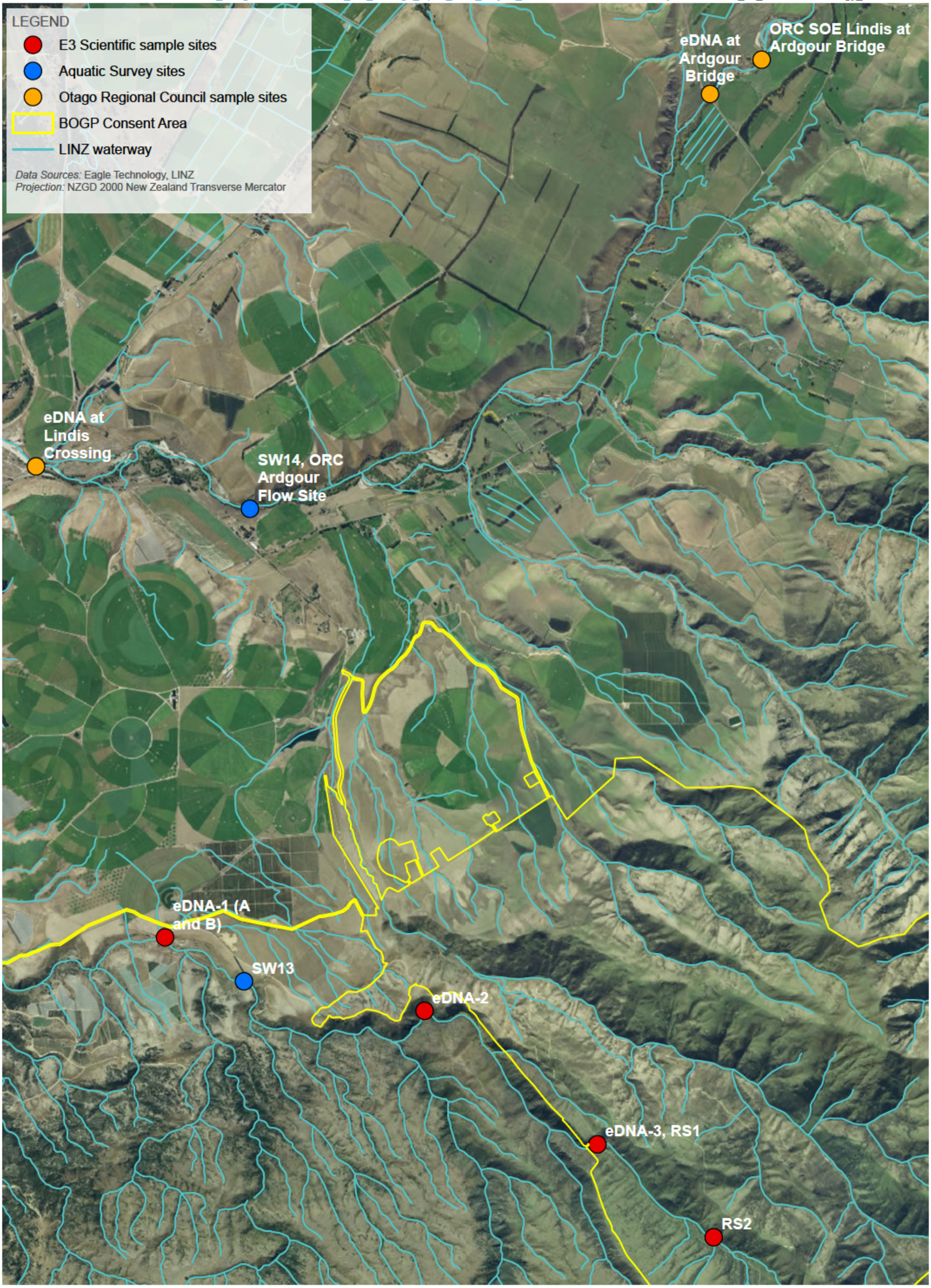
In response to the request for additional information on the baseline freshwater values of Bendigo Creek and the Lindis River, field investigations were undertaken on 15 and 16 July 2026 by Chris Arbuckle and Harrison Keesing (Ecologists, Boffa Miskell). The objective of these site investigations was to assess baseline freshwater ecological values at the proposed monitoring locations within Bendigo Creek and the Lindis River.

The intention was to undertake the recommended freshwater assessments at each of the two survey sites. However, as outlined in Section 3.0, undertaking freshwater investigations during the winter period presents a number of constraints that may not occur during the preferred summer monitoring period. These constraints were most significant at site SW14, where elevated flows and water depth resulted in unsafe conditions for undertaking in-stream assessments.

Notwithstanding this limitation, the baseline ecological values of the Lindis River at and surrounding SW14 can be characterised with confidence based on the available information. This includes existing desktop information, previous ecological investigations, and data from nearby monitoring locations within the Lindis River catchment. Collectively, these sources provide an appropriate understanding of the freshwater values present and the ecological context of the proposed monitoring location. The absence of site-specific in-stream sampling at SW14 during the July survey does not prevent an informed assessment of baseline values but rather reflects the need to undertake monitoring under safe and representative conditions.

For future annual monitoring, which is typically undertaken during the summer period, we expect in-stream conditions to be more suitable for applying the recommended sampling methods. The recommended monitoring approach will therefore provide an opportunity to collect site-specific data at SW14 under conditions that are more representative of the long-term monitoring programme.

Spot measures of basic water chemistry (pH, dissolved oxygen, conductivity) and water temperature were collected using a hand-held YSI water-quality meter.



Boffa Miskell

www.boffamiskell.co.nz

BENDIGO OPHIR GOLD PROJECT

Aquatic Ecology Survey

Date: 04 August 2026 | Revision: 0

Plan prepared for Santana Minerals Ltd by Boffa Miskell Limited

Project Manager: [redacted] | Drawn: BMc | Checked: CAr

2.5.2 Riparian and in-stream habitat

Riparian and in-stream habitat were assessed only for site SW13, and not for SW14 due to safety constraints within the Lindis River as mentioned previously. At the time of proposed sampling the flow in the Lindis was over 70 m^3 due to sudden snow melt. While this section includes site-specific observations from the SW14 location, the proposed in-stream measurements could not be completed during the July survey due to elevated flows and unsafe conditions. The available desktop information provides an overview of the general ecological character and freshwater values of this reach of the Lindis River and provides additional context for the assessment of baseline values at this location.

For SW13, the riparian and in-stream habitat were assessed across six cross-sectional transects spaced at 4 m intervals along a 50 m sample reach.

The following was assessed and recorded for each transect:

- Wetted width;
- Substrate type and cover;
- Water and sediment depth;
- Macrophyte cover and species present;
- Periphyton cover;
- Riparian vegetation

At SW13, deposited fine sediment was assessed using the visual estimation method described in Sediment Assessment Method 2 (SAM2) (Clapcott et al., 2011). Across each transect, representative sections of streambed were inspected from true left bank to true right bank, and the percentage cover of sediment, including fine sediment (<2 mm) on the stream substrate was visually estimated using a bathyscope.

Fine sediment deposition is a useful indicator of catchment disturbance and can adversely affect habitat quality, periphyton development, and macroinvertebrate communities. Results were reported as percentage sediment cover.

2.5.3 Rapid Habitat Assessment

A Rapid Habitat Assessment (RHA) (Clapcott, 2015) to assess riparian and in-stream habitat conditions was undertaken at each site. The RHA involves ranking each of the ten parameters between 1 and 10; deposited sediment, macroinvertebrate habitat diversity, macroinvertebrate habitat abundance, fish cover diversity, fish cover abundance, hydraulic heterogeneity, bank erosion, bank vegetation, riparian width, and riparian shade. Scores for these individual parameters were summed at each site to give a total RHA score ranging from 10 to 100, where higher scores indicate better habitat availability.

Each monitoring reach at SW13 was assessed using standard RHA field procedures and assigned a Habitat Quality Score (HQS). The HQS provides an integrated measure of stream habitat condition and allows comparison among monitoring sites and between monitoring events.

2.5.4 Periphyton cover and productivity

Periphyton cover was assessed in accordance with the National Environmental Monitoring Standards (NEMS) for Periphyton. Visual estimates were undertaken across six cross-section transects, of which were representative streambed habitats and substrate cover, categorised into the standard NEMS classes:

- Bare substrate (no algae)
- Thin films
- Mats
- Filamentous algae

Percentage cover of each category was recorded and used to characterise periphyton abundance at each monitoring site.

Periphyton biomass was not assessed for this round of monitoring due to seasonality effects. However, a representative periphyton samples will be more relevant during the summer periods.

2.5.5 Macroinvertebrate community

Benthic macroinvertebrate communities were sampled using a modified National Environmental Monitoring Standards (NEMS) approach recommended for larger, non-wadeable streams and rivers (Collier et al. 2012; NEMS 2024). This approach was selected because the Lindis River is a relatively large river system with extensive deep-water habitats that cannot be effectively sampled using standard quantitative hard-bottom protocols developed for small wadeable streams. National guidance recognises these challenges and recommends targeted sampling of representative shoreline habitats to provide a repeatable assessment of ecological condition.

The modified NEMS approach was also considered appropriate given the elevated winter flows present during the survey period. Higher flows reduced access to parts of the river channel and further limited the ability to safely and consistently sample the full range of instream habitats. Under these conditions, shoreline and marginal habitats provide the most practical and repeatable basis for ecological assessment.

Although Bendigo Creek is smaller and generally suitable for conventional wadeable-stream sampling methods, it was also in-spate, so the same composite sampling methodology was applied to maintain consistency across the monitoring programme. Adoption of a common sampling approach reduces methodological variability and provides a robust basis for comparison between sites and future monitoring events.

At SW13, representative monitoring reaches were chosen above the vehicle ford, 5-6 m in linear length. Sampling focused on accessible mesohabitats. Target habitats included:

- Shallow runs
- Gravel margins
- Vegetated edges
- Root mats (where present)
- Woody debris (where present)
- Macrophyte beds (where present)

Macroinvertebrate samples were collected in accordance with protocol C2 of Stark et al. (2001) using a standard 0.5 mm mesh kick-net. Six individual sampling efforts were combined (two per sample container) to provide a representative sample of available marginal habitats, with a total sampled area of approximately 0.9 – 1.5 m^2. Samples were preserved with 70% ethanol and sent to a suitably qualified taxonomist for processing. The sample was processed in accordance with Protocol P2 (200+ count with scan for missed taxa) (Stark et al., 2001)[3]. Macroinvertebrates were identified to the taxonomic resolution required for calculation of the Macroinvertebrate Community Index (MCI).

The following macroinvertebrate community metrics were assessed:

- Total taxonomic richness
- EPT taxonomic richness
- %EPT abundance
- Macroinvertebrate Community Index (MCI)
- Semi-Quantitative Macroinvertebrate Community Index (SQMCI)

Table 3 provides a summary of how MCI-hard-bottomed and SQMCI-hard-bottomed scores were used to evaluate stream health.

Table 3. Interpretation of MCI-hb and SQMCI-hb scores for hard-bottomed streams (Stark & Maxted, 2007).

Stream health	Water quality descriptions	MCI	SQMCI
Excellent	Clean water	>119	>5.99
Good	Doubtful quality or possible mild enrichment	100-119	5.00-5.90
Fair	Probable moderate enrichment	80-99	4.00-4.99
Poor	Probable severe enrichment	<80	<4.00

2.5.6 Fish community

The fish community was surveyed within a (minimum) reach of 15 m in length or 30 m^2 in area. The area fished overlapped with the reach where habitat conditions and macroinvertebrate community was assessed. The fish community at site SW13 was assessed using a single pass with a Kainga EFM 300 backpack mounted electric-fishing machine (NIWA Instrument Systems, Christchurch). Fish were captured in a downstream pole net and temporarily held in buckets. All fish were identified, counted, and measured (length to the nearest 5 mm) before being returned alive to the stream. Electrofishing surveys targeted representative fish habitat (i.e., pools, runs, undercut banks, root masses, woody debris) within each monitoring reach.

The fish community within the Lindis River at SW14 was not assessed using electric fishing methods, as water flow and depth at the time of the survey made in-stream sampling unsafe. However, fish records from the wider Lindis River catchment indicate the presence of native fish species within this river system. Based on the available information, including the habitat observed at SW14 and the wider catchment records, fish are considered likely to be present within the project area. A site-specific fish survey is recommended during the summer

[3] This Protocol 2 method is the same as the laboratory method of the National Environmental Monitoring Standard (NEMS) for macroinvertebrates.

monitoring period when flow conditions are more suitable and safer for undertaking electric fishing assessments. Further detail is provided in Section 5.1.

2.5.7 Environmental DNA

Environmental DNA (eDNA) was sampled in surface water at sites SW13 (Bendigo Creek) and SW14 (Lindis River), which provided additional information on the macroinvertebrate and fish communities present. Six replicated samples were collected for at both sites. Samples were sent to Wilderlab NZ Ltd in Wellington, and the eDNA present was recorded using the comprehensive freshwater multispecies assay.

eDNA is now regularly used to supplement more standard freshwater survey methods, providing an overview of the species or taxa present in a waterbody. However, the likelihood of detection of species can be influenced by the abundances of species (i.e., when in extremely low abundances, detection via eDNA may be difficult). For this baseline survey, we considered eDNA a useful technique to increase the chances of establishing the presence of macroinvertebrate and fish species with high conservation value or species that are often difficult to detect with standard sampling methods (e.g., kēkēwai / freshwater crayfish and kanakana / lamprey).

3.0 Seasonal Constraints

This survey was undertaken in July 2026 under winter conditions, outside the preferred summer monitoring period typically used for freshwater ecological assessments. At the time of the survey, both Bendigo Creek and the Lindis River were experiencing elevated flows associated with recent snowmelt,

Bendigo Creek was experiencing elevated flow conditions at the time of survey. Despite these conditions, habitat assessments, macroinvertebrate sampling and eDNA sampling were successfully undertaken, providing a useful snapshot of ecological condition and aquatic communities present at the site. Periphyton biomass sampling was not undertaken, as recent elevated flows were likely to have scoured or reduced algal biomass, meaning any results would largely reflect recent flow disturbance rather than the creek's typical ecological condition.

The Lindis River was experiencing substantially elevated flood flows during the site visit in July 2026, which restricted safe access to representative habitats and prevented the collection of meaningful biological samples. Consequently, the ecological characterisation of the Lindis River site relies primarily on existing information sources, including Otago Regional Council State of the Environment monitoring data, previous ecological investigations, freshwater fish records and other relevant catchment-scale studies.

Freshwater ecological monitoring is typically undertaken during summer baseflow conditions when stream habitats are relatively stable, periphyton communities have accumulated under extended periods of low flow, and aquatic invertebrate communities are generally at their seasonal peak. Surveys undertaken during summer therefore provide the most sensitive assessment of ecological condition and environmental effects. In contrast, winter surveys following elevated flow events are more likely to reflect recent disturbance and seasonal environmental conditions.

The results and interpretations presented in this report should therefore be considered in the context of winter conditions and recent flow events. However, sufficient information was obtained from Bendigo Creek despite the influence of elevated flows to characterise current aquatic ecological values. Additionally, the assessment of the Lindis River has drawn more heavily on existing ecological datasets and published information, of which captures provides enough historical and current aquatic ecological values to provide an appropriate baseline of downstream freshwater ecological values for the purposes of this investigation.

4.0 Catchment Descriptions

4.1 Lindis River

The Lindis River is a large tributary of the Clutha River / Mata-Au in Central Otago, draining a catchment of approximately 1,055 km^2 and flowing for around 70 km from the Lindis Pass and Dunstan Mountains to its confluence with the Clutha River upstream of Lake Dunstan (~5km downstream of monitoring site SW14). The catchment transitions from cooler alpine and tussock-covered headwaters to the semi-arid landscapes of the lower Lindis Valley, where sheep and beef farming, irrigated agriculture, horticulture and viticulture are the dominant land uses.

The Lindis River has a highly variable flow regime, with flows driven by winter snowfall and spring snowmelt in the upper catchment, followed by prolonged low-flow periods during summer. Extensive water abstraction and strong groundwater interactions further influence flows, particularly in the middle and lower catchment, where sections of the river can become disconnected or dry during extended low-flow periods. The river is predominantly a gravel-bed system comprising riffles, runs and pools. In the lower reaches the channel becomes broader and more unconfined, with groundwater-surface water interactions playing an important role in determining habitat availability, flow permanence and aquatic ecological values.

4.2 Bendigo Creek

Bendigo Creek is approximately 11 km long and has a catchment area of about 26 km^2 above SW13. The upper catchment originates from the Dunstan Mountain Range, headwaters are characterised by its steep gorge sections, boulder substrates, and deep pools in the upper reaches, transitioning downstream to lower gradient riffle and run habitats (Water Ways Consulting Limited, 2025).

Land use is dominated by sheep and beef farming, irrigated agriculture, viticulture, and historic mining activity, while indigenous dryland vegetation and tussock grasslands remain on surrounding hill slopes and upland areas. Stream flow is measured at the ORC flow monitoring site, collocated at SW13. Flows at this site reach as low as 65 L/s in summer, eventually dropping to no flow approximately 2.5 km further downstream (Otago Regional Council, 2008).

Historical imagery indicates that there is a loss of surface water approx. 3.5 – 5.1 km upstream of the confluence with the Clutha River, suggesting intermittent downstream connectivity is a natural characteristic of the catchment rather than solely a consequence of water abstraction (LandPro Ltd. 2020).

5.0 Results

5.1 Historical ecological information – desktop review

5.1.1 Lindis River

5.1.1.1 Overview

For the purposes of characterising the Lindis River ecology, the 2008 Otago Regional Council report, *Management Flows for Aquatic Ecosystems in the Lindis River* (ORC 2008). Otago represents the most comprehensive and relevant historical ecological fish dataset identified. The report integrates fish distribution records, NIWA instream habitat modelling, lower Lindis River habitat assessments, electrofishing surveys, and hydrological monitoring undertaken between 2006 and 2008, providing an important baseline for understanding fish community composition, habitat use, and ecological processes within the catchment.

Much of the field data underpinning the report, including fish surveys and ecological monitoring, was collected by Chris Arbuckle and Matt Hickey as part of Otago Regional Council's early investigations into the aquatic values of the Lindis River. The report therefore provides a robust and locally relevant foundation for assessing the current fishery and aquatic ecological values of the lower Lindis River

The Lindis Catchment supports a relatively diverse fish community comprising five native fish species and two introduced salmonid species. Native species recorded from the catchment include Clutha flathead galaxias (formerly Galaxias sp. D), longfin eel (*Anguilla dieffenbachii*), kōaro (*Galaxias brevipinnis*), common bully (*Gobiomorphus cotidianus*) and upland bully (*Go. breviceps*), while the introduced fish fauna comprises brown trout (*Salmo trutta*) and rainbow trout (*Oncorhynchus mykiss*).

Clutha flathead galaxias have a threat classification of Threatened – Nationally Vulnerable, longfin eel and koaro have are At Risk – Declining, upland bully, At Risk – Naturally Uncommon, common bully is Not Threatened, brown trout and rainbow trout are both Introduced and Naturalised (Dunn et al., 2025).

Historical records indicate that brown trout are widespread throughout the catchment, rainbow trout primarily occupy the mainstem river, and Clutha flathead galaxiid populations are largely confined to smaller tributaries, often above instream barriers.

Longfin eel has also been recorded within the catchment but appears to occur at relatively low abundance within lower-river monitoring datasets (NZFFD, 2025). Long-term Otago Regional Council (ORC) monitoring recorded only a single large individual during State of Environment fish surveys, suggesting the species is present but not a dominant component of the lower river fish community.

Ecological monitoring documented substantial habitat loss associated with declining summer flows. Surface flow cessation, refuge pool loss and fish kills were observed in the lower Lindis River. Monitoring demonstrated that groundwater interactions-controlled flow losses in the lower river and that river dewatering during the irrigation season resulted in the loss of connectivity, reduction of refuge habitat and mortality of stranded fish (Otago Regional Council, 2008)

5.1.1.2 Fish ecology summary relevant to site SW14

Site SW14 (Figure 1) is located outside of the project footprint and a designated baseline reference site for the assessment of baseline freshwater ecological values. For assessment of the SW14 site, the most relevant historical information comes from the lower Lindis River monitoring and electrofishing study undertaken in February 2007 downstream of Lindis Crossing, as this reach is ecologically similar to much of the lower river and is located relatively close, 2.4km downstream of the present survey site (ORC 2008).

The lower river study demonstrated that the fish community was strongly dominated by brown trout, which comprised 92.6% of all fish captured during electrofishing surveys. Brown trout were recorded at all survey sites and in substantially greater numbers than any other species. Smaller numbers of rainbow trout, common bully, upland bully and kōaro were also present.

Importantly, the lower Lindis River does not function primarily as an adult trout fishery. Instead, it is identified as an important juvenile trout rearing reach. Of all brown trout captured, 96.2% were young-of-the-year (0+) fish, and no adult trout were recorded during the survey period. This indicates that the lower Lindis River provides extensive shallow riffle and run habitat that is highly suitable for juvenile trout growth and recruitment, while larger fish are generally absent or move through the reach seasonally (ORC, 2008).

The habitat characteristics recorded during the study help explain this population structure. The lower river was dominated by broad shallow runs and riffles with predominantly cobble and gravel substrates, habitat that is considered excellent for juvenile brown trout.

A key ecological finding was that fish abundance and distribution were strongly influenced by declining summer flows. As surface flows contracted, juvenile trout aggregated into remaining wetted habitats and refuge pools. Brown trout abundance increased substantially at upstream refuge locations as fish migrated away from drying reaches. Conversely, downstream habitats became disconnected and ultimately dried completely, resulting in fish stranding and mortality. The study documented a fish kill in a refuge pool where stranded fish consisted of approximately 60% brown trout, 30% bullies and 10% kōaro.

Historical monitoring suggests that fish assemblages within lower Lindis River in reaches like SW14 are likely to be dominated by juvenile brown trout, with, upland bully and kōaro occurring at lower abundance. Rainbow trout may also be present, particularly within the mainstem.

However, species composition and abundance are expected to vary substantially with seasonal flow conditions, summer low flows and the extent of habitat connectivity. Based on the existing information, at the SW14 site we would expect to find: juvenile brown trout, upland bully and koaro in the summer months.

5.1.1.3 Macroinvertebrate ecology of the Lindis River

Historical macroinvertebrate information for the Lindis River is available from both targeted catchment investigations and long-term State of Environment biomonitoring. ORC (2016) reported that macroinvertebrate communities in the Lindis River were generally consistent with good water quality and that community condition was typically better in upper catchment reaches than in lower reaches affected by abstraction and low flows. Long-term monitoring at the ORC SOE Lindis at Ardgour Road Bridge (EY105), Figure 1) provides a continuous record from 2006 to 2025, with MCI scores ranging from 95 to 115, taxa richness ranged from 12 to 24 taxa, and EPT richness ranged from 6 to 13 taxa.

The community was consistently dominated by EPT taxa including *Deleatidium*, *Hydrobiosis*, *Hydropsyche*, *Olinga*, *Pycnocentrodes* and *Pycnocentria*, although periodic increases in tolerant taxa such as Oligochaeta and Orthocladiinae were observed. Several years, including 2020, were characterised by high EPT representation and elevated abundance-based community metrics. During 2020, MCI reached 111 and EPT taxa comprised more than 90% of total abundance, indicating relatively strong ecological condition during that monitoring period.

The Lindis River supports a macroinvertebrate community typical of coarse-substrate upland rivers, with a strong representation of sensitive EPT taxa (mayflies, stoneflies and caddisflies), including *Deleatidium*, *Nesameletus*, *Hydrobiosis*, *Hydropsyche*, *Olinga*, *Pycnocentrodes*, *Pycnocentria* and *Zelandobius*. The persistent occurrence of these taxa indicates that suitable instream habitat has been maintained throughout much of the catchment.

5.1.1.4 Longterm trends

Long-term monitoring indicates that macroinvertebrate condition within the Lindis River varies considerably between years in response to changes in flow regime, habitat availability and hydrological connectivity. For example, the 2020 survey recorded a high-quality assemblage characterised by abundant EPT taxa (MCI 111; SQMCI 7.0), whereas the January 2023 survey recorded lower EPT abundance and a greater proportion of taxa tolerant of the environmental conditions present at the time (MCI 102; SQMCI 1.9).

These results are representative of the variability that characterises the lower Lindis River rather than evidence of long-term ecological decline. The lower river regularly experiences prolonged low flows, habitat contraction and periodic loss of surface-water connectivity resulting from a combination of natural climatic variability, groundwater interactions and water abstraction pressures. Higher-flow events subsequently rework habitats and drive ecological recovery, effectively resetting biological communities.

The 2023 survey coincided with an extended low-flow period, with mean January flow of approximately 1.04 m^3/s. These conditions likely reduced habitat availability and influenced community composition. The long-term record is therefore best interpreted as reflecting a cycle of disturbance and recovery associated with both natural and anthropogenic drivers, demonstrating the resilience of this highly flow-variable river system (ORC, 2016).

5.1.1.5 Algal and macrophyte ecology

The most comprehensive historical assessment of algae and periphyton in the Lindis River catchment is the ORC Water Quality in the Lindis River Catchment study (2016), which established an ecological baseline using surveys undertaken between October 2014 and March 2015.

Periphyton communities in the upper Lindis River (upstream of Lindis Peak) were consistently described as indicative of unenriched conditions, characterised by low chlorophyll-a concentrations and low cover of long filamentous algae. Chlorophyll-a concentrations in these upper reaches generally remained below 50 mg/m^2 throughout the monitoring period, indicating relatively low algal biomass and conditions that would typically be considered consistent with low nutrient enrichment and limited nuisance periphyton development.

Historical investigations indicated that periphyton biomass in the lower Lindis River was considerably more variable and was influenced by the combined effects of nutrient availability, prolonged stable low-flow conditions, reduced flow disturbance, water abstraction and groundwater interactions. Chlorophyll-a concentrations ranged from low levels comparable to upper catchment sites to a maximum of 151.1 mg/m^2 at the Ardgour Road site in March 2015, demonstrating substantial temporal and spatial variability in algal biomass throughout the catchment. Lower river sites also supported greater cover of filamentous algae and extensive growths of the invasive diatom *Didymosphenia geminata* (didymo).

This variability is consistent with the highly dynamic nature of the Lindis River, where periods of prolonged low flow and reduced habitat connectivity can promote algal proliferation, while larger flow events periodically scour and reset benthic communities. As with macroinvertebrate communities, observed patterns are best interpreted as reflecting the combined influence of natural hydrological variability and anthropogenic catchment pressures rather than a simple directional trend in ecological condition.

Benthic cyanobacteria, principally *Phormidium*, were widely distributed throughout the catchment and were observed at most monitoring sites during surveys. Cyanobacterial cover upstream of Cluden Stream exceeded the national recreational Alert Level threshold of 20% cover in February 2015, reaching greater than 35% cover. However, cover remained below the Action Level threshold of 50% cover. These thresholds are derived from New Zealand Cyanobacteria Guidelines and are used to indicate increasing levels of recreational health risk associated with benthic cyanobacterial proliferations.[4]

Long-term monitoring confirms a substantial shift in lower-river periphyton communities following the establishment of *Didymosphenia geminata* after 2007. This species dominated periphyton communities at Ardgour Road during multiple monitoring years and was recorded throughout much of the catchment during the 2014-15 surveys.

No historical quantitative macrophyte datasets were identified for the Lindis River or its tributaries in the reviewed ORC reports. Historical ecological information is therefore largely focused on periphyton biomass, algal cover, cyanobacteria and didymo, rather than aquatic macrophytes.

5.1.1.6 eDNA assessment and catchment context

Environmental DNA (eDNA) surveys were undertaken upstream (eDNA at Ardgour Bridge) and downstream of the SW14 monitoring site (eDNA at Lindis Crossing, Figure 1) and they provide an independent view regarding ecological condition within this reach of the Lindis River. Although eDNA and conventional biomonitoring measure different components of the biological community, the results are broadly consistent and indicate a river ecosystem that continues to support characteristic Lindis River fish and macroinvertebrate assemblages as set out above.

5.1.1.7 Fish Community

Across both upstream and downstream eDNA surveys, the fish community was consistently dominated by upland bully with brown trout and rainbow trout are also regularly detected. Longfin eel and kōaro were additionally detected in some samples. The repeated detection of these taxa throughout the study reach indicates that species historically recorded from the Lindis River remain present within the catchment and that suitable habitat continues to occur within the survey reach. However, eDNA data primarily provide evidence of species presence and should not be interpreted as a direct measure of fish abundance, movement or connectivity.

eDNA detections upstream and downstream of the SW14 monitoring site were broadly comparable and suggest similar fish assemblages occur throughout this as well as upstream of this section of the river.

[4] Ministry for the Environment and Ministry of Health cyanobacteria guidelines define an Alert Level as >20% cyanobacteria cover and an Action Level as >50% cover, reflecting increasing potential risks to recreational users.

5.1.1.8 Macroinvertebrate Community

The eDNA-derived macroinvertebrate assemblage showed strong agreement with the long-term ORC biomonitoring record. Characteristic EPT taxa detected through conventional biomonitoring, including *Aoteapsyche*, *Hydrobiosis*, *Hydropsyche*, *Olinga*, *Pycnocentrodes*, *Pycnocentria* and *Deleatidium*, were also identified in the eDNA datasets. Upstream sampling near the ORC monitoring location and downstream sampling below the SW14 site both consistently detected taxa associated with flowing, coarse-substrate river habitat

The eDNA data also recorded a range of chironomids, simuliids, hydrobiosid caddisflies and other taxa characteristic of productive gravel-bed rivers. While oligochaete worms were commonly detected, their occurrence alongside diverse EPT taxa is consistent with the mixed macroinvertebrate communities recorded through long-term ORC biomonitoring and does not indicate a community dominated solely by pollution-tolerant taxa. This interpretation is consistent with the long-term MCI record from the Lindis River.

5.1.1.9 Consistency between historical monitoring methods

Importantly, the eDNA results provide a complementary and independent view that is broadly consistent with patterns observed through ORC biomonitoring and fish monitoring programmes.

The same core ecological signal emerges from all datasets:

- fish communities remain dominated by species typical of Central Otago gravel-bed rivers;
- macroinvertebrate communities retain a strong representation of sensitive EPT taxa;
- ecological communities detected upstream and downstream of the SW14 site are broadly comparable;
- observed variability is generally consistent with the influence of temporal and hydrological factors rather than evidence of a substantial shift in community composition.

5.1.1.10 Implications for future sampling of the SW14 monitoring site

The combination of long-term ORC biomonitoring, fish survey information, and recent eDNA results provides a high degree of confidence in the interpretation of ecological condition within this reach of the Lindis River. While individual macroinvertebrate surveys may show substantial year-to-year variation due to flow conditions, the weight of evidence indicates that the river continues to support a diverse gravel-bed river community characteristic of fair to good ecological condition.

The approved timing of the proposed freshwater ecological monitoring programme for BOGP (summer), at a time comparative to ORC sampling, will be particularly valuable because it enables direct comparison with the closest long-term reference dataset in the catchment (ORC SOE data).

The addition of eDNA information collected upstream at the ORC site and downstream of the SW14 survey location further strengthens this assessment by providing independent evidence that ecological communities detected within the study reach remain broadly consistent with those identified through conventional monitoring methods. The eDNA results also suggest that ecological patterns observed at the survey locations are not unique to a single sampling point within the study reach.

5.1.2 Bendigo Creek

5.1.2.1 Overview

Historical information on freshwater ecology within the Bendigo Creek catchment was obtained from previous resource consent applications and associated Assessments of Environmental Effects AEEs by Waterways (2020); Bright (2020) and Landpro Ltd. (2020). However, the most comprehensive and up-to-date assessment is the freshwater ecological survey undertaken by E3 Scientific (2023) which provides the primary baseline for the catchment.

No fish were recorded within the Rise & Shine sub-catchment during the E3 Scientific survey.

Macroinvertebrates were sampled at two sites within Rise & Shine Creek: RS1, located downstream of the proposed mining area, and RS2 (Figure 1), located upstream. RS1 supported a degraded community dominated by pollution-tolerant taxa, with an MCI score of 70 and no Ephemeroptera, Plecoptera or Trichoptera (EPT) taxa present, indicating poor ecological condition. In contrast, RS2 supported a more diverse community, including sensitive EPT taxa, and recorded an MCI score of 93.3, indicative of fair ecological condition. These sites represent the only dedicated macroinvertebrate records currently available for Rise & Shine Creek and indicate spatial variation in ecological condition within the catchment.

Although evidence of historical mining disturbance, stock access, and other land-use impacts have been identified, E3 Scientific (2023) concluded that Bendigo Creek and Rise & Shine Creek provide important freshwater habitat within an otherwise dry, semi-arid landscape. Consequently, this assessment has adopted the E3 Scientific report as the principal source of historical ecological information and catchment-scale context for the freshwater values of upper Bendigo Creek and its tributaries.

5.1.2.2 eDNA assessment and catchment context

The eDNA surveys (Figure 1) undertaken by E3 Scientific (2023) detected no fish species within Rise & Shine Creek. Fish eDNA was only detected in lower Bendigo Creek, where koaro, unidentified galaxiids and brown trout were detected at both sampling events. Together with the electrofishing results, the eDNA data indicate that Rise & Shine Creek did not support detectable fish populations during the survey period, although fish are present elsewhere within the wider Bendigo catchment.

5.1.2.3 Macroinvertebrate sampling methodological considerations

The macroinvertebrate sampling methods employed by E3 Scientific (2023) were generally consistent with standard New Zealand biomonitoring practice (Stark *et al*. (2001). Kick sampling provided an appropriate basis for assessing macroinvertebrate community condition.

However, the study also incorporated macroinvertebrates collected opportunistically during electrofishing operations and subsequently calculated MCI and QMCI metrics from these pooled samples. While electrofishing-derived collections can provide useful supplementary information on taxa presence and overall community composition, they do not represent a standardised benthic sampling method suitable for MCI or QMCI assessment. Accordingly, interpretation of ecological condition should rely primarily on results derived from the dedicated kick samples rather than the electrofishing composite samples.

5.2 2026 Stream survey results

5.2.1 Water quality

Lindis River - SW14

Spot measures of water quality were not taken due to high flow conditions.

Bendigo Creek – SW13

Water temperature at Bendigo Creek (SW13) was 2.9°C, conductivity was 55.8 µS / cm, pH was recorded at 7.3, and dissolved oxygen was 8.16 mg/L (60.6%).

5.2.2 Riparian and in-stream habitat

Lindis River - SW14

Riparian and instream measures were not taken due to high flow conditions.

Bendigo Creek – SW13

The riparian vegetation at SW13 was sparse, dominated by exotic deciduous trees, matagouri, sweet briar, exotic grass and, the occasional fern and native shrub. At the time of the survey (winter), there was little to no canopy cover or overhanging vegetation along the reach, with limited shading provided primarily by the adjacent steep hillsides. However, during summer, when the riparian willows are in full leaf, substantially greater shading of the channel is expected.

This reach was a fast flowing, confined waterway with deep pools, riffles and run habitats. The riparian banks were mostly stable, where, in some sections, banks were naturally lined with boulders / bedrock of which, approx. 5% was stable undercut. The average wetted width was 3.4 m, and the water depth was 30.4 cm. However, as discussed in Section 3, surveys were not taken during baseflow conditions.

The in-stream substrate composition was diverse, comprising of boulders, large cobbles, cobbles and gravels, with the occasional sand / silt cover occurring along the usually exposed stream edges (primarily due to the creek being in spate). The average sediment depth was 2.8 cm. The average percent cover of substrate was dominated by boulders (52%). Boulders and large cobbles were often covered with a thin brown diatom biofilm that reached an average cover of 59%.

At the downstream extent, there was sparse cover of cyanobacteria, most likely *Nostoc*[5]. Previous investigations at the downstream extent of Bendigo Creek also recorded the presence of didymo). There was little macrophyte cover present, making up approx. ~5%. The macrophyte species present were watercress and water forget me not. The highly invasive aquatic weed, oxygen weed (*Lagarosiphon major*) has also been recorded at the downstream extent of Bendigo Creek.

There was significant organic matter present within the waterway, most likely due to the autumn leaf fall, winter period, post willow leaf drop. Organic matter that was present comprised of covering of willow leaves and woody debris.

[5] Nostoc is a colonial cyanobacterium (blue-green alga) that forms jelly-like masses when wet and becomes a brownish, inconspicuous mat when dry.

5.2.3 Rapid habitat assessment

Lindis River – SW14

In-stream measures were not taken due to high flow conditions.

Bendigo Creek – SW13

The overall riparian and in-stream conditions was relatively good, with an RHA score of 75 due to the abundance and diversity of invertebrate and fish habitat, characterised by deep pools, riffle and run sections and a combination of boulders, cobbles, and gravels. Established riparian vegetation and canopy cover was limited.

5.2.4 Macroinvertebrate community

Lindis River – SW14

In-stream measures were not taken due to high flow conditions.

Bendigo Creek – SW13

The macroinvertebrate community was diverse, comprising a range of taxa including abundant tolerant taxa such as *Potamopyrgus antipodarum* (New Zealand mud snail), crustaceans, Nematoda and true flies, alongside pollution-sensitive EPT taxa including mayflies and caddisflies. A full taxa list and abundance data are provided in Appendix 4.

The EPT insect orders are generally sensitive to changes in water quality and habitat condition and are widely used indicators of stream ecological condition. Across the three replicate samples, the average percentage of EPT taxa was 45%, with the assemblage largely comprising mayflies (*Austroclima* and *Deleatidium*) and caddisflies (*Ecnomina*, *Neurochorema* and *Polyplectropus*). The average Macroinvertebrate Community Index (MCI) score was 107, indicating a 'good' macroinvertebrate community. The semi-quantitative macroinvertebrate community index (SQMCI) score was lower (3.6), reflecting the high abundance of *P.antipodarum* within the assemblage. High densities of *P. antipodarum* are common in stable Central Otago stream environments, particularly where coarse substrates, stable habitat conditions and abundant periphyton (including diatom communities) provide favourable conditions for grazing taxa. Therefore, the abundance of *P. antipodarum* should be interpreted in the context of the stream habitat and natural community composition rather than as a standalone indicator of degraded water quality.

The Average Score Per Metric (ASPM) score, which integrates %EPT, EPT taxa richness and MCI scores, and the individual MCI score were above the NPS-FM national bottom line thresholds (>0.3 and >90 respectively). The SQMCI score was below the national bottom line threshold of 4.5, reflecting the dominance of abundant tolerant taxa within the community and lower community evenness.

Macroinvertebrate community composition is influenced by a range of interacting factors, including substrate stability, periphyton availability, flow regime and food-web interactions. Introduced trout can modify stream food webs through predation effects on benthic invertebrates and associated trophic cascades affecting lower trophic levels (Flecker & Townsend, 1994; Biggs et al., 2000). These factors should be considered when interpreting macroinvertebrate metrics, particularly in stable, productive stream environments. Overall, macroinvertebrate metrics indicate moderate to good ecological condition at SW13, with the presence of diverse EPT taxa demonstrating that the stream supports sensitive invertebrate groups. The community structure appears consistent with a stable, productive Central Otago stream environment, where habitat characteristics, periphyton availability and trophic interactions contribute to the observed assemblage.

5.2.5 Fish Sampling

Lindis River - SW14

Electric fishing was not undertaken due to high flow conditions.

Bendigo Creek – SW13

Within the 50 m survey reach of SW13, six brown trout, ranging from 70 – 150 mm were captured by electro-fishing, confirming their presence.

5.2.6 eDNA

Lindis River - SW14

eDNA detected the presence of brown trout, rainbow trout, upland bully , and longfin eel .

The fish community at SW14 shows no meaningful departure from adjacent reaches, with the same core fish species detected throughout the study area. It is reassuring that the eDNA results from the July 2026 sampling indicate that SW14 supports essentially the same macroinvertebrate assemblage as the surrounding Lindis River sites located both upstream and downstream.

Similarly, SW14 samples contain the characteristic EPT fauna expected of a Central Otago river system, including a range of mayfly, stonefly and caddisfly taxa that were also detected at the upstream and downstream sites. They also contained a small number of additional mayfly and caddisfly taxa that were not detected at the other sites. However, these differences are minor and likely reflect natural spatial variability and detection probabilities rather than any substantive ecological difference.

Bendigo Creek – SW13

eDNA detected the presence of brown trout, upland bully, and kōaro.

The eDNA results were broadly consistent with the macroinvertebrate community identified through kick sampling and did not materially alter the ecological interpretation of stream condition. Key taxa contributing to MCI / SQMCI assessment metrics, including *Coloburiscus*, *Deleatidium*, *Nesameletus*, *Stenoperla*, *Taraperla*, *Olinga*, *Hydrobiosella*, *Hydrobiosis*, *Polyplectropus* and *Psilochorema*, were detected using both approaches.

Although eDNA detected additional taxa, these were largely supplementary to the community characterised through kick sampling and would not be expected to materially influence MCI calculations. Overall, the eDNA results corroborate the kick-sampling assessment and provide additional confidence that SW13 supports a diverse macroinvertebrate assemblage, including pollution-sensitive EPT taxa indicative of good ecological condition.

6.0 Aquatic ecological values and condition

6.1 Ecological values

The downstream receiving environments of Bendigo Creek and the lower Lindis River support aquatic communities that are characteristic of Central Otago gravel-bed waterways and provide important freshwater ecological values within the wider Clutha River catchment. Available information from historical ecological investigations, long-term monitoring programmes, contemporary field surveys, freshwater fish records and environmental DNA (eDNA) analyses indicates that these waterways support diverse fish and macroinvertebrate communities, including indigenous species of conservation significance and communities containing a strong representation of pollution-sensitive EPT taxa. Together, these attributes demonstrate that the downstream receiving environment is functioning as a healthy and ecologically connected freshwater system.

The lower Lindis River has recognised ecological and fisheries values. Historical investigations identified the river as supporting brown trout, rainbow trout, longfin eel, upland bully, common bully and non-diadromous galaxiid species. Previous instream habitat investigations of the Lindis River identified the river as providing important spawning and recruitment habitat for brown and rainbow trout associated with the wider Clutha River and Lake Dunstan catchment (Jowett & Wilding, 2003). Extensive riffle, run and gravel-bed habitats within the lower river provide suitable habitat for trout spawning, juvenile trout recruitment and indigenous fish populations. Long-term ecological monitoring and recent eDNA sampling demonstrate that these values remain present within the downstream environment.

Bendigo Creek also supports ecological values typical of permanent Central Otago tributaries. Historical investigations and contemporary surveys indicate that the creek provides habitat for brown trout and indigenous fish species including kōaro and upland bully. Macroinvertebrate communities contain a diverse assemblage of taxa, including pollution-sensitive mayflies and caddisflies, while habitat conditions are characterised by stable coarse substrates, riffles, runs and pools that support a range of aquatic organisms. Although ecological values within Bendigo Creek are not considered exceptional in a regional context, the waterway contributes to the diversity and connectivity of freshwater habitats within the wider catchment and supports indigenous fish species classified as At Risk under the New Zealand Threat Classification System.

Ecological condition within both waterways varies naturally in response to seasonal flow conditions, hydrological variability, groundwater interactions, water abstraction, climatic influences and other catchment-scale pressures. Despite these influences, the weight of evidence indicates that the downstream receiving environments continue to support resilient aquatic communities typical of Central Otago river systems. The confirmed presence of conservation-significant indigenous fish species, diverse macroinvertebrate assemblages and recognised trout spawning and recruitment values demonstrates that the downstream environment possesses meaningful freshwater ecological values and provides a robust baseline against which future ecological change can be assessed.

6.2 Ecological condition of survey sites SW13 and SW14

6.2.1 Background

The baseline investigations, together with historical ecological information, indicate that both SW13 (Bendigo Creek) and SW14 (Lindis River) support aquatic communities typical of Central Otago river systems and provide suitable locations for long-term ecological monitoring of potential mining-related effects. The ecological values observed at both sites are consistent with catchment-scale patterns previously documented within Bendigo Creek and the lower Lindis River.

6.2.2 Lindis River - SW14

Direct biological sampling at SW14 was constrained by flood conditions during the July 2026 survey. However, the combination of long-term ORC State of the Environment monitoring, historical fish surveys, and recent eDNA results provides a robust assessment of ecological values at this site. The available evidence indicates that SW14 supports a fish and macroinvertebrate community typical of the lower Lindis River. Historical monitoring demonstrates persistent representation of sensitive EPT taxa and generally fair-to-good ecological condition, while eDNA results confirmed the presence of brown trout, rainbow trout, upland bully and longfin eel. Longfin eel and upland bully are species of conservation significance and contribute to the ecological value of the lower river.

Overall, SW14 appears biologically very similar to adjacent reaches of the Lindis River. Any differences observed among sites are most likely attributable to local habitat variation and the influence of sampling during a flood event, which can affect eDNA transport and detection patterns, rather than indicating a distinct fish or macroinvertebrate community at SW14. The weight of evidence suggests that SW14 is representative of the ecological condition of the lower Lindis River and provides an appropriate monitoring location for long-term trend assessment.

6.2.3 Bendigo Creek - SW13

SW13 supported a diverse aquatic invertebrate community with an average MCI score of 107, indicating good ecological condition. The site contained a substantial proportion of pollution-sensitive EPT taxa, including mayflies, stoneflies and caddisflies, demonstrating that instream habitat quality and water quality are sufficient to support sensitive aquatic fauna. The macroinvertebrate assemblage was characteristic of a relatively stable, coarse-substrate stream with abundant habitat diversity provided by riffles, runs, pools, boulders and cobbles. Fish surveys confirmed the presence of brown trout, while eDNA additionally detected kōaro and upland bully. The detection of kōaro, an At Risk-Declining species, highlights the ecological value of Bendigo Creek as part of the wider freshwater network within the Bendigo catchment. eDNA and kick-net sampling collectively demonstrated a diverse aquatic community and provided multiple lines of evidence supporting the ecological integrity of the site.

Although riparian vegetation was dominated by exotic species and shading was relatively limited during winter, habitat quality remained relatively high, reflected by the RHA score of 75. The reach provides a range of habitat types important for both fish and macroinvertebrates and appears capable of supporting self-sustaining aquatic communities despite historical catchment disturbance and seasonal flow variability.

6.3 Confirmed conservation-status taxa

Conservation status of aquatic biota was assessed by cross-referencing fish and macroinvertebrate taxa detected during eDNA surveys, electro-fishing (EFM), and macroinvertebrate kick sampling with the relevant New Zealand Threat Classification System listings for freshwater fish and freshwater invertebrates (DOC 2018, 2023). Macroinvertebrate classifications were interpreted cautiously due to the taxonomic resolution of S2 Protocol identifications.

Fish

- 2 At Risk - Declining species (*Anguilla dieffenbachii*, *Galaxias brevipinnis*)
- 1 At Risk - Naturally Uncommon species (*Gobiomorphus breviceps*)
- 2 Introduced and Naturalised species (*Salmo trutta*, *Oncorhynchus mykiss*)

Macroinvertebrates

Communities are dominated by taxa whose identified species are generally classified as Not Threatened.

7.0 Monitoring

7.1 Suitability of monitoring sites for assessment of mining effects

The monitoring locations established at SW13 and SW14 are considered fit for purpose for assessing potential freshwater ecological effects in the downstream environment associated with the Bendigo Ophir Gold Project, consistent with the conclusions reached in the freshwater ecological assessment prepared for the project (Boffa Miskell, 2025).

SW13 provides a downstream receiving environment within Bendigo Creek where any changes in water quality, sedimentation, habitat condition, periphyton development, macroinvertebrate communities, or fish communities associated with mining activities would be expected to be detectable. The site supports a measurable biological community and is readily accessible for repeat monitoring, making it suitable for long-term ecological assessment.

Similarly, SW14 provides an appropriate downstream performance-monitoring location within the Lindis River. The long-term availability of historical ecological data from nearby ORC monitoring sites substantially increases the value of this location by allowing future results to be interpreted within a broader temporal and catchment context.

Both monitoring locations occur within catchments that are subject to multiple environmental stressors operating across a range of spatial and temporal scales. Ecological condition in Bendigo Creek and the Lindis River is influenced by hydrological variability, water abstraction, climatic conditions, land-use activities, groundwater interactions and natural disturbance processes such as flood events. As recognised in freshwater ecological assessments of mining environments, biological responses frequently reflect the combined influence of multiple stressors rather than a single causal factor. Accordingly, future monitoring results should be interpreted within the context of broader catchment processes and long-term environmental variability when evaluating any potential project-related effects (Harding & Boothroyd, 2004; Cavanagh et al., 2010)

Overall, the proposed monitoring programme is considered appropriately designed to support the Freshwater Ecology Management and Monitoring Plan and should provide a robust basis for assessing changes in ecological values and potential mine-related effects throughout the life of the project, particularly when combined with repeat seasonal monitoring and consistent long-term sampling methodologies

Future monitoring that includes ecological surveys within Rise and Shine Creek, particularly at an upstream reference site above SW14, should be undertaken concurrently with the Bendigo Creek and Lindis River surveys to maximise comparability.

7.2 Monitoring methodology considerations

A review of historical ecological investigations undertaken within the Bendigo Creek and Lindis River catchments shows that a range of sampling approaches have been applied over time. While these studies have collectively provided valuable ecological information, methodological differences can introduce variability that complicates direct comparison between datasets.

To maximise consistency and statistical confidence in future trend analyses, continuing biological monitoring should utilise a single standardised methodology wherever practicable. For macroinvertebrates, the modified NEMS kick-net approach adopted during the present survey is considered appropriate for both monitoring sites and should be retained for future surveys. Similarly, fish monitoring should continue using consistent methods and reach lengths during each monitoring event. Maintaining standardised sampling protocols is fundamental to reducing methodological noise and improving the ability to detect genuine ecological change associated with project activities.

7.3 Seasonal considerations and future monitoring

An important consideration when interpreting all available datasets is that many previous ecological surveys for the Bendigo Ophir Gold Project have been undertaken during winter, spring, or elevated-flow conditions. Freshwater ecological indicators such as periphyton cover, macroinvertebrate abundance, fish distribution, and habitat availability can vary substantially in response to seasonal flow patterns and recent disturbance events. The July 2026 survey occurred during winter fresh-to-flood conditions, which limited some field assessments and influenced ecological measurements. Similarly, historical variability observed within the Lindis River monitoring record is strongly related to differences in flow regime and hydrological connectivity between years. Consequently, comparisons among surveys undertaken under differing seasonal conditions should be made with caution.

Future monitoring should therefore continue to be undertaken concurrently across all sites during the agreed summer low-flow period, wherever practicable, to maximise comparability of results and maintain consistency in sampling conditions. Summer monitoring provides the most stable and repeatable assessment conditions, allows direct comparison with historical ORC monitoring datasets, and represents the period when ecological indicators are generally most sensitive to environmental change. Establishing a consistent summer baseline through repeated monitoring will significantly improve confidence in detecting any long-term trends associated with mining activities.

8.0 Conclusion

Based on the combined evidence from historical investigations, contemporary field surveys, fish records, and eDNA analyses we consider that both Bendigo Creek (SW13) and the lower Lindis River (SW14) support aquatic communities typical of Central Otago waterways and are currently in fair to good ecological condition. Sensitive macroinvertebrate taxa remain well represented, fish communities contain both native and valued introduced recreational species, and no evidence was identified to suggest widespread ecological degradation at either monitoring location.

SW13 is characterised by diverse instream habitat and a good-quality macroinvertebrate community, while SW14 supports biological communities representative of the wider lower Lindis River. Fish surveys identified three indigenous species of conservation concern, comprising longfin eel (*Anguilla dieffenbachii*; At Risk - Declining), koaro (*Galaxias brevipinnis*; At Risk - Declining), and upland bully (*Gobiomorphus breviceps*; At Risk - Naturally Uncommon). Brown trout (*Salmo trutta*) and rainbow trout (*Oncorhynchus mykiss*), both classified as Introduced and Naturalised, were also recorded.

Macroinvertebrate identifications were undertaken using S2 Protocol methodologies and are not suitable for formal species-level threat assessments. Although some recorded taxa include species with recognised conservation classifications, most threatened freshwater invertebrates in New Zealand are highly localised taxa associated with specialised habitats such as offshore islands, wetlands, springs, caves, and geographically restricted catchments that are absent from the study area. Accordingly, there is no evidence from the present survey to indicate the occurrence of threatened macroinvertebrate species within either survey reach, and the macroinvertebrate communities recorded are considered typical of healthy Central Otago stream ecosystems.

More broadly, the downstream receiving environments of Bendigo Creek and the lower Lindis River support freshwater communities typical of Central Otago waterways and contain a range of recognised ecological values. These include diverse macroinvertebrate assemblages with strong representation of pollution-sensitive taxa, indigenous fish species of conservation significance, and, within the Lindis River, habitat that contributes to the wider trout spawning and recruitment values of the Clutha River and Lake Dunstan catchment. The ecological condition of these waterways is influenced by multiple interacting natural and anthropogenic stressors, including seasonal flow variability, flood events, groundwater-surface water interactions, water abstraction, climatic variability and catchment land-use activities. Consequently, ecological patterns and future monitoring results should be interpreted within the context of these broader catchment drivers as well as any potential project-related influences.

Collectively, the available information demonstrates that the selected survey sites are suitable and fit for purpose for evaluating potential freshwater ecological effects of the Bendigo Ophir Gold Project. The presence of At Risk native fish species reinforces the ecological value of the receiving environment, while the diverse and sensitive macroinvertebrate communities provide a reliable indicator of stream health. With implementation of consistent summer-based monitoring and standardised survey methodologies, the monitoring network will provide a robust framework for detecting ecological change, assessing environmental performance, and evaluating the effectiveness of mitigation measures throughout the life of the project.

9.0 References

Biggs, B.J.F., Francoeur, S.N., Huryn, A.D., Young, R.G., Arbuckle, C.J. & Townsend, C.R. (2000). Trophic cascades in streams: effects of nutrient enrichment on autotrophic and consumer benthic communities under two different fish predation regimes. Canadian Journal of Fisheries and Aquatic Sciences, 57, 1380–1394.

Boffa Miskell (2025). Bendigo Ophir Gold Project: Assessment of Freshwater Ecological Effects. Report prepared by Boffa Miskell Ltd., October 2025.

Bright, C. (2020). Hydrological Assessment for Flow Losses/Gains – Bendigo Creek. Landpro Ltd Technical Comment, 24 February 2020.

Cavanagh, J.E., Pope, J., Harding, J.S., Trumm, D., Craw, D., Rait, R., Greig, H., Niyogi, D., Buxton, R., Champeau, O. & Clemens, A. (2010). A Framework for Predicting and Managing Water Quality Impacts of Mining on Streams: A User's Guide. Landcare Research, CRL Energy, University of Canterbury and University of Otago.

Collier, K.J. et al. (2012). Review of Functional and Macroinvertebrate Sampling Methods for Non-Wadeable Rivers. Cawthron Report 2222.

Conservation status of New Zealand freshwater invertebrates, (2018) (New Zealand Threat Classification Series No. 28). Department of Conservation. https://www.doc.govt.nz/

Conservation status of New Zealand freshwater fishes, (2023) (New Zealand Threat Classification Series No. 46). Department of Conservation. https://www.doc.govt.nz/

E3 Scientific (2023). Bendigo-Ophir Gold Project Freshwater Ecological Assessment. Prepared by e3Scientific Ltd for Matakanui Gold Ltd. Document ID: 22065. Final Report, May 2023.

Flecker, A.S. & Townsend, C.R. (1994). Community-wide consequences of trout introduction in New Zealand streams. Ecological Applications, 4, 798–807.

Harding, J.S. & Boothroyd, I.K.G. (2004). Impacts of mining. In: Winterbourn, M.J., Gregson, K.L.D. & Dolphin, C.H. (eds.), Freshwaters of New Zealand. New Zealand Hydrological Society and New Zealand Limnological Society.

Joy et al. (2013). New Zealand Freshwater Fish Sampling Protocols Part 1: Wadeable Rivers and Streams. Institute of Natural Resources. Ecology Group. Massey University.

Jowett, I.G. & Wilding, T.K. (2003). Flow requirements for fish habitat in the Chatto, Lindis, Manuherikia, Pomahaka and Waianakarua Rivers. NIWA Client Report HAM2003-052. Prepared for Otago Regional Council. National Institute of Water and Atmospheric Research Ltd (NIWA), Hamilton.

Landpro Ltd. (2020). Resource Consent Application for a Surface Water Take: Bendigo Station Limited. Prepared for Bendigo Station Ltd. Otago Regional Council; Application RM20.079.

National Environmental Monitoring Standards (NEMS). (2024). Macroinvertebrate Sampling and Measurement Protocols for Wadeable Rivers and Streams and Large Streams and Rivers. Ministry for the Environment, Wellington.

National Institute of Water and Atmospheric Research (NIWA). New Zealand Freshwater Fish Database (NZFFD). Available at the NZFFD web portal. Accessed 22nd July 2026.

Otago Regional Council. (2008). Management flows for aquatic ecosystems in the Lindis River. Otago Regional Council. ISBN 1-877265-63-2.

Otago Regional Council. (2016). Water Quality in the Lindis River Catchment. Otago Regional Council, Dunedin, New Zealand. ISBN 978-0-908324-26-2.

Otago Regional Council biomonitoring dataset, Lindis at Ardgour Road Bridge (EY105), (2006-2025), containing MCI, QMCI, SQMCI, ASPM, taxa richness, EPT metrics, and taxon abundance data.

Otago Regional Council. (2021). Decision Report: Bendigo Station Limited RM20.079.01, RM20.079.02 and RM20.079.03. 24 May 2021.

Waterways (2020). Bendigo Creek Fish Survey. Water Ways Consulting Ltd. Prepared for Landpro Ltd, 10 January 2020.

Water Ways (2025). Bendigo Ophir Gold Project: Assessment of Effects on Aquatic Habitat. Report prepared by Water Ways Consulting, June 2025.

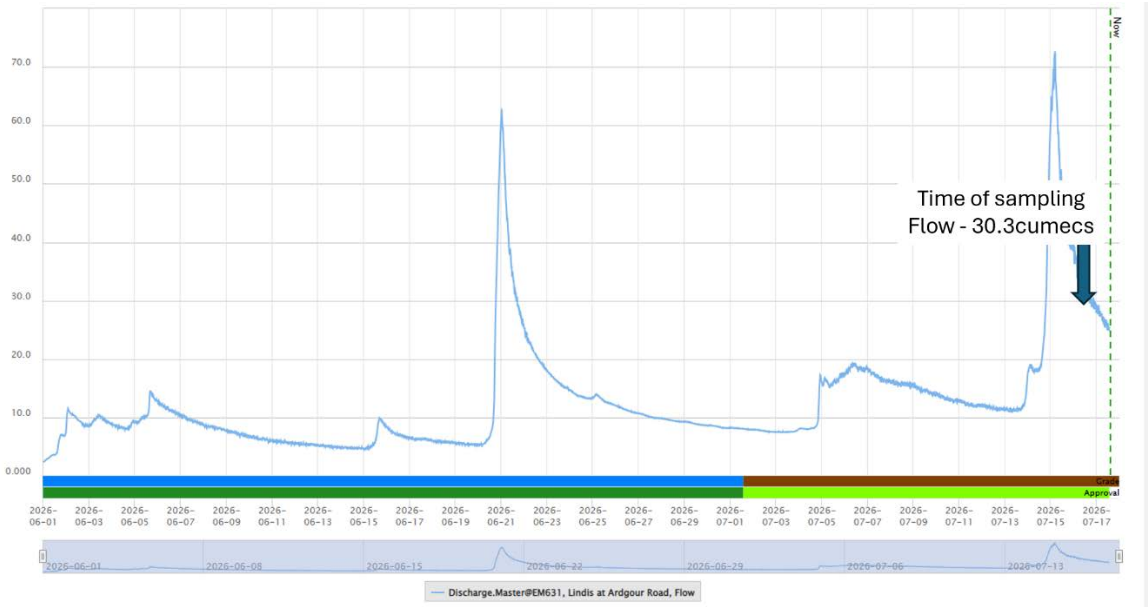
Appendix 1: Site Photos

	
SW14 looking downstream	SW14 looking upstream
	
SW13, Reach 1 looking downstream	SW13, Reach 1 looking upstream
	
SW13, Reach 2 looking downstream	SW13, Reach 2 looking upstream

	
SW13, Reach 3 looking downstream	SW13, Reach 3 looking downstream

Appendix 2: Flow conditions -Lindis River.

Flow conditions proceeding sampling, Lindis River at Ardgour Rd (EM631) on the sampling dates - ORC Environmental Data Portal



Appendix 3: In-stream habitat data

A3:1. Substrate composition measured as percent cover (%) at Bendigo Creek (SW13) undertaken at six cross sectional transects at four points per transect. Site SW14 (Lindis River) was unable to be surveyed due to high flow event.

Site	In-stream point	Substrate composition (%)				
		Boulder	Large cobble	Cobble	Gravel	Sand / Silt (Fine Sediment)
SW14	N/A	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
SW13 – Transect 1	1	0	80	0	20	0
	2	0	80	0	20	0
	3	70	0	30	0	0
	4	0	0	60	40	0
SW13 – Transect 2	1	70	0	30	0	0
	2	80	0	10	10	0
	3	60	0	30	10	0
	4	5	90	0	5	0
SW13 – Transect 3	1	90	0	0	10	0
	2	40	30	0	30	0
	3	60	20	0	20	0
	4	0	0	0	0	100 (likely usually exposed bank)
SW13 – Transect 4	1	90	0	0	10	0
	2	90	5	0	5	0
	3	100	0	0	0	0
	4	60	20	5	15	0
SW13 – Transect 5	1	5	20	30	45	0
	2	90	0	5	5	0
	3	50	40	0	10	0
	4	80	10	5	5	0
	1	50	40	0	10	0

SW13 – Transect 6	2	50	10	0	40	0
	3	90	0	0	10	0
	4	20	0	60	20	0
Average		**52**	**18**	**11**	**14**	**4**

A3:2. Substrate composition measured as percent cover (%) at Bendigo Creek (SW13) undertaken at six cross sectional transects at four points per transect. Site SW14 (Lindis River) was unable to be surveyed due to high flow event.

Site	In-stream point	Periphyton form	Periphyton colour	Cover (%)	Bare (%)	Cyanobacteria presence (Y/N)
SW14	N/A	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
SW13 – Transect 1	1	Thin film/slime	Brown	100	0	Y
	2	Thin film/slime	Brown	100	0	Y
	3	Thin film/slime	Brown	100	0	Y
	4	Thin film/slime	Brown	70	30	Y
SW13 – Transect 2	1	Thin film/slime	Brown	100	0	Y
	2	Thin film/slime	Brown	100	0	Y
	3	Thin film/slime	Brown	90	10	Y
	4	Thin film/slime	Brown	100	0	Y
SW13 – Transect 3	1	Thin film/slime	Brown	10	90	N
	2	Thin film/slime	Brown	30	70	N
	3	Thin film/slime	Brown	0	100	N
	4	Thin film/slime	Brown	90	10	N
SW13 – Transect 4	1	Thin film/slime	Brown	10	90	N
	2	Thin film/slime	Brown	5	95	N
	3	Thin film/slime	Brown	0	100	N
	4	Thin film/slime	Brown	10	90	N
SW13 – Transect 5	1	Thin film/slime	Brown	60	40	N
	2	Thin film/slime	Brown	50	50	N
	3	Thin film/slime	Brown	50	50	N
	4	Thin film/slime	Brown	50	50	N

SW13 – Transect 6	1	Thin film/slime	Brown	100	0	N
	2	Thin film/slime	Brown	90	10	N
	3	Thin film/slime	Brown	90	10	N
	4	Thin film/slime	Brown	20	80	N
Average				**59**	**40**	

Appendix 4: Macroinvertebrate data

A4:1. Macroinvertebrate community present at SW13. Taxa are identified at the 'MCI' level.

Group	*Taxa*	SiteID: B1 (SW13)	SiteID: B2 (SW13)	SiteID: B3 (SW13)
PLATYHELMINTHES	PLATYHELMINTHES	0	40	0
NEMATODA	NEMATODA	240	1300	0
OLIGOCHAETA	OLIGOCHAETA	0	0	42
CRUSTACEA	Amphipoda	0	0	1
CRUSTACEA	Copepoda	0	0	2
CRUSTACEA	*Helice*	180	840	0
CRUSTACEA	Ostracoda	0	0	261
Ephemeroptera	*Ameletopsis*	0.5	0	0
Ephemeroptera	*Austroclima*	420	380	0
Ephemeroptera	*Deleatidium*	0	0	234
Plecoptera	*Taraperla*	0	0.5	0
Coleoptera	Scirtidae	0.5	0.5	2
Coleoptera	Staphylinidae	40	0.5	0
Diptera	*Aphrophila*	0	20	1
Diptera	*Austrosimulium*	80	40	40
Diptera	Chironomidae	0	0	1
Diptera	Diptera indet.	0.5	0	0
Diptera	Dolichopodidae	0	0.5	0
Diptera	Empididae	0	0	7
Diptera	*Eriopterini*	0	0	16
Diptera	*Limonia*	0	0	4
Diptera	*Mischoderus*	0	0	1
Diptera	*Neocurupira*	80	80	0
Diptera	*Orthocladiinae*	0	0	71
Diptera	*Paucispinigera*	0	0.5	0
Diptera	Stratiomyidae	0.5	0	0
Diptera	Tanypodinae	0	0	1
Trichoptera	*Ecnomina*	320	40	0
Trichoptera	*Helicopsyche*	20	20	0
Trichoptera	*Hudsonema*	0	0	18
Trichoptera	*Hydrobiosis*	0	0	4

Group	*Taxa*	SiteID: B1 (SW13)	SiteID: B2 (SW13)	SiteID: B3 (SW13)
Trichoptera	*Hydropsyche - Aoteapsyche*	0.5	0.5	1
Trichoptera	*Neurochorema*	360	0.5	2
Trichoptera	*Oecetis*	0	0.5	0
Trichoptera	*Oeconesidae*	0	0	1
Trichoptera	*Olinga*	0	0	81
Trichoptera	*Oxyethira*	0	0	7
Trichoptera	*Paroxyethira*	0.5	0.5	0
Trichoptera	*Philorheithrus*	0.5	40	0
Trichoptera	*Polyplectropus*	360	40	5
Trichoptera	*Psilochorema*	0.5	20	9
Trichoptera	*Pycnocentria*	0	0	33
Trichoptera	*Pycnocentrodes*	0	0	8
MOLLUSCA	*Gyraulus*	0	0	2
MOLLUSCA	Lymnaeidae	3940	1520	0
MOLLUSCA	*Melanopsis = Zemelanopsis*	0	20	0
MOLLUSCA	*Physa = Physella*	6040	4400	0
MOLLUSCA	*Potamopyrgus*	0	0	2614
MOLLUSCA	*Sphaeriidae*	0	0	6

Appendix 5: eDNA results

*A5:1. eDNA results including fish, aquatic insects, molluscs, worms, flatworms, diatoms, and red algae detected from Bendigo Creek (SW13) and the Lindis River (SW14). *Values represent the sum of six replicates of which is the number of sequencing reads. Higher values represent stronger DNA matches.*

Scientific name	Common name	Group	SW13*	SW14*
Salmo trutta	Brown trout; taraute; tarauta	Fish	518320	283386
Gobiomorphus breviceps	Upland bully	Fish	972	92193
Oncorhynchus mykiss	Rainbow trout; taraute;tarauta; hāmana; tāmana	Fish	0	9014
Anguilla dieffenbachii	Longfin eel; tuna; kūwharuwharu; reherehe; kirirua	Fish	0	3020
Galaxias brevipinnis	Koaro; kōaro; maehe	Fish	783	0
Hydra viridissima	Hydra; huru moana	Cnidarians	192	0
Potamopyrgus antipodarum	Mud Snail	Molluscs	1116	787
Sphaerium novaezelandiae	NZ freshwater clam	Molluscs	972	320
Physella acuta	Left-handed sinistral snail	Molluscs	0	274
Euglesa personata	Red crusted pea mussel	Molluscs	47	0
Australoplana sanguinea		Flatworms	0	50
Eiseniella tetraedra	Squaretail worm	Worms	99954	108964
Lumbriculus variegatus	Blackworm	Worms	52225	70240
Tubifex tubifex	Sludge worm	Worms	20863	79773
Stylodrilus heringianus	Worm	Worms	1346	47941
Limnodrilus hoffmeisteri	Redworm	Worms	7796	39162
Chaetogaster diastrophus	Oligochaete worm	Worms	12329	737
Chaetogaster diaphanus	Oligochaete worm	Worms	9923	1553
Nais communis	Sludgeworm	Worms	10088	986
Nais elinguis	Sludgeworm	Worms	1704	2459
Aulodrilus pluriseta	Aquatic oligochaete worm	Worms	3284	407

Bothrioneurum vejdovskyanum	Worm	Worms	0	527
Aulodrilus japonicus		Worms	0	327
Austrosimulium australense	Sandfly	Insects	24005	163
Coloburiscus humeralis	NZ spinygilled mayfly	Insects	6507	3188
Austroclima jollyae	Mayfly	Insects	4358	513
Aoteapsyche colonica	NZ caddisfly	Insects	623	3112
Olinga feredayi	Hornycased caddisfly	Insects	1346	576
Pycnocentria evecta	NZ caddisfly	Insects	1217	646
Psilochorema bidens	NZ caddisfly	Insects	550	1236
Archichauliodes diversus	NZ dobsonfly; puene	Insects	463	1142
Deleatidium magnum	NZ mayfly	Insects	995	573
Hydrobiosella stenocerca	Caddisfly	Insects	1161	59
Deleatidium vernale	NZ mayfly	Insects	924	64
Stenoperla prasina	Stonefly	Insects	519	332
Austrosimulium sp.		Insects	815	16
Zelandobius pilosus	Stonefly	Insects	0	803
Taraperla ancilis	Stonefly	Insects	554	33
Psilochorema macroharpax	NZ caddisfly	Insects	474	109
Hydrobiosis clavigera	Caddisfly	Insects	0	544
Oxyethira albiceps	Micro caddisfly	Insects	480	0
Spaniocerca longicauda	Stonefly	Insects	0	246
Deleatidium fumosum	NZ mayfly	Insects	0	194
Aoteapsyche tipua		Insects	0	136
Nesameletus ornatus	Small swimming mayfly	Insects	113	0
Polyplectropus puerilis	Caddisfly	Insects	0	100
Taraperla howesi	Stonefly	Insects	0	99
Hudsonema alienum	Cased caddisfly	Insects	40	55
Ephydridae sp.		Insects	8	80
Spaniocerca acuta	Stonefly	Insects	0	77

Ochlerotatus subalbirostris		Insects	0	76
Zelandoperla fenestrata	Stonefly	Insects	21	52
Zelandoperla tillyardi		Insects	69	0
Hydrobiosis chalcodes	Caddisfly	Insects	16	44
Cricotopus sp. NZeP20	NZ mining midge	Insects	27	26
Zelandobius furcillatus	Stonefly	Insects	0	53
Pseudoeconesus stramineus	Caddisfly	Insects	51	0
Psilochorema tautoru	NZ caddisfly	Insects	46	0
Deleatidium sp. Dl_S38_01	Single gill mayfly	Insects	26	16
Costachorema psaropterum	Caddisfly	Insects	0	41
Hudsonema amabile	Long-horned caddisfly	Insects	29	12
Hydropsyche raruraru	Netspinning caddisfly	Insects	22	13
Bryophaenocladius sp. 8ES	Non-biting midge	Insects	9	22
Nesameletus murihiku	Mayfly	Insects	27	0
Zelandobius unicolor		Insects	0	20
Zelandobius albofasciatus	Stonefly	Insects	18	0
Zelolessica cheira	Caddisfly	Insects	17	0
Oeconesus maori	NZ caddisfly	Insects	0	17
Austrosimulium ungulatum	NZ sandfly	Insects	0	17
Zelandobius macburneyi	Stonefly	Insects	0	16
Nannochorista philpotti		Insects	0	10
Limonia repanda	Cranefly	Insects	10	0
Oniscigaster distans	Mayfly	Insects	9	0
Helophilus hochstetteri	Metallic blue hoverfly	Insects	0	7
Tanytarsus sp. EJD-2015	Non-biting midge	Insects	7	0

Corynoneura scutellata	Non-biting midge	Insects	0	6
Psychoda lativentris		Insects	5	0
Costachorema xanthopterum	Caddisfly	Insects	5	0
Audouinella hermannii	Black algae	Red algae	3571	13979
Sheathia transpacifica	Red alga	Red algae	20	2859
Sheathia confusa	Freshwater red alga	Red algae	1608	374
Torularia atra	Red algae	Red algae	745	644
Sheathia arcuata	Freshwater red alga	Red algae	0	1204
Sheathia boryana	Red alga	Red algae	0	576
Didymosphenia geminata	Didymo	Diatoms	59	447
Frustulia vulgaris	Diatom	Diatoms	155	9
Pinnularia neomajor	Diatom	Diatoms	28	36
Mayamaea permitis	Diatom	Diatoms	20	28
Nitzschia acidoclinata	Diatom	Diatoms	33	0
Sellaphora cf. minima	Diatom	Diatoms	31	0

Together. Shaping Better Places.

Boffa Miskell is a leading New Zealand environmental consultancy with nine offices throughout Aotearoa. We work with a wide range of local, international private and public sector clients in the areas of planning, urban design, landscape architecture, landscape planning, ecology, biosecurity, Te Hīhiri (cultural advisory), engagement, transport advisory, climate change, graphics, and mapping. Over the past five decades we have built a reputation for creativity, professionalism, innovation, and excellence by understanding each project's interconnections with the wider environmental, social, cultural, and economic context.

www.boffamiskell.co.nz

Whangarei	Auckland	Hamilton	Tauranga	Wellington	Nelson	Christchurch	Queenstown	Dunedin
09 358 2526	09 358 2526	07 960 0006	07 571 5511	04 385 9315	03 548 8551	03 366 8891	03 441 1670	03 470 0460