

Before the Hearing Commissioners
appointed by the Grey District Council and
West Coast Regional Council

Under the Resource Management Act 1991

In the matter of Resource consent applications by TiGa Minerals and Metals
Ltd to establish and operate a mineral sands mine on State
Highway 6, Barrytown (RC-2023-0046; LUN3154/23)

Statement of evidence of Mark Roper

19 January 2024

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Qualifications and experience

- 1 My full name is Mark Roper.
- 2 I have been employed as an ecologist at Ecological Solutions Limited since 2022. Ecological Solutions Limited is a specialist ecological consulting firm with offices in Northland, Auckland, Tauranga and Hawkes Bay.
- 3 I hold a degree of Bachelor of Science (2003) in Environmental Studies and Psychology from Victoria University in Wellington. I also completed the equivalent of a Postgraduate Diploma in Biology through my work at the University of Waikato in Hamilton (2006), the University of the South Pacific in Fiji (2007), and Hólar University in Iceland (2009).
- 4 I have approximately 15 years' experience as an ecologist in New Zealand, Europe, and the Pacific Islands. Throughout my career, I have successfully delivered complex projects across a variety of sectors including mining, energy, infrastructure and forestry.
- 5 Prior to my current role I was an Environmental Forester with Forest Management New Zealand (for four and a half years) in Hawke's Bay. Prior to that I was a Senior Freshwater Ecologist with Cardno (for one and a half years) where I was the Project Ecologist for the Transmission Gully Motorway Project near Wellington.
- 6 I am a certified Electric Fishing Machine (EFM) operator. I have undertaken a large number of fish surveys using electric fishing, spotlighting, trapping and collection of eDNA samples. I have also undertaken many fish salvage operations utilising electric fishing and trapping techniques.

Involvement in the Project

- 7 My colleagues at Ecological Solutions have been involved with TiGa Minerals and Metals Limited's (**TiGa**) application to establish and operate a mineral sand mine at SH6 Barrytown (**Application and Application Site**) since early 2022, which predates my joining the company. More recently my role has been to provide advice in relation to freshwater ecological matters. Although I did not undertake the original surveys, I have visited the Application Site.
- 8 My assessment is based upon the proposal description attached to the evidence of Ms Katherine McKenzie as Appendix 1.
- 9 In preparing this statement of evidence I have considered the following documents:
 - (a) the AEE accompanying the Application;
 - (b) submissions relevant to my area of expertise;

- (c) the assessment of hydrological effects prepared by Kōmanawa Solutions Limited;
 - (d) the Water Management, Monitoring and Mitigation Plan prepared by Kōmanawa Solutions Limited
 - (e) the erosion and sediment control plan prepared by Ridley Dunphy Environmental Limited;
 - (f) the statement of evidence of hydrology by Mr Jens Rekker;
 - (g) the statement of evidence on terrestrial ecology by Dr Gary Bramley;
 - (h) the statement of evidence on water chemistry by Dr Mike Fitzpatrick;
 - (i) planning provisions relevant to my area of expertise;
 - (j) section 42A reports from Grey District and West Coast Regional Councils;
 - (k) the draft proposed conditions prepared by Ms Mckenzie.
- 10 Ecological Solutions Limited was engaged in early 2022 by TiGa Minerals and Metals to undertake the baseline terrestrial and aquatic surveys necessary to inform this resource consent application and contribute to the mine planning, particularly in relation to avoidance of adverse effects on the ecological values of the areas adjoining the Application Site. Ecological Solutions Limited prepared an assessment of environmental effects of the proposed activities ('the AEE') and provided recommendations to mitigate and/or remedy effects which could not be avoided (where that approach is appropriate).

Code of Conduct for Expert Witnesses

- 11 While this is not a hearing before the Environment Court, I confirm that I have read the Code of Conduct for expert witnesses contained in the Environment Court of New Zealand Practice Note 2023 and that I have complied with it when preparing my evidence. Other than when I state I am relying on the advice of another person, this evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

Scope of Evidence

- 12 I have prepared evidence in relation to:
- (a) Describing the assessment methodology;
 - (b) Describing the existing ecological context and freshwater ecological values at the Application Site.

- (c) the key findings of the assessment of effects;
- (d) Describing the opportunities for ecological restoration at the Application Site as part of the mining proposal
- (e) the relevant planning framework as it applies to ecological matters;
- (f) matters raised by submitters to the Application;
- (g) matters raised in the West Coast Regional Council's (**WCRC**) and Grey District Council's (GDC) staff reports (reports issued under s42A of the RMA);
- (h) questions of clarification from the Chair of the Hearings Panel; and
- (i) proposed conditions of consent.

Executive Summary

- 13 The Application Site is located on farmland situated between Collins Creek, Deverys Creek, State Highway 6 and the coast at the Barrytown flats, approximately 36km north of Greymouth. Streams immediately adjoining the Application Site include Collins Creek and the Northern Drain, whilst Canoe Creek is located to south of the Application Site. Coastal lagoons and a former dredge pond (Rusty Pond) occur in the lower reaches of streams to the north and west of the Application Site as described in the evidence of Dr Bramley.
- 14 Throughout my evidence I refer to Canoe Creek Lagoon, Collins Creek Lagoon and Deverys Creek Lagoon. Collins Creek and Deverys Creek lagoons together make up Canoe Creek Lagoon, and where appropriate I refer to Collins Creek and Deverys Lagoons separately. These locations are shown in Figure 1 of **Attachment A** to this evidence.
- 15 Collins Creek and the Northern Drain have been adversely affected by previous land use resulting in the removal of almost all indigenous vegetation and the degradation of aquatic habitats through realignment, bank erosion and sediment inputs. There are no recognised sites of ecological significance within the Application Site, but it does adjoin an SNA, which includes Deverys Creek Lagoon and Rusty Pond as described in the evidence of Dr Bramley.
- 16 The freshwater ecological values of the Northern Drain were assessed as 'low'. The section of Collins Creek adjoining the Application Site was assessed as having 'high' ecological value due to the presence of 'At Risk' (Declining) fish species despite the aquatic habitat being modified and degraded. Canoe Creek was assessed as having 'high' ecological value due to the presence of 'At Risk'

(Declining) fish species and the higher quality and less modified state of the aquatic habitats.

- 17 Mining would require dewatering of the pit and this dewatering could cause drawdown of the water table and result in potential effects on hydrology including water quality and quantity. With respect to effects on surface water hydrology, investigations by Kōmanawa Solutions Ltd have found Collins Creek and the Northern Drain are hydrologically isolated from groundwater which is expected to limit effects on surface water. In the unlikely event that drawdown occurred, water management measures are proposed to avoid adverse effects on stream ecology including returning treated mine water to ground and surface locations to maintain surface flows. This will be achieved via infiltration trenches, reinjection wells and direct discharge to affected waterbodies. Discharge to an infiltration basin near Canoe Creek is also an option to manage excess water at the Application Site. Frequent and comprehensive monitoring of ground and surface water levels would inform compliance and management would be adjusted as necessary to protect aquatic habitats. With this mitigation deployed, surrounding water bodies are expected to be subject to only negligible flow depletion resulting in less than minor effects.
- 18 With respect to effects on water quality, the discharge of treated groundwater derived from mining activities to Collins Creek, Northern Drain, Canoe Creek and Canoe Creek Lagoon will not result in exceedance of relevant water quality guidelines as described by Dr Fitzpatrick, so adverse effects on aquatic biota are not expected. Nonetheless, monitoring is required by Condition 25.2 and discharge to surface water is only permitted if metal and metalloid water quality parameters in Table A are complied with and the non-metal water quality parameters in Table B are also met. Table B includes a limit of 20 NTU for turbidity and a requirement for there to be no change in the NPS-FM attribute states of the receiving surface water bodies. I consider that these requirements will protect aquatic habitats adjoining the Application Site, including the coastal lagoon to which Collins Creek and the Northern Drain both contribute. On that basis, adverse effects on fish and aquatic macroinvertebrates would be avoided.
- 19 In my opinion the proposal meets the relevant directive policies of the National Policy Statements (i.e., the New Zealand Coastal Policy Statement (2010) and the National Policy Statement for Freshwater Management (2020)). It also meets the policies of the regional and local planning instruments.
- 20 I conclude that from an ecological effects perspective, the level of effects can either be avoided or managed to a very low level. This is equivalent to no effects (avoidance) or less than minor (very low) effects in the RMA context.

Assessment Methodology

- 21 My assessment included a review of available literature relating to the Application Site, review of existing reports, records of fish held in the New Zealand Freshwater Fish Database and collection of data during ecological surveys undertaken on 6-7 September 2022 and 18 December 2023.
- 22 A stream ecological survey was undertaken by Ecological Solutions at four sites on streams adjacent to the mining area on Collins Creek (upper and lower), Northern Drain and Canoe Creek as shown in Figure 2 in **Attachment A**. Data collected included water quality, stream and riparian habitat, macrophytes, periphyton, benthic macroinvertebrates and fish presence to assist in describing the existing environment and inform the ecological impact assessment. Environmental DNA (eDNA¹) was collected from the four sites during the 6-7 September 2022 survey and from lower Collins Creek and sites within the Collins Creek Lagoon and Deverys Creek Lagoons on 18 December 2023.
- 23 The ecological effects of the proposed mineral sand mine were assessed following the approach in the second edition of the Ecological Impact Assessment ('EclA') guidelines produced by the Environment Institute of Australia and New Zealand (Roper-Lindsay et al. 2018)². Briefly, this method assigns values to species and habitats within the Application Site and the surrounding 'zone of influence' according to conservation status, considers the magnitude of effect (ranging from positive (net gain) to very high (total loss)) and assigns an overall level of effect ranging from very high to net gain.

Habitat Characteristics

- 24 Collins Creek is a highly modified natural watercourse, part of which appears to have been historically realigned to flow along the southern boundary of the Application Site. The riparian vegetation on the true right (north) of the upper parts of the stream has been removed by grazing, and closer to the lagoon both sides of the stream are devoid of any riparian shrubland. Collins Creek provides moderate-poor quality aquatic habitat and reflects its highly modified state and bank instability. Examples of the riparian vegetation and habitats in Collins Creek are shown in Figures 3 – 8 of **Attachment A** to this evidence.

¹ Environmental DNA (eDNA) is organismal DNA that can be found in the environment. Environmental DNA originates from cellular material shed by organisms (via skin, faeces, urine, leaves etc.) into aquatic or terrestrial environments that can be sampled and monitored. eDNA is particularly useful for detecting the presence/absence of rare and cryptic species or invasive species.

² Roper-Lindsay, J., Fuller S.A., Hooson, S., Sanders, M.D., Ussher, G.T. 2018. Ecological impact assessment. EIANZ guidelines for use in New Zealand: terrestrial and freshwater ecosystems. 2nd edition. Published by Environmental Institute of Australia and New Zealand, Melbourne. 133 pp

- 25 The Northern Drain is a highly modified soft-bottomed (sand/silt) watercourse with a straight channel alignment. Both sides of the drain are accessible to livestock, resulting in pugging of the stream bank and direct channel disturbance. The channel was poorly shaded due to a lack of riparian vegetation, and had a high proportion of macrophyte cover. Data from the Northern Drain is typical of a channelised and highly modified watercourse affected by livestock grazing and other farming inputs. An example of the riparian vegetation and habitats in the Northern Drain is provided in Figures 9 and 10 of **Attachment A**.
- 26 Canoe Creek is a moderate sized, hard-bottomed natural river with diverse aquatic habitat. It is naturally a frequently highly disturbed environment, but nonetheless provides high-quality habitat for invertebrates and native fish. An example of the habitats present at Canoe Creek is shown in Figure 11 of **Attachment A**.

Water Quality

- 27 Baseline surface water quality in Collins Creek, Northern Drain, Canoe Creek and Canoe Creek Lagoon was reviewed and summarised in paragraphs 11 – 13 of the evidence by Dr Fitzpatrick. The summary presented indicates water quality would not be limiting aquatic biota in Collins Creek or Canoe Creek. Dr. Fitzpatrick's review also indicates that water quality would also not be limiting aquatic biota in the Northern Drain.

Benthic Macroinvertebrate Communities

- 28 Macroinvertebrate results indicated 'fair' to 'good' stream health but 'moderate' to 'severe' loss of ecological integrity in Collins Creek and 'poor' stream health and 'severe' loss of ecological integrity in Northern Drain. The lower Canoe Creek sampled supported a very sparse macroinvertebrate community with low abundance and diversity so it was not possible to conclude anything meaningful from the results.

Fish Fauna

- 29 A search of the New Zealand Freshwater Fish Database (NZFFD) on 2 July 2021 provided records between 1985 and 2012 and revealed the following:
- (a) Collins Creek – four species of native fish and one exotic species: longfin eel (*Anguilla dieffenbachii*), redfin bully (*Gobiomorphus huttoni*), common bully (*Gobiomorphus cotidianus*), bluegill bully (*Gobiomorphus hubbsi*) and brown trout (*Salmo trutta*).
 - (b) Deverys Creek – four species of native fish and one exotic species: longfin eel, Inanga (*Galaxias maculatus*), redfin bully, common bully and brown trout.

- (c) Deverys Creek lagoon – five native species and one exotic species shortfin eel (*Anguilla australis*), longfin eel, common bully, giant kōkopu (*Galaxias argenteus*), redfin bully and brown trout.
 - (d) Canoe Creek – eight species of native fish and one exotic species: kōaro (*Galaxias brevipinnis*), torrentfish (*Cheimarrichthys fosteri*), redfin bully, bluegill bully, shortfin eel, common bully, longfin eel, banded kōkopu (*Galaxias fasciatus*), and brown trout.
- 30 Ecological Solutions Limited's fish surveys were conducted on 6-7 September 2022 using an electric fishing machine and eDNA sampling as described in Paragraph 22. Surveys were undertaken at sites on Collins Creek (lower and upper), Northern Drain and Canoe Creek adjacent to the Application Site. Additional eDNA sampling was carried out on lower Collins Creek, Collins Creek Lagoon and Deverys Creek lagoon on 18 December 2023. eDNA results were as follows;
- (a) In 2022 Collins Creek supported six species: longfin eel, common bully, redfin bully, bluegill bully, torrentfish and brown trout. eDNA results from 18 December 2023 also indicated the potential presence of giant kōkopu. Collins Creek supported 'At Risk (Declining)' species (Dunn et al. 2018³) including longfin eel, bluegill bully, torrentfish and potentially giant kōkopu.
 - (b) Northern Drain supported a sparse fish fauna with only shortfin eel recorded during electric fishing. Results reflected the highly modified and degraded state of the habitat due to land use and cattle trampling damage along streambanks and within the channel.
 - (c) Canoe Creek supported torrentfish, longfin eel, bluegill bully and common bully. eDNA results also indicated the potential presence of kōaro. Canoe Creek supported low-moderate density of native species with an 'At Risk (Declining)' threat status (Dunn et al. 2018) including longfin eel, torrentfish, bluegill bully and potentially kōaro.
 - (d) eDNA sampling in Collins Creek Lagoon indicated the potential presence of six fish species including longfin eel, common bully, inanga, banded kōkopu, grey mullet and black flounder. Two of the species, longfin eel and inanga, have an 'At Risk (Declining)' threat status (Dunn et al. 2018).
 - (e) eDNA sampling in Deverys Creek lagoon indicated the potential presence of ten fish species including longfin eel, shortfin eel, common bully, redfin bully,

³ Dunn, N.R., Allibone, R.M., Closs, G.P., Crow, S.K., David, B.O., Goodman, J.M., Griffiths, M., Jack, D.C., Ling, N., Waters, J.M., Rolfe, J.R. 2018: Conservation status of New Zealand freshwater fishes, 2017. New Zealand Threat Classification Series 24. Department of Conservation, Wellington. 11 p.

bluegill bully, īnanga, banded kōkopu, grey mullet, black flounder and brown trout. Species with an 'At Risk' (Declining) (Dunn et al. 2018) threat status are longfin eel, bluegill bully and īnanga.

- 31 Brown trout were recorded in Collins Creek during the 6-7 September 2022 survey. There are NZFFD records of brown trout in Deverys Creek lagoon and in Canoe Creek.

Ecological Values

- 32 Collins Creek and Canoe Creek are assessed as having 'high' ecological value, primarily due to the presence of four native fish species with an 'At Risk' (Declining) threat status and also because they are in the lower reaches of the catchment and provide an important migratory pathway for diadromous native fish to the upper catchment. The Northern Drain is assessed as having 'low' ecological value due to its highly modified and degraded state, sparse fish fauna limited to shortfin eel and poor-quality macroinvertebrate community.

Assessment of Effects

Hydrology

- 33 The diversion of water away from the natural catchment of streams has the potential to affect flow and reduce habitat in streams. My understanding of the potential effects on hydrology at the Application Site is based on the assessment by Kōmanawa Solutions Limited and the evidence prepared by Mr Rekker. In Paragraph 95 of his evidence, Mr Rekker identifies five types of potential effects on the ground and surface water at the Application Site.
- 34 In Paragraph 20 of his evidence, Mr Rekker notes that in contrast with the general stratification of materials and groundwater properties, the margins and beds of Collins Creek and the Northern Boundary Drain were found to be associated with pronounced thickening of the clay-rich, low permeability overburden covering. Thus, the water courses are isolated hydrologically from the underlying groundwater system. This has been confirmed in drilling and groundwater property testing investigations.
- 35 Although effects on surface water are unlikely, because of this separation from the underlying groundwater, water management at the Application Site is proposed to address any unexpected effects due to surface water depletion including direct augmentation of/discharge to Collins Creek and/or the Northern Drain. Discharge to infiltration trenches to bolster shallow groundwater levels, and sub-surface injection via injection wells to bolster medium depth and deeper groundwater levels and discharge to the Canoe Creek Infiltration Basin, if required to manage excess water at the Application Site during mining, are also proposed.

- 36 Mr Rekker concludes in Paragraph 147 of his evidence that the revised groundwater model without mitigation measures specified indicates limited flow depletion on surrounding surface water bodies, including creeks, lagoons, wetlands and springs would occur. Given the monitoring dependent mitigation of groundwater, lowering groundwater as a result of mining would result in negligible flow depletion in waterbodies within and surrounding the Application Site.
- 37 Introduced brown trout, particularly large individuals, are the fish species present that would be most susceptible to a reduction in flow. Collins Creek is a very small stream with shallow water depths and does not provide habitat for large brown trout. The negligible depletion of flow predicted by Mr Rekker is unlikely to affect habitat for the small brown trout present in Collins Creek.

Water Quality

- 38 Land disturbance activities associated with the construction phase of the mining operation will be short term and managed with erosion and sediment control measures outlined in the Erosion and Sediment Control Plan (ESCP) prepared by Ridley Dunphy Environmental (2024) and discussed in the evidence of Mr Ridley.
- 39 Mr Ridley outlines key points regarding erosion and sediment for the project in paragraph 54 of his evidence and considers the risk of erosion and consequential sediment discharges is low due to the controlled nature of the mining phase works, staged approach and progressive stabilisation of rehabilitated areas.
- 40 The application proposes to discharge treated groundwater derived from sand extraction activities to Collins Creek, the Northern Drain, Canoe Creek and Canoe Creek Lagoon. Dr Fitzpatrick has conservatively modelled worst case water quality outcomes under a range of different scenarios and considered whether resultant quality in the receiving environment will meet required surface water standards and assessed the effects of discharging treated groundwater to surface waters adjoining the Application Site.
- 41 Dr Fitzpatrick states in the assessment of effects section of his evidence that discharges of treated groundwater that will be mixed with surface waters (at ratios stated in Kōmanawa Solutions Limited 2023) will not result in exceedances of relevant metals/metalloids guidelines, will cause no change in the NPS-FM (2020) attribute state for ammoniacal-nitrogen and there will not change the dissolved reactive phosphorus (DRP) attribute state of the receiving waters. Modelled nitrate nitrogen concentrations will be within Attribute Band A of the NPS-FM (2020). Dr Fitzpatrick did not model water clarity but states in paragraph 38 of his evidence that the proposal to control turbidity via bio-degradable flocculation in primary treatment ponds and treatment via a clarifier if required will readily achieve the limits proposed via consent conditions.

- 42 I agree with the conclusions in Dr Fitzpatrick's evidence and expect no effects on aquatic biota from metals/metalloids, ammoniacal-nitrogen, nitrate nitrogen, DRP or turbidity in Collins Creek, the Northern Drain, Canoe Creek and Canoe Creek Lagoon due to the proposed mining operation at the Application Site.
- 43 Proposed riparian planting and fencing along Collins Creek and the Northern Drain as described by Dr Bramley and Ms Crawford will enhance stream ecological values and function and also water quality in the long-term by providing shade to the currently sparsely vegetated watercourses and reducing streambank trampling, sediment inputs and ongoing damage by livestock.

Water take from Canoe Creek

- 44 The Processing Plant may require an initial water take from Canoe Creek with maximum rate of 63 litres/second to fill up the Processing Plant circuit. The water take from Canoe Creek may be required sporadically during mining to top up the water circuit, however generally the processing plant will use water recovered from pit dewatering or mechanically from the HMC product and un-mineralised sands via a series of cyclones which will be recirculated for reuse.
- 45 I understand that shallow ground water would be extracted from Canoe Creek via a subsurface gallery take with an appropriate fish screen as required by Condition 30.7. This method of take should avoid any risk of fish becoming entrained and 'relocated' from Canoe Creek to Collins Creek, or inadvertently killed, and will therefore avoid this type of potential adverse effect. A water take limit of 63 L/s from Canoe Creek comprises 10% of MALF. A water take of this size is expected to maintain instream conditions (i.e., habitat quality, native fish abundance) since the frequency of higher flushing and channel maintenance flows would remain mostly unchanged.

Fish Passage

- 46 The proposed installation of a culvert in upper Collins Creek to enable the access road to the Processing Plant has the potential to affect fish passage if it is not designed and installed properly. The section of Collins Creek within the Application site represents an important migratory pathway for diadromous native fish species migrating upstream into the upper catchment. The culvert will be designed and installed in accordance with permitted activity rules and guidelines in the NZ Fish Passage Guidelines for Structures up to 4 m (Franklin et al. 2018)⁴ and will ensure

⁴ Franklin, P., Gee, E., Baker, C., Bowie, S. 2018. New Zealand Fish Passage Guidelines for structures up to 4 metres. NIWA, Department of Conservation and New Zealand Fish Passage Advisory Group.

fish passage is maintained, so no fish passage related adverse effects are expected.

National Policy Statement for Freshwater Management (NPS-FM)

47 The National Policy Statement for Freshwater Management (2020) (NPS-FM) came into effect on 3 September 2020. The objective of the NPS-FM is to ensure that natural and physical resources are managed in a way that prioritises:

- (a) The health and well-being of water bodies and freshwater ecosystems
- (b) The health needs of people (such as drinking water)
- (c) The ability of people and communities to provide for their social, economic, and cultural well-being, now and in the future.

48 The NPS-FM sets out 15 policies. Relevant policies to this proposal from an ecological perspective are listed below:

- (i) Policy 3: Freshwater is managed in an integrated way that considers the effects of the use and development of land on a whole-of-catchment basis, including the effects on receiving environments.
- (ii) Policy 5: Freshwater is managed through a National Objectives Framework to ensure that the health and well-being of degraded water bodies and freshwater ecosystems is improved, and the health and well-being of all other water bodies and freshwater ecosystems is maintained and (if communities choose) improved.
- (iii) Policy 6: There is no further loss of extent of natural inland wetlands, their values are protected and their restoration is promoted.
- (iv) Policy 7: The loss of river extent and values is avoided to the extent practicable.
- (v) Policy 9: The habitats of indigenous freshwater species are protected.
- (vi) Policy 10: The habitat of trout and salmon is protected, insofar as this is consistent with Policy 9.
- (vii) Policy 12: The national target (as set out in Appendix 3) for water quality improvement is achieved.

I discuss each of these policies in more detail below.

49 *Policy 3* – Collins Creek and the Northern Drain lie within grazed pasture and have been affected by a long history of farming land use. Above the Application Site

upper Collins Creek is forested. Proposed riparian planting and fencing along Collins Creek and the Northern Boundary Drain will enhance stream ecological function, aquatic habitat values and water quality and importantly, remove ongoing cattle grazing and trampling damage of the streambanks and streambed. The quality of water reporting to the Canoe Creek Lagoon is expected to improve slowly over time as a result. The riparian planting and fencing will increase riparian habitat connectivity within the catchment between the farmed lower reaches and vegetated upper reaches of Collins Creek and will notably increase the extent of riparian vegetation along the currently unvegetated Northern Drain. In my view this is consistent with the policy to manage freshwater in an integrated way and considers the effects of the use and development of land on a whole-of-catchment basis as well as the effects on the coastal lagoons receiving environment.

- 50 *Policy 5* – the long-term health and well-being of freshwater ecosystems within the Application Site are expected to be improved via the proposed riparian planting, fencing and retirement from unrestricted cattle grazing access. This will improve the health and well-being of degraded water bodies and freshwater ecosystems adjoining the site. The proposal is consistent with Policy 5.
- 51 *Policy 6* – The proposal does not directly remove any natural inland wetlands and proposes a suite of mitigation actions to avoid the potential for groundwater drawdown beyond the site which could affect natural inland wetlands beyond the boundary. The policy is consistent with Policy 6.
- 52 *Policy 7* – no stream loss is proposed and the depletion of flow (and habitat) will be negligible based on the evidence of Mr Rekker. The loss of streams and their values will be avoided.
- 53 *Policy 9 and Policy 10* – The proposed riparian planting along Collins Creek and the Northern Drain will enhance stream ecological values and function and protect aquatic habitat for benthic macroinvertebrates, native fish and brown trout. The proposal is consistent with Policies 9 and 10.
- 54 *Policy 12* – The proposed riparian planting and stock exclusion along Collins Creek and Northern Boundary Creek is expected to improve water quality in the long-term which will contribute to achieving the outcome desired by Policy 12.
- 55 I consider the proposed application to be consistent with the relevant policies of the NPS-FM (2020).

National Policy Statement for Indigenous Biodiversity (NPS-IB)

- 56 The NPS-IB came into effect on 7 July 2023. The NPS-IB applies to indigenous biodiversity in the terrestrial environment Aotearoa New Zealand (Clause 1.3) and therefore excludes water bodies, freshwater matters and the coastal marine area.

- 57 However, clause 3.4 requires an integrated that recognises the interconnectedness of the whole environment and the interactions between the terrestrial environment, freshwater, and the coastal marine area.
- 58 I consider proposed planting of the constructed wetland, Collins Creek, Northern Drain and visual screening areas as well as the proposed riparian planting along Collins Creek and the Northern Drain recognise the interconnectedness between terrestrial habitats and aquatic habitat values and will improve ecological resilience, improve the connectivity at the interface of the freshwater and terrestrial environments and create better instream habitat through shading, bank stabilisation and improved water quality.
- 59 I consider the proposed application to be consistent with NPS-IB policies that are relevant to freshwater ecology.

New Zealand Coastal Policy Statement (NZCPS)

- 60 The coastal lagoons are within the Coastal Marine Area and the NZCPS applies. Policy 11 of the NZCPS relates to indigenous biological diversity (biodiversity) and Policy 11(a) is to avoid adverse effects on indigenous taxa that are listed as threatened or At Risk in the New Zealand Threat Classification System lists and/or taxa that are listed by the International Union for Conservation of Nature and Natural Resources as threatened. Freshwater fish present with an 'At Risk' (Declining) status are longfin eel, bluegill bully, torrentfish and potentially giant kōkopu and kōaro (based on eDNA data).
- 61 Policy 11(a) also relates to indigenous ecosystems, which the coastal lagoons are. As described by Mr Rekker, water at the Application Site ultimately reports to Collins Creek Lagoon and Devery's Lagoon before flowing out to sea. This will continue to be the case and water levels will be consistent with natural water levels allowing for the natural dynamism of the coastal environment. Based on Mr Rekker's evidence, it is my opinion that there will be no adverse effects on the coastal lagoons due to mining are expected nor will there be any significant effect on at-risk aquatic species.
- 62 Policy 11(b) is to avoid significant adverse effects and avoid, remedy or mitigate other adverse effects of activities on habitats in the coastal environment that are important during the vulnerable life stages of indigenous species and indigenous ecosystems and habitats that are only found in the coastal environment and are particularly vulnerable to modification. Coastal aquatic habitats with a connection with upstream freshwater habitats can provide an important pathway for migrating native diadromous fish. A significant change in hydrology within the coastal margin could adversely affect native fish migration but the evidence of Mr Rekker indicates a change in hydrology is not expected, but in the unlikely event it occurs, it can be managed to maintain the status quo. Upstream migrating native fish with an 'At

Risk' (Declining) status will be small individuals (i.e., whitebait, elvers) and are unlikely to be affected.

West Coast Regional Land and Water Plan (2021) (WCRLWP)

63 Policy 3.3.1 of the WCRLWP is when managing any activity involving water to give priority to avoiding, in preference to remedying or mitigating adverse effects on the habitats of threatened species identified in Schedule 7A. None of the habitats identified in Schedule 7A are located within the proposed mining area.

Matters Raised by Submitters

64 I have read the following submissions which raise matters relating to the aquatic ecology of the Application Site. In addition to a number who indicate "waterways" are a concern, there are two specific submissions from:

- a) The Director General of Conservation;
- b) Dr Roseanna Gamlen-Greene;

Each of these submissions is addressed in more detail below.

Effects on Freshwater Species and Habitat

65 The Director General of Conservation recommended an updated assessment of freshwater fish be undertaken due to several 'At Risk' (Declining) species recorded in fish surveys conducted in the 1980-90s and the potential for adverse hydrological effects that can impact freshwater fauna and values.

66 The assessment of the fish fauna was thorough and involved surveys in September 2022 and December 2023 using an electric fishing machine and eDNA sampling in each stream within the Application Site. The assessment also included a survey of Canoe Creek, Collins Creek Lagoon and Deverys Creek lagoon adjacent to the Application Site. The suite of fish species recorded during surveys was comparable with existing known fish species present. I do not consider an updated assessment is necessary, and would not meaningfully contribute in terms of understanding the species present.

67 Potential hydrological effects will be minimised via water management and Mr Rekker is of the opinion that, with this mitigation, surrounding water bodies would be subject to only negligible flow depletion. As a result, the potential for adverse hydrological effects that can impact freshwater fauna and values, including 'At Risk' (Declining) fish species, are not expected to occur.

Fish Fauna (Methods)

- 68 Dr Gamlen-Greene's submission lists seven matters relating to the fish fauna survey methods, which she believes makes the Assessment of Environmental Effects incomplete. A significant amount of work in the hydrology space and additional eDNA sampling has been undertaken since Dr Gamlen-Greene's submission and as such all of her concerns have now been addressed.
- 69 In relation to sampling effort and accurately describing fish diversity, the fish fauna in streams adjoining the Application Site and wider catchment were assessed by drawing on existing information (i.e., New Zealand Freshwater Fish Database). The methods and approach applied were appropriate for the nature of the streams and provided results that allowed a good representation of the fish fauna present or potentially present. Electric fishing was carried out by an operator that has attended the NIWA Electric Fishing Machine Operator course and has 20 years of experience with electric fishing New Zealand streams, including streams on the West Coast. The electric fishing machine operator applied a range of techniques to draw fish out of the wide range of habitats fished (e.g., runs, pools, riffle). The range of habitats present in each stream were electric fished to account for differences in the various habitat preferences of each fish species. I consider the electric fishing results to provide an accurate representation of the fish fauna present in each stream, and when assessed in combination with existing NZFFD data and eDNA results, provide a thorough assessment of the fish fauna present or potentially present.
- 70 With respect to the fishing method following national standards, ~50–60m long reaches of stream were fished and the operators ensured that all habitat types present within each stream were fished to maximise the chance of capturing species with different habitat preferences. The electric fishing survey provided results that are considered to accurately reflect the fish fauna in each stream. Spotlighting and trapping in Collins Creek and Canoe Creek is unlikely to have identified additional species and was considered unnecessary after a review of NZFFD data from streams in the vicinity of the Application Site and the results obtained in our surveys. No fish were detected in the eDNA sample collected from Northern Drain, but a small number of shortfin eel were captured during electric fishing. Northern Drain provided marginal habitat, unshaded and affected by cattle trampling, so the presence of only shortfin eel is not unexpected.
- 71 With respect to not undertaking a concerted effort to look for brown mudfish, there are no NZFFD records of brown mudfish within the Application Site (Collins Creek or the Northern Drain) with the nearest records being ~6 km to the north (lower Hibernia Creek catchment) and at a location ~40 km to the south. Of the 46 sites where fish have been surveyed within 10km of the Application Site, only one site (lower Hibernia Creek catchment) had brown mudfish. The Northern Drain is highly

disturbed via unrestricted livestock trampling within the channel and along streambanks and supports shortfin eel, which is a potential predator of brown mudfish. There is a surprisingly low level of co-occurrence between mudfish species and eels (O'Brien and Dunn 2007)⁵. The presence of predatory shortfin eels in Northern Drain, no NZFFD records of brown mudfish in streams adjoining the Application Site, only one of the 46 sites within 10km with data in the NZFFD having brown mudfish and that site being 6km away, combined with the highly disturbed nature of the habitat (e.g., cattle trampling damage) and no detection of brown mudfish in the eDNA sample, confirms to me that the presence of brown mudfish in the Northern Drain is unlikely. Regardless, in the unlikely event brown mudfish are present, mining is set back from the Northern Drain and there will be no direct disturbance of habitat, in fact it will be improved via riparian planting, and the proposed water management mitigations (including surface discharge of treated water which meets the appropriate water quality standards) will protect the habitat of any mudfish present.

- 72 With respect to the effectiveness of electric fishing in the Northern Drain, at the time of the survey, turbidity and water velocity did not restrict the effectiveness of the electric fishing survey. The Northern Drain was not turbid and it was possible to see and capture fish during the electric fishing survey. There was slight flow (0.05–0.2 m/s) at the time of the survey. The Northern Drain is a narrow and shallow watercourse, so it was possible to fish a section from the bank first and then walk in the stream in a downstream direction to 'spook' and guide fish downstream into the stop-net that spanned the entire width of the channel. If any fish were present in a fished section, they most likely would have been captured. Short sections of the stream were electric fished at a time, and once fished, fishing continued in an upstream direction until ~50–60m of stream was fished.
- 73 With respect to only taking one eDNA sample per stream, eDNA was used to compliment electric fishing results and existing NZFFD data. eDNA sampling involved collecting stream water from several locations within a survey reach and from different habitats in order to maximise the extent and type of habitats sampled. Two eDNA samples were collected from Collins Creek on two separate occasions. eDNA sampling results provided useful additional information, including the potential presence of banded kōkopu and kōaro somewhere in the Collins Creek catchment upstream of the sampling locations. These species would not have been detected from electric fishing alone.
- 74 In general, the lower section of Collins Creek adjoining the Application Site does not provide habitat conditions preferred by banded kōkopu (i.e., overhead cover,

⁵ O'Brien, L.K. and Dunn, N.R. 2007. Mudfish (*Neochanna Galaxiidae*) literature review. Science for Conservation 277. Science & Technical Publishing Department of Conservation, Wellington.

instream shelter) or kōaro (i.e., high velocity, good overhead cover, large streambed substrate), so DNA from these species in samples most likely came from individuals in the upper catchment where the stream drains steep topography in native bush and where habitat conditions are likely to be better suited to these species. The section of Collins Creek adjoining the Application Site is however considered to provide an important migratory pathway for these species.

- 75 The detection of fish using eDNA varies from site to site and as noted by Dr Gamlen-Greene, can result in false-negatives, however, it can also result in false-positives, which is why we also electric fished the streams to ensure multiple methods were used to characterise the fish fauna.
- 76 In terms of the timing of the fish survey, the ecology report (Ecological Solutions 2023) stated that surveys were carried out on 6 and 7 September 2022. Surveys were carried out between 12:30 pm and 4:30 pm. The survey was carried out in spring and at a time when native fish would have been active. The capture of whitebait in Canoe Creek and Collins Creek indicates the survey was carried out at a time when juvenile fish were also actively migrating upstream. The moderate-high abundance and diversity of the fish fauna recorded in Collins Creek and Canoe Creek indicates that the survey was carried out at a suitable time of year when fish were active.
- 77 In terms of the sampling effort in each watercourse, electric fishing effort was based on fishing a standardised area across streams and typically along a ~50–60 m long survey reach. Electric fishing was undertaken across the range of habitats present in each stream to maximise the potential for capturing the range of species potentially present and to gain a general understanding of the relative abundance of each species in each stream.

Effects on Stream Ecology

- 78 With respect to the adequacy of the fish survey and being able to adequately assess effects, I consider that the combination of electric fishing and eDNA sampling in each stream, the sampling effort and timing of the surveys, and reference to existing data, mean that we have accurately described the fish fauna present within the waterbodies that we had access to adjoining the Application Site and wider catchment and allowed us to accurately assess the potential effects of the proposed mining operation on fish.
- 79 In terms of mitigation not being sufficient for the 'At Risk' species, given that there will be no direct stream disturbance other than for the construction of a culvert for a road crossing, no stream diversions, and no reduction of flows or loss of habitat, the potential effects on native fish have been adequately identified and addressed with the proposed water management measures and erosion and sediment control as required by the draft proposed conditions. The proposal is not expected to result

in the depletion of flow or any adverse effects on water quality. I also note that Collins Creek and the Northern Drain, which are currently heavily damaged by livestock grazing, will undergo riparian planting as part of the proposal and this will enhance overall stream ecological function and value and benefit the fish fauna beyond the life of mining.

- 80 Dr Gamlen-Greene rightly notes that sedimentation and turbidity can be harmful to fish. Land disturbance activities associated with the construction phase of the mining operation will be short term and managed with erosion and sediment control measures outlined in the ESCP prepared by Ridley Dunphy Environmental (2024) and discussed in the evidence of Mr Ridley. Dust from the site which could reach water bodies would be managed in accordance with the Dust Management Plan prepared by Mr Berry. Turbidity in mine water will be controlled via flocculation in the primary treatment ponds, which is standard practice, and will readily achieve the limits proposed via consent conditions to protect aquatic biota. A clarifier is proposed to improve water clarity if required as described in the evidence of Mr Lawson. Only water which meets the standards of Condition 25.2 will be discharged to surface waters. Water that is too turbid to discharge to stream environments would be directed to the Canoe Creek Infiltration Basin as outlined in Paragraph 121 in the evidence of Mr Rekker. Mr Rekker outlines how water with high turbidity or Total Suspended Solids concentrations exceeding the prescribed thresholds would be discharged to the infiltration basin and suspended solids would be removed through immobilisation and filtration in basin bed materials. The infiltrated water would join the underlying water table and prevailing groundwater flow. I consider the above proposed measures will avoid potential effects of suspended sediment and turbidity on stream ecology.

Matters raised by WCRC and GDC staff reports

- 81 Paragraph 98 of the WCRC s42A staff report prepared by Dr Durand states some of the works are within 10m of a riparian margin. My understanding is that the only aspect of the project that is within the riparian margin is reinstatement work for the Canoe Creek Infiltration basin (as well as riparian planting and fencing which does not require consent). The project is otherwise set back at least 20m from streams and property boundaries as described by Ms McKenzie. In my opinion the effects of works within the riparian margin will be less than minor as the vegetation within the current riparian margin is mostly comprised of gorse and blackberry.
- 82 Dr Durand has referred to the Canoe Creek Lagoon as a natural inland wetland. I agree with Dr Bramley's opinion that the two components (Collins Creek Lagoon and Deverys Lagoon) are coastal wetlands and Rusty Pond is not.

Proposed consent conditions

83 I understand that Dr Bramley, Dr Fitzpatrick, Mr Rekker and Mr Ridley have all had input in the proposed consent conditions prepared by Ms Mckenzie. I have read these draft proposed consent conditions and can confirm that in my opinion they are sufficient to protect native fish and aquatic habitats from mining within the application Site. In particular Condition 8 relating to Hazardous substances, Condition 9.1d which requires Collins Creek, the northern boundary drain, surrounding wetlands and the coastal lagoon to be protected from the effects of erosion and sediment generation, Condition 19 relating to wetland restoration and riparian planting, Condition 23 relating to erosion and sediment control, Condition 24 requiring the water management plan, Condition 25 relating to water discharge methods and parameters and Condition 26 relating to water monitoring and Condition 27 relating to dust management and Condition 29 setting minimum outcomes for Collins Creek, the Northern Drain and Canoe Creek Lagoon as well as Condition 30 relating to water take from Canoe Creek relate to potential effects on freshwater ecological values and I am satisfied that these conditions are suitable to protect the aquatic values and habitats at the Application Site.

Conclusion

84 The freshwater ecological values of the Northern Drain were assessed as 'low'. The section of Collins Creek adjoining the Application Site was assessed as having 'high' ecological value. Canoe Creek was assessed as having 'high' ecological value.

85 The proposal would require dewatering of the pit and this dewatering could cause drawdown of the water table and result in potential effects on hydrology including water quality and quantity, and aquatic species.

86 The proposed water management measures and frequent monitoring of ground and surface water and Kōmanawa Solutions Limited's conclusion that Collins Creek and the Northern Drain are hydrologically isolated from groundwater are expected to mean that only negligible flow depletion occurs as a result of the proposal, resulting in less than minor effects.

87 The proposed water discharges are not expected to result in the exceedance of relevant water quality guidelines as described in Dr. Fitzpatrick's evidence and with the monitoring requirements of Condition 25.2, which are aimed at protecting the aquatic environment, I conclude that adverse effects on fish and aquatic macroinvertebrates would be avoided.

88 In my opinion the proposal meets the relevant directive policies of the National Policy Statements (i.e., the New Zealand Coastal Policy Statement (2010), the National Policy Statement for Freshwater Management (2020) and the National

Policy Statement for Indigenous Biodiversity (2023)). It also meets the policies of the regional and local planning instruments.

89 I conclude that, the level of effects can either be avoided or managed to a very low level and so there are no impediments to the mining from a freshwater ecology standpoint.

Mr Mark Roper

Dated this 19 day of January 2024

Roper Evidence – Attachment A



Figure 1: Location of water bodies within and near the Application Site, Barrytown.



Figure 2: Location of aquatic surveys at Nikau Deer Farm, Barrytown.



Figure 3: Upper Collins Creek (drone photograph supplied by Luke McNeish).



Figure 4: Upper Collins Creek closer to SH6 (drone photograph supplied by Luke McNeish).



Figure 5: Upper Collins Creek.



Figure 6: Middle reach of Collins Creek with riparian vegetation on the true left.



Figure 7: Middle reach of Collins Creek.



Figure 8: Lower Collins Creek



Figure 9: Upper section of the Northern Drain at the Application Site.



Figure 10: Typical habitat conditions along the Northern Drain (Site 1).



Figure 11: Typical habitat conditions along lower Canoe Creek (Site 4).



Figure 12: Canoe Creek habitats.