BEFORE THE HEARING COMMISSIONERS APPOINTED BY GREY DISTRICT COUNCIL AND WEST COAST REGIONAL COUNCIL

Under	**The Resource Management Act 1991**
And In the matter of	**Applications by TiGa Minerals and Metals Ltd to establish and operate a mineral sand mine on State Highway 6, Barrytown (RC-2023-0046; LUN3154/23)**

Supplementary Statement of Mike Harding

on behalf of Perspective Consulting/Grey District Council

Terrestrial Ecology

Dated: 18 March 2024

Table of Contents

Background

1. My name is Mike Harding.

2. I prepared terrestrial ecology evidence on behalf of Perspective Consulting/Grey District Council dated 12 December 2023. My qualifications and experience are set out in that evidence. I confirm that I have complied with the code of conduct for expert witnesses (Environment Court's Practice Note 2023) when preparing this statement.

Purpose and Scope

3. This statement supplements the advice provided in my 12th December 2023 review of terrestrial ecology. It considers the additional information provided in the applicant's evidence (January 2024), supplementary statements (February 2024), material presented by expert witnesses and submitters at the hearing (February 2024), and post-hearing documents (March 2024).

4. This supplementary statement addresses outstanding terrestrial ecology issues under the following headings. It then responds to questions raised in Commissioner Minute 6, and provides comments on the Avian Management Plan and proposed Conditions of Consent:

    a) Effects at the location (mine footprint).

    b) Effects at adjacent habitats.

    c) Effects of mine vehicles on fauna along State Highway 6.

    d) Catastrophic events.

    e) Coastal plain ecosystem.

    f) Commissioner Minute 6.

    g) Avian Management Plan.

    h) Proposed Conditions of Consent.

Effects at the location (mine footprint)

Taiko

5. An important potential effect of the proposed activity at the mine location is the presence of artificial light which may cause grounding of taiko/Westland petrel. Expert evidence and submissions confirm this risk.

6. For example, the evidence of Dr Waugh states that taiko "come into land in the early evening, and generally fly out to sea before dawn," "don't fly in a direct line from the sea to the colonies, and they spend up to 1 hr circling above the land/sea and colony boundaries before landing." [1] It also states that taiko flight paths can vary depending on wind and weather conditions.

7. The revised application restricts most mining activities – including transport of material – to daylight hours (30 minutes before sunrise to 30 minutes after sunset). It is unclear, from the evidence of which I am aware, whether that time restriction is sufficient to avoid adverse effects on taiko. It may be prudent for the restriction to include "weather conditions that require external lighting" as noted by Dr Waugh[2] and Kate Simister.[3]

8. The revised application proposes to restrict artificial light in accordance with a Lighting Management Plan (LMP). The restricted operating hours and lighting will reduce – but may not eliminate – the risk of taiko groundings.

9. Kate Simister notes that the LMP was prepared by Dr Bramley, "who states no qualifications, or experience in designing, implementing lighting mitigation at operational mine sites."[4] I concur that such a plan should be prepared by an appropriately qualified lighting practitioner in consultation with an appropriately qualified ecologist.

10. Ceri Warnock raises the concern that the proposed LMP may be incompatible with mine health and safety requirements.[5] The suitability and effectiveness of the LMP remains uncertain until that issue is resolved.

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[1] Statement of Evidence, Dr Susan Waugh, 25 January 2024 [50].
[2] ibid [70]
[3] Summary Statement of Oral Evidence, Kate Simister, 26 February 2024 [6]
[4] Supplementary Statement, Kate Simister, 15 March 2024 [7]
[5] Legal Submission from Counsel on behalf of the Director-General of Conservation, Ceri Warnock, 15 March 2024.

11. The frequency and extent of "maintenance of equipment supporting the WCP plant which cannot be deferred until daylight is required, or when staff are moving between buildings"[6] is unclear. If this is a commonly occurring activity, the risk of taiko grounding may be high.

12. Submissions and evidence indicate the difficulty detecting grounded taiko. Grounded birds seek cover, are dark-coloured, and remain quiet. Observations at night, without artificial light, by mine staff, are unlikely to be a reliable method of detecting grounded birds. Grounded taiko appear more likely to be observed when they emerge from shelter during daylight hours, by which time the birds are weak and unlikely to survive regardless of intervention.

13. The revised Avian Management Plan (AMP) proposes installation of ten trail cameras to record (continuously at night) any grounded birds.[7] The reliability of trail cameras to record birds in the dark is unclear. Operation of the cameras during daylight hours (as well as night-time) may help detect the emergence from cover of any grounded taiko. Nevertheless, the cameras will not ensure that adverse effects on taiko are avoided; instead, they will help ensure that this effect is more likely to be detected.

14. Dr Bramley states that the camera footage will be reviewed by an independent ecologist.[8] This requirement is not clearly stated in the consent conditions.[9]

15. I advised earlier that the loss of an individual taiko would have an adverse effect on the taiko population.[10] Expert evidence of Dr Susan Waugh[11] and Kate Simister[12] concurs that the loss of individual taiko would have a population-level effect. The evidence I have heard affirms my view that the loss of an individual taiko would likely be a significant (more than minor) adverse effect.

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[6] Supplementary Statement, Gary Bramley, 8 March 2024 [11]
[7] Avian Management Plan v5, p30.
[8] Supplementary Statement, Gary Bramley, 8 March 2024 [19]
[9] Consent Condition 18.5, as presented in the Avian Management Plan v5, p11.
[10] Terrestrial Ecology Review, Mike Harding, 12 December 2023 [94]
[11] Statement of Evidence, Dr Susan Waugh, 25 January 2024 [37 & 63]
[12] Statement of Evidence, Kate Simister, 26 January 2024 [67-68]; Summary Statement of Oral Evidence, Kate Simister, 26 February 2024 [11]

Kororā

16. Since the preparation of my earlier review, further evidence has been presented which indicates a greater likelihood that kororā may use – or traverse – the mine location.[13] The revised AMP acknowledges the possible presence of kororā.[14]

17. The revised AMP proposes monitoring of kororā prior to commencement of mining and eliminating cavities under buildings (potential nest sites). These measures, along with restricted operating hours and lighting will reduce – but may not eliminate – the risk of kororā disturbance or mortality.

18. The revised AMP proposes that actual response to the presence of kororā will be determined by a – yet to be prepared – "response" plan" or "management plan."[15] The AMP states that the response plan may include "relocation" of nesting kororā. Displacement of kororā from favoured nesting sites may have a significant adverse effect, and therefore be inconsistent with the goal of the AMP.

Displacement of other nesting birds

19. A further potential effect of the activity is disturbance or displacement of birds that forage or nest at the mine location, such as South Island pied oystercatcher and possibly banded dotterel, or traverse the mine location, such as kororā.

20. The revised AMP proposes surveys of the proposed mining area during the bird breeding season to detect "breeding behaviour or nesting." Proposed species' management "comprises discouraging nesting before it occurs and managing any established nests once they are discovered."[16] Bird nesting will be discouraged to "reduce the need to disrupt mining activities by having to place a 50m buffer around any nests."[17]

21. Such management actions will not avoid adverse effects on avifauna, as birds would be displaced from favoured forage or breeding sites. The magnitude of the adverse effects of any displacement is unclear.

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[13] Oral submission of New Zealand Penguin Initiative.
[14] Avian Management Plan v5, p20.
[15] ibid p27
[16] ibid p24
[17] ibid p25

22. Dr Bramley responds to the evidence of Dr Waugh at paragraph 85 (which supports my evidence at paragraphs 126-127) "that the methods proposed to deter dotterel and pipit are unproven."[18] Dr Bramley then describes in detail the efficacy of different methods for displacing birds from potential nest sites.[19]

23. My primary evidence at paragraphs 126-127 is not about the effectiveness of different displacement methods. Instead, my evidence stated that because the purpose of the methods is to displace birds from potential nest sites, it will not avoid adverse effects on indigenous fauna.

24. As stated in my earlier evidence: It is unclear …. whether these actions would have adverse effects on 'at risk' or 'threatened' taxa and whether the magnitude of any adverse effects would be more than minor.[20] Dr Bramley's supplementary statement does not address this concern.

Invertebrate fauna

25. My terrestrial ecology review noted the lack of data on the presence of or effects on mobile invertebrate fauna such as Lepidoptera (e.g., moths) at the mine location.[21] No further data have been provided. However, the proposed restrictions on artificial light will reduce the potential for adverse effects on night-flying invertebrates.

Effects at adjacent habitats

Adequacy of information

26. Two of the matters requiring further information identified in my terrestrial ecology review were the vegetation/habitat and the presence/habitat use by cryptic/secretive bird species at areas adjacent to the mine site.[22]

27. No comprehensive recent data on vegetation and habitat – and habitat use – on the property north of the site have been provided by the applicant or submitters. This lack of data constrains the assessment of adverse effects. Indigenous vegetation and habitat are present

[18] Supplementary Statement, Gary Bramley, 8 March 2024 [24]
[19] ibid. [24-26; Table 1; Figure 1]
[20] Terrestrial Ecology Review, Mike Harding, 12 December 2023 [127]
[21] ibid [47]
[22] ibid [82]

along that property boundary; I expect that vegetation/habitat to be ecologically significant.[23] In the absence of information to the contrary, it must be assumed that significant ecological values – including natural wetlands – are present.

28. Six previously unrecorded cryptic/secretive bird species were listed in my review as possibly using habitats adjacent to the mine location.[24] The presence of three of these species – fernbird, kororā and reef heron – has since been confirmed. A fourth species (marsh crake) has possibly been recorded at Barrytown. And a further notable species (little shag) was recorded at the site in January 2024.[25]

29. These recent bird observations illustrate the risk of relying upon existing (e.g. eBird database) records and short-term surveys. It also reaffirms my view that the adjacent lagoon-wetland ecosystem has ecological value greater than its size and condition may suggest.

Disturbance of fauna

30. The potential adverse effects of the activity on avifauna at habitats adjacent to the mine location include artificial light, noise, and movement/activity. Restricting mine operations to daylight hours and restrictions on artificial light will reduce potential adverse effects on avifauna at habitats adjacent to the mine location.

31. The potential adverse effects of noise on avifauna at adjacent habitats remain unclear. The applicant's evidence indicates that the noise of mine operations will be the same as or slightly greater than the background noise (principally wave action/surf) at adjacent habitats, depending on location.[26]

32. I am unaware of any applicable data on the disturbance effects of noise on avifauna. In my experience, birds are disturbed by unusual and/or abrupt noise, rather than by a continuous background noise such as that generated by processing equipment or water pumps (or surf). A single or occasional loud noise from machinery or vehicles is more likely to frighten a bird.

33. It is unclear whether the presence (visibility of) of machinery, vehicles and people would discourage birds from using adjacent habitats or disturb birds at those habitats. Mining

[23] Grey District Plan criteria (s5.4, p27); National Policy Statement for Indigenous Biodiversity 2023, Appendix 1.
[24] Terrestrial Ecology Review, Mike Harding, 12 December 2023 [82ii]
[25] Summary Statement and Rebuttal Evidence, Gary Bramley, 2 February 2024 [6]
[26] Statement of Evidence, Jon Farren, 19 January 2024 [38-39; Figure E3]

would be an intensive land disturbance activity in a rural environment. At any one time the excavation will extend across an area 300m long by 100m wide.[27] In my experience, some bird species are tolerant of such disturbance and other species are not. Species that are likely to be intolerant of disturbance include mātā/fernbird, matuku/bittern, and grey duck.[28]

34. Mitigation proposed by the applicant includes buffer planting adjacent to the mine, and setbacks during the bird breeding season. Proposed plantings will take several years to effectively screen the mine activity from adjacent habitats. The effectiveness of such screening is unclear. Setbacks are discussed below.

Buffering of adjacent habitats

35. The applicant's assessment of effects assumes that the activity will not have adverse effects on bird species using habitats adjacent to the site. Insufficient data have been provided to support that assumption. It remains unclear whether the presence of machinery, vehicles and people, and the noise generated by their use, will disturb avifauna at adjacent habitats.

36. To address these potential adverse effects the revised AMP proposes to avoid mining within 100m of Canoe Creek Lagoon during the first year of mining and during the bird breeding season (August to December inclusive) in following years, and to establish buffer plantings.[29] At other times mining is proposed within 20m of Canoe Creek Lagoon.

37. The 100m distance is somewhat arbitrary; there are no data of which I am aware that define 100m as an appropriate buffer distance. However, 100m is the distance defined in the Resource Management (National Environmental Standard for Freshwater) Regulations 2020, is the distance recommended in the Commissioners' decision for an earlier application at the site, and is the distance proposed by the applicant for the bird breeding season.

38. I concur that 100m is a <u>minimum</u> distance for buffering adjacent habitats from the adverse effects of the activity. However, it is unclear whether a 100m buffer will be sufficient to avoid all adverse effects on avifauna at adjacent habitats; there are insufficient data to provide that certainty.

[27] Statement of Evidence, Stephen Miller, 19 January 2024 [39]
[28] Displacement of matuku may have a population-level effect.
[29] Avian Management Plan v5, p17

39. Any agreed buffer must apply to the boundary of the mining activity adjacent to Canoe Creek Lagoon and to the boundary of the property adjacent to the northern site boundary. The 100m buffer must apply all year (12 months).

Effects of mine vehicles on fauna along State Highway 6

40. Increased traffic resulting from the mine poses an additional risk to taiko and kororā. The application has been revised so that "Truck movements to or from the site associated with removal of heavy mineral concentrate must only travel south of the site, and must be limited to 50 per day and 5 per hour and must only occur during the hours of daylight."[30]

41. These provisions will reduce – but may not eliminate – the risk of taiko groundings or kororā roadkill. The risk of vehicle-induced bird grounding or mortality may be further reduced if there was no trucking in weather conditions that require external lighting.

42. The magnitude of the effect on birds – notably kororā – of increased traffic on State Highway 6 is unclear.

Catastrophic events

43. Evidence presented by the applicant proposes that beach erosion is unlikely, due to the composition of the beach material and elevation of the site above sea level.[31] That evidence appears inconsistent with the West Coast Regional Coastal Plan, which places the site within a coastal hazard area threatened by beach erosion and wave inundation,[32] the Review of West Coast Region Coastal Hazard Areas, which identified beach erosion as a hazard at Barrytown Beach,[33] and the proposed Te Tai Poutini Plan which places the adjacent lagoon in a 'coastal alert' zone.[34] It is also inconsistent with the evidence of James Renwick[35] and submitters' observations of the effects of storm events.

44. A potential adverse effect is that a storm event and/or high seas may inundate the mine pit, scouring or collapsing the pit wall, and adversely affecting the landform and ecological values at adjacent lagoons or wetlands. The applicant's evidence is that the risk of uncontrolled pit

[30] Draft Lighting Management Plan v2 (consent condition 15.1), p11
[31] Summary Statement and Rebuttal Evidence, Gary Teear, 2 February 2024 [5-7]
[32] West Coast Proposed Coastal Plan 2016, p110.
[33] Measures, M; Rouse, H. 2022. Review of West Coast Region Coastal Hazard Areas, Version 2. NIWA Client Report CHC2012-081, p41.
[34] Proposed Te Tai Poutini Plan, Natural Hazards Map 39.
[35] Statement of Evidence, James Renwick, 12 January 2024 [28]

wall collapse is very low.[36] It is unclear if this evidence gives due consideration to a coastal inundation event.

45. A major seismic event (earthquake) may have similar effect. The applicant's evidence is that the likelihood of a "magnitude 8 Alpine Fault earthquake impacting this Proposal within in any one year period is 0.001%"[37] This appears inconsistent with evidence that major seismic events on the Alpine Fault have a recurrence interval of 300 years.[38] The risk of a seismic event causing pit failure and subsequent effects on the coastal lagoon appear uncertain.

Coastal plain ecosystem

46. Existing and recent (new) avifauna records are consistent with my earlier advice that the coastal plain ecosystem at this location, of which Canoe Creek Lagoon is an integral part, has an ecological value greater than its size and condition would suggest. Dr Waugh attributes the richness and abundance of the bird fauna to "the mix of relatively undisturbed wetland, coastal, forest, and marine habitats occurring within a small area, as well as the open-fields and low-intensity nature of the farming activity in the area."[39]

47. The application contains little analysis of the value of the coastal plain ecosystem (ecological context) of the proposed mine site. And, in fairness, it would be difficult to survey, research and document those ecosystem-level values in a period of just a year or two. Nevertheless, intact parts of the coastal plain ecosystem at this location are regionally significant, as they provide the most favourable habitat of this type along a long stretch of an otherwise steep and rocky coastline.

Commissioner Minute No.6

48. In response to paragraph 7(b): I confirm my opinion[40] that vegetation and habitat at Canoe Creek Lagoon that lies outside the SNA identified as PUN-W034 is ecologically significant and has high ecological value.

49. In response to paragraph 7(d): the ecological values have been adequately characterised for the purpose of assessing ecological significance but have not been adequately characterised

[36] Summary Statement, Cam Wylie, 2 February 2024 [14]
[37] Supplementary Evidence, Cam Wylie, 6 February 2024 [3a]
[38] Orchiston et al, 2018., *New Zealand Journal of Geology and Geophysics*, 61:3, 389-402, DOI: 10.1080/00288306.2018.1455716
[39] Statement of Evidence, Dr Susan Waugh, 25 January 2024 [16]
[40] Terrestrial Ecology Review, Mike Harding, 12 December 2023 [35]

for a full and robust assessment of sensitive fauna. The very recent (January 2024) discovery of a further notable bird species (little shag) indicates that the habitat values of the lagoon are not yet fully understood.

Avian Management Plan

50. Components of the Avian Management Plan (AMP) have been addressed in the preceding paragraphs. Additional advice is provided below.

51. The first goal of the AMP is to avoid adverse effects on 'threatened' and 'at risk' birds in the vicinity of the site. The second goal is to avoid during the breeding season, and minimise at other times, adverse effects on habitats adjoining the mine site.[41] The distinction between 'in the vicinity of' and 'adjoining' is unclear to me.

52. Adjoining habitats lie in the coastal environment, within which there is a NZCPS obligation to avoid adverse effects on 'at risk' and 'threatened' taxa (which are present), and to avoid significant adverse effects on indigenous vegetation and habitats.[42] The AMP goals should more clearly reflect the NZCPS obligations.

53. The AMP proposes that the goals will be achieved by avoiding "effects on birds and important habitats identified" and by monitoring.[43] Two types of monitoring are proposed in the AMP: monitoring to detect bird species on and adjacent to the mine site; and monitoring of the effects of the mining activity. The first type of monitoring is essential, as it will provide valuable information on habitat use and may help enable any mining operation to avoid adverse effects.

54. The second type of monitoring has limited value. Monitoring adverse effects will not ensure those effects are avoided; instead, it will simply mean those effects are more likely to be detected.

55. Further, it may not be possible to clearly attribute those detected effects to the mining activity. To draw that conclusion – to the level of certainty required for enforcement – would require monitoring of 'control' sites unaffected by the mining activity. Otherwise, a legitimate

[41] Avian Management Plan v5, p15
[42] New Zealand Coastal Policy Statement 2010, Policy 11(a) (i) and Policy 11 (b), respectively
[43] Avian Management Plan v5, p16

explanation may be that the cause of the effect was an unrelated 'background' event, such as extreme weather or a general population decline.

56. The AMP "will be updated in the event of tāiko being detected using the site" and "updated annually."[44] The interrelationship between the AMP and consent conditions is explained by Dr Bramley.[45] The consent conditions must provide for independent review of any updates or revisions of the AMP and any other management plans (to ensure those changes are consistent with the consent conditions), and must require certification/approval by the consent authority.

Proposed Consent Conditions

57. The consent conditions assessed here are those in the Proposed Conditions of Consent dated 14 March 2024. Only those conditions relevant to terrestrial ecology are assessed, and advice is provided only where the conditions are inadequate for the protection and maintenance of indigenous biodiversity.

Condition	Issue	Advice	Reference[46]
6	Management Plans	All management plans, and reviews of those plans, must be certified by the consent authority (Grey District Council). Certification must include written approval of the plan or plan revision by the consent authority.	
7.1	Mine boundaries	The delineated mine boundaries must be a minimum of 100m from the northern property boundary, the coastal lagoon, and any wetland.	35-39
18.1	100m setback	The 100m setback must apply throughout the year (12 months).	35-39

[44] Avian Management Plan v5, p16
[45] Supplementary Statement, Gary Bramley, 8 March 2024 [9]
[46] Reference to paragraph numbers in this Statement.

18.5	Wildlife cameras	It is unclear who will review the camera footage; interpretation of the images must be undertaken by a suitably qualified and independent person.	
18.7	AMP review	Any reviewed AMP and LMP must be approved/certified by the consent authority (Grey District Council) (see Condition 6).	
18.8	AMP review	Certification of the AMP and LMP must include approval by the consent authority (Grey District Council). (see Condition 6).	
18.9 (iii)	Kororā/penguins	Mining activities must avoid nesting kororā.	
18.9 (iv)	Penguin Management Plan	Any Penguin Management Plan must be approved and certified by the consent authority (Grey District Council).	
18.11	AMP objectives	The second objective (referred to elsewhere as a 'goal') must amended so it is consistent with the NZCPS.	51-52
18.13	AMP	Certification of the AMP must include approval by the consent authority (Grey District Council). (see Condition 6).	

Conclusion

58. The application for this mining activity has changed considerably since I provided my advice in December 2023. Critical changes for terrestrial ecology are: no night-time mining activity (except the Wet Concentrator Plant within a window-less building, and water-pumping equipment); restrictions on artificial lighting and vehicle movements; and, transport of material south – instead of north – along State Highway 6. These changes reduce the likelihood of adverse effects on indigenous fauna.

59. Analysis of the likelihood and magnitude of potential adverse effects is constrained by our limited understanding of the ecology of the mine environs and the wider coastal plain ecosystem. The applicant has provided considerable information. Nevertheless, the following uncertainties remain:

    a) The ecological value of vegetation and habitat on the property north of the proposed mine site (vegetation/habitat that is almost certainly ecologically significant) and the sensitivity of fauna using that habitat.

    b) The extent to which mining activities will disturb or displace wildlife at the adjacent Canoe Creek lagoon-wetland complex (a regionally important habitat).

    c) The magnitude of the adverse effects of displacing birds from foraging and/or nesting sites at the mine location.

    d) The likelihood of the mining activity causing grounding of taiko (the loss of any taiko may have a population-level effect).

    e) The compatibility of the Lighting Management Plan with health and safety lighting requirements.

    f) The effect on the local kororā and taiko populations of any increased mortality caused by mine traffic on State Highway 6.

    g) The risk of the mine pit causing erosion and/or dewatering of the adjacent coastal lagoon-wetland complex in the event of a catastrophic storm event, earthquake, or coastal inundation.

    h) The reliability and robustness of self-reporting by mining staff of adverse effects on birds, and of compliance by mining staff with bird-protection operating procedures.

60. Two of the potential effects listed above are, in my view, critical: (b) disturbance and/or displacement of wildlife at the adjacent Canoe Creek lagoon-wetland complex; and (d) taiko groundings at the mine site. If either one of these occur, the adverse effects on terrestrial ecology will likely be significant (more than minor).

61. The Canoe Creek lagoon-wetland complex clearly provides very important habitat – in a regional context – for indigenous fauna, including at least 15 'at risk' or 'threatened' species. The application includes a suite of actions to mitigate the adverse effects of the proposed mining activity. If one or more of these mitigating actions fail, there is a high probability that the adverse effects on adjacent habitats will be more than minor.

62. The loss of an individual taiko would be an adverse effect. The magnitude of this adverse effect would depend on the health of the taiko population. The evidence is clear that this species faces numerous threats, some of which are likely to increase, such as storm events and warming sea temperatures. If the loss of a taiko coincides with adverse effects from other population-level threats, the adverse effect on the taiko population will be significant (more than minor).

63. I have recent experience of two open-cast mining operations. My reviews of these mining operations found that intended mitigation – as required by consent conditions – did not occur as expected. Regardless of the diligence and intentions of the mine operator, there were failings which had consequent adverse effects on indigenous biodiversity.

64. There remains a considerable risk that regardless of the operator's intentions – and the requirements of the consent conditions – one or more components of the proposed mitigation will fail. The location of the proposed mine in the coastal environment, adjacent to important bird habitats, and within the range of taiko, mean the consequences of failure will likely be high.

Mike Harding

18th March 2024