BATHURST RESOURCES LIMITED

Aquatic Ecology Management Plan

Buller Plateaux Continuation Project

July 2026

BPCP-ENV-PLN-006 v0.1

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Glossary of Terms and Abbreviations

Term	Definition
AEMP	Aquatic Ecology Management Plan
ANZECC	Australian and New Zealand Environment and Conservation Council
ANZG	Australian and New Zealand Guidelines for Fresh and Marine Water Quality
AMD	Acidic and metalliferous drainage
AMDI	Acid Mine Drainage Index
Bathurst	Bathurst Resources Limited, including its subsidiary companies BT Mining Ltd, Bathurst Coal Ltd, and Buller Coal Ltd
BPCP	Buller Plateaux Continuation Project
BDC	Buller District Council
BRL	Bathurst Resources Limited
Buller Plateaux	A collective reference to the Stockton Plateau and Denniston Plateau
CCME	Canadian Council of Ministers of the Environment
DOC	Department of Conservation
ELF	Engineered Landform
DFS	Deposited fine sediment
DRP	Dissolved reactive phosphorus
ESE	Escarpment Extended Project sub-area
ESNZ	Earth Sciences New Zealand
EPT	Ephemoptera, Plecoptera, Trichoptera (mayflies, stoneflies, caddisflies)
FTAA	Fast-track Approvals Act 2024
GCL	Geosynthetic clay liners
IANZ	International Accreditation New Zealand
MCI	Macroinvertebrate Community Index
MFS	Mount Frederick South Project sub-area
MPI	Ministry for Primary Industries
MSR	Mussel shell reactor
NEMS	National Environmental Monitoring Standards
NH_4-N	Ammoniacal nitrogen
NO_3-N	Nitrate nitrogen
NO_2-N	Nitrite nitrogen
NPS-FM	National Policy Statement for Freshwater Management

Term	Definition
NZFFD	New Zealand Freshwater Fish Database
NZTCS	New Zealand Threat Classification System
OCL	Orbit-carapace length
PAF	Potentially-acid forming
QA/QC	Quality Assurance/Quality Control
QMCI	Quantitative Macroinvertebrate Community Index
RMA	Resource Management Act (1991)
RPS	Regional Policy Statement
SAM1	Sediment Assessment Method 1
SAM2	Sediment Assessment Method 2
SEMP	Site Environmental Management Plan
SQEP	Suitably Qualified and Experienced Practitioner
The Project	The Buller Plateaux Continuation Project
TSS	Total suspended sediments
TTPP	Te Tai o Poutini Plan (Decisions version, 2025)
Plan	Management Plan
UWHR	Upper Waimangaroa Haul Road (a Project sub-area)
VDT	Vegetation Direct Transfer
WCRC	West Coast Regional Council

1.0 Introduction

1.1 Purpose

This Aquatic Ecology Management Plan (AEMP, or this Plan) sets out the objectives, risks, management controls, monitoring commitments, responsibilities, and training requirements to effectively manage aquatic ecology effects in accordance with the conditions of consent during the construction, operation and closure phases for the Escarpment Extended (ESE), Mount Frederick South (MFS) and Upper Waimangaroa Haul Road (UWHR) sub-areas of the Buller Plateaux Continuation Project (BPCP or the Project). The AEMP been prepared to support the Fast Track Approval Act (FTAA) process for the BPCP and has been guided by recommendations set out in the Assessment of Environmental Effects: Aquatic Ecology prepared by Earth Sciences New Zealand (ESNZ, 2026).

The purpose of this AEMP is to describe the methods and protocols for the effective management and monitoring of aquatic ecology in accordance with the proposed conditions of consent and to assign responsibilities to personnel to undertake the necessary tasks to achieve compliance with this Plan. The AEMP is part of a suite of management plans for the BPCP. The AEMP references management measures in other plans and sets out additional measures to avoid, remedy, minimise, and mitigate for potential adverse effects on aquatic ecology, including water quality, in-stream habitat, plants (periphyton, bryophytes), macroinvertebrates, and fish (where present) during construction, operation and closure phases. The AEMP also outlines an aquatic ecology monitoring programme including recording of adaptive management measures implemented and any aquatic ecology related incidents or observations based on those records.

The AEMP recognises and provides for existing high-value freshwater ecosystems, avoiding or minimising disturbance where practicable, and implementing targeted management measures and monitoring to maintain or enhance these freshwater values.

1.2 Location

The BPCP covers areas on both the Stockton Plateau and the Denniston Plateau (collectively referred to as the Buller Plateaux). The Buller Plateaux is located approximately 15 km northeast of Westport on the West Coast of the South Island. The Project comprises five sub-areas: ESE, MFS, UWHR, Stockton and Cypress. The proposed consent boundary as well as the proposed and existing disturbance areas for the Project are shown in Figure 1. The land ownership is a mix of Bathurst, Crown and private owned land with existing approvals for the current mining operations across several areas of the Project footprint. The Project area covers four main catchments which are associated with specific Project sub-areas including: Ngākawau River (Stockton, Cypress), Waimangaroa River (ESE, MFS, UWHR, Stockton, Cypress), Whareatea River (ESE) and Cascade Creek (ESE) as shown in Figure 2.

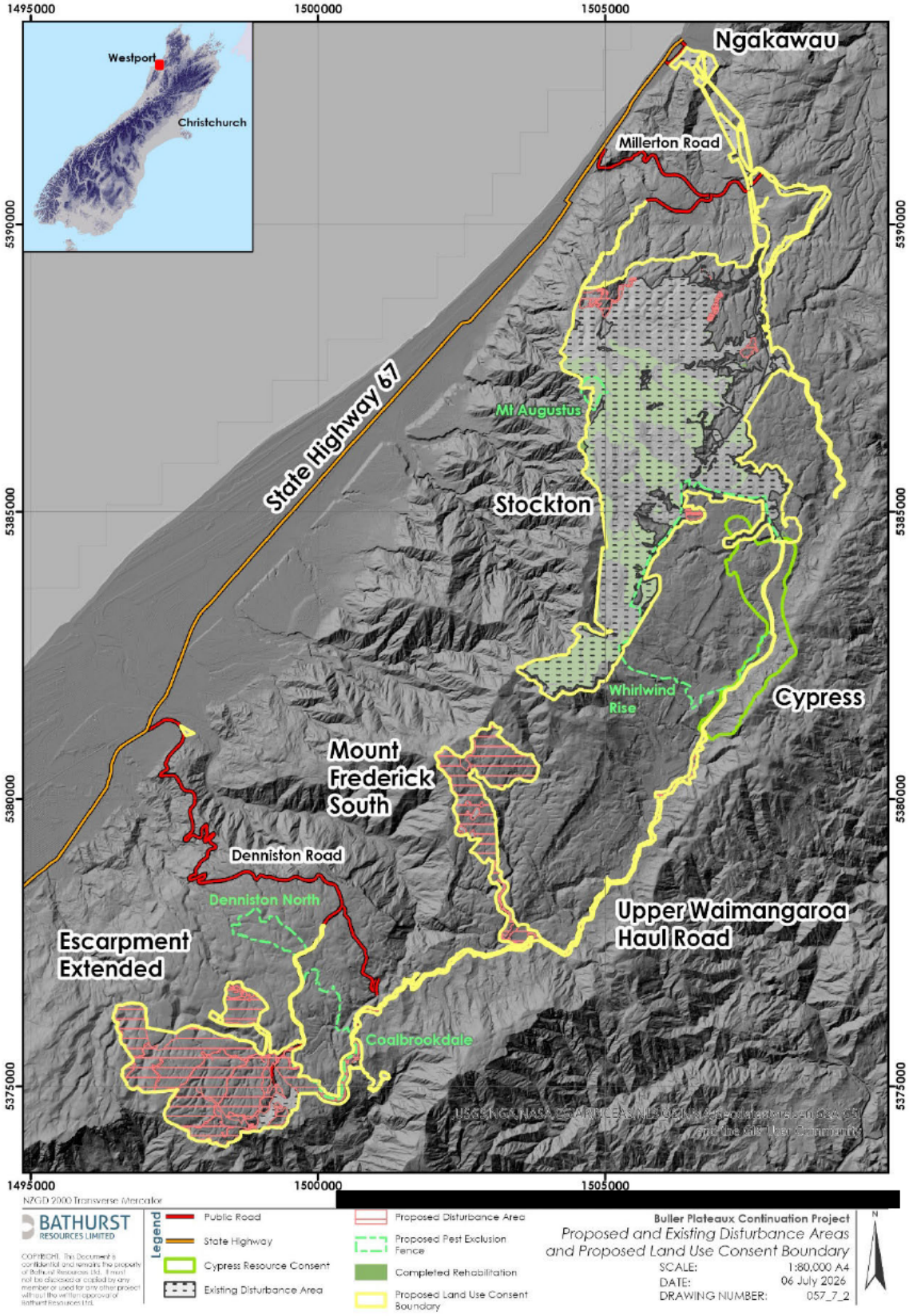

Figure 1: Map of the Project sub-areas on the Buller Plateaux showing the proposed land use consent boundary and proposed and existing disturbance areas.

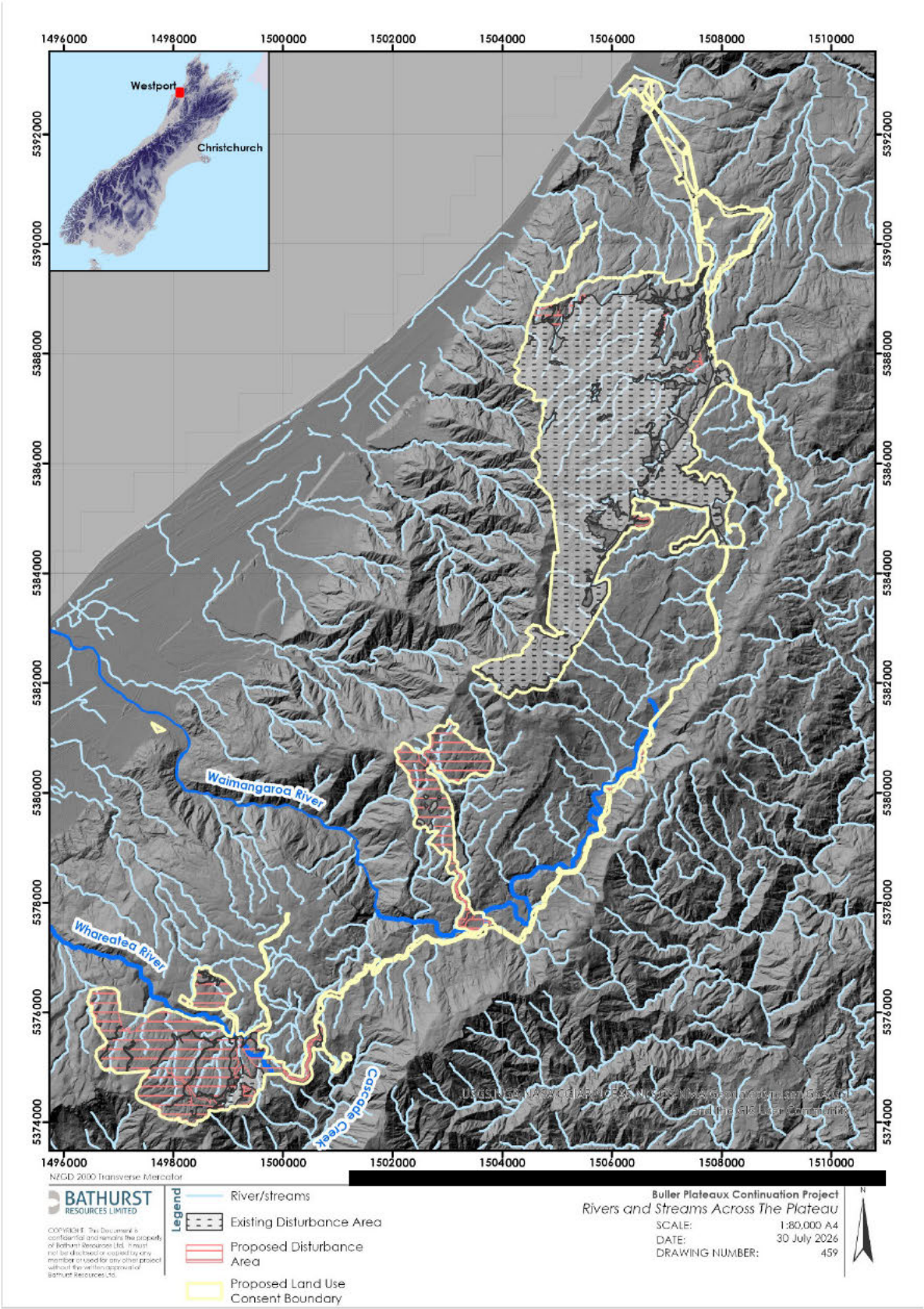

Figure 2: Three main river catchments associated with this Plan: Waimangaroa River, Whareatea River and Cascade Creek.

1.3 Objectives and Scope

This Plan focuses on the aquatic ecology within and downstream of the ESE, MFS and UWHR sub-areas only. The Stockton and Cypress sub-areas are covered in separate management plans.

The objectives of this Plan are to:

- Protect and preserve ecological values in streams with diverse bryophyte and macroinvertebrate communities, including kōura;
- Protect kōura populations and maintain habitat connectivity through kōura passage;
- Monitor the effects of the Project on aquatic ecology;
- Provide a monitoring programme and adaptive management framework to enable early detection and timely, effective responses to changing environmental conditions; and
- Provide methods to demonstrate compliance with the requirements of the proposed consent conditions.

The scopes of other management plans for the Project that are linked to physical and chemical changes in the environment that may affect aquatic ecology include:

- Maintain or improve downstream water quality (particularly pH, dissolved metals, turbidity) relative to baseline and/ or consented compliance limits;
- Prevent, capture and treat AMD from disturbed potentially-acid forming (PAF) materials;
- Prevent or minimise erosion and sediment generation from land disturbance activities, and avoid adverse effects on downstream receiving environments;
- Reinstate and rehabilitate stream habitat where loss is avoidable to enable natural recolonisation potential and ecological recovery; and
- Maintain or restore hydrological and habitat connectivity.

The AEMP should be read alongside other BPCP management plans that describe measures to address and minimise effects on aquatic ecology, including:

- AMD Engineered Landforms (ELF) Management Plan, BPCP-ENV-PLN-011.
- AMD Water Management Plan, BPCP-ENV-PLN-010.
- Biosecurity Management Plan, BPCP-ENV-PLN-007.
- Conceptual Mine Closure Strategy, BPCP-ENV-PLN-050.
- Erosion and Sediment Control Plan for Land Disturbance Activities, BPCP-ENV-PLN-013.
- Hazardous Substances Management Plan, BPCP-ENV-PLN-014.
- Lighting and Visual Amenity Management Plan, BPCP-ENV-PLN-018.
- Rehabilitation Management Plan, BPCP-ENV-PLN-002.
- Water Infrastructure Design Plan, BPCP-ENV-PLN-012.

This Plan has been developed based on the assessment of effects on aquatic ecology and management measures (Sections 5.1.1) to support the FTAA application for the BPCP.

2.0 Statutory Alignment and Legal Framework

2.1 Relevant Legislation

The following Acts and Regulations are relevant to the AEMP:

- The protection of rivers and significant habitats for indigenous fauna are matters of national importance as set out in Section 6(a) and 6(c) of the **Resource Management Act 1991** (RMA).
- The **Conservation Act 1987** applies to activities on public conservation land. Activities affecting these areas may require Department of Conservation (DOC) approvals, particularly where they involve wildlife or freshwater ecosystems within conservation areas; these approvals can sometimes be combined under an FTAA process.
- The **Wildlife Act 1953** applies to the protection of indigenous fauna including freshwater species such as kōura or fish. Wildlife authorisations can be required for handling, salvage, relocation or habitat disturbance.
- The **Freshwater Fisheries Regulations 1983** regulates structures in waterways, fish (including kōura) passage, disturbance and activities involving freshwater fauna. Certain approvals, including approvals and dispensations for complex freshwater fisheries activities, may be granted under the FTAA.
- The **Conservation (Indigenous Freshwater Fish) Amendment Act 2019**, includes kōura (freshwater crayfish; *Paranephrops* spp.) within the legal definition of "freshwater fish", meaning they are managed under the same regulatory framework as other indigenous freshwater fish, including restrictions on their take and disturbance.
- **Fast-track Approvals Act 2024** (FTAA) provides the consenting/ statutory pathway for project approval.

2.2 Relevant Standards, Policies and Guidelines

Policies, standards and/or guidelines relevant to the AEMP are listed below in Table 1.

Table 1: Policies, standards and guidelines relevant to this Plan.

Reference	Relevance to this Plan
West Coast Regional Policy Statement (RPS; West Coast Regional Council, 2000)	Policy 7.1a; Appendix 1. Protection of biodiversity including areas of significant indigenous vegetation and fauna habitat. Encourages use of criteria to identify significant areas including representativeness, rarity, diversity/pattern, distinctiveness, ecological context.
Te Tai o Poutini Plan (TTPP, Decisions version, 2025)	Proposed planning provision alongside the RPS to identify, protect, and manage significant indigenous biodiversity and habitat. ECO-P1 2ii. Identify areas of significant indigenous vegetation and fauna habitat in Buller and Westland areas through consenting process until district-wide mapping of significant natural areas completed.

National Policy Statement for Freshwater Management (NPS-FM, 2024)	Giving effect to *Te Mana o te Wai* by prioritising ecosystem health, water quality and hydrological integrity ahead of operational needs where practicable. Monitoring design aligns with five components of ecosystem health (water quality, water quantity, habitat, aquatic life, ecological processes). Protection of kōura populations addresses an ecosystem value that must be managed for. Supports mahinga kai outcomes through managing concerns on water quality, habitat and connectivity. Monitoring ecology, setting out response frameworks and addressing issues via adaptive management to meet established water quality guidelines for protection of aquatic communities.
Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG) / Australian and New Zealand Guidelines for freshwater and Marine water quality (ANZECC)/ Canadian Council of Ministers of the Environment Water quality guidelines (CCME)	As used in Hickey (2026) for the derivation and setting of Project specific water quality guideline values differing levels of protection. Acute and chronic guideline values were set for the protection of bryophytes, macroinvertebrates and fish.
National Environmental Monitoring Standards (NEMS)	NEMS for Periphyton and Macroinvertebrates set out standardised methods for site selection, sampling procedures, sample processing, data analysis and reporting, and quality assurance/quality control (QA/QC). These nationally recognised methods are used for ecological monitoring to ensure consistent, robust and defensible data is collected and can be used to assess impacts or patterns over time.

3.0 Cultural Values

The AEMP acknowledges outcomes from mana whenua engagement and the Cultural Impact Assessment (Te Rūnanga o Ngāti Waewae 2026) relevant to freshwater values, including kaitiakitanga and mahinga kai considerations.

Bathurst is committed to working with mana whenua to explore and develop ways to incorporate Mātauranga Māori into management protocols and monitoring. It is understood that the development and integration of these measures and approaches will occur over time with iwi and align with the principles of Te Tiriti o Waitangi, recognise and provide for the relationship of Māori with their ancestral lands, water, and taonga, and enable the exercise of kaitiakitanga.

The incorporation of Mātauranga Māori into aquatic ecology management and monitoring will be progressed collaboratively with Ngāti Waewae, with a focus on areas of shared interest identified in the Cultural Impact Assessment. These include opportunities to enhance historically impacted waterways within the Project area (e.g., Cascade Creek), management of the land–water interface (including stream reinstatement and wetland or tarn creation), and the provision of kōura passage. Engagement with Ngāti Waewae will also provide opportunities for iwi to contribute to project outcomes, including design, implementation, monitoring, and interpretation of results.

Monitoring frameworks will integrate Mātauranga Māori alongside other scientific approaches. This may include the development and application of a Cultural Health Index for waterways in partnership with Ngāti Waewae, with iwi involvement in interpretation and reporting. Monitoring methods may incorporate culturally-relevant approaches such as tau kōura (traditional kōura sampling methods), undertaken in accordance with the tikanga of Ngāti Waewae. Where used, these methods will complement standard ecological survey techniques and may contribute to the development of indices such as catch-per-unit-effort measures for kōura.

Findings from Project-related research, including kōura passage and movement ecology investigations (e.g., laboratory trials and field studies), will be shared with Ngāti Waewae and will inform both management practice and the wider knowledge base. Opportunities to support such research, including through collaboration or funding (e.g., postgraduate research), will be explored.

Particular attention will be given to taonga ika species identified in the Cultural Impact Assessment (Table 2), including kōura (freshwater crayfish) and tuna (longfin and shortfin eels), which are important mahinga kai species in the catchments associated with the Project area. Monitoring programmes will be designed to assess the condition, distribution, and long-term trends of these species and their habitats.

Adapative management frameworks within the AEMP will include a response approach to address any identified declines in aquatic ecosystem health or mahinga kai species. This will ensure that adaptive management measures are implemented in a timely manner to avoid, remedy, or mitigate adverse effects and to support the ongoing health of freshwater ecosystems.

Overall, the integration of Mātauranga Māori into the AEMP will support a holistic approach to aquatic ecosystem management, recognising cultural values alongside ecological function, and enabling Ngāti Waewae to exercise kaitiakitanga through ongoing involvement in monitoring, interpretation, and decision-making.

Table 2: Taonga Ika species in the Kawatiri/Buller catchment area (as listed in Cultural Impact Assessment). Note: the dominant species of kōura in the Waimangaroa River and Whareatea River catchments is Paranephrops planifrons.

Ingoa Māori	Common name	Species name
Īnanga	Whitebait	*Galaxias* spp. (juveniles)
Īnanga	Īnanga	*Galaxias maculatus* (adults)
Kōkopu	Short-jaw kōkopu	*Galaxias postvectis*
Pako	Common bully	*Gobiomorphus cotidianus*
Kōkopu/Hawai	Giant bully	*Gobiomorphus gobioides*
Tipokopoko	Upland bully	*Gobiomorphus breviceps*
Paraki/Pōrohe	Common smelt	*Retropinna retropinna*
Tuna heke	Longfin eel	*Anguila dieffenbachia*
Tuna	Shortfin eel	*Anguila australis*
Kanakana	Lamprey	*Geotria australis*
Kekewai/kōura	Freshwater crayfish	*Parenephrops zealandicus*
Kōuraura/Mowhitiwhiti	Freshwater shrimp	*Paratya curvirostris*

4.0 Stakeholder Consultation

BRL is committed to active engagement with stakeholders to understand the operational effects of BPCP activities upon the environment.

DOC, WCRC, BDC and Iwi have been consulted during the preparation of this draft Plan with comments received considered in the development of this Plan with the view of mitigating risks associated with the operation of BPCP.

Bathurst recognises that a range of stakeholders, both internal and external to its operations, have economic, environmental, social, and cultural interests in BPCP. Bathurst retains responsibility for stakeholder relations and aims to ensure that it engages with stakeholders in a clear, open and honest manner, both as part of regular operations and during the statutory processes associated with application for and maintenance of resource consents, permits, access arrangements and licences.

BPCP's Environment and Community Team is responsible for relationships primarily relating to the mine's resource consents, permits, access arrangements, licences, and the other environmental performance undertakings.

A draft of this Plan was supplied to relevant regulators and iwi as part of the FTAA pre-consultation engagement.

The stakeholder consultation regarding associated technical reports and this Plan has been summarised in the Stakeholder Consultation section of the BPCP FTAA main application.

Once this Plan is approved, this section will document all future stakeholder engagement undertaken for subsequent versions.

5.0 Management Approach

5.1 Environmental Setting

The Buller Plateaux comprises high-rainfall, steep headwater catchments with many naturally acidic (pH ~4–6) streams with low conductivity, low nutrients and high water clarity. Upland vegetation is primarily low-growing scrub, with areas of tussock, forest and wetland vegetation. The lower slopes of the Plateaux are covered with temperate forest. Stream flows on the Buller Plateaux are highly variable, with frequent flood events and a flashy hydrology due to low soil infiltration and impervious bedrock.

Diverse bryophyte and macroinvertebrate communities are found in many waterways across the Buller Plateaux, including some Threatened /At Risk species. Fish are typically absent from streams in the upper catchments due to physical barriers, and kōura is the top predator. However, diverse fish communities are present in the lowland reaches of the Whareatea and Waimangaroa River catchments.

Historic underground mining on the Buller Plateaux has led to legacy AMD inputs in parts of Whareatea (e.g., Rapid Stream below the Sullivans adit), Waimangaroa River and Cascade Creek headwaters, resulting in very low pH and elevated metal concentrations with iron and/or aluminium precipitates coating stream substrates in some reaches. Water quality and habitat are most degraded in and just below these AMD-affected reaches with depauperate communities comprising of a few tolerant taxa (algae, bryophytes, macroinvertebrates). Water quality improves downstream of the historic AMD contamination via tributary dilution, but ecological values remain low. Farther downstream, macroinvertebrate diversity increases and native fish can be present.

The aquatic ecology of the Whareatea River, Waiamangaroa River and Cascade Creek catchments are described in detail in ESNZ (2026). A brief summary of each catchment follows.

Whareatea River catchment: Streams in the Whareatea catchment are typically small, steep waterways that are naturally acidic. Upper tributaries have low pH (~4–5), low conductivity, and low nutrient conditions. These headwater streams flow through intact native vegetation and provide high-quality habitat for diverse aquatic biota adapted to the natural acidity. The headwaters support high to very high ecological values. Periphyton growth is minimal due to low pH and shading, but bryophytes (mosses and liverworts) are common on submerged rocks, including several rare species.

Macroinvertebrate communities in unimpacted sections are diverse and dominated by acid-tolerant taxa with mayfly nymphs (*Deleatidium* spp.) abundant at pH 4–5. The upper catchment tributaries are fishless resulting in kōura being widespread and often abundant. Historical AMD inputs from the abandoned Sullivan Mine adit to Rapid Stream (a tributary to the Whareatea river) have led to very low pH (~3), high dissolved metals, and metal precipitates on the streambed. Macroinvertebrates are represented by only the most tolerant taxa (chironomids, oligochaete worms, and the caddisfly *Oxyethira*); kōura are entirely absent in highly acidic AMD-affected reaches. Farther downstream water quality conditions improve with tributary dilutions but ecological values in Rapid Stream remain low.

In the lower Whareatea River, fish are present (and replace kōura as the top predator) with at least seven native fish species recorded (kōkopu/shortjaw kōkopu, kōaro, giant kōkopu, banded kōkopu, bluegill bully, redfin bully, tuna/shortfin eel, and tuna heke/long fin eel); all but one of these species (tuna/shortfin eel) are classified as Threatened or At Risk under the New Zealand Threat Classification System (NZTCS).

Overall, the Whareatea catchment exhibits high to very high ecological values in its upper reaches — where AMD impacts are absent — and supports diverse communities including some uncommon macroinvertebrate species and several rare bryophytes.

Waimangaroa River catchment: The Waimangaroa catchment contains largely unmodified headwater streams, with isolated areas affected by historic underground mining[1]. Upper tributaries draining sandstone and coal measures of the Stockton and Denniston Plateaux are naturally acidic (pH ~4.0–5.5) with very low conductivity (< 40 µS/cm) and high shading, while eastern granite-draining streams are circumneutral (pH >6.5). All upland streams have low contaminant levels, though naturally elevated dissolved aluminium concentrations can occur under low pH conditions.

Stream habitat is dominated by shaded riffle–run sequences over cobbles and boulders. Periphyton is sparse (due to high vegetation cover and shading), whereas diverse bryophyte communities are widespread. Macroinvertebrate assemblages are diverse and dominated by mayflies, stoneflies, caddisflies and chironomids. Upper catchment streams are fishless, with kōura widespread and common to abundant.

The mainstem of the Waimangaroa River becomes less acidic in lowland reaches (pH rising to ~6.2) while conductivity remains low. The lower Waimangaroa River supports at least eight native fish species (īnanga, kokopu/shortjaw kōkopu, kōaro, banded kōkopu, bluegill bully, redfin bully, torrentfish, tuna/shortfin eel, and tuna heke/long fin eel); all but one of these species (tuna/shortfin eel) are classified as Threatened or At Risk.

Overall, the catchment has high to very high ecological values (i.e., high species diversity, including rare and Threatened/At Risk species), with only localised reductions in values in areas influenced by historic mining discharges.

Cascade Creek catchment: Upper Cascade Creek is heavily impacted by drainage from several historic underground mine adits. Headwater reaches have very low pH (~4.1), elevated dissolved metals and substrates coated with metal hydroxide precipitates, resulting in severely degraded habitat. Biological communities are depauperate: periphyton is virtually absent, few bryophytes are present, macroinvertebrate diversity is very low, and kōura and fish are absent.

Water quality conditions improve in Cascade Creek downstream of unimpacted tributaries that contribute circumneutral water. Within 2–3 km of the headwaters, pH rises above 5, and below the Rochfort Creek confluence pH reaches ~7.5. These lower reaches have clean riffle–run habitat, improved water quality, and moderate to high macroinvertebrate diversity. Although kōura remain scarce, two native fish species (kōaro and kokopu/shortjaw kōkopu) have been recorded in the lower reaches.

[1]Including AMD discharge from the Iron Bridge historic underground workings on the mainstem of the Waiamangaroa River downstream of the BPCP footprint, as shown in Figure 4 (Section 6.2).

Overall, the Cascade Creek catchment ranges from severely impaired in the historically mined upper reaches to higher ecological values downstream where water quality and habitat improves.

5.1.1 Species of significance

Bryophytes

Bryophyte (mosses and liverworts) communities on the Buller Plateaux are diverse, with 126 taxa recorded across 50 streams (Hogsden and Hickey 2025). Several threatened and at risk bryophytes have been recorded in recent baseline surveys including: *Allisoniella scotti* (liverwort; Threatened – Nationally Critical); *Acromastigum vertical* (liverwort; Threatened – Nationally Vulnerable), *Telaranea inequalis* (liverwort; Threatened – Nationally Vulnerable); *Herzogianthus vaginatus* (liverwort; At Risk – Naturally Uncommon); *Isotachis westlandica* (liverwort; At Risk – Naturally Uncommon); *Pallavicinia rubristipa* (liverwort; At Risk – Naturally Uncommon); *Blindia immersa* (moss; At Risk-Naturally Uncommon); and *Fissidens rigidulus* (moss; At Risk – Naturally Uncommon).

Macroinvertebrates

Macroinvertebrates communities on the Buller Plateaux are generally diverse, with assemblages comprised primarily of mayflies, stoneflies, caddisflies, and chironomids. Species of conservation significance recorded in baseline surveys for BPCP include the stonefly *Omanuperla hollowayae* (Threatened – Nationally Critical), the caddisfly *Kokiria miharo* (At Risk – Declining), the stonefly *Megaleptoperla grandis* (At Risk – Naturally Uncommon), and the freshwater crayfish (kōura) *Paranephrops zealandicus* (At Risk – Declining).

The majority of kōura on the Buller Plateaux are the South Island species *Paranephrops planifrons* (Not Threatened), which are known from >80 waterways across the Plateaux. Kōura on the Buller Plateaux may constitute an ecologically significant unit (as a genetically distinct population), which is important for conservation purposes. Kōura are considered taonga and an important mahinga kai species.

Fish

Diverse fish communities are present in lower reaches of Buller Plateaux catchments, including several species of conservation significance: īnanga and kokopu/shortjaw kōkopu (Threatened – Nationally Vulnerable), tuna heke/longfin eel, giant kōkopu, and kōaro (At Risk – Declining), and banded kōkopu, torrentfish, bluegill bully, and redfin bully (At Risk – Naturally Uncommon). Fish species considered taonga in the Kawatiri/Buller catchment area are listed in Table 2.

5.2 Aquatic ecology effects

Potential adverse effects of the Project on aquatic ecology during construction, operation and closure phases were assessed in ESNZ (2026) and are described below by Project phase. Management and controls of adverse effects are embedded through design, construction methodology, operational procedures, closure planning, and adaptive management. Water quality guidelines for the BPCP (Hickey 2026) were established for the protection of macroinvertebrates and fish.

Outcomes from the effects assessment and proposed effects management measures are summarised below in Sections 5.2.1 and 5.3.

5.2.1 Environmental effects on and risks to aquatic ecology

In the ESE, MFS and UWHR sub-areas, the proposed built environment will include site infrastructure areas, water treatment plants, water treatment systems (e.g., sumps, polishing ponds), mining staging areas, mine pits, and access/haul roads, engineered landforms (ELFs) and ultimately, rehabilitated landscapes that will be sympathetic to the surrounding terrain.

Mining and associated activities have the potential to alter the physical and chemical characteristics of local and downstream waterways across all phases of BPCP, from construction and operation through to closure and post-closure. These changes can affect aquatic habitats and biodiversity through mechanisms such as habitat loss, sediment and contaminant inputs, altered hydrology, and changes in water quality. The key potential adverse effects and risks associated with the Project are summarised below, by phase.

Construction effects relate to the creation and establishment of infrastructure areas and access/ haul roads to establish the site for operational use and include:

- aquatic habitat disturbance and alteration;
- sediment mobilisation, release and deposition;
- water quality changes (acidic and metalliferous drainage (AMD) and contaminated water risks);
- flow alterations during stream diversions and disturbance during instream works (including culvert installation) potentially causing displacement or mortality of freshwater fauna;
- passage barriers for freshwater fauna (kōura) at culverts;
- spread of didymo; and
- noise, vibration and light disturbances from heavy machinery and lighting structures.

Operations effects relate to mining activities and the on-going operation and maintenance of Project infrastructure including water treatment systems, coal storage and transport on haul roads, development and progressive rehabilitation of ELFs and include:

- stream habitat alteration and removal/permanent loss of stream habitat;
- sediment erosion and inputs;
- water quality changes (AMD and contaminated water risks);
- elevated pH conditions downstream of passive mine water treatment systems for bryophytes;
- release and deposition of coal fines;
- hydrological alterations, including from treated discharge;
- loss of riparian vegetation with land clearance;
- nutrient enrichment;
- noise, vibration and light disturbances from heavy machinery and lighting structures; and

- spread of didymo.

Closure effects relate to on-going risks to downstream water quality due to water management (AMD) and final landform establishment (sediment), transition from operational to post-mining hydrological regimes, habitat establishment and closure waterbodies, including:

- water quality changes (AMD and contaminated water)
- sediment erosion and inputs;
- altered stream morphology and hydrology; and
- slow ecological recovery following stream reinstatement.

To mitigate and manage these effects, the BPCP will implement a set of management measures including avoidance and minimisation of stream disturbance, erosion and sediment controls, AMD and water quality management, progressive rehabilitaton and adaptive management informed by ongoing water quality and aquatic ecology monitoring. Stream habitat removed will be reinstated and stream habitat rehabilitated to support aquatic communities.

5.3 Management measures

A suite of environmental management plans for the BPCP set out a comprehensive set of measures to manage potential adverse effects on aquatic ecology related to sediment, water quality, habitat loss, AMD minimisation/treatment and rehabilitation. An overview of these effects and management measures are summarised in Table 3. Further detail for some measures are provided in Sections 5.3.1 to 5.3.4.

Table 3: Proposed measures to manage the potential effects of the BPCP on aquatic ecology. Plan numbers are listed in Section 1.3.

Effect	Management measures	Reference in Plan
Sediment erosion, release, and deposition	Implement a suite of erosion and sediment control measures to minimise sediment inputs to waterways, including installation and maintenance of sediment retention ponds, silt fences, traps, clean water diversions, and slope stabilisation structures (e.g., contour drains, bunds, geotextiles), with culverts installed during low-flow periods. Schedule earthworks during drier conditions, apply weather-triggered stop-work protocols, and undertake regular inspection and maintenance of controls to ensure effectiveness. Use active treatment systems (e.g., modular Siltbuster) where required. Discharges must meet visual clarity standards, with accumulated sediments periodically removed and disposed of appropriately on site. Discrete or continuous water quality monitoring at selected waterway sites to meet established water quality guidelines for the protection of aquatic biota and compliance limits. Targeted deposited fine sediment monitoring during the construction phase of UWHR and MFS access road to detect and adaptively manage any changes in sediment deposition and associated risks to instream habitat and ecological values.	Erosion and Sediment Control Plan; AMD Water Management Plan

Effect	Management measures	Reference in Plan
	Use findings to inform adaptive management of sediment sources.	
Water quality changes (AMD and other contaminants)	Actively manage AMD and potential contaminants by capturing, storing, and treating all mine-affected water using appropriate active or passive treatment systems to meet Project-specific water quality guidelines, with contingency capacity to manage reduced treatment effectiveness during high rainfall events. Implement geochemical controls such as preferential use of NAF materials and targeted installation of GCL in high-risk areas (e.g., UWHR) to limit seepage, alongside routine monitoring of water quality to enable timely response to any deterioration. Manage materials carefully and encapsulate PAF materials within ELFs to minimise AMD generation. Prevent and respond to contamination risks through appropriate storage and handling of fuels and chemicals, spill prevention and containment measures, and treatment or secure disposal of contaminated water, ensuring discharged water meets suitable pH and environmental standards. Implement event-based monitoring to respond to changes in water quality and ecological conditions triggered by identified Project risks. Additional aquatic ecology monitoring and investigations will be guided by a qualified freshwater ecologist, supporting adaptive management and compliance.	AMD ELF Management Plan; AMD Water Management Plan; Water Infrastructure Design Plan; This Plan
Loss of stream extent and habitat; loss of wetland extent and habitat	Baseline ecological (pre-removal) surveys. Stream reinstatement, habitat establishment and habitat rehabilitation, including channel creation, habitat complexity and planted riparian margins to stabilise banks and provide shading. Transfer aquatic boulders (with bryophytes) and macroinvertebrates to support recolonisation and ecological recovery in reinstated streams in rehabilitated areas. Targeted monitoring after completion. Construction and monitoring of tarns.	Rehabilitation Management Plan; this Plan
Kōura habitat alteration or loss	Salvage and relocate some kōura from diverted stream sections and removed streams to suitable, undisturbed habitats prior to disturbance.	This Plan
Kōura passage barriers	Culverts will be designed (and tested) to facilitate kōura passage at mainstem and tributary crossings. Culverts will be inspected after major flood events (and at least annually) with any scour or passage issues remediated as required. Kōura passage provision monitoring following culvert installation.	This Plan
Bryophyte community changes with elevated pH during passive treatment	Monitoring and adaptive management, including routine bryophyte monitoring downstream of mussel shell reactors (MSRs), experimental trials and the use of trigger levels to guide timely responses. Monitoring data will be periodically reviewed to refine pH limits and inform ongoing management actions.	This Plan
Noise and vibration disturbances	Avoid heavy machinery use, and blasting near streams to be retained, to the extent possible. Maintain a conservative disturbance setback distance (e.g., 30 m to 100 m) from	This Plan

Effect	Management measures	Reference in Plan
	streams to be retained, where practicable, to minimise risk of sediment disturbance, bed mobilisation and impacts on biota.	
Light disturbances	Artificial lighting structures will be designed, where practicable, to reduce attractiveness to adult winged insects. This includes: use of minimum light required for safe access and operations, use of warm light fixtures (< 3000 K) that filter out UV and blue wave lengths (where possible), directing light onto work surfaces (e.g., haul roads, infrastructure areas, pits) rather than into surrounding habitats or into the night sky; equipping lights with shields to prevent stray beams scattering into the sky. For mobile lighting plants, ensure that temporary towers can be adjusted and lowered (where appropriate for safety, access and operations) to minimise sky glow.	Lighting and Visual Amenity Plan/ This Plan
Flow and habitat alterations for stream diversions	Minimum flows will be maintained in diversion channels to protect habitat and avoid dewatering, with diversions designed and operated to maintain baseflows and manage large discharges during low-flow conditions.	Water Management Plan
Loss of riparian vegetation	Progressive rehabilitation of mined areas near streams, including vegetation direct transfer (VDT) to replace vegetation. Monitoring of vegetation cover to track reestablishment success and meet cover criteria.	Rehabilitation Management Plan
Nutrient enrichment and periphyton blooms	Nutrient monitoring with adaptive management for relevant activities (e.g., blasting, fertiliser application). Monitor periphyton cover in downstream waterways to ensure any increase in nutrients (should this occur) does not result in stream eutrophication.	AMD Water Management Plan; This Plan
Didymo incursion and spread in Project waterways	Regular inspection of instream and near stream equipment (e.g., drills, pumps, hoses, sampling devices) and waterbody (natural and artificial) monitoring for early detection. Annual aquatic ecology monitoring surveys and eDNA testing. Ad hoc reporting by all personnel of pest species detection. Didymo will be managed using surveillance and Check-Clean-Dry protocols.	Biosecurity Management Plan; This Plan
Poor habitat and water quality in closure waterbodies	Littoral habitat quality and summer anoxia risks are mitigated by proposed pit lake design. Monitoring of littoral habitat development, summer dissolved oxgyen profiles, aquatic communities and outflow water quality spot checks during spill events in early years. Measures implemented and monitoring required are dependent on ecosystem service(s) to be provided by closure waterbody.	This Plan

The significant residual adverse effects of the BPCP on aquatic ecology, where effects cannot be avoided, minimised or remedied, were addressed in ESNZ (2026). That report also outlines the measures proposed to compensate for the significant residual effects on aquatic ecology associated with the Project.

5.3.1 Pre-commencement

Prior to the construction phase, work will be completed to build on the existing aquatic ecology baseline dataset at proposed monitoring sites. Culvert design will be completed and tested for kōura passage provision before the installation of any culverts.

5.3.1.1 Aquatic ecology baseline surveys at monitoring sites

To build on existing baseline data for the proposed monitoring sites and confirm current conditions before the Project begins, additional aquatic ecology monitoring will be undertaken, such that three surveys are completed at each proposed site by March 2027 (see Section 6.4). Surveys will include water quality, instream habitat, bryophytes, periphyton, macroinvertebrates, kōura and fish (where present) and will follow methods as described in Section 6.3.

5.3.1.2 Culvert design and kōura passage provision

Road construction for the BPCP will require approximately 60 new culverts and the replacement of some existing culverts. Culvert design will be informed by the most recent New Zealand Fish Passage Guidelines (Franklin et al. 2024) and project-specific guidance (Franklin & Crawford 2025; BRL 2026a) for all mainstem and tributary crossings. These design criteria provide for upstream kōura passage and are planned to be tested through laboratory-based trials with kōura in 2026/2027.

Pest exclusion fences to protect high value areas of terrestrial flora and fauna will be established during the Project in accordance with consent conditions and as described in Pestproof Fences (2025). These fences will cross streams and require culverts. Dispensation for the use of fence culverts will be sought under the Freshwater Fisheries Regulations. Following fence construction, a study will be undertaken to assess whether or not the pest exclusion fence culverts effectively exclude the target pest species and provide passage for kōura, where practicable. This study will be designed, implemented and reported by a Suitably Qualified and Experienced Practitioner (SQEP). The internal report will provide results on kōura passage and any recommendations for design, placement and construction specifications of culverts to be used in future pest exclusion fences.

5.3.2 Construction

To manage the potential key effects of construction on aquatic ecology, the measures and protocols set out in the Erosion and Sediment Control Plan for Land Disturbance Activities (BPCP-ENV-PLN-013), AMD ELF Management Plan (BPCP-ENV-PLN-011), AMD Water Management Plan (BPCP-ENV-PLN-010), and the Hazardous Substances Management Plan (BPCP-ENV-PLN-014) will be followed. These measures and protocols manage for sediment, AMD and other contaminants (e.g., fuels, oils) to minimise and mitigate physical and chemical changes to waterways that affect aquatic habitat and biota.

In addition, the following measures outlined in Sections 5.3.2.1 and 5.3.2.2 are to be implemented to manage kōura during instream works and ensure provision of kōura passage through culverts, where practicable.

Kōura are non-migratory and preferentially occupy low-velocity edge habitats, including stream margins, backwaters, and pools. These habitats are important for rearing. Spawning occurs between December and April, during which females carrying young are particularly vulnerable to disturbance

(Smith 2014). Kōura are often territorial and aggressive, therefore relocation of individuals needs to be done with care not to exceed the carrying capacity of the receiving environment, especially if habitat, refugia and food may be limited.

5.3.2.1 Kōura salvage and relocation during instream works

To avoid harm and minimise injury or mortality of kōura during instream works (including culvert installation, dewatering, and stream diversions), kōura salvage and relocation will be undertaken where practicable. The methods and measures described below align with best-practice principles outlined in the National Works in Waterways Guidelines (Ministry for the Environment 2021), including:

- Relocating freshwater fauna to safe and appropriate habitats;
- Avoiding or minimising disturbance and mortality of freshwater fauna;
- Avoiding, as far as practicable, alteration of natural hydrological patterns;
- Avoiding impediments to fish (kōura) passage; and
- Avoiding[2] instream works during critical spawning periods.

Prior to the commencement of instream works, the affected reach will be isolated upstream and downstream using appropriate temporary barriers (e.g. cofferdams) to prevent kōura movement into the works area. The reach will remain isolated for the duration of works and until construction activities are complete and flows are reinstated.

Kōura salvage will be undertaken by, or under the supervision of, a SQEP and will include:

- Three-pass depletion electrofishing and visual searches with hand-netting within the isolated reach prior to dewatering. Tau kōura[3] collection methods may be implemented at sites where it is deemed suitable and appropriate by mana whenua and the SQEP in advance of works.
- Relocation of salvaged kōura to suitable upstream habitat, or alternative suitable habitat if required, as assessed by the SQEP. It is expected that kōura will be transported to the relocation site by walking or driving a short distance.
- Salvage of kōura from downstream reaches where sediment disturbance is expected to be high, generally within 20–50 m downstream of the works, and extending further where visual water clarity reduction, deposited sediment, or habitat disturbance indicates potential effects, as determined by the SQEP.
- All reasonable efforts to remove kōura from the reach prior to drawdown.

[2] Given the staging of instream works, it will not be practicable to entirely avoid kōura spawning periods. Salvage will be undertaken at this time with increased sensitivity with handling and relocation protocols to minimise stress.
[3] Tau kōura is a traditional Māori kōūra harvest method and may be used and adapted as advised by iwi and undertaken in conjunction with modern methods for kōura capture as noted above. Tau kōura involves the placement of fern bundles (known as whakaweku in the Te Arawa and Taupō lakes, made of bundles of bracken fern *Pteridium escultentum*) on the stream bed that are colonised by kōura over a minimum of two (and up to four weeks) and retrieved with a large stop net to collect kōura. Tau kōura methods are described by Kusabs et al. (2018) and will be varied for local conditions and tikanga.

- A dedicated observer present during dewatering to monitor for kōura movement or stranding, with any exposed individuals promptly captured and relocated.
- Measures to prevent kōura entrainment in pump intakes (e.g., mesh covers with an aperture of no more than 5 mm).

Handling, release, and animal welfare measures

Kōura will be handled carefully to minimise stress and injury and will be released as soon as practicable into suitable habitat with slow flowing water and appropriate substrate and cover (e.g., cobbles, boulders, undercut banks, large wood). Captured kōura will be counted, measured for body size, and held in 20 L containers partially filled with clean aerated[4] stream water for no more than one hour. The biomass of kōura in containers will be limited to 50 g/L. The water temperature in holding containers will be checked every 20 minutes and kept below 15°C by replacement with fresh stream water. These measures are in place to avoid additional stressors on kōura held in containters, including temperature fluctuations and reduced oxygen availability.

Recording and reporting

A record of kōura salvage and relocation will be maintained for each location and will include:

- Date, method and location of capture, including GPS coordinates;
- Species, number of individuals and condition of kōura salvaged, including whether eggs were present (see Appendix A);
- Size (as orbit-carapace length[5]; see Appendix B);
- Release location, including GPS coordinates and general habitat description; and
- Any mortality observed during kōura salvage and relocation.

These records will be entered into the New Zealand Freshwater Fish Database (NZFFD) within six months of completion of instream works and included in post-works annual environmental reporting. The Annual Water Quality and Aquatic Ecology Monitoring Report will also detail the final methods undertaken for the kōura salvage and relocation (based on the methods described above) and be provided to the consent authority and mana whenua by 31 August for works undertaken in the previous 12-month period from 1 July to 30 June (i.e., hydrological year).

5.3.2.2 Culverts and kōura passage provision

Regular inspection of culverts, and any required maintenance, will be undertaken at least annually and following major flood events, to address any scour, kōura passage constraints or other maintenance issues. To confirm that culverts are functioning as intended and providing kōura passage, selected sites will be monitored over time. Monitoring will include the use of mark-recapture techniques and assessment of kōura abundance and body size upstream and downstream of the culverts (See Section 6.7). If monitoring demonstrates that culverts are not functioning as expected, a

[4] Aeration will be provided by a battery-powered aerator (e.g., battey-powered aquarium air pump).
[5] To provide information on kōura body size and population structure.

SQEP or freshwater ecologist will undertake an investigation to identify the cause(s) and implement appropriate remedial actions to improve kōura passage.

Monitoring results will be provided in the Annual Water Quality and Aquatic Ecology Monitoring Report issued to consent authorities and Ngāti Waewae by 31 August.

5.3.3 Operations

To manage the potential key effects of operations on aquatic ecology, and in accordance with the consent conditions, the measures and protocols set out in the Erosion and Sediment Control Plan for Land Disturbance Activities, AMD ELF Management Plan, AMD Water Management Plan, and Biosecurity Management Plan will be implemented. These measures and protocols manage for sediment, AMD and other contaminants to minimise and mitigate physical and chemical changes to waterways that affect aquatic habitat and biota. Progressive rehabilitation measures for landforms and riparian areas near streams are set out in the Rehabilitation Management Plan.

In addition, measures will be undertaken to salvage, relocate and provide passage for kōura, as per best practice guidelines and described above for the construction phase (Sections 5.3.2), to study bryophyte community response to changes in pH with treated discharge following the commissioning of passive treatment systems, specifically the mussel shell reactors (MSRs), and to support the restablishment of bryophytes and macroinvertebrates communities (including kōura) to reinstated streams.

5.3.3.1 Kōura salvage, relocation and passage provision

Kōura salvage and relocation during operations (for complete removal of stream habitat in streams that will be lost to mining) will follow measures described in Section 5.3.2, except kōura will be relocated into another habitat (in the same or nearby catchments) assessed as suitable by a freshwater ecologist and iwi. It is recommended that some are moved into selected unimpacted headwater streams or into the mainstem of Whareatea or Waimangaroa Rivers and some to natural and created tarns on the Stockton Mine to trial habitat suitability for future considerations in ESE and MFS constructed tarns. Transfer of kōura to the Stockton tarns will require a Ministry for Primary Industries (MPI) permit for Transferring and releasing freshwater species.

During operations, culverts will continue to be inspected after major floods (and no less than annually) so that any habitat scour or kōura passage constraints or other maintenance issues are remediated as they arise.

5.3.3.2 Bryophyte pH tolerance studies and bryophyte surveys during passive treatment

To address uncertainties regarding how bryophyte communities respond to changes in water quality associated with passive treatment, specifically treated discharge from MSRs, a programme of targeted investigations, monitoring, and adaptive management will be implemented prior to commissioning of the first MSRs.

There is currently limited information regarding how established bryophyte communities will respond to changes in pH downstream of MSRs, where naturally slightly acidic waters (typically pH 4.5–5.5) receive neutral to slightly alkaline discharge (pH ≥7). In particular, the persistence of bryophyte mats under sustained elevated pH conditions is uncertain (Hogsden and Hickey 2025). Targeted

investigations will be undertaken to improve understanding of bryophyte tolerance to these conditions.

Investigations will include experimental trials designed to evaluate bryophyte responses to sustained exposure to pH 6.5–7.5 waters alongside field-based assessments of bryophyte communities downstream of existing MSRs (e.g., Whirlwind Stream, Stockton Mine) to inform expectations under comparable conditions. Results from this work will then be available to inform adaptive management of the treatment and discharge regime (see below).

Bryophyte MSR monitoring surveys will be undertaken at selected reference and compliance sites, with initial bryophyte cover surveys conducted at three-month intervals, initially, during the early stages of passive treatment. Site selection will take into account whether passively treated water is entering upstream of monitoring locations. Baseline data for selected sites will be available from the annual monitoring programme (see Section 6.5). The surveys will track changes in bryophyte cover and condition over time. Further detail on methods and reporting is provided in Section 6.9.

The pH compliance range of 4.5–7.0 (assessed as a 95th percentile of monitoring data) will be applied during the initial operational period (Hickey 2026). Trigger levels were established to identify early signs of adverse effects on bryophyte communities (Table 4). Any notable declines in bryophyte cover will trigger further investigation, including assessment of species composition, to determine the cause of change and the need for mitigation or management intervention.

Table 4: Trigger Action Response Plan (TARP) for management of bryophytes during the passive treatment phase

Trigger	Action
Level 1	
Percentage cover of bryophytes ≥50% of site maximum (from baseline monitoring)	Continue bryophyte MSR monitoring surveys; Check for observable changes in site conditions (e.g., flow, shading, sediment); Report results to consent authorities; and Summarise bryophyte MSR survey results in the Annual report.
Level 2	
Percentage cover of bryophytes <25 to 50% of site maximum (from baseline monitoring).	Actions as for Level 1 PLUS: Review, and if necessary, refine survey programme (e.g., frequency); Engage relevant technical specialists to investigate potential causes and recommended management actions; Confirm water quality and flow conditions are suitable and implement remedial actions, if required; and Collect representative bryophyte samples for identification to assess changes in community composition.
Level 3	
No obvious living bryophytes	Actions as stated for Level 2 PLUS: Immediately notify relevant regulatory authority, BRL Environment Manager, and relevant technical specialists; Develop a site-specific plan for management in consultation with technical specialists and regulatory authorities within 1 month (pending stakeholder availability).

Where surveys indicate that bryophyte communities are adversely affected by elevated pH or other water quality changes, adaptive management measures will be implemented in accordance with the AMD Water Management Plan (BPCP-ENV-PLN-010). These measures may include operational control of discharge pH (e.g., through acid trimming) or other treatment adjustments. Additional mitigation options, such as bryophyte transfer/relocation, may also be considered where appropriate and confirmed by a freshwater ecologist. This could include the transfer of acidophilic (i.e., acid-preferring) bryophytes on boulders from passively treated streams to naturally acidic reference streams, including species of significance (e.g., *Blindia imersa*; see Hogsden and Hickey 2025). The effectiveness of these measures will be monitored, and management approaches refined iteratively to achieve acceptable ecological outcomes. Data from byrophyte surveys, investigations and monitoring will be used to inform adaptive management and will reported in the Annual Water Quality and Aquatic Ecology Monitoring Report.

5.3.3.3 Stream reinstatement and rehabilitation

Following completion of mining operations and progressive rehabilitation of the mined landforms during the operations and closure phases, the extent of stream removed during the Project will be reinstated (to ensure no net loss of stream extent) in the ESE and MFS sub-areas on the Denniston Plateau. Stream reinstatement will occur progressively as mining advances and completed areas become available for rehabilitation.

Initial reinstatement works will focus on establishing stream channels and channel structure, with habitat features added where practicable at the time. Hydrological reconnection and additional habitat enhancement will be undertaken as rehabilitation progresses. Reinstated streams will ensure no net loss of stream extent and will be designed to provide diverse aquatic habitats with ecological values and functionality comparable to those that were removed due to mining.

Streams reinstatement will be undertake with the aim of achieving these high-level objectives:

1. *Restore hydrological connectivity*: Re-establish natural flow pathways to maintain upstream–downstream linkages and support catchment-scale water movement.
2. *Recreate natural channel morphology*: Design and construct stream channels that mimic pre-disturbance dimensions, sinuosity, gradient, and substrate composition (to the extent practicable) to promote stability and ecological function.
3. *Re-establish riparian and aquatic habitat*: Provide suitable conditions for colonisation by native flora and fauna through riparian planting and addition of instream habitat features (e.g., woody debris, riffle-pool sequences).
4. *Improve water quality and habitat stability*: Implement measures to reduce erosion and maintain stream channel and bed stability (e.g., riparian planting, use of appropriately sized substrates in stream channels) to provide suitable habita for aquatic biota typical of the high-energy streams on the Buller Plateaux.
5. *Enhance biodiversity and ecosystem services:* Support recovery of bryophytes, macroinvertebrate communities, and riparian wildlife, contributing to overall ecological catchment health.

6. *Ensure long-term stability and resilience:* Incorporate design elements that withstand variable flow regimes and climate impacts, reducing maintenance requirements.

7. *Meet regulatory and cultural obligations*: Alignment with environmental legislation, resource consent conditions, and cultural values, including recognition of mana whenua perspectives on freshwater ecosystems.

Design characteristics for reinstated streams are outlined in detail in the Rehabilitation Management Plan (BPCP-ENV-PLN-002) and include the following:

- integration of stream channels within rehabilitated catchments;
- incorporation of habitat features to provide hydraulic diversity and habitat complexity and (e.g., riffle-run-pool sequences, variable substrate sizes, woody material); and
- restoration of riparian margins using planting and vegetation direct transfer (VDT) to stabilise banks, provide shading and contribute organic inputs.

While the objectives and design characteristics guide reinstatement, not all elements may be achievable in all streams due to site-specific constraints. Accordingly, closure criteria focus on establishing suitable habitats for flora and fauna. Bathurst will engage SQEPs to collectively design reinstated streams consistent with these objectives and requirements of consent conditions.

Stream reinstatement will be implemented as a staged process. Following channel and habitat establishment, water quality will be monitored to confirm it is suitable to support aquatic life (for details see Section 6.12.1), recognising that time may be required to flush residual acidity and contaminants from substrates. Once suitable conditions are achieved, additional habitat and ecological enhancement measures may be undertaken, including aquatic boulder transfer (as outlined in the Rehabilitation Management Plan[6]) to reintroduce bryophytes to the reinstated stream channels, and, where necessary, assisted recolonisation.

Macroinvertebrate recovery in reinstated streams may be limited where natural dispersal is constrained. In such cases, assisted recolonisation ("reseeding") may be used to accelerate recovery; however, its success depends on suitable habitat conditions, appropriate donor selection, and management of biosecurity risks. Reseeding will only be undertaken once reinstated streams are physically stable, hydraulically connected, and exhibit suitable and stable water quality and habitat, including food sources (e.g., periphyton or organic matter). Natural recolonisation will be assessed first, and reseeding will be considered only where recovery is limited. Any translocation of macroinvertebrates (including kōura) is considered an additional management measure and will be guided by a SQEP to ensure methods support successful establishment. Monitoring of reinstated streams is described in Section 6.12.1.

5.3.3.4 Tarn creation

Tarns (and wetlands[7]) will be created following progressive rehabilitation of the mined landforms in ESE and MFS sub-areas as outlined in the Rehabilitation Management Plan. Tarns will be created in small depressions and on gentle slopes on the ELFs, with VDT and planting used to establish vegetation

[6] See Rehabilitation Management Plan (BPCP-ENV-PLN-002) for aquatic boulder transfer methods and monitoring.
[7] Wetland monitoring is described in the Rehabilitation Monitoring Plan.

on the edges of tarns, and benthic substrates comprising a sediment base over rock/gravel floor to provide a better habitat for aquatic macroinvertebrates. The use of direct transfer methods (i.e., where vegetation and sediment are relocated to new, constructed tarns) can also facilitate the establishment of dispersal-limited species. Constructed tarns are common on Stockton Mine and may provide new and important habitats for aquatic macroinvertebrates adapted to slow-moving or still waters (i.e., lentic species). In contrast, streams and rivers support lotic species adapted to flowing water. Therefore, constructed tarns have the potential to support aquatic communities that are similar to nearby natural tarns (Figure 3; Watson et al. 2024). Monitoring of constructed tarns for aquatic ecology is described in Section 6.12.2.

Figure 3: A constructed tarn (TM1, left) and natural tarn (TN4, right) on the Stockton Mine in January 2024. Photos from Watson et al. (2024)

5.3.4 Closure

The closure phase will commence following the cessation of mining operations and will focus on decommissioning, rehabilitation, and the long-term management of residual effects. The overall closure strategy and intended outcomes are guided by the Conceptual Mine Closure Strategy (BPCP-ENV-PLN-050). Closure planning and implementation will be guided by a staged and progressive rehabilitation framework, with management, monitoring, and maintenance continuing until closure objectives, criteria, and consent conditions are met, and site relinquishment can be achieved.

Closure management measures for AMD, water quality, and sediment control will be implemented in accordance with the AMD ELF Management Plan (BPCP-ENV-PLN-011), AMD Water Management Plan (BPCP-ENV-PLN-010), Erosion and Sediment Control for Land Disturbance Activities Plan (BPCP-ENV-PLN-013), and Water Infrastructure Design Plan (BPCP-ENV-PLN-012) to minimise the risk of long-term adverse effects on downstream environments and achieve closure criteria. These measures are adaptive and performance-based, recognising that AMD risks are expected to reduce over time as landforms stabilise and reactive materials are isolated. Key actions include source control through ELFs, continued operation of AMD treatment systems where required, and ongoing sediment management focused on completion and stabilisation of final landforms, including capping and revegetation of ELFs. Selected water management infrastructure (e.g., settling ponds associated with MSRs) will be retained to manage residual sediment and metal precipitates prior to discharge.

Sediment controls will remain in place until vegetation is fully established and erosion risks are minimised.

Water quality monitoring will continue to confirm that criteria for the protection of aquatic ecology are met, with further investigation and adaptive management undertaken where necessary. Aquatic ecology monitoring will also continue during the closure phase (see Section 6.6).

Reinstated streams, tarns, and closure waterbodies including pit lakes will remain in the post-mining landscape. These waterbodies will be managed and monitored against closure criteria to demonstrate that they are physically and chemically stable, do not pose a risk to downstream water quality, and can support aquatic habitat or ecosystem services consistent with the agreed post-mining land use.

5.3.4.1 Closure waterbodies

Some water management infrastructure (i.e., mine voids, sumps) will remain at closure of the BPCP and will be rehabilitated as closure waterbodies with the intention of providing ecosystem services as described in the AMD Water Management Plan (BPCP-ENV-PLN-010). Ecosystem services may include water management and storage, aquatic habitat and biodiversity, or renewable energy generation and will be determined closer to the closure phase as part of mine planning.

Further detailed studies will be required to determine extent, water quality and key habitat features for each waterbody, where practicable within the disturbance footprint, and once the intended long-term purpose has been confirmed (e.g., water storage for energy generation, supporting aquatic life). Monitoring requirements for consideration are outlined in Section 6.12.3.

6.0 Monitoring

6.1 Objectives and scope

The aquatic ecology monitoring programme proposed for the BPCP includes several components that occur in different phases of the Project, from pre-commencement to closure. The monitoring programme has been informed by the Cultural Impact Assessment and matters raised by mana whenua, and provides for continued engagement and involvement of iwi in design, implementation, and reporting of monitoring, including incorporation of Māturanga Māori where appropriate.

The objectives of the monitoring are to:

- Build the existing baseline at monitoring sites (pre-commencement monitoring);
- Monitor the effects of the Project (targeted construction phase monitoring for deposited fine sediment, compliance/performance monitoring, event-based monitoring);
- Assess kōura passage provision at culverts (kōura monitoring);
- Monitor ecological recovery in Cascade Creek catchment (focused recovery monitoring);
- Monitor for changes in bryophyte community after passive treatment systems (MSRs) commissioning (targeted surveys);
- Monitor the effectiveness of stream reinstatement activities in re-establishing suitable stream characteristics and habitat for aquatic flora and fauna and ensure habitat closure criteria are met (reinstatement monitoring);
- Monitor aquatic ecology within the reinstated streams and tarns to determine if closure criteria are met (presence of bryophytes, macroinvertebrates, kōura; reinstatement monitoring); and
- Monitor closure waterbodies for water quality, littoral habitat development and colonisation by aquatic fauna (dependent on ecosystem service(s) provided);
- Ensure compliance with conditions of consent.

Aquatic ecology monitoring in streams and rivers will include water quality, instream habitat, bryophytes, periphyton, macroinvertebrates, kōura and fish (where present) at established monitoring sites. These sites were selected to provide a representation of instream habitat within and downstream of the Project area and of key activities, including mainstem and tributary sites in the ESE, MFS and UWHR sub-areas and in the Cascade Creek catchment (Section 6.2). This monitoring will involve a combination of methods as described in Section 6.3, with any variations or specifications on timing and frequency noted in Sections 6.4 to 6.11. Reinstated stream, tarn and closure waterbody monitoring and methods are described in Section 6.12.

6.2 Monitoring sites

Most monitoring will be undertaken at sites established within the ESE, MFS, and UWHR sub-areas as compliance, performance, and reference sites as shown in Figure 4 and listed below in Section 6.2.1 and 6.2.2.

Compliance sites were established to assess the downstream effects of the BPCP on water quality, with consent conditions and water quality limits outlined in the AMD Water Management Plan. These limits are based on Project-specific water quality guidelines developed to protect macroinvertebrates and fish communities, and provide a range of levels of protection (Hickey 2026). Aquatic ecology monitoring will also be undertaken at compliance sites.

Performance sites were established to assess the effectiveness of management measures and track water quality over time. Monitoring at these sites enables early detection of potential issues and supports adaptive management by informing timely adjustments to Project controls and mitigation measures. Aquatic ecology monitoring will be undertaken at selected performance sites that are also classified as longitudinal sites. Longitudinal sites have been established along a stream network with historical mining impacts that are at different stages of recovery (e.g., Rapid Stream), with monitoring used to track improvements in water quality over time. Longitudinal sites in the Cascade Creek catchment are also used for focused recovery monitoring (see Section 6.8).

Reference sites represent baseline conditions and are used to provide a benchmark against which changes in water quality and ecology due to Project activities at compliance and performance/longitudinal sites can be compared. The reference sites help distinguish natural variability or other effects (e.g., climate change) from Project-related effects and support interpretation of monitoring outcomes.

6.2.1 ESE sub-area

- V62 (V62 Stream, Whareatea River tributary) (compliance)
- V70 (V70 Stream, Whareatea River tributary) (reference)
- RAP.R1 (Rapid Stream tributary) (reference)
- W07 (Rapid Stream) (compliance)
- W08 (Rapid Stream) (performance; longitudinal))
- W09 (Rapid Stream at SH67) (performance; longitudinal)
- KEL (Wharatea River) (compliance)
- WM-3 (Whareatea River at SH67) (performance; longitudinal)
- MM1 (V8 Creek, Cascade Creek tributary) (compliance)
- DS.V37 (Cascade Creek d/s V37) (performance; longitudinal)

6.2.2 MFS and UWHR sub-areas

- 14W (Waimangaroa River) (performance; longitudinal)
- 15W (Waimangaroa River) (performance; longitudinal)
- 16W (Waimangaroa River above Smokestack) (performance for UWHR, local reference)

- 17W (Waimangaroa River d/s Deep Stream) (compliance)
- 2W (Waimangaroa River Smokestack) (compliance)
- WIL.MS1 (Wilsons Creek, Waimangaroa River tributary) (reference)
- CED.MS1 (Cedar Creek, Waimangaroa River tributary) (reference)
- BIL.L1 (Billo Stream tributary) (reference)
- BS01 (Billo Stream) (performance)
- SW01 (Deep Stream) (compliance)
- SW02 (Waimangaroa River tributary) (reference)
- SW03 (Deep Stream) (compliance)
- 18W (Waimangaroa River upstream SH67) (performance; longitudinal)

6.2.3 Cascade Creek catchment

Performance (longitudinal) sites used for focused recovery monitoring in the Cascade Creek catchment, in addition to DS.V37 listed above, are shown in Figure 5 and are listed below. Focused recovery monitoring will be undertaken at performance sites in the Cascade Creek catchment, which are also classified as compensation sites, to track early signs of ecological recovery following the implementation of Project activities intended to improve water quality (see Section 6.9).

- Upper Cascade Creek
- Cascade Creek d/s V8 Creek
- V37 Stream (Cascade Creek tributary)
- Cascade Creek 2 km d/s V38 Creek
- Cascade Creek u/s Rochfort Creek
- Rochfort Creek (unimpacted tributary to Cascade Creek, i.e., local reference conditions)
- Cascade Creek d/s Rochfort Creek

Monitoring site coordinates are provided in Appendix C, and site photographs are presented in Appendix D.

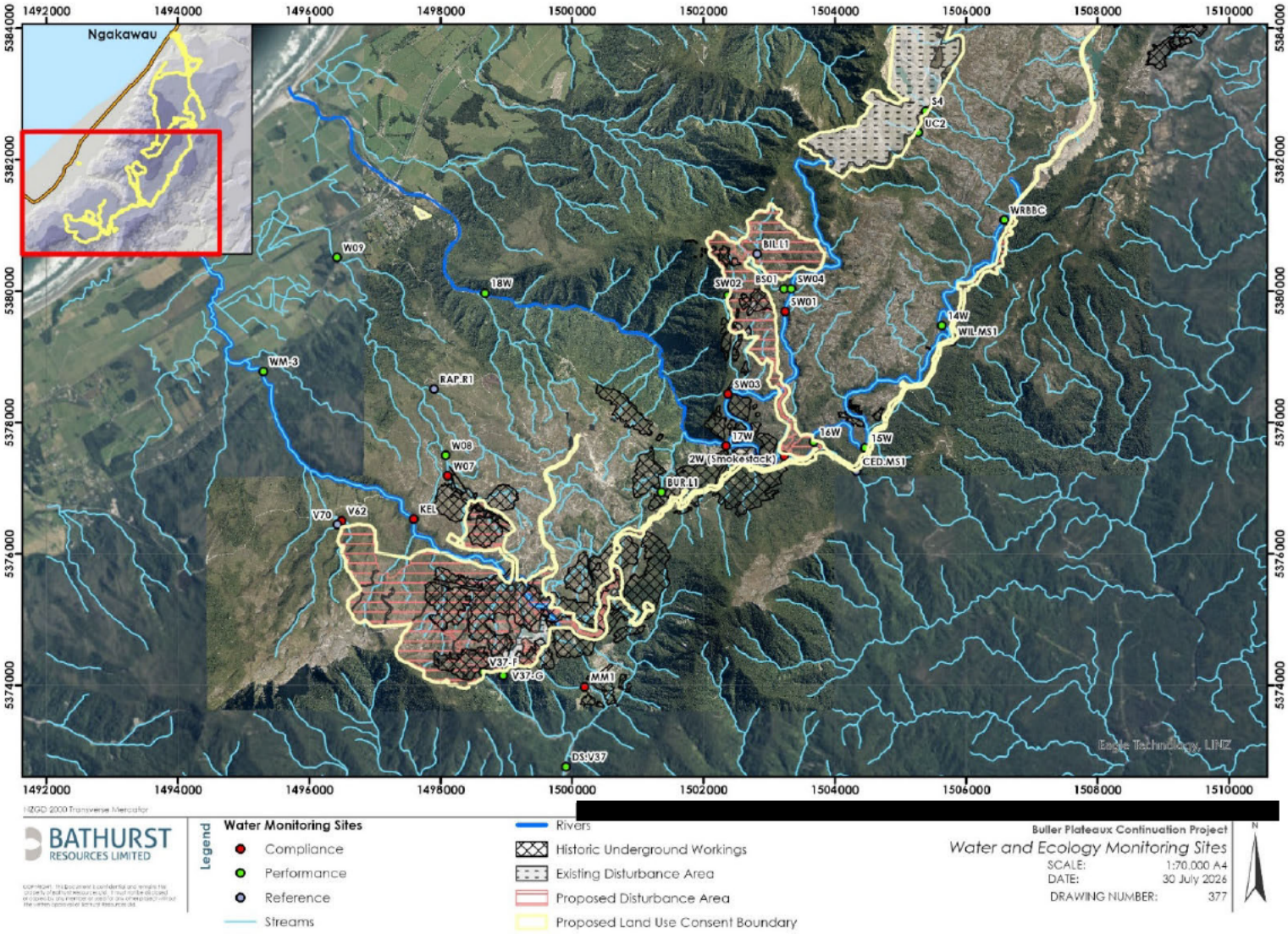

Figure 4: Water quality and aquatic ecology sites for monitoring across the ESE, MFS and UWHR sub-areas

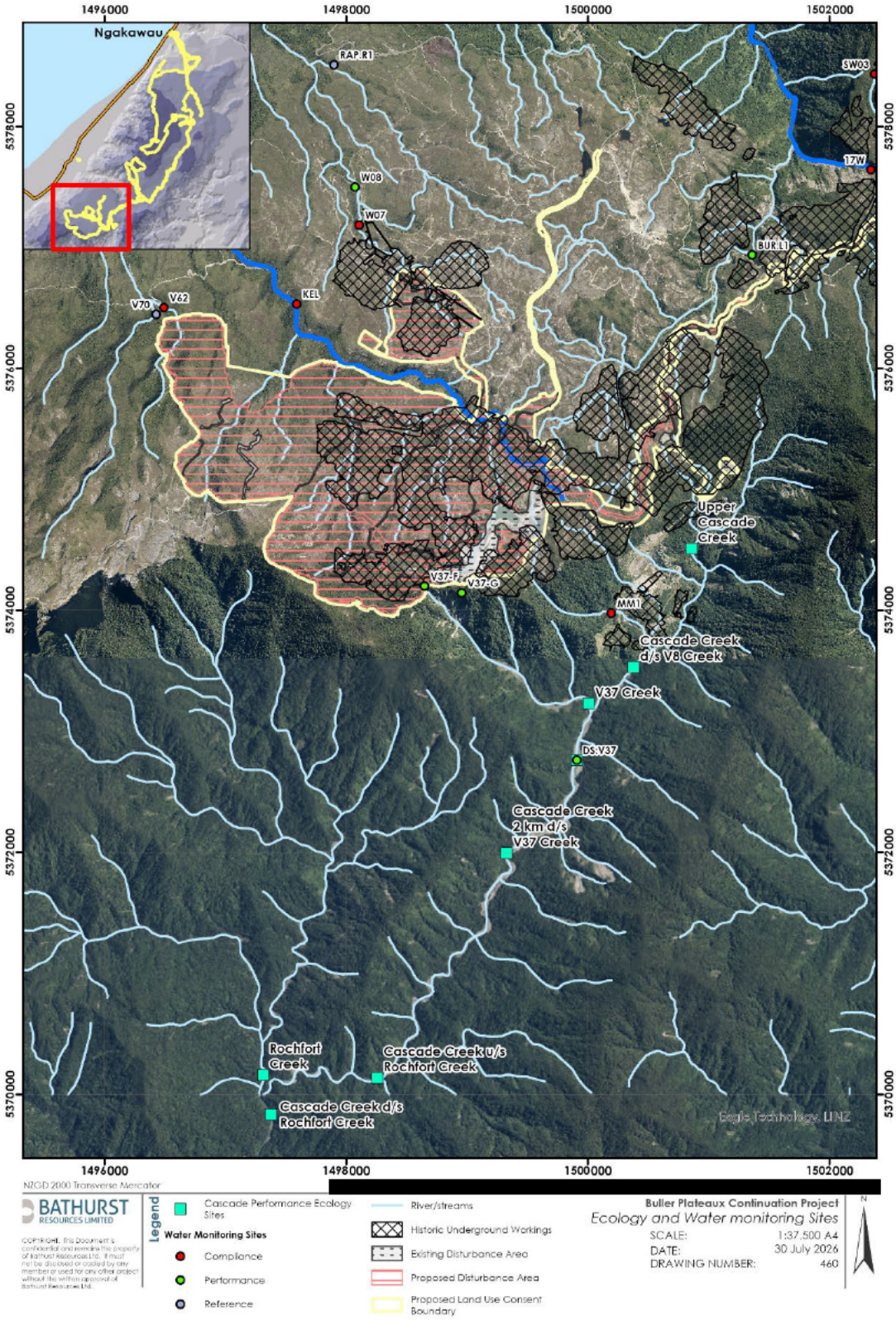

Figure 5: Additional aquatic ecology sites for monitoring in the Cascade Creek catchment

6.3 Monitoring methods

At each site, a sampling reach (20 m in length) will be established for aquatic ecology monitoring. The site coordinates will be recorded with a handheld GPS unit and photographs taken on each sampling occasion. Cultural health monitoring tools and methods (e.g., Cultural Health Index assessment) will integrated where appropriate to monitor the health of waterways as guided by iwi.

6.3.1 Water quality

Spot measurements of water quality including water temperature, pH, conductivity and dissolved oxygen using a calibrated hand-held meter will be taken. In-situ aluminium concentrations will be measured using the Aluminon™ field-based colorimetric method on an unfiltered water samples. Spot grab samples will be collected for analysis of dissolved metals (for the comprehensive suite of metals described in the AMD Water Management Plan), dissolved organic carbon (DOC), total suspended solids (TSS), dissolved nutrients (nitrate nitrogen, NO_3-N, nitrite nitrogen, NO_2-N, ammoniacal, NH_4-N and dissolved reactive phosphorus, DRP) and turbidity following NEMS (2019). Grab samples will be kept chilled and sent for laboratory analysis. Other routine water quality monitoring data collected for the Project will be made available for aquatic ecology reporting, as required.

6.3.2 Instream and riparian habitat

Instream and riparian habitat features will be assessed over the 20 m reach at each site and data on the following habitat variables will be collected, including: habitat type (percentage (%) riffle, run, pool), substrate composition (% cover: bedrock, boulder, cobble, gravel, silt/sand/mud), organic matter composition (% cover: macrophytes, moss, algae, woody debris and leaves), metal precipitates presence and composition (% cover of thin/med/thick, orange/silver/other), shade (using a densiometer), flow (high, low or base), depth profile and riparian habitat (bank stability, % bank vegetation cover and dominant species). Methods and protocols for assessing the instream and riparian habitat features listed above are described in Section 4.1 of NEMS (2022a) and outlined in P2 protocols in Harding et al. (2009).

6.3.3 Periphyton and bryophytes

Visual assessments of periphyton cover will be made following the approach, protocol and cover types set out in NEMS (2022b). Briefly, percentage cover of each type of periphyton will be estimated at five points on each of four transects using an underwater viewer, for a total of 20 points per site. On smaller streams where channel width is not sufficient for five points, more transects with fewer points on each will be completed to achieve 20 points per site. Percentage cover of no algae (bare rock) and bryophytes will also be estimated at each of the 20 points per site as part of the visual assessment. Photographs will be taken through the underwater viewer to supplement visual cover assessments and to illustrate any changes in cover over time.

Representative bryophyte samples will be collected by visually inspecting each site during the estimates of percentage cover and from other habitats present (e.g., exposed boulders and cobbles, overhanging and undercut banks, etc.). Bryophyte samples will be kept chilled in the refrigerator and identified by a SQEP to determine community composition and taxa richness.

6.3.4 Macroinvertebrates

Macroinvertebrates will be collected with a kick net (250 µm mesh) following the semi-quantitative sampling approach to capture all representative mesohabitats (e.g., riffle, run, bedrock, bank margins/edge vegetation, submerged woody debris) in the reach as set out in NEMS (2022a). One composite kick-net sample will be collected comprising between four and eight unit efforts[8] from different mesohabitats in proportion to their abundance across the monitoring reach. Samples will be preserved in isopropyl alcohol or ethanol (at least 70–80% concentration in container) upon completion of sample collection in the field. Samples will be processed following protocol P3 (Full count with subsampling) as outlined in NEMS (2022a). Macroinvertebrate data will be used to describe community composition and calculate the following metrics which provide an indication of stream health:

- Ephemeroptera, Plecoptera, Trichoptera (EPT) taxa richness[9]
- % EPT abundance
- Macroinvertebrate Community Index (MCI; and its quantitative variant, QMCI)
- Acid Mine Drainage Index (AMDI).

The MCI and QMCI assess stream health based on macroinvertebrate tolerance to organic pollution (Stark 1985; Stark and Maxted 2007), whereas the AMDI is an AMD specific index (Gray and Harding 2012). Interpretation tables of metric scores are provided in Appendix E. Interpretation of macroinvertebrate EPT and MCI/QMCI results should include consideration of species with known acid or metal tolerance (e.g., *Deleatidium*, *Spaniocercoides philpotti*, *Spaniocerca*, *Psilochorema*; see Hogsden et al. 2000).

6.3.5 Kōura and fish

Monitoring of kōura and fish (where present in at sites in lowland reaches) will use a combination of methods, including traditional Māori harvesting methods (e.g., tau kōura, as described in footnote 3) where appropriate.

Kōura and fish will be sampled using single-pass electrofishing with a Kainga EFM 300 backpack electrofishing machine (Earth Sciences New Zealand Instrument Systems, Christchurch) or similar, undertaken under suitable conditions, typically during baseflow and following a period of stable antecedent flows. Electrofishing will be conducted over a minimum reach length of 20 m in small streams or at least 50 m² in larger streams (or mainstem sites), with 'on time' recorded to standardise effort. All available habitat types (e.g., riffles, pools, undercut banks) will be surveyed, with electrofishing machine operators moving upstream to maximise capture efficiency. All electrofishing will be undertaken by two staff, one using a push net (1.5 m width) and the electrofishing operator with a hand-held scoop net. Traditional methods such as night-time spotlighting (rama) and the use

[8] Each unit effort shall be approximately 0.1–0.15 m^2 in area and the total sampling area shall be 0.6–0.9 m^2.
[9] EPT taxa, i.e., mayflies (Ephemeroptera), stoneflies (Plecoptera) and caddisflies (Trichoptera), are regarded as being more sensitive to changes in water quality and habitat than other aquatic macroinvertebrates and are generally considered more pollution-sensitive taxa. Macroinvertebrate communities on the West Coast are regionally diverse and include many acid- and metal-tolerant taxa. Diverse assemblages, including some EPT taxa, occur naturally in low pH streams (including pH <4.5) on the Buller Plateau; however, tolerance to low pH is dependent on low metal concentrations (Hogsden et al. 2020).

of tau kōura may be applied where suitable. The combination of survey methods ensures effective detection across a range of habitats and flow conditions.

All captured kōura will be counted, and orbit-carapace length (OCL) measured to estimate total length using established relationships (See Appendix B). All captured fish will be identified and measured for total body length. Body size measurements will be used to characterise the population structure and life stage distribution, providing insights into recruitment, growth and overall population health.

6.4 Pre-commencement baseline monitoring

Baseline surveys were completed to support the AEE for the BPCP. Data from baseline surveys informed the selection of compliance and reference monitoring sites. Additional baseline surveys will be undertaken to strengthen the existing dataset, build a more representative baseline range and better characterise natural spatial and temporal variability. This will improve the definition of reference conditions and increase confidence in impact detection, particularly at sites with fewer surveys undertaken to date (e.g., 16W). Additional surveys will be undertaken so that three surveys are completed at each site by March 2027. Surveys will include water quality, instream habitat, bryophytes, periphyton, macroinvertebrates, kōura and fish (where present) as shown in Table 5 and following the methods as described in Section 6.3.

Table 5: Summary of parameters measured in aquatic ecology monitoring

Water quality	Instream habitat	Periphyton & bryophytes	Macroinvertebrates & kōura	Fish
Water temperature	Habitat type	Periphyton cover	Macroinvertebrate metrics	Fish species richness
pH	Substrate composition	Bryophyte cover	Kōura counts	Fish counts
Conductivity	Organic matter composition	Bryophytes taxa richness	Kōura body size	Fish body size
Dissolved oxygen	Metal precipitates			
Aluminon™	Shade			
Dissolved metals	Flow			
TSS	Depth			
Dissolved nutrients				
Turbidity	Riparian cover			

6.5 Construction phase deposited fine sediment monitoring

Deposited fine sediment monitoring (DFS) will be undertaken during the construction phase in 29 streams where culverts will be installed along the UWHR and MFS Access Road. These streams occur in catchments classified as Type 4 (ephemeral forested catchment central drainage path) or Type 5 (large catchments with perennial central drainage path) (BRL 2026a).

The purpose of the DFS monitoring is to identify changes in fine sediment deposition downstream of construction activities, particularly in largely pristine tributaries, using rapid visual assessment methods used as screening tools. Where potential effects are identified, more detailed ecological monitoring will be triggered. This targeted, tiered approach complements the broader water quality

and aquatic ecology monitoring programme and is intended to ensure that any deposited sediment-related effects identified early and managed through adaptive responses to minimise ecological risk.

Streams on the Buller Plateaux typically exhibit low fine sediment cover under natural conditions (ESNZ 2026). Elevated inputs of sediment can result in unnaturally silty streambeds, reducing habitat availability and complexity by covering coarse substrates, infilling interstitial spaces used by macroinvertebrates for refuge and reproduction, and limiting food resources (e.g., periphyton). Ecological effects are expected to increase where DFS exceeds approximately 20–30% cover, with more pronounced impacts on sensitive taxa (e.g., EPT: Ephemeroptera (mayflies), Plecoptera (stoneflies), Trichoptera (caddisflies) (Clapcott et al. 2011, Burdon et al. 2013).

The streams included in DFS monitoring during the construction phase correspond to culvert locations listed in Table 6. Access road plans showing culvert locations is provided in Appendix 1 of BRL (2026a).

*Table 6: 29 streams included in construction phase deposited fine sediment monitoring listed by Project sub-area and culvert number. Catchment type refers to Type 4 (ephemeral forested catchment central drainage path) or Type 5 (large catchments with perennial central drainage path) as in BRL (2026a). *denotes reference site for BPCP water quality and aquatic ecology monitoring (see Section 6.6)*

Sub-area	Culvert number	Stream name	Catchment type	Downstream confluence
UWHR	7	Burnetts Stream	5	Waimangaroa River
UWHR	8	Burnetts Stream	5	Waimangaroa River
UWHR	12	Unnamed tributary	5	Waimangaroa River
UWHR	15	Hut Stream	5	Waimangaroa River
UWHR	17	Gomorrah Creek	5	Waimangaroa River
UWHR	20	Unnamed tributary	5	Waimangaroa River
UWHR	21	Unnamed tributary	5	Waimangaroa River
UWHR	22	Unnamed tributary	5	Waimangaroa River
UWHR	25	Unnamed tributary	5	Waimangaroa River
UWHR	26	Cedar Creek*	5	Waimangaroa River
UWHR	29	Unnamed tributary	4	Waimangaroa River
UWHR	30	Unnamed tributary	5	Waimangaroa River
UWHR	31	Unnamed tributary	5	Waimangaroa River
UWHR	32	Unnamed tributary	5	Waimangaroa River
UWHR	33	Unnamed tributary	5	Waimangaroa River
UWHR	35	Unnamed tributary	4	Waimangaroa River
UWHR	36	Unnamed tributary	5	Waimangaroa River
UWHR	38	Wilsons Creek*	5	Waimangaroa River
UWHR	40	Unnamed tributary	4	Waimangaroa River
UWHR	41	Unnamed tributary	4	Waimangaroa River
UWHR	42	Unnamed tributary	4	Waimangaroa River
UWHR	45	Unnamed tributary	4	Waimangaroa River
UWHR	49	Unnamed tributary	4	Waimangaroa River
UWHR	50	Unnamed tributary	4	Waimangaroa River
UWHR	51	Ernest Stream	5	Waimangaroa River
UWHR	54	Cypress Stream	5	Waimangaroa River
MFS	1	Waimangaroa River	5	-
MFS	4	Unnamed tributary	5	Deep Stream

MFS	7	Billo Stream	4	Deep Stream

Prior to commencement of road construction activities, a baseline survey of substrate composition (% cover) and macroinvertebrate communities will be completed at each stream following methods described in Sections 6.3.2 and 6.3.4. These data will define baseline conditions against which potential DFS effects will be assessed. During the baseline surveys, fixed monitoring locations (e.g., representative run habitats, photo points) will be established in each stream reach. The number and placement of these locations will vary by stream and will be determined by SQEP, taking into account the distance between the culvert installation site and downstream confluence.

DFS monitoring will be undertaken during construction using a tiered approach and methods consistent with sediment assessment guidance in New Zealand (Clapcott et al. 2011), combining routine visual assessments with triggered detailed assessments, where required.

Tier 1: Routine Visual Inspections (SAM1)

Routine visual inspections will be undertaken daily during construction by site management or trained personnel[10] using Sediment Assessment Method 1 (SAM1). This method involves rapid, qualitative estimation of the percentage cover of fine sediment (<2 mm) in representative run habitats at fixed monitoring locations, including an upstream control location. Observations will be supported by repeat photographic records collected at regular intervals (e.g., daily or weekly) to provide a consistent time series of sediment conditions and enable early detection of changes. Where these inspections identify a sustained increase in fine sediment cover relative to baseline conditions (i.e., 10–15% over 7 consecutive days) at multiple monitoring locations, a more detailed Tier 2 assessment (SAM2) will be triggered.

Tier 2: Triggered Detailed Assessment (SAM2)

The Tier 2 assessment will use Sediment Assessment Method 2 (SAM2), providing a more detailed, semi-quantitative evaluation of DFS. This will include quantitative visual estimates of fine sediment cover based on a minimum of 20 stratified observations collected using an underwater viewer within representative run habitats. The assessment will be undertaken at locations across the reach extending from the culvert installation site to the downstream confluence, to characterise and provide a robust assessment of the spatial extent and magnitude of the fine sediment deposition.

Following completion of the Tier 2 assessment, results will be evaluated against defined trigger thresholds to determine the appropriate management response and additional monitoring requirements as outlined below.

- Where DFS cover is <20%, erosion control measures will be assessed and adapted, if required. Routine inspections (SAM1) will resume.
- Where cover is ≥20% and the effect can be attributed to construction activities, construction activities at the affected site will temporarily cease, erosion control measures will be assessed and adaptive management measures implemented. These measures may include removal or redistribution of accumulated sediment where practicable, as well as

[10] The site manager/personnel will be trained on DFS monitoring methods by a SQEP prior to implementation of the DFS monitoring programme.

review and strengthening of erosion and sediment control measures for the site. These adaptive response measures will inform erosion and sediment control measures used at other culvert installation sites for the Project. An ecological assessment including instream habitat and macroinvertebrate sampling will be undertaken to assess the impact on habitat and instream communities.

A DFS monitoring report will be provided annually, as part of the Annual Water Quality and Aquatic Ecology Monitoring report to consent authorities and iwi (Ngāti Waewae) on 31 August, including a summary of inspection and monitoring results (including photographs), trigger exceedances and responses, adaptive management measures implemented and recommendations for refinement of monitoring or management, as required.

6.6 Compliance, performance (longitudinal) and reference site monitoring

Aquatic ecology monitoring will be undertaken at compliance and reference sites annually and at performance (longitudinal)[11] sites on a six-yearly schedule. Monitoring frequency at performance (longitudinal) sites may be increased where water quality conditions indicate that ecological recovery has occurred. Specifically, sites will be monitored every three years where streams meet recovery criteria, including median annual pH >4.5, 75th percentile annual dissolved aluminium concentrations <1 mg/L for three consecutive years, and biological indicators consistent with recovered conditions (AMDI >40 or comparable to reference sites, and EPT richness >8 or comparable to reference sites), unless differences are attributable to natural processes, as set out in the Stockton AMD Water Management Plan (STO-ENV-PLN-016).

Annual surveys will be undertaken at compliance and reference sites to document the state of waterways through the term of the consents. Reference sites (unaffected locations) represent natural background conditions, while compliance sites (downstream of mining/activities) are indicative of any Project-related changes. Monitoring frequency should be reviewed following the transition from the operation to closure phases of the BPCP, as per consent conditions, to determine if any changes are appropriate.

Aquatic ecology monitoring surveys will be undertaken between November and March, under baseflow conditions and following a period of stable antecedent flows (i.e., no major flood event in the two weeks prior to surveys). Measured parameters for each aquatic ecology monitoring survey will include water quality, instream habitat, bryophytes, periphyton, macroinvertebrate, kōura and fish as shown in Table 5 and following the methods described in Section 6.3.

An Annual Water Quality and Aquatic Ecology Monitoring Report will be provided to the consent authority and mana whenua by 31 August. The report will include results from compliance and reference sites for the 12-month period from 1 July to 30 June (i.e., hydrological year) along with adaptive management recommendations, as required. Performance site results will be included in annual reporting in years when monitoring surveys have been completed.

[11] Performance sites that are not classified as longitudinal sites are not monitored for aquatic ecology.

6.6.1 Assessment of annual ecological monitoring over time

Annual ecological monitoring results will be assessed at compliance and reference sites using a trend direction framework that evaluates whether conditions are improving, deteriorating, or showing no detectable change over time relative to baseline conditions. Non-parametric trend analyses (e.g., Mann-Kendall tests and Sen slope estimation with associated confidence intervals as described by Snelder et al. (2021)) and comparisons with baseline variability ranges will be used to distinguish genuine ecological changes from natural variability. Results will be classified as improving, deteriorating, no change, or indeterminate, and interpreted in the context of trends at reference sites to differentiate, where possible, Project-related effects from regional or natural variability (following McBride (2019)).

Trend detection is more reliable when longer time series are available, as datasets spanning ≥10 years reduce the influence of interannual variability and improve the statistical power to detect monotonic trends (i.e., consistently changing in one direction). Trends derived from shorter records are more susceptible to natural variability and will therefore be interpreted cautiously and may be classified as indeterminate where confidence in direction is low. Trend analysis and assessment will begin after five years of monitoring, noting that results will be interpreted cautiously until 10 years of annual data are available. These results will be added to annual monitoring reports annually when available.

6.7 Event-based monitoring

Event-based monitoring will be implemented, in addition to routine monitoring (Section 6.6) to identify and respond to notable changes in water quality (e.g., pH and turbidity) and/or aquatic habitat conditions associated with Project activities,triggered by a non-compliance event. Initial assessment of nature and severity of non-compliance for aquatic ecology will be undertaken by the SQEP, who will advise Bathurst of any effects on aquatic ecology and any additional investigations required. Where events occur (e.g., water treatment plant failure or landslip into waterway caused by mining or Project activities) or non-compliance events are recorded, any additional aquatic ecology monitoring and any required investigations will be undertaken and overseen by a SQEP to ensure site-appropriate and effective responses for the local receiving environment.

This targeted, event-driven monitoring approach enables rapid assessment of short-term or unanticipated effects that may not be captured through scheduled routine monitoring, and supports adaptive management and ongoing alignment with ecological protection and compliance objectives throughout the Project.

Event-based notification will be provided to the consent authority within 24 hours of a non-compliance event followed with further details in the monthly reporting. The monthly reporting will outline the nature of the event, impact on aquatic habitat and biotic communities, and a proposed investigations or recovery monitoring programme as advised and prepared by a SQEP.

6.8 Kōura passage provision monitoring

Culverts will be designed on the UWHR and mine access roads to facilitate kōura passage, where practicable, in accordance with BRL (2026a) and Franklin and Crawford (2025). To confirm that culverts are functioning as intended and effectively providing kōura passage, selected sites will be monitored over time using mark-recapture techniques and targeted surveys of kōura abundance upstream and

downstream of the culvert at selected sites. Monitoring will evaluate kōura abundance and population structure, movement of individuals between upstream and downstream reaches, and whether culverts provide passage across different life stages.

Monitoring sites will be confirmed by a SQEP following completion of culvert installation along the UWHR. This will include sites with culverts where kōura passage will be provided for and sites where dispensation was approved and different designs were implemented (e.g., internal roughened surfacing in the culvert). At each monitoring site, two reaches will be established – one upstream of the culvert and one downstream of the culvert. The reaches will be of sufficient length (generally 20–50 m) to represent local habitat conditions and allow effective sampling.

Kōura will be captured using a combination of electrofishing and hand-netting/search methods, including turning of suitable substrates. Captured kōura will be assigned a unique identifier and marked using an appropriate and ethically-approved technique[12]. For each captured kōura, data will include body length (as OCL, see Appendix B), body condition (qualitative assessment), sex (where identifiable), and life stage (juvenile/adult). Capture information will also be recorded, including location (upstream or downstream of the culvert), capture method, and recapture status (new or previously marked individual). Movement will be assessed by tracking the location of marked individuals across sampling events. Data on water temperature, flow conditions[13], and habitat characteristics will also be collected to support interpretation of results.

Mark-recapture data will be used to estimate kōura abundance and population structure, and to assess movement between upstream and downstream reaches as an indicator of culvert passage. Recaptures of marked individuals on opposing sides of culverts will provide evidence of movement, while comparisons of abundance, size distribution, and life stage composition upstream and downstream will provide additional information to assess passage effectiveness.

Culvert performance will be evaluated based on the presence of kōura upstream and downstream, representation of all life stages, and evidence of movement through the culvert. Where similar community structure and movement patterns are observed, culverts will be considered to be functioning effectively for kōura passage.

Sampling effort and field methods will be standardised across sites and survey events to ensure comparability over time. Monitoring will be undertaken by trained personnel under the supervision of a SQEP, and all data will be checked for completeness and consistency following each survey. The provision of kōura passage will be assessed at a minimum of 12 sites six times within the first year following culvert installation and then annually for a further three years. Sites will include at least six for which kōura passage was provided (i.e., culvert control site) and at least six with other culvert treatments (i.e., culvert treatment site), depending on the range of treatments or designs implemented. Additional surveys may be undertaken following significant disturbance events (e.g., floods that follow a 10-year return period rainfall event, i.e., 374 mm over 24 hours, with 16 mm in 10 minutes or 34 mm in 30 minutes) if required and advised by a SQEP.

Kōura monitoring methods, including mark–recapture techniques, will be implemented in accordance with accepted freshwater ecological survey practices in New Zealand, with appropriate consideration

[12] Marking or tagging kōura may require approval from an Animal Ethics Committee if invasive marking techniques used. Kōura should be handled to minimise harm and tagged by a SQEP.
[13] If possible, flow will be monitored by a water level recorder to capture continuous water level conditions at some sites.

of animal welfare requirements and standardised sampling protocols to ensure robust and repeatable results. Mark-recapture methods are described in the Guidelines for monitoring fish passage success in New Zealand (Baker et al. 2024) and will be adapted for kōura.

If monitoring indicates culverts are functioning as intended (i.e., providing unimpeded passage), then monitoring can cease, unless structures change over time. If monitoring indicates that culverts are not functioning as intended (e.g., reduced abundance upstream, absence of key life stages, or limited evidence of movement), a SQEP will investigate the likely causes and recommend appropriate remedial actions. This outcome may also trigger additional investigations at other installed culverts along the UWHR or MFS access road to confirm kōura passage provision. If the state of culvert changes over time, as per routine maintenance inspections then monitoring may be required to recommence to ensure passage continues to be provided. Monitoring results will be used to inform adaptive management, including maintenance or modification of culvert structures where required to improve kōura passage.

A kōura passage provision monitoring report will be provided annually, as part of the Annual Water Quality and Aquatic Ecology Monitoring report to consent authorities and iwi (Ngāti Waewae) on 31 August, including adaptive management recommendations as required, for three years.

6.9 Focused recovery monitoring at compensation sites

Focused recovery monitoring will be undertaken at performance sites in the Cascade Creek catchment (Figure 5), which are classified as compensation sites, to track early signs of ecological recovery following the implementation of Project activities (i.e., removal and sealing of historic AMD sources, addition of treated water) intended to improve water quality. These activities form part of the Project's offsetting, compensation and positive effects package. The purpose of this targeted monitoring is to verify that water quality and ecological conditions are improving as anticipated, and to provide an evidence base to inform adaptive management and future rehabilitation and restoration efforts of mine-impacted streams in the region.

Monitoring will initially focus on key indicators of water quality and habitat improvements including increasing pH, decreasing dissolved metal concentrations, and reduction in metal precipitates. Progression to ecological monitoring will occur once water quality reaches thresholds considered suitable to support ecological recovery (i.e., annual median pH >4 and annual 75th percentile of dissolved aluminium concentrations <2.8 mg/L; Stockton AMD Water Management Plan (STO-ENV-PLN-016)).

Monitoring will follow methods outlined in Section 6.3 This will include two surveys per year (between November and March) for an initial period of three years to assess ecological responses such as increases in macroinvertebrate abundance and diversity, and the return of sensitive taxa. The commencement of the ecology surveys is contingent on water quality improvements following commencement of Project activities, as described above.

Where ecological recovery is observed in impacted reaches of Cascade Creek, the patterns and rates of recovery (e.g., timing of species return, changes in community composition, and habitat improvements) will be used to inform expectations and management approaches for other streams affected by the Project. Lessons learned—such as which taxa are slowest to recover, or the

environmental thresholds required to trigger more rapid ecological improvement—will be incorporated into the adaptive management framework for the BPCP.

Following this initial monitoring period of three years, results will be reviewed to assess recovery trajectories and determine the appropriate ongoing monitoring frequency. Subject to this review, monitoring may be reduced and integrated into the existing long-term monitoring programme (e.g., six- or three-yearly surveys for impacted/recovering or recovered sites, respectively, as set out in the Stockton AMD Management Plan (STO-ENV-PLN-016) and noted above in Section 6.6.

6.10 Bryophyte surveys during passive treatment with MSRs

Targeted bryophyte monitoring will be undertaken at selected reference and compliance sites during the early stages of passive treatment, where treatment systems (MSRs) may increase the pH of receiving waters to ≥7. This monitoring will be progressively implemented in line with the commissioning of MSRs and the discharge of passively treated water into receiving environments at least four representative monitoring sites and one control site within the ESE and MFS sub-areas. The purpose of this monitoring is to assess bryophytes responses to increases in pH and detect any early signs of adverse effects from the passive treatment systems.

Bryophyte surveys will initially be undertaken at three-monthly (i.e., quarterly) intervals. Site selection will take into account whether passively treated water is entering upstream of the monitoring location and timing of the MSR coming online (so earlier MSRs are preferentially selected). Selected sites will be those that have: continuous monitoring instrumentation (including pH sensors) and monthly water quality grab samples and diverse bryophyte communities to enable assessment of bryophyte responses with water quality conditions. To avoid confounding influences, selected sites will exclude those potentially affected by upstream inputs or discharges (e.g., historic AMD, Stockton MSRs) to ensure that observed responses can be attributed to Project-related effects. The sites proposed for this bryophyte monitoring downstream of MSRs are listed below, including expected MSR commissioning date, Project sub-area, and associated MSR. A control site will be included to provide a baseline for comparison.

1. Whareatea River at KEL (2030, ESE sub-area, Central ELF MSR)
2. Deep Stream at SW03 (2039, MFS sub-area, outside West Pit MSR)
3. Rapid Stream at W07 (2046, ESE sub-area, NSUL MSR)
4. Deep Stream at SW01 (2047, MFS sub-area, East Pit MSR)
5. Waimangaroa River tributary at SW02 *or* Billo Stream at BS01 (performance water quality monitoring sites, not influenced by MSR)

Monitoring will focus on bryophyte cover and condition assessed within permanent quadrats on established transects in a specific reach at each site to enable tracking of changes over time. Surveys results will be interpreted alongside water quality monitoring data, with a particular focus on pH, to evaluate relationships between passively treated discharge and bryophyte responses over time. Baseline data for selected sites will be available from the annual monitoring programme (see Section 6.5).

Trigger levels have been established to identify early signs of adverse effects on bryophyte communities (Table 4). Any notable declines in bryophyte cover will trigger further investigation, including assessment of species composition, to determine the cause of change and the need for mitigation or management intervention. Observed responses will also be used to refine understanding of bryophyte pH tolerance thresholds, and to inform adaptive management and optimisation of treatment performance.

Three-monthly (quarterly) bryophyte surveys will be undertaken for the first year of the initial three-year monitoring period following commissioning of the passive treatment systems (MSRs) and then the frequency of monitoring will reviewed. At the end of the three years, monitoring results will be reviewed to assess bryophyte responses to elevated pH and determine whether there is evidence of adverse effects. Subject to this review, monitoring frequency may be reduced or ceased where results demonstrate no adverse effects from sustained elevated pH on bryophyte communities. Long-term monitoring of bryophyte communities will continue at compliance sites downstream of active and passive treatment systems for the duration of the Project, including operational and closure phases (Section 6.6). Findings from this targeted bryophyte monitoring and any adaptive management recommendations will be included in annual environmental reporting.

6.11 Eutrophication risk monitoring

Eutrophication risk monitoring will be undertaken in receiving waters downstream of mining-modified landscapes in the Project area where elevated concentrations of dissolved inorganic nitrogen (DIN; primarily nitrate, NO_3–N, and ammoniacal nitrogen, NH_4-N) may occur, including from blasting, ELF seepage and sump discharges. This monitoring is intended to assess whether increased nutrient availability results in the stimulation of nuisance periphyton growth under suitable environmental conditions.

Baseline aquatic ecology surveys at sites across the Buller Plateaux has shown that periphyton cover is typically low to moderate and comprising of thin films, mats or short filaments (ESNZ 2026) and would not be described as nuisance periphyton[14]. This provides a reference condition against which potential nutrient enrichment effects associated with the Project can be assessed.

Eutrophication risk in receiving waters will be assessed using a framework that combines mean monthly DIN (NO_3–N + NH_4-N) concentration at compliance sites and days of accrual (i.e., duration of stable flows between bed-mobilising flow events that could potentially reduce periphyton biomass) following Biggs (2000a, b).

Measured DIN concentration and days of accrual will be compared against the eutrophication risk screening table (Table 7) to determine the predicted trophic status (oligotrophic, mesotrophic or eutrophic; i.e., low, moderate or high nutrient/periphyton biomass conditions, respectively). This approach recognises that:

- periphyton biomass is controlled by both nutrient supply and time available for growth, and

[14] Nuisance periphyton can be defined as: >60% cover by mats >0.3 cm thick or >30% cover of filamentous algae >2 cm long (Biggs 2000a).

- increasing accrual duration reduces the nutrient concentration required for eutrophic conditions to develop.

The screening thresholds were derived from the nutrient-accrual framework presented in Biggs (2000a,b) as provided in Appendix F. The trophic boundaries approximate criteria for the protection of benthic biodiversity (oligotrophic to mestrophic range) as well as aesthetic and trout fishery values (mesotrophic to eutrophic range).

Mean annual DIN will be calculated from the weekly DIN concentration measurements over the preceding 12 months.

Days of accrual will be defined as the number of days since a bed-mobilising flow event, assessed as daily mean flow that exceeds three times the median annual flow, with the median calculated from the existing flow records. The metrics will be determined using flow records from the nearest flow recorder site. It would also be possible to determine metrics for a compliance site in each catchment (e.g., KEL in the Whareatea catchment and site 17W in the Waimangaroa catchment) and assume that when a flood event resets the accrual period at these sites, the same reset applies to all compliance monitoring sites within the catchment. Flows of this magnitude (i.e., > 3 × median annual flow) are used to define bed-mobilising events as they are generally sufficient to disturb the substrate and reset periphyton biomass, providing a consistent, hydrologically-based method for determining the start of a new accrual period. Note that in the Biggs (2000a,b) framework, days of accrual were calculated as the mean number of days per year between flood events exceeding 3 × median flow (from the long-term flow record[15]). The framework has been adapted here to apply to individual accrual periods.

Application of the table (Table 7) is as follows:

- **Oligotrophic** - conditions consistent with the desired state; no additional action required.
- **Mesotrophic** - elevated risk; enhanced monitoring may be applied, particularly during summer low flows.
- **Eutrophic** - conditions are predicted to support nuisance periphyton growth and trigger periphyton monitoring.

Where predicted eutrophic conditions are identified[16], monthly periphyton cover monitoring will be initiated at the relevant compliance sites for an initial period of one year during the operations phase to determine whether the eutrophication risk is realised (i.e., . at least one occurrence of >60% cover by periphyton mats >0.3 cm thick, or >30% cover by filamentous algae >2 cm long).

Monitoring will focus on periphyton cover (as a rapid, semi-quantitative indicator of biomass) assessed using standard methods (Section 6.3), and will be interpreted alongside concurrent water quality data from the site, including nutrient concentrations (e.g., NO_3–N, NH_4-N, DRP) and flow conditions. Particular attention will be given to periods of prolonged low flows, especially during summer, when stable hydraulic conditions and warmer water temperatures may promote periphyton development.

[15] Noting that the length of the flow records will vary between compliance sites.
[16] Note, where DIN concentrations are ≤0.01 mg/L (10 mg/m³), eutrophic conditions are not predicted regardless of accrual duration, reflecting strong nutrient limitation on periphyton biomass.

The eutrophication risk is expected to be moderated by a phosphorus limitation, which constrains algal growth despite elevated nitrogen concentrations, and high flow variability, which limits sustained biomass accumulation through regular disturbance and flushing in West Coast Rivers (ESNZ 2026). The risk is expected to be further reduced downstream of MSRs, as nitrate that passes through the MSRs will be converted to nitrogen gas. However, localised increases in periphyton growth to nuisance levels may occur during favourable conditions, particularly in low-flow periods.

Following the initial one-year monitoring period following identification of potential eutrophic conditions, results will be reviewed to assess (a) whether the elevated DIN concentrations that triggered the additional monitoring persisted cover time (or changed by increasing or decreasing) and (b) whether any increases in DIN (or other nutrients) were accompanied by periphyton cover high enough to be considered a nuisance and problematic for ecological communities or other river users (Biggs 2000a). Based on this review, monitoring requirements may be refined. This may include: discontinuing periphyton cover monitoring where no response was observed (i.e., periphyton cover never attained nuisance levels, even though the DIN concentrations and days of accrual combination(s) predicted eutrophic conditions); reducing monitoring frequency if the outcome was increased cover, but still below nuisance levels, or implementing conditional monitoring, such as targeted annual surveys during periods of greatest risk (e.g., summer low flows) during the operations phase (when nitrogen risk may increase as mining progresses and more blasting occurs).

Monitoring results will be reported to the consent authority and will include a summary of patterns in periphyton cover as related to nutrient concentrations and flow conditions and recommendations for adaptive management, where required.

Table 7: Eutrophication risk screening table relating to dissolved inorganic nitrogen (DIN; NO_3-N + NH_4-N) and days of accrual to predicted trophic status and monitoring triggers, adapted from Biggs (2000a). DIN concentrations are shown as mg/L and mg/m³ noting that 1 mg/L = 1000 mg/m³ and refer to the mean of monthly concentrations measured in the year leading up to the assessment. Days of accrual are calculated as the number of days since the flow at the relevant flow monitoring site exceeded 3 × median flow (from long-term record), with all flow data as mean daily flows.

DIN (mg/L)	DIN (mg/m³)	Days of accrual (days)	Predicted trophic status	Risk interpretation	Monitoring requirement
0–0.01	0–10	0–20	Oligotrophic	Very low nutrient availability, frequent disturbance	No trigger
0–0.01	0–10	20–100	Oligotrophic to Mesotrophic	Some biomass accrual possible under long stable flows	No trigger
0.01–0.03	10–30	0–20	Oligotrophic	Low risk	No trigger
0.01–0.03	10–30	20–60	Mesotrophic	Moderate risk if stable flows persist	Consider enhanced monitoring (seasonal)
0.01–0.03	10–30	60–100	Mesotrophic	Increased biomass potential but nutrient-limited	No trigger
0.03–0.10	30–100	0–20	Oligotrophic	Moderate nutrient supply but disturbance-limited	No trigger

0.03–0.10	30–100	20–60	Mesotrophic	Moderate risk of periphyton development	Consider enhanced monitoring
0.03–0.10	30–100	60–100	Eutrophic	Extended accrual enables high biomass	Trigger monitoring
0.10–0.30	100–300	0–10	Oligotrophic to Mesotrophic	Limited by short accrual period	No trigger
0.10–0.30	100–300	10–40	Mesotrophic	Elevated risk	Consider enhanced monitoring
0.10–0.30	100–300	40–100	Eutrophic	High likelihood of nuisance growth	Trigger monitoring
0.30–1.00	300–1000	0–10	Mesotrophic	Elevated nutrients but disturbance-limited	Consider enhanced monitoring
0.30–1.00	300–1000	10–100	Eutrophic	High biomass risk even with moderate accrual	Trigger monitoring

6.12 Reinstated streams, tarns and other closure waterbodies

6.12.1 Reinstated streams

The BPCP will reinstate the extent of streams removed during mining within the Project area (i.e., to ensure no net loss of stream extent) and provide diverse aquatic habitat of similar ecological value and functionality to the streams that were removed. Reinstatement will occur progressively through the operational and closure phases and is expected to be staged across several years. Detailed staging and design will be undertaken at a later stage of the Project, at which time the specific locations and timing of stream reinstatment will be confirmed.

The number of sites monitored per reinstated stream will depend on the length of the stream and location in the post-mine landscape. Monitoring sites will be selected to represent the range of stream conditions, habitat types, and water quality influences as the reinstated stream network is progressively established. Site selection will be guided by reinstatement objectives (Section 5.3.3.3) and will include representative upstream and downstream locations, as well as sites that may be influenced by passive treatment systems or catchment inputs. The number and location of sites will be confirmed as reinstated streams are developed, with sufficient spatial coverage to characterise habitat, ecological communities and recovery trajectories over time, consistent with guidance provided in the Restoration Indicator Toolkit (Parkyn et al. 2010). As a guide, monitoring will typically include at least one to two sites within each reinstated stream reach, with additional sites established where there are changes in water quality, hydrological inputs, or habitat characteristics.

Following the establishment of stream channels and suitable habitat, a period of water quality monitoring will be undertaken to confirm stable and suitable conditions for aquatic communities at sites in the reinstated stream. Water quality monitoring will include continuous monitoring of pH, electrical conductivity, water temperature and dissolved oxygen concentrations and dissolved metal samples to confirm conditions are suitable to support aquatic life (e.g., pH >4, dissolved aluminium concentrations of ~<1–2.8 mg/L, water temperature ideally between 5–20°C and less than 25°C, dissolved oxygen saturation ≥80% (~ 7–8 mg/L)).

Aquatic boulders transferred into a reinstated stream will be photographed, permanently marked at placement with GPS coordinates of location recorded. Initial monitoring will be undertaken three months after placement and will include collection of GPS waypoint and assessment of condition, followed by annual monitoring to determine outcomes and inform viability of boulder transfer (as outlined in the Rehabilitation Management Plan (BPCP-ENV-PLN-002)).

A post-reinstatement baseline survey will be completed once water quality conditions are suitable to support aquatic life. This will include sampling water quality, habitat, periphyton, bryophytes and macroinvertebrates, and kōura following the methods outlined in Section 6.3. Natural colonisation will then be assessed through monitoring at approximately one year and again at three years after the baseline survey (i.e., once suitable habitat conditions are established). A review of data will be undertaken at this time to determine whether macroinvertebrate communities are developing as expected or whether recovery is limited. These results can also be compared with nearby reference sites monitored for the Project and expected communities in other reinstated streams.

Where communities are developing as expected, aquatic ecological monitoring will continue at six-yearly intervals for the duration of the consent. Where recovery is limited, potential constraints will be assessed including, dispersal limitation (e.g., distance from source populations), habitat limitations (e.g., substrate, flow, food availability), or ongoing water quality or sediment stressors (e.g., Kitto et al. 2015). Assisted recolonisation (reseeding) will only be considered where, after three years monitoring, data shows that macroinverterbrate abundance or taxa richness remains low relative to expectations, community composition remains simplified or dominated by tolerant taxa, key taxa or functional groups are absent despite suitable conditions and recovery patterns indicate limited natural colonisation over time. This approach recognises that reinstated streams may remain biologically depauperate where dispersal pathways are constrained, and that assisted recolonisation should only be undertaken where natural recovery is demonstrably limited and environmental conditions are suitable for establishment (Clinton et al. 2022)

Monitoring results will be reviewed to confirm whether intervention is required and to determine the most appropriate response, including habitat enhancement and/or reseeding. Where intervention is warranted, suitable donor sites will be identified and assessed for biosecurity and ecological risks. Any translocation will be designed and overseen by a SQEP to maximise the likelihood of successful establishment.

The reinstated stream monitoring (and management) framework is consistent with the Restoration Indicator Toolkit (Parkyn et al. 2010), which recommends the use of integrated physical, chemical, and biological indicators to assess recovery trajectories toward functional ecosystem conditions. This approach recognises that recovery occurs progressively and supports the use of adaptive management where natural recolonisation is constrained.

6.12.2 Constructed tarns

The purpose of tarn monitoring is to provide quantitative and repeatable data to confirm that tarn creation and rehabililtation are achieving the expected extent, habitat quality and aquatic ecology outcomes consistent with the objectives and design criteria set out in the Rehabilitation Management Plan (BPCP-ENV-PLN-002) and performance of constructed tarns observed at Stockton Mine (see Section 5.3.3.4; Watson et al. 2024). Following completion of rehabilitation, extent of tarns in rehabilitation areas will be mapped and delineated including the open water area and vegetated

littoral margin informed by wetland delineation indicators (including soils, hydrology and vegetation) in accordance with Ministry for the Environment (2022) guidance.

Tarn extent and vegetation will be assessed using a repeatable field-based mapping and characterisation approach. Monitoring will be undertaken at a consistent time of year (e.g., late summer) to minimise seasonal variability. At each tarn, the boundaries of open water and the littoral margin will be delineated using GPS or aerial imagery, allowing calculation of surface area and total tarn extent. Physical characteristics will also be recorded, including tarn depth (e.g., cross-section, midpoint, and maximum depth), shape, base substrate (e.g., sediment, rock/gravel), edge slope and material, degree of connectivity or isolation (with other tarns or waterbodies), and indicators of water permanence. Habitat structure will be assessed by estimating the proportional cover of key habitat features, including macrophytes, bryophytes, algal and detrital cover and supported by photographic records to document tarn condition and change over time.

Water quality and ecological attributes will be monitored to assess habitat suitability and development. Field measurements will include pH, electrical conductivity, dissolved oxygen, and temperature using calibrated handheld meters, with water samples collected for analysis of dissolved metals. Macroinvertebrate communities will be assessed using a standardised multi-habitat kick-net approach, with replicate samples collected in proportion to available habitat types to ensure representative sampling. Samples will be preserved and processed in the laboratory, with taxa identified to the lowest practicable taxonomic resolution. These data will be used to evaluate development of macroinvertebrate communities alongside physical habitat and water quality conditions.

Performance of constructed tarns will be assessed against extent, stability, and ecological development criteria. Total tarn extent (open water plus littoral margin) will be compared with design expectations outlined in the Rehabilitation Management Plan and outcomes observed at comparable constructed tarns at Stockton Mine over time (i.e., macroinvertebrate communities similar to nearby natural tarns; Watson et al. 2024). Tarn extent is expected to remain broadly stable over time, allowing for natural seasonal variation. Vegetation establishment will be assessed through development of littoral margins and surrounding wetted areas, with a target of achieving an average of at least 75% cover of low pākahi vegetation cover (<0.5 m height) at closure (as set out in the Rehabilitation Management Plan (BPCP-ENV-PLN-002), alongside progressive establishment of aquatic vegetation. Monitoring results will also be used to assess habitat function and the development of macroinvertebrate communities consistent with tarns at Stockton Mine (Watson et al. 2024). Where monitoring indicates declining extent, limited vegetation establishment, or reduced ecological development, further investigation and adaptive management measures will be implemented.

Vegetation monitoring of planted and vegetation direct transfer in constructed tarns will follow monitoring frequency, locations and methods set out in the Rehabilitation Management Plan.

An aquatic ecology survey of habitat (including mapping, physical characteristics, water quality) and macroinvertebrate communities will be undertaken two years after the construction of the tarn and then once every five years until closure criteria (for extent and vegetation) are met. All tarns must be monitored within five years of the end of the consents to confirm closure criteria are still met and allow time to address any non-conformance with the criteria.

6.12.3 Closure waterbodies

The focus of monitoring of the closure waterbodies will be dependent on the ecosystem service to be provided, which will be determined as BPCP operations progress. The focus of monitoring may include verifying that water quality conditions and littoral habitat development support ecological communities and function over time. If any closure waterbody is connected to a downstream receiving environment, spot checks of outflow water quality during initial spill events into the downstream waterbody should be undertaken to confirm it is suitable for the downstream receiving environment. Targeted monitoring could include annual late-summer dissolved oxygen profiling to assess stratification and oxygen availability in pit lakes. Photo point and transect surveys could be completed to track littoral habitat development, based on measures of habitat structure and substrate (cover of woody debris, macrophytes, rocky substrate, algae and organic matter) and surveys of macroinvertebrate communities in the littoral zone (following sampling methods for constructed tarns, Section 6.12.2) once every five years for the duration of the consent. These monitoring programmes should be developed and confirmed by SQEPs once the ecosystem services to be provided by closure waterbodies are confirmed.

Any closure waterbodies that are providing ecosystem services must be monitored within five years before the end of the consents to confirm closure criteria are still met and allow time to address any non-conformance with the criteria.

6.13 Quality Assurance and Quality Control

Water samples for analysis of dissolved metals will be processed by a laboratory in New Zealand accredited by International Accreditation New Zealand (IANZ).

Macroinvertebrate QA/QC procedures are set out in the National Environmental Monitoring Standards (NEMS 2022b).

7.0 Complaints Management

Bathurst will maintain a register to record any complaints relating to aquatic ecology management and associated environmental effects. In the event of a complaint, Bathurst will:

- Acknowledge the complaint within two working days;
- Investigate the complaint and carry out a site inspection of where appropriate within five working days;
- Implement corrective actions where required; and
- Document outcomes of the investigation, and communicate findings to the complainant.

8.0 Reporting Requirements

Reporting is undertaken to document aquatic ecology management activities, monitoring outcomes, and incidents to demonstrate compliance with applicable consent conditions, and support the ongoing environmental management of potential aquatic ecology effects associated with the Project.

Reporting in accordance with this Plan is proportionate to the scale and nature of monitoring undertaken and is aligned with the monitoring framework set out in Section 6.

8.1 Internal Reporting

As outlined in previous sections, aquatic ecology management information, including inspection outcomes, incidents, and complaints, will be recorded and managed through Bathurst's EMS.

This information will be used to support internal reporting, management review, and continuous improvement of aquatic ecology management practices.

8.2 External Reporting

External reporting will be undertaken in response to aquatic ecology incidents that result in, or have the potential to result in, adverse environmental effects.

Where required, Bathurst will notify relevant regulatory authorities in accordance with relevant regulatory requirements and Bathurst's incident management procedures.

8.2.1 Annual Work Plan

Prior to undertaking any activities on site, and annually thereafter, BRL shall provide an Annual Work Plan (AWP) to the relevant regulatory authorities.

8.2.2 Annual Monitoring Report

Bathurst will prepare an Annual Monitoring Report in accordance with project approval requirements. The report will summarise aquatic ecology activities, including monitoring, inspection outcomes, incidents, complaints, and any identified trends or changes to management measures.

9.0 Roles, Responsibilities, and Training

9.1 Roles and Responsibilities

Effective implementation of this Plan relies on clearly defined roles, responsibilities and appropriate training for all personnel involved in Project activities. Bathurst is committed to ensuring that all relevant employees and contractors understand their responisbilities in managing aquatic ecology related environmental effects and are aware of the process for monitoring, response, and escalation.

Implicit in the effective management of aquatic ecology for the BPCP is the allocation of responsibilities to key individuals. The AEMP is to be referred to and implemented during pre-commencement, construction, operation and closure phases of the Project. Details of roles and responsibilities associated with the AEMP are provided in Table 8 below.

Table 8: Responsible personnel and tasks

Position	Accountable Task
BRL General Manager	• Provide adequate resources for the implementation of this AEMP. • Ensuring all site work are undertaken in accordance with the AEMP and all relevant conditions set out in the Approvals.
Mine Manager / SSE	• Ensure appropriately qualified and resourced personnel are appointed to the key roles, and their responsibilities are well understood. • Ensure periodic review and auditing of this Plan is undertaken.
BRL Environmental Manager	• Be responsible for supporting the implementation of the requirements of this AEMP and communicating any issues to the Mine Management Team. • Reading and understanding the AEMP. • Facilitating a project start-up meeting with the site manager, site engineer and relevant contractor(s) at the beginning of each phase. The purpose of the start-up meeting is to establish, make a plan and avoid delays in the construction/operation schedule. • Contacting the SQEP(s) a minimum of 10 working days before each phase of monitoring required. • Inviting Ngāti Waewae to participate in and support any monitoring surveys deemed necessary so that iwi can exercise kaitiakitanga responsibilities and any cultural concerns are addressed. • Maintaining clear communication with the site manager(s), site engineers(s), contractors and SQEP(s) regarding staging and sequence for work and any changes in work schedule. • Briefing new Project personnel including contractors about their responsibilities undert the AEMP. • Maintaining an incident register and record of adapative management measures implemented.

BRL Health and safety Coordinator	• Ensuring all employees are fully trained and aware of relevant requirements. • Facilitate Employee and Contractor inductions. • Making available all the relevant equipment to manage spills and/or emissions of hazardous substances.
Supervisors	• Responsible for ensuring the instruction of workers, implementation and overseeing of the requirements of this AEMP, including monitoring the effectiveness of the methods set out in this Plan. • Reporting any activity which presents a risk to the safety and environmental responsible management of the site.
All personnel	• Maintain excellent erosion and sediment control processes to keep down potential sources of sediment in any water runoff • Report uncontrolled discharges of stormwater except where bypass flows are provided for during higher rainfall events to immediate supervisor, and ensure completion of an incident report

9.2 Training and Inductions

Environmental issues are included within the Mine Induction Package and induction process and regular environmental awareness training through toolbox talks is planned.

Environmental issues will be a regular topic for toolbox talks, including aquatic ecology management as required. All monitoring results will be assessed, and significant results or events will be raised for discussion via toolbox talks to encourage and remind staff on appropriate activities.

Bathurst will ensure that a copy of the AEMP is always available onsite and online (i.e., accessible to staff on intranet) during the construction, operation and closure phases of the Project.

A site induction for all employees and contractors likely to be involved with construction activities related to waterways (i.e., road construction, culvert installation) will be required to understand and comply with specific requirements as outlined in the AEMP. The induction will include, at a minimum:

- protocols for managing effects on aquatic ecology (e.g., AMD generation, sediment release, flow diversions);
- procedures for managing the discovery and occurrence of didymo; and
- importance of complying with protocols and reporting procedures for observed exceedances of water quality thresholds and implementing adaptive management plans and TARPs.

10.0 Management Plan Approval and Revision

All documents that sit within the SEMP will be managed in accordance with the ***BRL-HST-STD-003 Document Control Standard.*** This Plan will be reviewed three yearly or upon:

- *Change in operations;*
- *Receipt of substantiated complaints related to [aspect];*
- *Regulatory request.*

10.1 Change Register

This Aquatic Ecology Management Plan is issued, revised, and amended under authorisation of the SSE.

A copy will be stored electronically with access available to all workers. The signed hard copy will be maintained in the Westport document library.

Reasons for making changes will be documented and recorded in the document management table, refer to Table 9. A copy of the original document and subsequent versions will be kept for records and marked as obsolete. Each new/updated version will be issued with a version number and date to eliminate obsolete documentation being used.

Table 9: Document management

Document Management:			
Regulatory Approvals Authorities:			
Document Owner:			
Document Owner Name:			
GM HSEC Approval Signature:			
Date:			
Document Approver:			
SSE/GM Name:			
SSE Signature:			
Date Approved:			
Revision History:			
Date	**Version No.**	**Lead Author**	**Contributing Authors**
Version No.:	**Detail / Changes:**		

Next Planned Review:

11.0 References

BRL (2026) AMD Engineered Landforms (ELF) Management Plan. BPCP-ENV-PLN-011

BRL (2026) AMD Water Management Plan. BPCP-ENV-PLN-010.

BRL (2026) Biosecurity Management Plan. BPCP-ENV-PLN-007.

BRL (2026) Conceptual Mine Closure Strategy. BPCP-ENV-PLN-050

BRL (2026) Erosion and Sediment Control Plan for Land Disturbance Activities. BPCP-ENV-PLN-013.

BRL (2026) Hazardous Substances Management Plan. BPCP-ENV-PLN-014.

BRL (2026) Lighting and Visual Amenity Management Plan. BPCP-ENV-PLN-018.

BRL (2026) Rehabilitation Management Plan. BPCP-ENV-PLN-002.

BRL (2026) Stockton AMD Water Management Plan. STO-ENV-PLN-016.

BRL (2026a) Kōura passage design requirements.

Baker, C., Franklin, P., Williams, P. (2024) Guidelines for monitoring fish passage success at instream structures and fishways. NIWA Client Report 2024156HN. Prepared for the Ministry for the Environment. Guidelines for monitoring fish passage success | Earth Sciences New Zealand | NIWA

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Appendix A: Female kōura carrying eggs and juveniles

Figure A-1: Female kōura carrying eggs (termed "in berry") captured in November 2024 (left) and carrying juveniles captured in March 2026 (right) in streams on the Denniston Plateau. [Photo credits A. Rose, NIWA/Earth Sciences New Zealand].

Appendix B: Measuring kōura body size

Orbit-carapace length (OCL) is measured using calipers. OCL is used to determine total length (TL) following the equation from previous sampling in upper Whareatea catchment (Hogsden et al. 2020):

TL = (2.4403 x OCL) + 1.0996

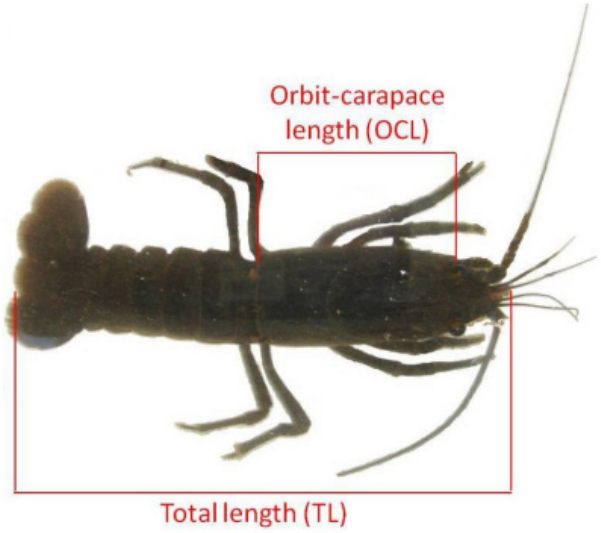

Figure B-1: Two length measures commonly used for kōura. The orbit-carapace length (OCL) is measured from behind the eye to the end of the carapace and total length (TL) is measured from the tip of the rostral spine to the back of the telson.

Appendix C: Monitoring site coordinates

Table C-1. Compliance, performance (longitudinal), and reference monitoring sites within the ESE, MFS and UWHR sub-areas and in Cascade Creek catchment. Photo refers to site photo/figure number in Appendix D.

Site code	Monitoring site type	Catchment	Easting	Northing	Photo
ESE Sub-area					
V62	Compliance	Whareatea	1496490	5376504	D-1
V70	Reference	Whareatea	1496426	5376448	D-2
KEL	Compliance	Whareatea	1497601	5376485	D-3
W07	Compliance	Rapid	1498106	5377188	D-4
W08	Performance (longitudinal)	Rapid	1498127	5377220	D-5
RAP.R1	Reference	Whareatea	1497898	5378511	D-6
W09	Performance (longitudinal)	Rapid	1496424	5380511	D-7
WM-3	Performance (longitudinal)	Whareatea	1495299	5378778	D-8
MM 1	Compliance	Cascade	1500193	5373978	D-9
DS.V37	Performance (longitudinal)	Cascade	1499907	5372763	D-10
MFS and UWHR sub-areas					
14W	Performance (longitudinal)	Waimangaroa	1505624	5379475	D-11
15W	Performance (longitudinal)	Waimangaroa	1504458	5377613	D-12
16W	Performance†, local reference	Waimangaroa	1503576	5377549	D-13
2W	Compliance	Waimangaroa	1503231	5377490	D-14
17W	Compliance	Waimangaroa	1502336	5377702	D-15
WIL.MS1	Reference	Waimangaroa	1505784	5379235	D-16
CED.MS1	Reference	Waimangaroa	1504329	5377257	D-17
BIL.L1	Reference	Deep	1502816	5380565	D-18
SW01	Compliance	Deep	1503241	5379689	D-19
SW03	Compliance	Deep	1502374	5378434	D-20
18W	Performance (longitudinal)	Waimangaroa	1498186	5380121	D-21
Cascade Creek catchment					
Upper Cascade Creek	Performance (longitudinal)	Cascade	1500857	5374512	D-22
Cascade Ck d/s V8 Creek	Performance (longitudinal)	Cascade	1500378	5373532	D-23
V37 Creek	Performance (longitudinal)	Cascade	1500006	5373231	D-24
DS.V37	Performance (longitudinal)	Cascade	1499907	5372763	D-10
Cascade Ck 2 km d/s V37	Performance (longitudinal)	Cascade	1499372	5371995	D-25
Cascade Ck u/s Rochfort	Performance (longitudinal)	Cascade	1498256	5370136	D-26
Rochfort Creek	Performance (longitudinal)	Cascade	1497311	5370159	D-27
Cascade Ck d/s Rochfort	Performance (longitudinal)	Cascade	1497377	5369833	D-28

Appendix D: Monitoring site photographs

Monitoring site locations shown in maps in Figure 4 and Figure 5. Site coordinates listed in Appendix C. Note: blue boxes indicate where site photos will be added when available.

Figure D-1. V62 upstream (left) downstream (right). Compliance site, Whareatea catchment.

Figure D-2. V70 upstream (left), downstream (right). Reference site, ESE sub-area, Whareatea catchment.

Figure D-3. KEL upstream (left), downstream (right). Compliance site, ESE sub-area, Whareatea catchment.

Figure D-4. W07 upstream (left), downstream (right). Compliance site, Rapid catchment.

Figure D-5. W08 upstream (left), downstream (right). Performance (longitudinal) site, Rapid catchment.

Figure D-6. RAP.R1 upstream (left), downstream (right). Reference site, Rapid catchment.

Figure D-7. W09 upstream (left), downstream (right). Performance (longitudinal) site, Rapid catchment.

Figure D-8. WM-3 upstream (left), downstream (right). Performance (longitudinal) site, Whareatea catchment.

Figure D-9. MM-1 upstream (left), downstream (right). Compliance site, Cascade catchment.

Figure D-10. DS.V37 upstream (left), downstream (right). Performance (longitudinal) site, Cascade catchment.

Figure D-11. 14W upstream (left), downstream (right). Performance (longitudinal) site, Waimangaroa catchment.

Figure D-12. 15W upstream (left), downstream (right). Performance (longitudinal) site, Waimangaroa catchment.

Figure D-13. 16W upstream (left), downstream (right). Performance (UWHR) and local reference, Waimangaroa catchment.

Figure D-14. 2W upstream (left), downstream (right). Compliance site, Waimangaroa catchment.

Figure D-15. 17W upstream (left), downstream (right). Compliance site, Waimangaroa catchment.

Figure D-16. WIL.MS1 upstream (left), downstream (right). Reference site, Waimangaroa catchment.

Figure D-17. CED.MS1 upstream (left), downstream (right). Reference site, Waimangaroa catchment.

Figure D-18. BIL.L1 upstream (left), downstream (right). Reference site, Deep catchment.

Figure D-19. SW01 upstream (left), downstream (right). Compliance site, Deep catchment.

Figure D-20. SW03 upstream (left), downstream (right). Compliance site, Deep catchment.

Figure D-21. 18W upstream (left), downstream (right). Performance (longitudinal) site, Waimangaroa catchment.

Figure D-22. Upper Cascade Creek upstream (left), downstream (right). Performance (longitudinal) site, Cascade catchment.

Figure D-23. Cascade Ck d/s V8 Ck upstream (left), downstream (right). Performance (longitudinal) site, Cascade catchment.

Figure D-24. V37 Creek upstream (left), downstream (right). Performance (longitudinal) site, Cascade catchment.

Figure D-25. Cascade Ck 2km d/s V37 upstream (left), downstream (right). Performance (longitudinal) site, Cascade catchment.

Figure D-26. Cascade Ck u/s Rochfort upstream (left), downstream (right). Performance (longitudinal) site, Cascade catchment.

Figure D-27. Rochfort Creek upstream (left), downstream (right). Performance (longitudinal) site, Cascade catchment.

Figure D-28. Cascade Ck d/s Rochfort upstream (left), downstream (right). Performance (longitudinal) site, Cascade catchment.

Appendix E: Macroinvertebrate metric interpretation tables

Table B-1. Interpretation of MCI and QMCI scores (Stark and Maxted 2007).

Quality class	Interpretation	MCI	QMCI/SQMCI
Excellent	Clean water	>119	>5.99
Good	Doubtful quality or possible mild pollution	100–119	5.00–5.99
Fair	Probable moderate pollution	80–99	4.00–4.99
Poor	Probable severe pollution	<80	<4.00

Table B-2. Interpretation of AMDI scores (Gray and Harding 2012).

Likely water quality	AMDI range
Severely impacted	<20
Impacted	20–40
Unimpacted	>40

Appendix F: Eutrophication risk monitoring framework

The nutrient-accrual monitoring framework was derived using the figure below from Biggs (2000b) as a guide.

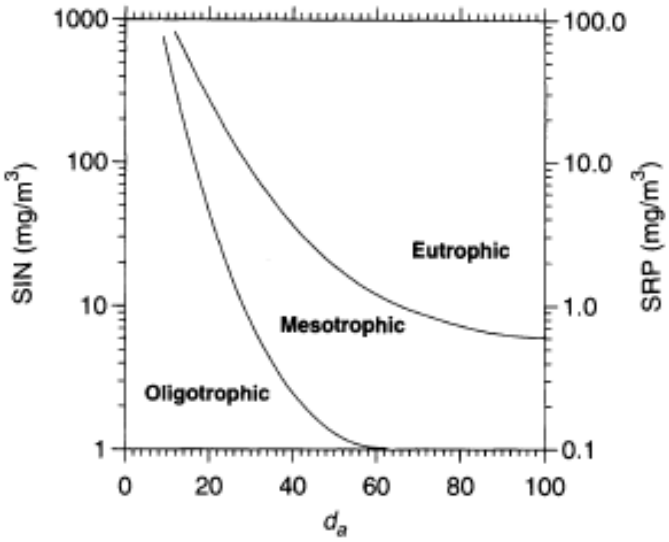

Figure F-1. Mean monthly soluble nutrient concentrations (SIN = soluble inorganic nitrogen, SRP = soluble reactive phosphorus) predicted to result in maximum benthic algal biomass indicating oligotrophic, mesotrophic and eutrophic conditions in gravel/cobble-bed streams for varying days of accrual (d_a). Figure reproduced from Biggs (2000b)

Attachment 1: Summary of Proposed Conditions

Conditions to be inserted upon issue of final decision.