

Macraes MP4 Project

Draft Fish Management Plan

Prepared for: OceanaGold (New Zealand) Limited

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Cover photo: Taieri flathead galaxias captured in Mare Burn, March 2026.

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1 INTRODUCTION

1.1 Purpose of this Fish Management Plan

This Fish Management Plan (FMP) has been prepared to manage the actual and potential adverse effects of the proposed works on freshwater fish and fish habitat associated with the Macraes Phase Four Project (MP4), part of the Macraes Operation located at Golden Point Road, Macraes Flat, East Otago ('the site').

The FMP outlines procedures for:

- The installation and maintenance of fish exclusion devices.
- Fish salvage and relocation.
- Fish handling and transportation.
- Relocation site selection.
- Biosecurity measures.
- Monitoring and reporting requirements.
- Adaptive management during works.

The purpose of these measures is to minimise adverse effects on freshwater fish during instream works and stream reclamation in Trimbells Gully associated with:

- The expansion of the Trimbells Gully waste rock stack (WRS)
- Works within Clydesdale Creek tributary associated with the expansion of the Golden Bar waste rock stack (WRS)
- Culvert installation for the predator-proof fence around the Murphys Ecological Enhancement Area (MEEA).

This FMP gives effect to the following consent conditions [to be completed once consents are granted. Cross-reference the conditions and the sections of the FMP which give effect to them].

This draft FMP accompanies the Fast-track Approvals Act 2024 (FTAA) application and will be finalised following confirmation of the detailed construction methodology and any relevant consent conditions.

1.2 Project Background

OceanaGold (New Zealand) Limited (OGNZL) has applied for resource consent through FTAA to develop MP4 of the Macraes Operation. The Macraes Operation was commissioned in 1990 and is the largest gold mine in New Zealand. MP4 seeks to extend the life of the mine until at least 2039.

Works associated with MP4 that may affect instream habitat and fish habitat include:

- Reclamation of 180 m of permanent stream in Trimbells Gully to accommodate expanded WRS footprint.
- Realignment of 670 m of intermittent stream in Trimbells Gully to accommodate expanded WRS footprint into a new channel 745 m in length, resulting in the loss of 105 m lineal stream length when combined with the reclaimed permanent reach above.
- Reclamation of 22 m of the Clydesdale Creek tributary to accommodate expanded WRS footprint.

- Reclamation of 80 m of Trimbells Gully tributary to accommodate a sediment retention pond.
- Installation of culverts on Murphys Creek associated with the predator proof fence of the MEEA.

As these works will occur within or adjacent to freshwater habitats, there is potential for adverse effects on freshwater fish and aquatic habitat.

This FMP should be read in conjunction with the Assessment of Aquatic Environmental Effects ('AAEE')¹, which assesses the ecological values of the site and the potential effects of the proposed works.

1.3 Site Description

1.3.1 Overview

The site contains various freshwater habitats. For the purposes of this FMP, only the waterways directly impacted by physical works are considered here. These waterways are:

- Trimbells Gully.
- Clydesdale Creek tributary.
- Trimbells Gully tributary.
- Murphys Creek.

The location of the waterways is shown in Figure 1, including how they relate to other waterways in the wider catchments. Note that the size of the waterways in the figure is not to scale; they have been increased in size for visibility.

Full descriptions of the impacted waterways are provided in the AAEE, however, for completeness, waterway descriptions are summarised below.

1.3.2 Trimbells Gully

Trimbells Gully originates to the east of the current Trimbells Gully WRS, draining from the north-western face of Highlay Hill. It flows in a generally north-western direction, around the base of the WRS before joining with Maori Hen Creek and discharging to Mare Burn. It ultimately sits within the Taieri River catchment.

A sediment pond at the base of Trimbells WRS (Figure 2a) presents a complete barrier to fish passage. The discharge point from the pond is a perched culvert. Downstream of the sediment pond, the stream was classified as permanent. Upstream of the pond it was classified as intermittent.

The permanent reach downstream of the sediment pond runs through a moderately incised channel stable channel with no areas of scour or erosion (Figure 2b). Stream substrates were heavily dominated by fine sediment overlying harder material. Base flow is generally low-moderate, though flows can increase rapidly given sufficient rainfall. The small, relatively steep catchment means flows can be flashy. Riparian tussocks and exotic grasses provided moderate levels of shade.

The intermittent channel was narrower and shallower than the permanent reach, with portions where water flowed just below ground level. Substrates were more variable, including gravels and small cobbles alongside fine sediment. Riparian tussocks and exotic grasses provided moderate shade.

¹ Viridis 2026. Macraes MP4 Project. Assessment of Aquatic Environmental Effects. A report prepared for OceanaGold (New Zealand) Limited by Viridis Limited. August 2026. 10023-011-1.

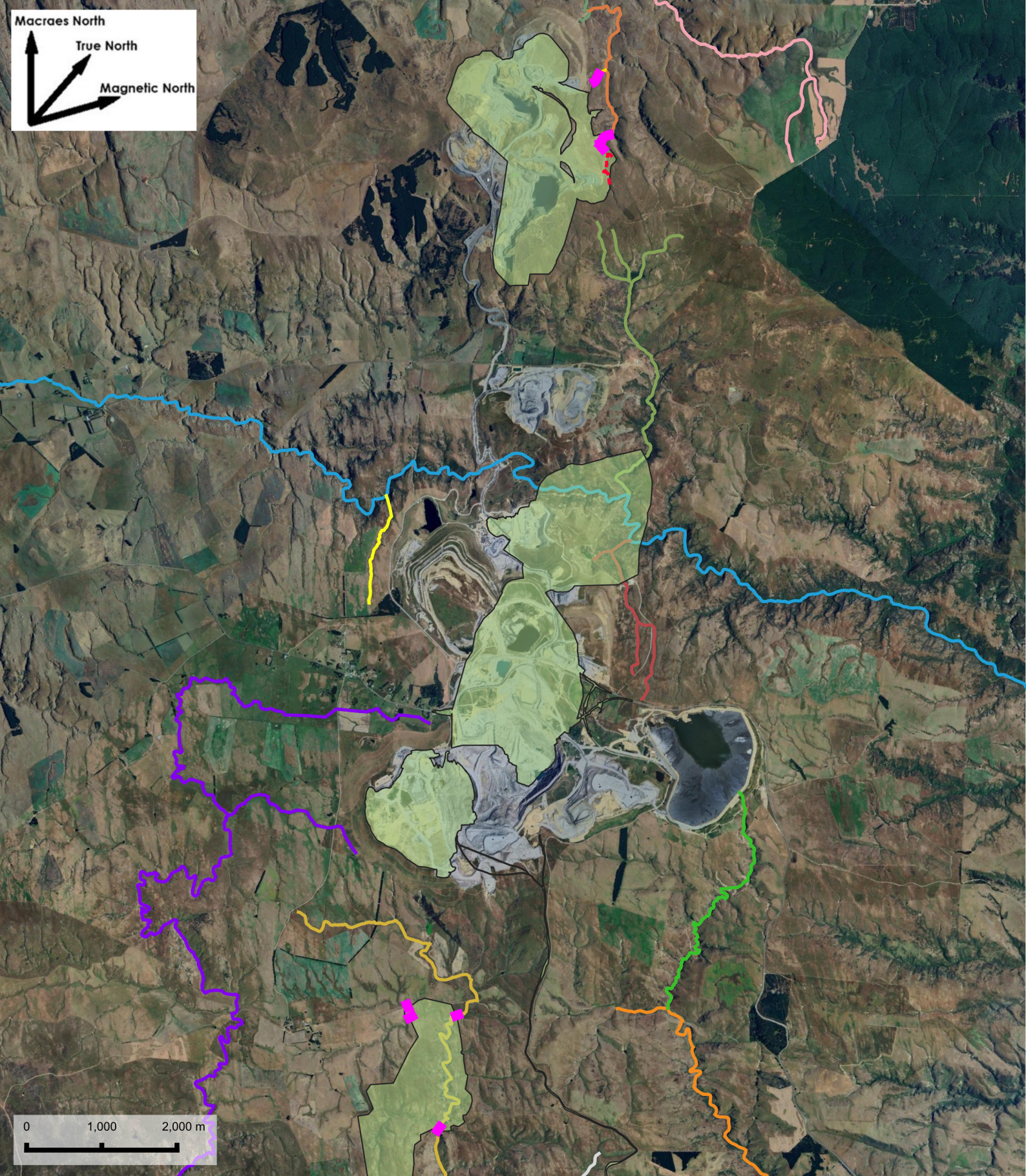


Figure 1. MP4 waterways including impacted reaches

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 MP4 footprint	 McCormicks Creek
 Impacted waterways subject to FMP	 Mare Burn
Watercourses	
 Unnamed Tributary	 Maori Hen Creek
 Clydesdale Creek	 Highlay Creek
 Trimbells Gully Creek	 Deepdell Creek
 Tipperary Creek	 North Branch Waikouaiti River
 North Gully Creek	 Trimbells Gully tributary
 Murphys Creek	



SOURCES
 Google Satellite 2023

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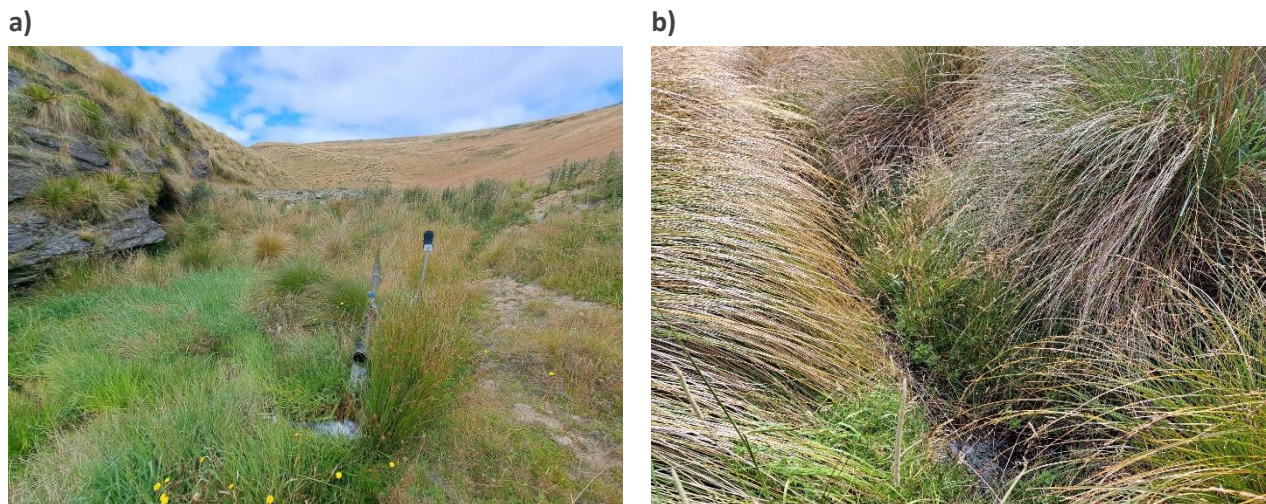


Figure 2. a) The sediment pond presenting a complete barrier to fish passage and b) habitat in the permanent reach of Trimbells Gully.

1.3.3 Clydesdale Creek Tributary

The Clydesdale Creek tributary is on the north-western side of the Golden Bar WRS, fed by seepage from the WRS and an area of wetland in the upper reaches of the channel (Figure 3a). The channel discharges to the Clydesdale Creek sediment pond which, in turn, discharges to Clydesdale Creek (Figure 3b). The sediment pond presents a complete barrier to fish passage due to the elevated bund holding the pond and perched discharge culvert. The channel was heavily pugged by stock and lacked any significant riparian vegetation. It presented low-quality instream habitat for aquatic fauna.



Figure 3. Clydesdale Creek tributary a) looking upstream to the WRS and wetland area and b) the bund holding the sediment pond.

The ecological value of the Trimbells Gully tributary was considered to be low.

The Trimbells Gully tributary originates as an ephemeral channel on the northern side of the existing Coronation North WRS, flowing northwards for a short distance before discharging to Trimbells Gully. The channel transitions from ephemeral to intermittent at a constructed vehicle access track which acts as a bund across the channel. A small culvert/pipe is present here too that conveys overland flow from the upper catchment into the intermittent channel.

The channel is characterised by areas of obvious channel with gravel substrates interspersed by reaches where flow appeared to go subsurface and no clear channel was present. It is essentially identical in character to the intermittent reaches of Trimbells Gully itself.

The intermittent nature, location high in the catchment, and lack of detection of fish in the adjacent Trimbells Gully means it is unlikely fish are present within the stream.

1.3.4 Murphys Creek

Murphys Creek originates south of the current active mining area, near the southern end of Red Bank Road. It flows through a steep gully system, in a generally south-easterly direction, before discharging to the North Branch Waikouaiti River.

The length of the creek is variable, ranging from wide, flat sections where a channel is not obvious, to narrow, moderately swift flows through small areas of gorge. Within the MEEA the creek is generally channelised with substrates consisting of a combination of soft sediment, gravels and small cobbles, and bedrock (Figure 4). Macrophyte coverage is variable and influenced by seasonal patterns. During warmer months, excessive growths of macrophytes can be present. Riparian vegetation includes a mixture of exotic and native scrub as well as common pasture species and agricultural weeds. Stock currently have access to the stream.



Figure 4. Murphys Creek as it flows through the MEEA.

1.4 Fish Values and Species Potentially Present

An instream eDNA survey completed in Trimbells Gully in March 2026 did not detect any fish species. Surveys of Mare Burn, the receiving waterway, undertaken as part of the Macraes Operation annual monitoring programme, have detected the presence of Taieri flathead galaxias (*Galaxias depressiceps*; At Risk – Declining) and freshwater crayfish / kōura (*Paraneophrops zealandicus*; At Risk – Declining).

The presence of the complete fish barriers in the form of the sediment ponds at the downstream extent of the Clydesdale Creek tributary and the intermittent reach of Trimbells Gully means no fish are expected to be present upstream of these barriers. This is further supported by the lack of detection of fish in Trimbells Gully through eDNA sampling.

However, it is possible that eels may be intermittently present in the permanent reach of Trimbells Gully and the intermittent reach of the Trimbells Gully tributary (when water is present) despite not being detected in eDNA or in the receiving environment during annual monitoring. They are known to be present in the wider area. While eels do have climbing ability, the habitat upstream of the sediment ponds in the Clydesdale Creek tributary and the intermittent reach of Trimbells Gully is shallow, narrow and intermittent, and ultimately of very low quality for eels. Therefore, it is considered highly unlikely eels will be present upstream of either sediment pond.

An eDNA sample suite collected from Murphys Creek in March 2026 detected Taieri flathead galaxias, shortfin eel (*Anguilla australis*; Not Threatened) and longfin eel (At Risk – Declining). Eels are expected to be present in relatively low numbers. Despite three sites on Murphys Creek undergoing annual fish surveys, no eels have ever been caught.

Species known to be or potentially present within the permanent reach of Trimbells Gully and Murphys Creek are summarised in Table 1. No fish are expected to be present in the intermittent reach of Trimbells Gully or the Clydesdale Creek tributary due to the presence of existing fish barriers.

Table 1. Summary of fish present in the effected waterways.

Fish	Trimbells Gully permanent	Trimbells Gully intermittent	Clydesdale Creek	Trimbells Gully tributary intermittent	Murphys Creek
Taieri flathead galaxias	Potentially	Not expected	Not expected	Potentially	Present
Shortfin eel	Not expected	Not expected	Not expected	Not expected	Present
Longfin eel	Not expected	Not expected	Not expected	Not expected	Present
Freshwater crayfish / koura	Potentially	Not expected	Not expected	Potentially	Present

1.5 Objectives of Fish Salvage and Relocation

The objectives of fish salvage and relocation are to:

- Minimise injury and mortality to freshwater fish during works.
- Prevent fish entering active work areas.
- Safely capture and relocate fish from affected habitats.
- Relocate fish to suitable habitat within the same catchment.
- Minimise stress during capture, handling, transport, and release.
- Ensure works are undertaken in accordance with relevant permits and industry best practice.
- Maintain appropriate biosecurity controls.

1.6 Roles and Responsibilities

The roles and responsibilities associated with implementation of this FMP are outlined in Table 2.

Table 2. Roles and responsibilities

Role	Responsibility
Supervising freshwater ecologist	Oversee implementation of the FMP; undertake fish salvage and relocation; determine salvage effort requirements; supervise fish handling and release; implement adaptive management measures where necessary; record fish capture data; and prepare post-salvage reporting.
Contractor / consent holder	Install and maintain fish exclusion devices as directed by the freshwater ecologist; provide safe access to work areas; comply with directions provided by the freshwater ecologist; and ensure works are undertaken in accordance with this FMP.
Project manager / consent holder	Ensure relevant permits and approvals are in place prior to works commencing; coordinate timing of salvage works; ensure resource consent conditions are complied with; and provide required reporting to Otago Regional Council where applicable.

2 METHODOLOGY

2.1 Overview

The methodology outlined below describes the procedures that will be implemented to minimise adverse effects on freshwater fish during works within the permanent reach of Trimbells Gully and within Murphys Creek. Fish salvage is only required on the permanent reach of Trimbells Gully, the intermittent Trimbells Gully tributary, only if water is present, and where culverts will be located on Murphys Creek. Fish salvage is not necessary in the intermittent reach of Trimbells Gully and the Clydesdale Creek tributary due to the presence of existing fish barriers.

2.2 Timing

Fish salvage and relocation will be undertaken immediately prior (within two to three days) to the commencement of any stream reclamation in the permanent reach of Trimbells Gully, or installation of culverts on Murphys Creek. Ongoing maintenance of any temporary fish barriers by the contractors will be undertaken until all stream works are complete within the area. Fish salvage should preferentially occur during the drier summer months when weather is generally more settled. No salvage should occur if moderate or higher rainfall is forecast for the salvage period.

2.3 Exclusion Devices

Prior to commencing works in the permanent reach of Trimbells Gully and Murphys Creek, barrier(s) will be installed to prevent fish moving up and downstream through the area of works. Only a downstream exclusion device is required for Trimbells Gully as the sediment pond already acts as an upstream barrier. Barriers are required for all culverts on Murphys Creek and should be located just beyond the up and downstream extents of works associated with each culvert.

Exclusion devices will be constructed from steel waratahs and shade cloth, or similar as shown in Figure 5. Shade cloth, or a similar material, allows water to continue to flow downstream while preventing fish passage. The exclusion screen will extend at least one metre past the wetted width of the aquatic habitat and will be embedded into the dry ground or the banks (Figure 5).

Waratahs will be securely hammered into the ground and evenly spaced across the stream to support the shade cloth. Where extra support is necessary, i.e. if the flow is very swift, wire will be threaded horizontally through the waratahs. Shade cloth will be fastened to the waratahs, and wire supports (where applicable) using zip ties or a similar mechanism. The shade cloth will extend approximately 0.5 m above the water level. Along the stream bed the shade cloth will either be embedded and pinned or securely weighted down, or an apron of the shade cloth will be formed and pinned. This creates a pocket, preventing fish from passing under the barrier.

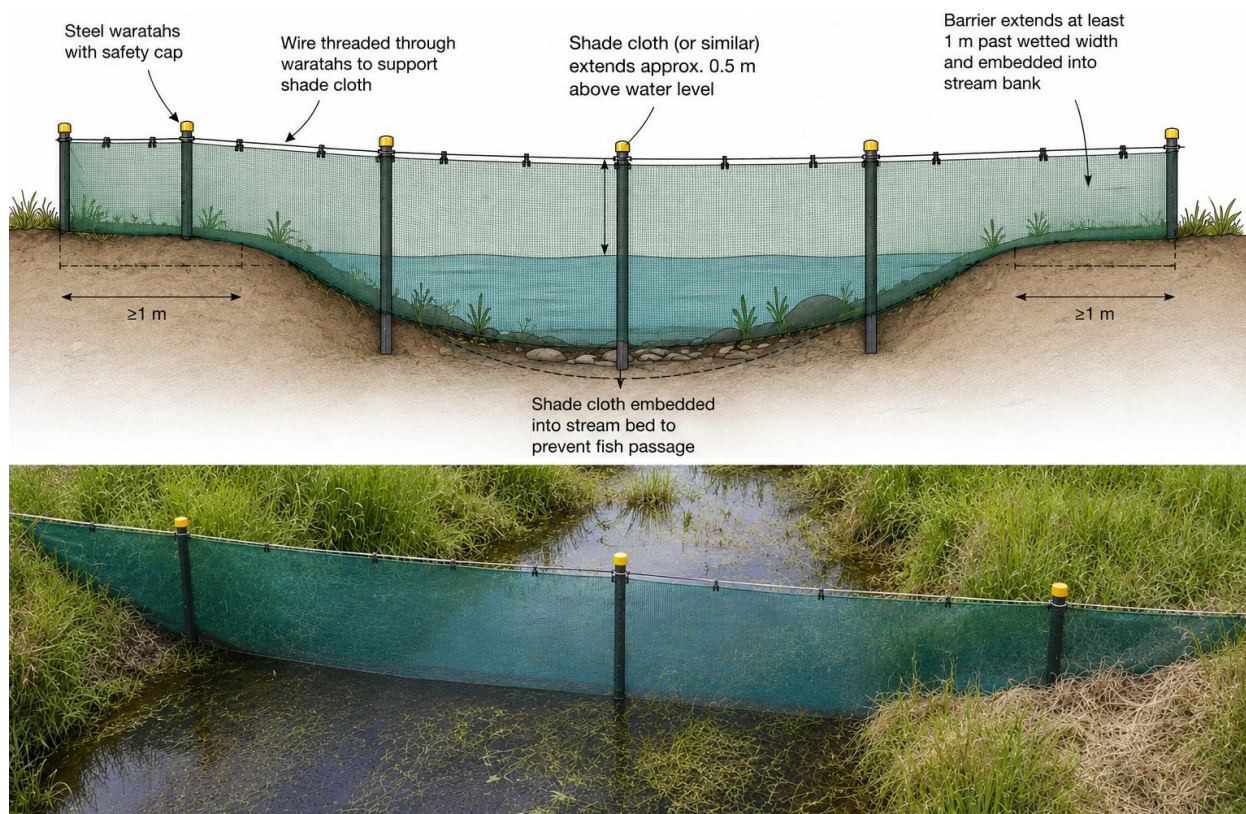


Figure 5. Example of a fish barrier installed in a stream to prevent passage into or out of an area.

2.4 Fish Capture

A combination of electric fishing and netting/trapping is proposed for both waterways where water is present. Where water is absent but saturated mud/sediment remains, this should be searched for eels.

The New Zealand Freshwater Fish Sampling Protocols (Joy *et al.* 2013) will be followed unless specified within this plan.

Electric fishing will be undertaken in the works reach (i.e. between the exclusion devices) prior to setting any nets. Several passes may be undertaken depending on fish capture rate. Fishing should occur from upstream to downstream which helps to shepherd any fish not captured by electric fishing downstream. Following electric fishing and providing water levels allow, baited Gee's minnow traps and fyke nets will be placed at intervals over the stream works areas and left in place overnight. Fine meshed fykes with a separator grill will be used if depth allows. All nets and traps will be set with an airspace to provide trapped fish access to atmospheric oxygen and will be set in general accordance with Joy *et al.* (2013). Floats will be placed in the fyke nets if required to ensure an airspace is available. The traps will be checked the following morning, prior to 9 am, with any captured fish recovered.

Trapping densities will be set, at minimum, at least one fyke net and two Gee's minnow traps over 25 m, in accordance with Joy *et al.* (2013). However, the densities of Gee's minnow traps may be increased if deemed appropriate by the supervising freshwater ecologist. Where water depth prevents fykes being set, the densities of Gee's minnow traps will be increased and hand-netting of any aquatic habitat (e.g. pools, overhanging vegetation, woody debris) will be undertaken. Hand netting will occur moving up the impact reach to sweep for any fish present within the channel which may not be able to move into the traps due to the shallow water depth. If water depths are not suitable for Gee's minnow traps, hand netting will still occur.

If more than 100 native fish are caught during a single fishing effort within the target area, fishing will continue until numbers are depleted to the satisfaction of the supervising freshwater ecologist (using an 80% removal rate as a target, based on the Hayne's (1949) regression method or other suitable method). A single fishing effort is considered to be one night of trapping or one pass of electric fishing. Electric fishing will be undertaken again following clearance of the nets.

Final teamwork's methodologies are not yet available. The final stream works methodology for Murphys Creek will be confirmed prior to works commencing. The FMP will be updated, if required, to align with the confirmed isolation, diversion, dewatering and culvert installation methodology. It is expected works to install the culverts in Murphys Creek will be required to occur 'in the dry'. At this point, bunding or sheet piling or similar will be installed to isolate the works area. Complete dewatering of the works area will commence provided capture rates have declined to the appropriate thresholds. All pumps used for dewatering will be appropriately screened to prevent fish being entrained in the pump. Screens will have gaps no larger than 3 mm. Native fish, such as eels (*Anguilla* spp.), will burrow into silt substrates when they are disturbed or as water levels decrease. As a result of this, during the dewatering stage, the supervising freshwater ecologist will be present to search through drained habitat, rocks/debris, remaining pools or thick sediment for any remaining fish. Once dewatering is completed, an excavator will be used to carefully scrape out any thick layers of soft sediment ('muck out'), if necessary. A toothed bucket will not be used on the excavator. In our experience it is more effective to use a non-toothed bucket. Provided that a minimum depth of approximately 200 mm of sediment is scraped, any eels buried within the mud will be scooped up unharmed. Toothed buckets are inefficient for muck out' as the teeth mean a shallower depth is scraped.

Dewatering is not expected to occur on Trimbells Gully. Given the lack of fish detected within the waterway, once the fish salvage methodology has been completed, the stream will be considered to be 'fished out'.

2.5 Fish Handling

Fish handling will be in accordance with Section 3.9 of the New Zealand Freshwater Fish Sampling Protocols (Joy *et al.* 2013) and the Viridis Ministry for Primary Industries (MPI) Special Permit (875) and Native Fish Transfer Authorisation 420 (NFT 420).

All fish captured in traps/nets or via electric fishing will be immediately transferred to water-filled, lidded containers of an appropriate volume for the number of fish captured. Multiple containers will be used if necessary. Containers will be stored in the shade. Fish will be stored in the containers for no more than one hour. If storage for longer is required, water will be changed at least once per hour and/or a battery powered air pump will be placed in each container to ensure oxygen levels are sufficient. A water conditioner, such as API Stress Coat, may be added to the water to reduce fish stress. Water conditioner will be added as per manufacturer instructions.

If any individual captured fish shows signs of stress (loss of righting response, exuding excessive mucus, gulping air, and/or mouth gaping) the water will be changed to provide more oxygen, or the fish will be moved to the relocation site immediately.

Fish will be visually examined for general health (visual skin lesions or heavy fungal burdens) and if considered unhealthy by the supervising freshwater ecologist, they will be humanely euthanised in accordance with condition 14 of the NFT 420.

Large eels (> 500 mm), if present, will be contained individually to avoid injury to other smaller captured fish. Kōura (*Paranephrops sp.*), if present, will also be separated into their own containers.

Captured fish will be securely transported to the relocation site and gently transferred into the stream as soon as practicable after being captured, but within four hours. If large numbers of fish are captured, they will be distributed across multiple release points in the general area to avoid short term overstocking and predation risks.

2.6 Relocation Site

2.6.1 Trimbells Gully and tributary

Fish captured within Trimbells Gully and the Trimbells Gully tributary will be released to one of two locations (Figure 6). The ultimate decision regarding which release site will be used will be at the discretion of the ecologist completing the fish salvage and will depend on sediment levels in Trimbells Gully downstream of the works sites.

As shown in Figure 6, relocation area 1 is located on Trimbells Gully, downstream of the works areas. It could be anywhere from approximately 100 m downstream of the works area, down to its confluence with Māori Hen Creek. The use of this site will depend on sediment levels in the stream. If visible sedimentation, elevated turbidity, poor flow conditions or other conditions likely to compromise fish welfare is present, as determined by the supervising freshwater ecologist, relocation area 2 will be used.

Relocation area 2 is located on Mare Burn. Mare Burn is the receiving waterway for Trimbells Gully and any fish present in Trimbells Gully would be able to access Mare Burn. The relocation site is located near where Trimbells Gully discharges to Mare Burn. Habitat here is generally similar to the impacted Trimbells Gully, though the wetted stream is larger and deeper and therefore capable of supporting any released fish as well as resident fish.

2.6.2 Murphys Creek

All fish captured in Murphys Creek will be returned to Murphys Creek. Two release sites are proposed (Figure 7). The first is located immediately upstream of the upstream most culvert. The second is located in the MEEA footprint, however use of this area will depend on access being available at the time.

2.7 Biosecurity

All equipment will be thoroughly cleaned and dried prior to use. Equipment includes, but is not limited to electric fishing machine, waders, fyke nets, Gee's minnow traps, stop nets, dip nets and transfer buckets.

Any pest fish caught will be humanely euthanised and all euthanised pest fish will be disposed of in a biosecure manner to land, in accordance with condition 20 of MPI Special Permit 875 and 16(d) of NFT 420.

2.8 Adaptive Management

Due to the high level of intrinsic variability in any fish recovery and relocation, this plan may be slightly modified by the supervising freshwater ecologist to ensure fish are recovered in a safe and professional manner, as well as in accordance with the New Zealand Freshwater Fish Sampling Protocols (Joy et al. 2013).

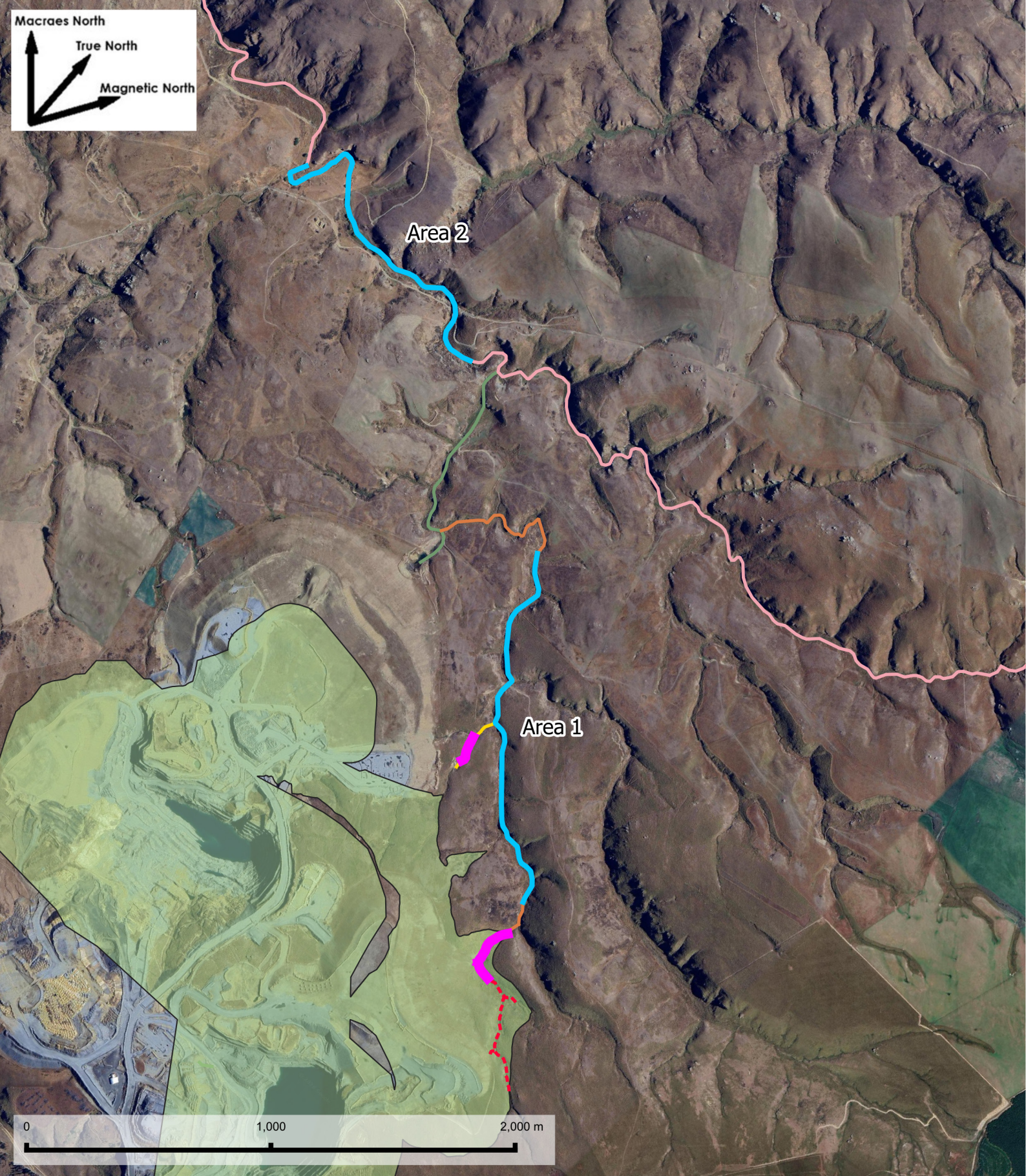


Figure 6. MP4 fish relocation sites - Trimbells Gully works

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- | | |
|---|---|
| MP4 footprint | Mare Burn |
| Impacted waterways subject to FMP | Maori Hen Creek |
| Fish release locations | Trimbells Gully tributary |
| Watercourses | |
| Trimbells Gully Creek | |



SOURCES
 Google Satellite 2023

DISCLAIMER: This map/plan is not an engineering draft. This map/plan is illustrative only and all information should be independently verified on site before taking any action.

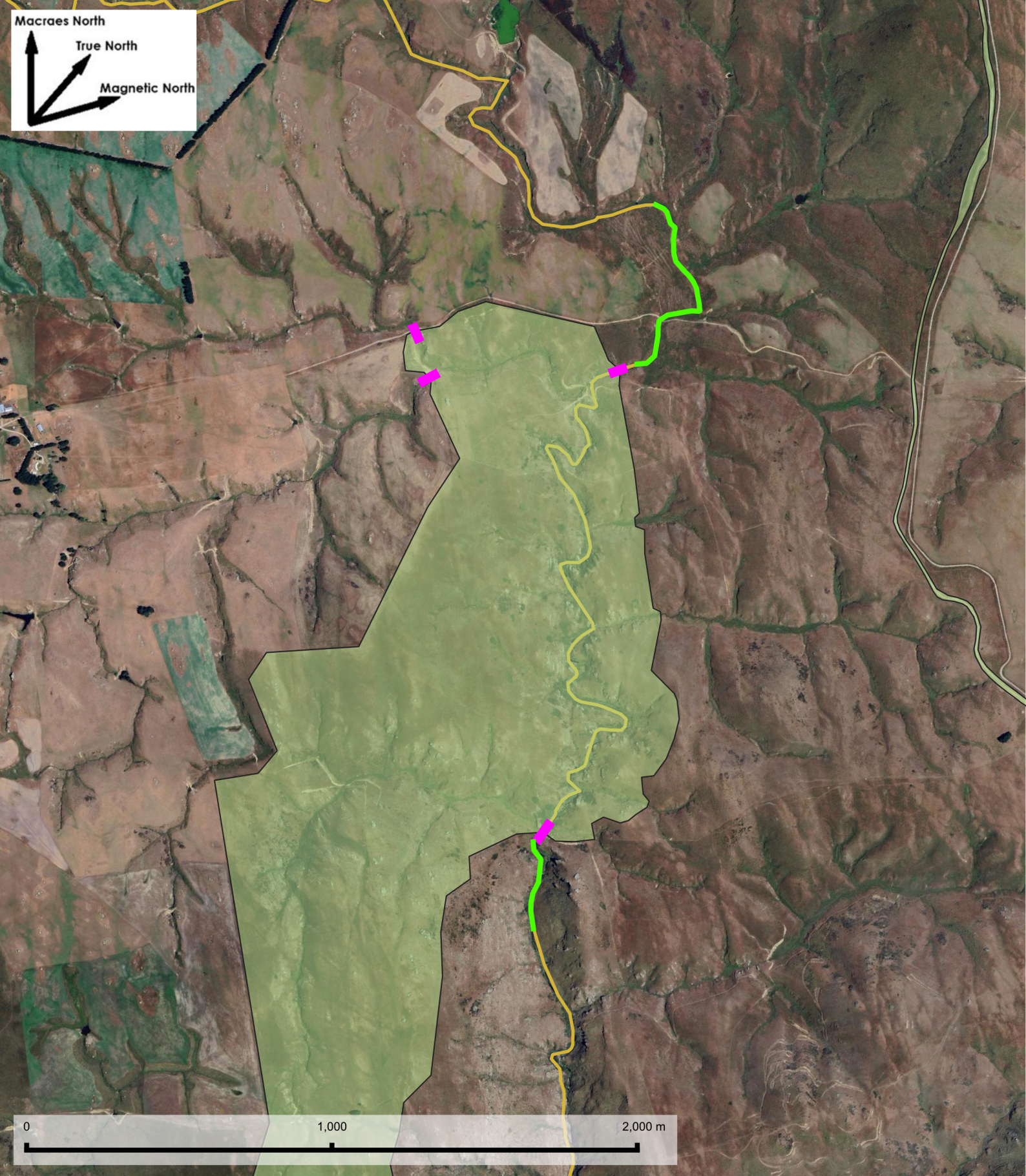


Figure 7. MP4 Fish release locations - MEEA works

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MP4 footprint
 Impacted waterways subject to FMP
 Fish release locations
 Watercourses
 Murphys Creek

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SOURCES
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2.9 Contingency Measures

Unexpected conditions may arise during fish salvage, relocation, dewatering, or excavation works. The following contingency measures will be implemented where necessary to minimise adverse effects on freshwater fish and aquatic habitat.

2.9.1 Rainfall events

Fish salvage and relocation will not be undertaken during periods of moderate or heavy rainfall, or where such conditions are forecast during the proposed salvage period. Elevated flows and reduced water clarity can reduce salvage effectiveness and increase risks to both fish and personnel.

If significant rainfall occurs during salvage or instream works, activities will cease until flows and water quality have stabilised to a level considered suitable by the supervising freshwater ecologist. Following any significant rainfall event, fish exclusion devices and isolated work areas will be inspected to confirm they remain functional and secure.

2.9.2 Fish mortality

If unexpected fish mortality occurs during salvage, handling, dewatering, or excavation works, the supervising freshwater ecologist will investigate the likely cause and determine whether modifications to salvage methods, handling procedures, work practices, or fish holding arrangements are required.

Any significant fish mortality event, including mortality of Threatened or At Risk species, will be recorded and reported to the relevant regulatory authority where required by resource consent conditions or permit requirements.

Higher-than-expected Capture of At Risk Species or Unexpected Native Species if Threatened or At Risk fish species are captured in greater numbers than anticipated, or an unexpected native fish species is captured, the supervising ecologist will review salvage effort, handling procedures and release arrangements before works continue in the affected area.

Where necessary, additional salvage effort, increased trap densities, or revised handling and relocation procedures may be implemented. Works within the affected area may be temporarily delayed if considered necessary by the supervising freshwater ecologist to ensure appropriate management of the species.

2.9.3 Equipment failure

In the event of equipment failure during salvage or dewatering activities, works will cease until the equipment is repaired or replaced, where failure may compromise fish salvage effectiveness, fish safety, or environmental protection measures.

Backup equipment, including spare nets, buckets, aeration devices, and dewatering pumps (where practicable), will be available during salvage operations to minimise delays and risks to fish.

3 REPORTING

Following completion of fish salvage and relocation works, a short report will be prepared detailing the fish captured (species and number of fish) during the salvage, as well as details on the relocation site. Otago Regional Council shall be provided with a copy of the report, subject to timeframes provided in the consent conditions, on completion of all fish relocation works. Fish capture data can be made available following the completion of stages if works are to be staged to avoid long periods of time between fish salvage and the delivery of the report.

Fish records will also be sent to NIWA to be included in the New Zealand Freshwater Fish Database.

Reporting will be in accordance with any resource consent conditions.

4 PERMITS

Viridis holds an MPI Special Permit (875) and NFT 420 that allows Viridis Limited, and their agents, representatives, and employees to take and relocate aquatic life to a suitable habitat where this is necessary or required to mitigate adverse effects of habitat modification on the aquatic life.

As the capture and relocation sites are not within a conservation area and because any fish captured will be relocated within the same catchment, no other permits are considered necessary.

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