ENVIRONMENT COURT OF NEW ZEALAND
WELLINGTON REGISTRY

I MUA I TE KOOTI TAIAO O AOTEAROA
TE WHANGANUI-A-TARA

ENV-2023-000005

Under	the Resource Management Act 1991
In the matter of	the direct referral of applications for resource consent and notices of requirement under sections 87G and 198E of the Act for the Ōtaki to North of Levin Project
By	Waka Kotahi NZ Transport Agency

STATEMENT OF EVIDENCE OF ALEXANDER BRYAN WILFRIED JAMES ON BEHALF OF WAKA KOTAHI NZ TRANSPORT AGENCY

FRESHWATER ECOLOGY

Dated: 4 July 2023

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INTRODUCTION

1. My full name is **Alexander Bryan Wilfried James**.

2. I am a Senior Freshwater Ecologist at EOS Ecology, where I have worked for 14 years.

3. I prepared Technical Assessment K: Freshwater Ecology (**Technical Assessment K**) as part of Volume IV of the Assessment of Environmental Effects (**AEE**), which accompanied the application for resource consents and notices of requirement for designations (**NoR**s) lodged with Manawatū-Whanganui Regional Council (**Horizons**), Greater Wellington Regional Council (**GWRC**), Horowhenua District Council (**HDC**) and Kāpiti Coast District Council (**KCDC**) in November 2022 in respect of the Ōtaki to north of Levin highway Project (**Ō2NL Project** or **Project**).

4. My qualifications and experience are set out in paragraphs 25 to 27 of Technical Assessment K. My evidence is supplementary to Technical Assessment K.

5. In preparing Technical Assessment K and my evidence, I have:

   (a) provided advice on Freshwater Ecology matters related to the Project to Waka Kotahi since December 2020;

   (b) designed and undertaken a field survey programme to collect information on the existing state of waterways intersected by the Ō2NL Project;

   (c) provided advice on fish passage requirements at waterway crossings along the Ō2NL Project;

   (d) produced a freshwater ecology assessment of environmental effects to support a consent application to allow test pits to be excavated in close proximity to some waterways as part of geotechnical investigations;

   (e) inputted into development of the Cultural and Environmental Design Framework;

   (f) attended various community meetings in 2021 and consultation and engagement exercises in May 2022 to provide Project updates on ecological matters;

(g) attended ecology workshops and attending a site visit with Project partners Muaūpoko and Ngāti Ruakawa ki te Tonga and also with stakeholders Horizons, the Department of Conservation (**DOC**), and Forest and Bird;

(h) attended hui with Project partners Muaūpoko and the hapū of Ngāti Ruakawa ki te Tonga to discuss freshwater ecology;

(i) inputted into the assessment of natural character;

(j) attended initial site visits and discussions with landowners of potential stream offsetting locations;

(k) undertaken fieldwork at some likely stream offsetting locations to inform offsetting calculations; and

(l) contributed to draft consent conditions relating to freshwater ecology.

6. Since the consent applications and NoRs were lodged I have:

(a) been involved in further discussions with landowners of potential stream offsetting locations;

(b) addressed s92 queries as relevant to freshwater ecology;

(c) attended two meetings with Wellington Fish and Game regarding their submission (15 and 27 March 2023); and

(d) met with Logan Brown (Regional Council freshwater ecology technical expert) on 6 April 2023 to discuss any remaining freshwater ecology issues.

Code of conduct

7. I confirm that I have read the Code of Conduct for expert witnesses contained in section 9 of the Environment Court Practice Note 2023. This evidence has been prepared in compliance with that Code. In particular, unless I state otherwise, this evidence is within my area of expertise and I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

Purpose and scope of the evidence

8. Technical Assessment K assesses the effects of the Project on freshwater ecology resulting from the construction and operation of the Project.

9. My evidence does not repeat in detail the matters discussed in Technical Assessment K. Rather, in this evidence I:

   (a) present the key findings of Technical Assessment K in an executive summary, updated to factor in the additional work carried out since lodgement;

   (b) provide a more detailed description of the additional work carried out, information obtained, and discussions held since lodgement, and the implications for my assessment;

   (c) comment on issues raised in submissions received in respect of the Project; and

   (d) comment on the section 87F/198D reports prepared by Horizons, GWRC, HDC and KCDC (**council reports**).

EXECUTIVE SUMMARY

Methodology and existing state of the freshwater environment

10. The proposed Ō2NL Project route traverses five water catchments (see Volume III Stormwater drawing set 310203848-01-300-C2000 – C2003). From north to south, these are the Koputaroa (a sub-catchment of the Manawatū River), Punahau/Lake Horowhenua, Ohau, Waikawa, and Waitohu. Forty-eight waterways that intersect with the Ō2NL Project have been identified (four ponds, 25 permanently flowing streams/rivers, and 19 ephemeral watercourses/overland flow paths). No intermittent streams have been identified.

11. Field surveys and site visits to all accessible sites were undertaken between March and November 2021. At the 21 permanent streams where access was available, surveys involved assessments of stream function and habitat condition using the Stream Ecological Valuation (SEV) methodology, collection of macroinvertebrate samples, and collection of environmental DNA (eDNA) samples to determine which fish species were present. Ephemeral sites were documented via site notes and photography. Surveys and site visits were undertaken at the site of impact (where the proposed designation intersects with the waterway).

12. The ecological surveys indicated that the majority of sites were degraded by agricultural and/or horticultural land use. Based on flow permanence, SEV

scores, habitat characteristics, macroinvertebrate community assemblages, and fish species present, the overall ecological values were:

(a) "High" – two sites (Ohau River and Waikawa River).

(b) "Moderate" – ten sites (Stream 39, Stream 39.1, Kuku Stream, Stream 29, Stream 27.1, Stream 19, Stream 17, Stream 18, Manakau Stream, and Waiauti Stream).

(c) "Low" – all other permanently flowing streams.

(d) "Negligible" – ephemeral waterways.

Assessment of effects

13. The actual and potential effects of the Ō2NL Project on freshwater ecology were assessed separately for the construction phase (generally short-term effects) and operational phase (generally long-term effects).

14. Various effects management actions are proposed to avoid, remedy, mitigate or offset the adverse effects on freshwater ecology identified above. The management actions, and assessment of overall levels of effect applying the Ecological Impact Assessment Guidelines (**EcIAG**) matrix, are summarised below.

15. The potential construction phase effects identified were:

(a) Freshwater habitat disturbance – the unavoidable disturbance of freshwater habitats during the construction of culverts and diversions that may injure and kill stream biota.

(b) Fish migration disturbance – disruption to the natural movements of fish resulting from the use of temporary diversions during construction.

(c) Release and deposition of fine sediments – the discharge of fine sediments from construction sites to adjacent waterways where it may cause adverse effects on stream biota by smothering of the streambed.

(d) Water contamination – the contamination of waterways and connected wetlands by machinery (e.g., oils, greases, fuel, hydraulic fluids) and construction materials (e.g., concrete, concrete wastewater, grouts, mortars).

(e) Water abstraction – the abstraction of water for construction purposes has the potential to have adverse effects on freshwater habitats and biota.

16. The potential operational phase effects identified were:

(a) Reduction in free movement of aquatic fauna – the permanent alteration of natural migration and movement pathways via the installation of culverts.

(b) Stormwater discharges – the discharge of stormwater from the Ō2NL Project to adjacent waterways where it may have adverse effects due to the contaminants (e.g., metals, hydrocarbons, fine sediments) it contains and via alteration to existing hydrology.

(c) Freshwater habitat loss and modification – the permanent loss and modification of freshwater habitat via installation of culverts and stream reclamation. There will be approximately 3,224 m of existing permanent stream channel length lost over the project.

(d) Light pollution – the installation of artificial lighting in locations where it may have adverse effects on freshwater ecology.

Effects management and overall level of effects

17. Various effects management actions are proposed to avoid, remedy, mitigate or offset the potential adverse effects on freshwater ecology identified above. The management actions, and assessment of overall levels of effect applying the EcIAG matrix, are summarised below.

Construction effects

18. Freshwater habitat disturbance effects during the construction phase will be minimised by the capture and relocation of fish and large macroinvertebrates (kōura, kākahi) from impacted stream reaches. With this action, the overall effect will be “Low” for the Ohau River and “Very Low” for all other sites.

19. Fish migration disturbance effects during construction will be avoided by either avoiding works during migration periods of fish species known to exist in the water course / at the site or by ensuring fish passage is possible through any temporary diversion pipes or open channels. With these actions, the overall effect will be “Low” for Stream 2 (near chainage 34,050) and “Very Low” for all other waterways.

20. The effects of release and subsequent deposition of fine sediments during construction will be minimised by the implementation of an erosion and sediment control plan (and associated site-specific erosion and sediment control plans) detailing the various methods and procedures to limit the discharge of runoff laden with fine sediments to adjacent waterways. Because of the differing sensitivities of receiving environments to fine sediment deposition, and the high likelihood that there will be at least some discharges of turbid water from the construction zone to adjacent waterways, the overall effects taking into account the implementation of the management plans vary among waterways (the evidence of **Mr Gregor McLean**, **Ms Ainsley McLeod,** and **Mr Keith Hamill** describes in more detail the approach to ESC). Effects are, as follows:

    (a) “Moderate” for Stream 17 (chainage 29,500) and Stream 19 (chainage 28,850); and

    (b) "Low” or “Very Low” for the remaining waterways.

21. The two waterways where the construction phase sedimentation level of effect has been assessed as moderate (Stream 17 and Stream 19), have been designated as having low sensitivity to increased sedimentation. Both are small, modified channels with degraded instream habitat that were deemed to be of “moderate” ecological value on account of the presence of the “At Risk – declining” longfin eel. I am confident the best practice ESC procedures used throughout the Project will be sufficient to mitigate this moderate level of effect.

22. As described in the evidence of **Mr Keith Hamill**, water contamination from machinery and construction materials during the construction phase will be avoided by:

    (a) appropriate vehicle and fuel management;

    (b) ensuring all work areas using wet concrete are isolated from flowing waters; and

    (c) ensuring all grouts or mortars are fully cured prior to contact with flowing water.

23. With these actions, the overall effect will be “Low” to “Very Low” for all waterways.

24. Adverse effects of water abstraction for construction purposes will be minimised or avoided by:

    (a) constructing storage ponds which will be replenished at low instantaneous abstraction rates;

    (b) only taking water from existing available allocations and use minimum flow levels defined in the relevant Regional Plan for each watercourse as the flow level at which any abstraction must cease; and

    (c) ensuring all intakes have 2-3 mm screens to avoid fish from entering pumps.

25. With these actions, the overall effect will be "Low" for all waterways where abstraction is proposed. I note that **Dr Jack McConchie** provides evidence in response to commentary by the Regional Councils on the proposed water takes.

Operational effects

26. The reduction in the free movement of aquatic fauna by installation of permanent culverts will be avoided at the major streams with the use of bridges. All culverts in permanent streams will be designed to provide fish passage using the "stream simulation" designs as standard (see description and design principles in NIWA/DOC (2018)[1]) . Ephemeral streams with permanent habitats upstream (that is farm dams and ponds) may use a flexible baffle design to facilitate fish passage at times when there is surface water flowing. This equates to:

    (a) A "no effect" situation for bridge sites (Ohau River, Waikawa Stream, Manakau Stream, Waiauti Stream).

    (b) A "Net Gain" for Stream 2 (new culvert under existing SH1 near chainage 34,050), Stream 20 (approximate chainage 28,575), and Stream 23 (approximate chainage 28,050), where a new culvert will increase connectivity due to existing barriers being removed, and for Kuku Stream where an existing farm culvert is being removed. This equates to a "positive effects" situation.

    (c) A "Very Low" level of effect for all other waterways.

[1] National Institute of Water & Atmospheric Research & Department of Conservation 2018. New Zealand fish passage guidelines for structures up to 4 metres. NIWA Client Report No: 2018019HN. 226 p.

27. The operational effects of stormwater discharges will be minimised by capturing all road runoff for conveyance through a stormwater treatment train incorporating swales and retention ponds/wetlands. This will result in any runoff to adjacent waterways being treated to remove as many contaminants as possible. This design means the overall effect is a "Net Gain", "Low" or "Very Low" level for all waterways.

28. The permanent loss and modification of freshwater habitat as a result of culvert installation and stream reclamation is an unavoidable effect of road construction. At some locations, stream diversions will reduce the overall length of open stream that is lost. Offsetting is proposed to address residual effects that are not able to be managed at the site of impact. This is to be achieved with riparian fencing and revegetation at other locations in the affected catchments. The quanta of offsetting is determined using the environmental compensation ratio derived from SEV scores.

29. The overall effect magnitude of freshwater habitat loss and modification is "Very High" in the absence of any effects management. When offsetting to achieve no-net-loss, including the construction of diversion channels, is taken into account the magnitude of effect is reduced from "Very High" to "Negligible" and potentially "Positive". This equates to either a "Very Low" to "Net Gain" overall level of effect in EcIAG terms. In practice, due to the practicalities of stream fencing (i.e., completing fencing to meet existing fence lines) a greater area is likely to be fenced and planted than strictly required by SEV Environmental Compensation Ratio (ECR) calculations. This will result in a net-gain situation.

30. The adverse effects of artificial lighting on freshwater ecology are largely avoided by the Ō2NL Project by only installing lighting at conflict points (being intersections where traffic enters/exits). This has meant that only four waterway sites are in close proximity to artificial lighting. These are all small streams, where riparian planting will create a closed canopy that will shade the stream surface from artificial light at night. Additionally, these streams are dominated by non-insect taxa that do not have flying adult stages, meaning that their macroinvertebrate assemblage is not overly sensitive to artificial light at night. For the four affected streams (Stream 39, Stream 39.1, Stream 1, and Stream 3) the overall level of effect of artificial lighting is "Very Low". For all other stream sites there is "No Effect". There is the potential that some additional lighting will be installed along parts of the SUP for public safety purposes but this will be of low intensity and associated with existing

urban areas. I note that a new proposed condition (RFE1A) will require lighting to avoid direct light spill onto the surface of streams and wetlands.

31. To summarise, the Ō2NL Project will have adverse effects on freshwater habitats. These adverse effects have been appropriately avoided, minimised, remedied, mitigated or offset.

WORK SINCE LODGEMENT

32. Since the application was lodged, I have been involved in further work related to freshwater ecology as set out below, liaising with the Project team (including iwi partners).

Response to section 92 requests for further information

33. I assisted with the response to further information requests from the Councils related to Technical Assessment K.[2] In summary, I was asked to address queries about the following topics:

    (a) the proposed abstraction of water for construction purposes;

    (b) the proposed monitoring of freshwater macroinvertebrates;

    (c) the avoidance of works during key fish migration periods;

    (d) the use of a flexible baffle design in some ephemeral stream culverts;

    (e) the timescales used when assessing effects on freshwater ecology;

    (f) the relationships between riparian planting width and estimated channel shading categories of the Stream Ecological Valuation methodology;

    (g) whether meanders in constructed diversion channels will definitely be built;

    (h) avoiding works in ephemeral channels when water is present;

    (i) some stream names/codes in the Catchment Culvert, Swale, and Pond/Wetland Schedule;

    (j) fish passage at temporary structures;

    (k) erosion and sediment control;

[2] The main responses were provided by Waka Kotahi to the regional councils and district councils respectively on 23 December 2023.

(l) PNRP Table 3.4 attribute states of streams in the GWRC region;

(m) proposed monitoring locations; and

(n) whether stormwater treatment devices will incorporate infiltration.

Baseline Freshwater Ecology Monitoring

34. Work has begun on establishing a baseline freshwater ecology monitoring programme. Paragraph 97 provides more detail about this.

Offsetting and compensation update

35. The proposed stream offsetting locations are described in paragraph 217 of Technical Assessment K. Discussions with landowners is ongoing and further site visits and fieldwork is anticipated. A detailed update is provided in paragraphs 87 and 88.

Engagement with stakeholders

36. I have also been involved in ongoing post-lodgement engagement with the Councils and other stakeholders. Since the consent applications were lodged, this has included:

(a) an initial meeting with Wellington Fish & Game on 15 March and a follow up meeting on 27 March 2023; and

(b) a meeting with Logan Brown (Horizons), who is the Regional Council's freshwater ecology expert, on 6 April 2023.

37. The meetings with Wellington Fish & Game where primarily to provide more information about the Ō2NL Project and to hear their concerns rather than close out any particular issues.

38. The meeting with Logan Brown was to determine if there were any remaining concerns following the Project's s92 response. That has since been superseded by Mr Brown's section 87F report.

COMMENTS ON SUBMISSIONS

39. DOC made the decision to not lodge a submission, instead sending a letter thanking the Ō2NL Project for its early engagement and consultation, which have resulted in a satisfactory suite of notice of requirement and resource consent conditions at the time of lodgement.

40. The Forest and Bird submission, while being satisfied that offset calculations are appropriate, considered "*the offsets and mitigation still don't achieve no net loss because of the lack of provision to ensure long term endurance of offset, an absence of appropriate pest plant and animal control to establish the plantings, no alternative plan if direct transfer of wetland plants is to fail and no requirement to maintain the offsets in the long-term to ensure no net loss*."

41. The freshwater ecology offsetting primarily involves riparian fencing and revegetation. I address the appropriate nature of the management regime for the riparian offsetting, including whether that should include long-term pest control, in response to Mr Logan Brown's section 87F report for Horizons and GWRC (see later in my evidence).

42. Two submissions had concerns relating to the freshwater ecology of streams and rivers (Louise Miles and Fish & Game) and two submissions included concerns about mosquitos in constructed stormwater treatment wetlands (Public Health Services and Maria Storey).

43. I address those submission points in turn below.

Louise Miles

44. Louise Miles considers that impacts on the Manga-huia Stream have been inadequately investigated and assessed. To confirm, potential effects on the Manga-huia Stream were assessed, and covered in Technical Assessment K.

45. Technical Assessment K included all streams that intersect with Ō2NL, with the exception of a few sites where the Project could not obtain access from the landowner(s). In the Manga-huia Stream catchment, we identified five small tributaries that intersect with Ō2NL. These are labelled as Streams 19, 20, 22, 23, and 25 in Technical Assessment K and shown on Figure 1 below.

46. Full ecological surveys including macroinvertebrate sampling and collection of environmental-DNA samples was undertaken in Stream 19 and Stream 23. We did not have access to Stream 22 or Stream 25, and Stream 20 was ephemeral in the designation (see Technical Assessment K paragraph 195(b) for description of the situation at Stream 20).

47. We detected three fish species in Stream 19 (shortfin eel, longfin eel, banded kokopu) and one in Stream 23 (shortfin eel). Stream 19 was designated as

being of “moderate” ecological value on account of the “at risk” threat classification of longfin eel, while Stream 23 was designated as of “low” ecological value.

48. Based on aerial imagery the Stream 25 site (located where the stream intersects with Ō2NL) is not fully fenced from stock, and cattle appear to periodically have access to the channel. Based on surveys at other small, unfenced, agricultural streams, I assigned a “low” ecological value for this site, which I consider to be reasonable. Further, it is likely the closing of the Waikawa Water Race has reduced the quality of habitat in Manga-huia Stream. This water race may have also been a pathway for some fish to enter Manga-huia Stream, and supplement those that had naturally migrated up the stream.

49. I also note that in his s87F report Mr Logan Brown has stated in response to this submission that the native fish fauna is only one of the factors considered when determining overall ecological value of a site.

50. **Mr Hamill** addresses the submitter’s comments on the water quality of the Manga-huia Stream. I would add that, in general, freshwater fish in New Zealand are not a good indicator of water quality. Their distribution is largely driven by distance from the ocean, the presence of migration barriers, and availability of suitable instream habitats. Even waterways that are considered to have relatively poor water quality may have numerous fish species present. A prime example is the Avon River in Christchurch, which has a catchment that is nearly 100% urban land use, and has relatively poor water quality as a result. In central Christchurch numerous native and endemic fish are found including shortfin eel, longfin eel, common bully, upland bully, bluegill bully, inanga, yellow eye mullet, and black flounder, as well as exotic brown trout.

51. However, I would like to reiterate that effects on all streams will be carefully managed during the construction and operation of Ō2NL. Streams form an interconnected network across their catchments such that sites of all ecological values are linked, and the Project must do its upmost to manage adverse effects at all points where it intersects with a waterway.

52. For all permanently flowing streams:

    (a) Where culverts are being installed, the “stream simulation” design will be utilised (i.e., buried invert, natural substrate through culvert) to allow

all fish known from the region to freely pass. This includes inanga, which of the migratory fish species, is poorest at negotiating instream barriers (see Condition RFE2).

(b) Throughout the construction zone, best practice erosion and sediment controls will be utilised to minimise fine sediment and other contaminants entering waterways (see Volume II Appendix 4 – Design and Construction Report and Conditions RES1-RES10).

(c) All stormwater from the road surface will be conveyed and treated in treatment facilities (wetlands, detention basins, swales) prior to any discharge to any waterways. Where soil conditions allow, it will also be dealt with via infiltration rather than surface discharges (see Volume II Appendix 4 – Design and Construction Report and Volume IV Technical assessment H – Water quality).

(d) Where open, permanent diversion channels are created, these will include ecology as one of the main design drivers, such that they will be designed to provide habitat for some of the large bodied fish known from the area (e.g., eels, giant kōkopu).

(e) Any temporary diversions created during the construction period will be required to allow for the free passage of fish.

(f) Wherever sections of channel are being dewatered during construction, fish (and large macroinvertebrates such as kōura) salvage and relocation will be undertaken (see Condition RFE1).

53. With respect to the Manga-huia Stream, the Project will actually have some benefits including:

(a) removal of cattle which I understand have free access to the stream in the vicinity of the Stream 25 site;

(b) removal of a perched culvert on Stream 23;

(c) surface water reconnection of Stream 20;

(d) extensive permanent fencing and riparian planting of tributary streams (see Volume III – Drawing No. 310203848-01-700-C1012 and C1013); and

(e) creation of permanent diversion channels upstream and downstream of some culverts that will be designed specifically to provide habitat for large-bodied fish such as eels and giant kōkopu (e.g., deeper water pool habitats, dense riparian vegetation).

54. The submission expresses disappointment that the Project does not propose to reconnect the Waikawa Water Race (or a replacement water race) to the Manga-huia stream as part of a Project net biodiversity gain.

55. As explained in Technical Assessment K and summarised above, a robust suite of measures is proposed to address the effects of the Project on freshwater ecology.

56. To reconnect the Waikawa Water Race as part of that package would be a water take from the Waikawa Stream, and resource consent would be required. Resource consents are only granted for a certain duration, so there is no guarantee such a consent would result in the permanent augmentation of flow in the Manga-huia Stream. The ongoing costs of maintenance would also need to be covered.

57. More importantly, the Project is striving to maintain natural flow paths and transfer of water in this way would go against that aim. From an ecological perspective, the Waikawa Stream is of high ecological value with nine species of fish detected and a macroinvertebrate community composed of a high proportion of pollution-sensitive taxa. It is preferable to keep this water in the Waikawa Stream and it would be difficult to justify a water take as providing a net biodiversity gain.

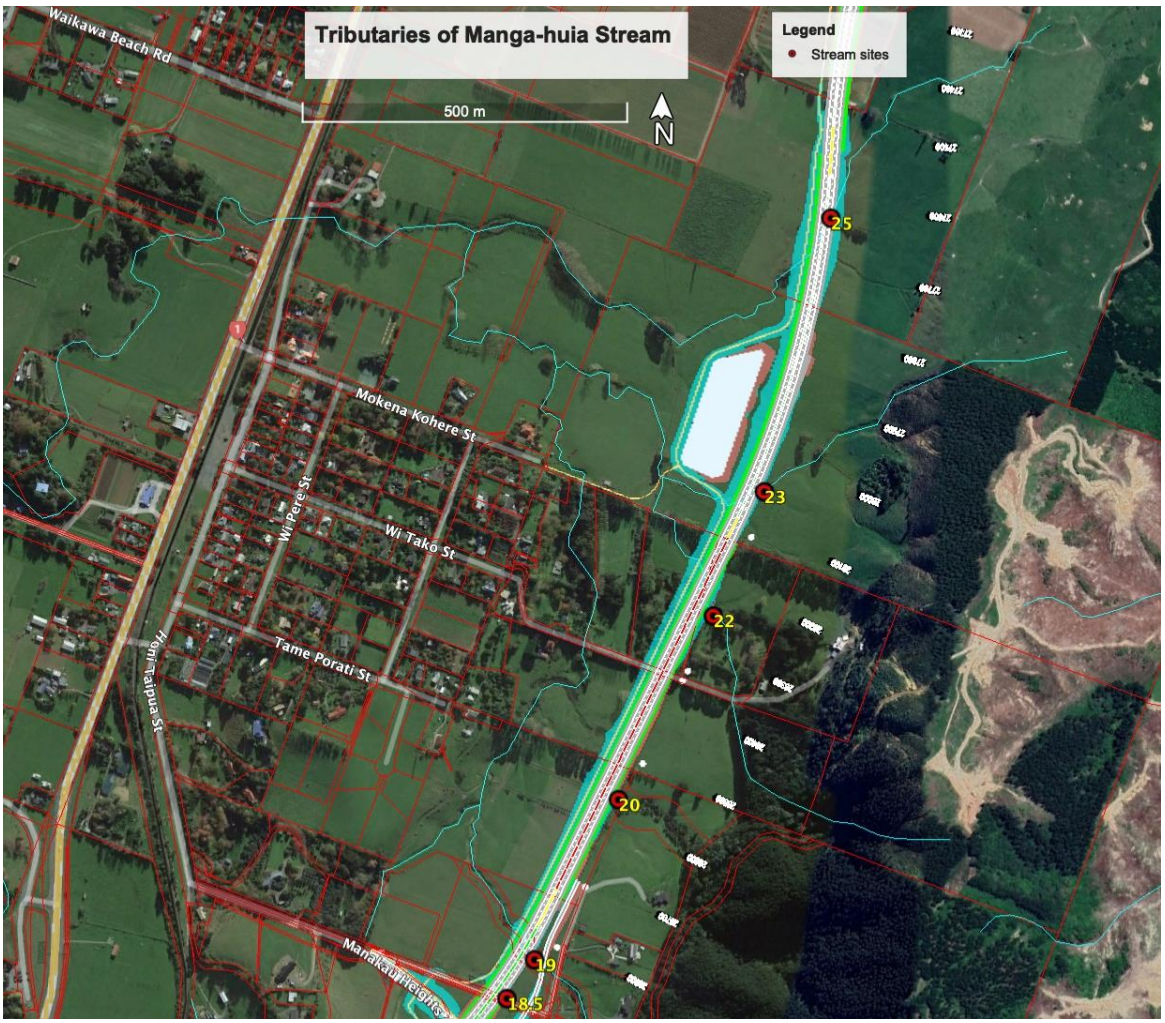

Figure 1 Tributary waterways of the Manga-huia Stream that intersect with Ō2NL.

Fish and Game

58. The Fish and Game submission is focussed on freshwater and wetland effects, with a particular emphasis on trout. Wetland effects are addressed by **Mr Goldwater**; I address the freshwater elements of the Fish and Game submission below.

59. Fish and Game are critical of what is perceived to be a lack of recognition of trout in the application. In my view, trout have been appropriately considered and provided for. In particular:

(a) Trout and salmon are not referred to as pest fish in Technical Assessment K and their importance under the RMA is acknowledged. Trout are considered as part of the overall fish assemblage in Technical Assessment K.

(b) Technical Assessment K describes the fish survey methodology utilised, and then states, "*In terms of sports fish, brown trout were*

detected in the Ohau River, Waikawa Stream, Stream 27.1, Manakau Stream, and Waiauti Stream. Rainbow trout were detected only in the Ohau River."[3]

(c) Hence, the Project has identified those waterways with trout. The vast majority of the waterways crossed by Ō2NL are small, degraded streams with small upstream catchments that do not provide habitat for trout.

(d) Appendix K4 of Technical Assessment K indicates the One Plan schedule values of waterways crossed by Ō2NL. Of all these waterways, only the Ohau River is identified as having "Trout Fishery" value in the One Plan at the point where it intersects with Ō2NL. No reaches of streams that intersect with Ō2NL are identified as being of "Trout Spawning" value.

(e) Additionally, on the Fish & Game website, of the waterways crossed by Ō2NL, only the Ohau River is mentioned and described as "*A small river, the fishing is poor in the Forest Park but improves heading downstream. Again, vulnerable to flooding, fish numbers vary greatly.*"[4]

(f) In the Ohau River catchment, there are reaches with "Trout Spawning" value in the One Plan but these are all tributaries that are upstream of the Ō2NL Project. Further, based on my observations while undertaking baseline freshwater ecology surveys within the Ō2NL designation, no sites had habitat particularly suitable for trout spawning due to either being too small to support large-bodied fish, having a silt-mud streambed, having a stony-stream bed with a high fine-sediment load, or being a stony-stream bed with substrate sizes not amenable to redd construction.

(g) The Ō2NL Project will not impede the movement of trout to upstream spawning areas, or the migratory movements of any fish species for that matter. Bridges will be constructed on all of the larger gravel bed waterways crossed by Ō2NL including the Ohau River, Waikawa Stream, Manakau Stream, Waiauti Stream, and Kuku Stream. During the construction phase, fish passage will be maintained in all these waterways at all times.

[3] Paragraphs 56 – 60; the quoted passage is at paragraph 130.
[4] https://fishandgame.org.nz/wellington/freshwater-fishing-in-new-zealand/fishing-locations-and-access/horowhenua-kapitit-coast-district

60. It is also worth noting that the shared use path (SUP) which is part of Ō2NL, will provide angler access (either informal or formal) to a section of the Ohau River that currently has no public access.

61. Fish and Game's submission also has a particular focus on fish passage / movement. In response, key points to note include:

    (a) The Project will construct bridges over the Ohau River, Waikawa Stream, Manakau Stream, and Waiauti Stream (as well as Kuku Stream). Bridges are the most desirable solution from a fish passage perspective.

    (b) Stream 27.1 and all permanently flowing streams will have culverts of the "stream simulation" design (see Paragraph 193 of Technical Assessment K).

    (c) Additionally, during construction all temporary diversions that are going to be in place for more than seven days will be required to allow for the free passage of fish (see Condition RFE2).

    (d) The Freshwater Ecology Management Plan required by the proposed conditions (and outlined in Schedule 7 of the conditions) will provide site-specific guidance of fish migration and spawning times. Where on-line stream works cannot be avoided, Waka Kotahi must provide temporary fish passage and manage the timing of works to avoid peak fish migration and spawning seasons. Hence, migration for all fish species is protected by the proposed consent conditions and management plans.

    (e) The bottom-line requirement for temporary fish passage provision where a structure or diversion is in place for more than 7 days (see Condition RFE2(a)) is intended for use in ephemeral waterways and overland flow paths where a very short-term temporary diversion may be required to construct online (or close to online) permanent culverts. This would not occur in any of the gravel bed streams where trout are known to be present. Adjustments to this condition are proposed and detailed later in my evidence.

62. Overall, I am comfortable that appropriate provision for fish passage / movement (including specifically for trout) is proposed by Waka Kotahi.

63. Fish and Game were concerned that "*The use of levels of 'pristine', 'moderate' or 'low' quality environment categories to justify limiting protections for more degraded waterways is inappropriate within the framework of Te Mana o te Wai*" Ecological values have been assigned to stream sites across the Project, as set out in detail Technical Assessment K. That has not been done in order to justify any limiting of protections, as is suggested by Fish and Game. As outlined above, will manage adverse effects at all points where it intersects with a permanent waterway.

64. Fish and Game expect "*conditions and site-specific management plans which clearly avoid or minimise harm to the habitat of sports fish and game birds*". The Ō2NL Project already proposes numerous management actions to minimise adverse effects on waterways to the benefit of all freshwater species. During construction these include:

    (a) strict erosion and sediment controls (see Volume II Appendix 4 – Design and Construction Report and Conditions RES1-RES10);

    (b) the maintenance of fish passage (see Conditions RFE2);

    (c) freshwater ecological monitoring (see Conditions RFE4); and

    (d) fish removal and relocation (see Conditions RFE1).

65. Longer term, during the operational phase management actions include:

    (a) maintenance and monitoring of fish passage at all culverts installed in permanent streams (see Conditions RFE2c);

    (b) the retention and treatment of all stormwater derived from the road surface (Volume II Appendix 4 – Design and Construction Report and Volume IV Technical assessment H – Water quality); and

    (c) the application of biodiversity offsets to account for the residual adverse effects of culverting and reclamation of freshwater stream habitats (see Conditions REM11 and Volume IV Technical assessment K – Freshwater ecology: paragraphs 215-221).

66. The proposed control of erosion and fine sediments is well described in Volume II Appendix 4 – Design and Construction Report and associated Conditions RES1-RES10. Further the freshwater ecological monitoring described in Conditions RFE4 includes monitoring of deposited sediments

and the macroinvertebrate communities that would be affected by increased rates of sediment deposition.

67. Overall, the Ō2NL Project is very unlikely to have any measurable adverse effects on the population of trout or any other fish species.

68. Fish and Game have suggested some additional management actions which I address below:

    (a) The sports fish monitoring programme suggested by Fish and Game is disproportionate to the actual effect Ō2NL will have on known trout habitats. The freshwater ecological monitoring described in Condition RFE4 includes the monitoring of various parameters including deposited sediments and benthic macroinvertebrates, hence will detect any habitat degradation that may be affecting all freshwater fauna that are sensitive to increased fine sediments.

    (b) "*Avoidance of works in stream bed, bank, riparian, and avoidance of discharge of sediment to water during trout spawning period 31 April to 31 August inclusive."* Of the waterways crossed by Ō2NL, only the Ohau River catchment has recognised "Trout Spawning" habitats, but these are all located in smaller tributaries of the Ohau River, upstream of Ō2NL. At no time will water flow or trout movement be impeded in the Ohau River. Additionally, the Project will avoid working in flowing water through the use, where necessary, of temporary diversions. All temporary diversions in permanent waterways where fish are present will be required to not impede fish passage. As explained above strict erosion and sediment controls will be in place to minimise the discharge of fine sediments to waterways. Hence, a blanket avoidance on such works during trout spawning season is not warranted and is anyway covered by the fish migration items that will be included in the Freshwater Ecology Management Plan (see Volume II, Appendix 5, Schedule 7).

Public Health Services and Maria Storey

69. These submissions raise concerns about the public health implications of the proposed stormwater treatment devices (and in particular stormwater ponds). Both submissions refer to the risk that the devices will become a breeding ground for mosquitoes. As well as mosquitoes, Maria Storey is also

concerned with other pests and has specifically mentioned rats, pukeko, and rabbits. These are covered in the evidence of **Mr Nick Goldwater**.

70. Modern stormwater treatment systems now often include constructed wetlands that may hold water either permanently or intermittently. Such wetlands have been constructed along other state highway projects that are near residential areas (e.g. McKays to Peka Peka) and also to service new subdivisions and mitigate flooding risk (e.g., Eastman Wetlands in Christchurch).

71. These are generally colonised by a suite of freshwater biota that are tolerant of or prefer such habitats. While this may include mosquitoes, it also includes various invertebrate species that predate mosquito larvae and adults. These include water boatmen, backswimmers, damselflies, dragonflies, diving beetles, aquatic and semi-aquatic spiders, copepods, and flatworms. Hence, provided a diverse range of invertebrates colonise the constructed wetlands, it is unlikely mosquitoes will be present in abundances that cause a public nuisance. Additionally, insectivorous birds such as fantail and welcome swallow will also use the ponds as feeding habitat.

72. Public Health Services seeks that the constructed ponds / wetlands be populated with native fish that feed on insect larvae.

73. The constructed stormwater treatments wetlands of the Ō2NL will not have a direct, permanently flowing surface water connection to any adjacent waterways where fish may be present. Hence, if migratory fish species where introduced, they may struggle to exit the wetlands when they get the urge to migrate. Further, these wetlands are designed to capture and store contaminants contained in stormwater. As such, from an animal welfare perspective, I cannot recommend actively introducing fish to these wetlands.

74. However, it is possible some wetlands may be colonised by highly mobile fish species, such as shortfin tuna and banded kōkopu. As mentioned above, a suite of invertebrate predators and insectivorous birds will colonise constructed wetland ponds, and consume mosquito larvae and adults. Therefore, I consider it unnecessary to populate stormwater ponds / wetlands with native fish.

COMMENTS ON THE COUNCIL REPORTS

75. The Horizons/GWRC section 87F reports of Mr Logan Brown and Mr Stuart Farrant and the KCDC/HDC section 198D report of Mr Bryn Hickson Rowden make comments of relevance to freshwater ecology. These comments are addressed in turn below.

Mr Logan Brown (GRWC/Horizons: Water Quality and Aquatic Ecology)

76. Mr Brown's report addresses water quality and aquatic ecology. I address the key freshwater ecology matters below, arranged in the following groupings:

    (a) offsetting details: requirements in respect of the proposed riparian fencing and planting scheme, which is to offset the loss of stream length associated with the Project;

    (b) light pollution effects on freshwater ecology values;

    (c) in-stream monitoring: the requirements of the proposed freshwater ecology monitoring (Condition RFE4);

    (d) managing effects on sports fish;

    (e) fish recovery requirements (Condition RFE1); and

    (f) culvert and constructed stream channel design details.

Offsetting details

77. Mr Brown's comments on the details of the riparian planting offset scheme cover:

    (a) securing by condition the permanent use of the land for the planting;

    (b) ongoing weed control;

    (c) the appropriate minimum planted width;

    (d) Ecology Offset Site Layout Plans; and

    (e) the overlap between the riparian planting (freshwater ecology) offset, and planting proposed to address natural character effects.

78. In paragraphs 16(d), 138, and 144 Mr Brown requests changes to the consent condition(s) to ensure the proposed ecological offsets meet the offsetting principle of perpetuity. This includes both ensuring that:

    (a) the actual land set aside for riparian planting is used for that purpose in perpetuity; and

    (b) there is ongoing pest control and monitoring to ensure the vegetation develops as intended and ultimately provides the predicted benefits to freshwater ecology.

79. Perpetuity/permanence is a key principle of biodiversity offsetting. In this case, that requires the land set aside for freshwater ecology offsetting riparian fencing and planting to be legally protected on a permanent basis. Condition REM13 addresses that requirement, by requiring the land to either be purchased, or protected via a registered title instrument.

80. However, while I agree that the land needs to be permanently protected, I do not agree with the view of Mr Brown (and Forest and Bird) that weed control should be required in perpetuity. The intention of the riparian planting offsetting scheme is that Waka Kotahi to manage of offset plantings so that they achieve the performance standards described in proposed condition REM12. After those standards are reached, any further management would fall to the landowner. After establishment, the planted areas are expected to become self-sustaining and the bottom-line requirements on the landowner will be to maintain the fencing around the planted area, exclude stock, and ensure planted vegetation is not removed, so that the established planting can function. This is consistent with riparian planting offset schemes applied for other projects (for example, Te Ahu a Turanga).

81. Imposing an active requirement to carry out weed control in perpetuity is not realistic and the monitoring and enforcement of this would be onerous and costly. From a freshwater ecology offsetting perspective, the key aspects of long term success and reaching a ‘net gain’ state, are achieving consistent and permanent shading of the stream channel and development of woody vegetation that will contribute debris to the stream channel. This does not require permanent weed control once planted vegetation has become established.

82. In paragraph 136-137 Mr Brown recommends the minimum riparian fencing width for freshwater offsetting be increased from 3 m to 5 m, as when a 1 m

planting setback from both the stream edge and fence only ~1 m is left for actual planting.

83. The original rationale for the 3 m minimum was that it matched the minimum riparian fencing setback of the Resource Management (Stock Exclusion) Regulations 2020. On reflection, the stock exclusion regulations do not require any riparian planting, only exclusion, hence I agree with Mr Brown that the minimum width for freshwater offsetting fencing and revegetation should generally be 5 m.

84. However, for those stream offsetting sites that are of a wetted with of 1 m or less, effective shading could be achieved relatively quickly by the planting of species such as the sedge *Carex secta* along the edge of the bank.
I therefore propose a minimum riparian planting width of 5 m for those stream offsetting sites with a wetted channel width of greater than 1 m (e.g., sites along the Manakau Stream, Waiauti Stream, Kuku Stream) and a minimum riparian planting width of 3 m for those channels equal or less than 1 m wetted channel width (small tributaries). Condition REM11 has been updated to that effect.

85. In paragraph 145 Mr Brown recommends an Offsetting Plan is developed and submitted to the Regional Councils, but states compliance with condition REM14 will likely produce the required plans. REM14 requires preparation of Ecology Offset Site Layout Plans, and I am confident this will produce the plans Mr Brown is requesting.

86. In paragraphs 148-150, Mr Brown states his concern regarding an overlap in proposed natural character mitigation planting and freshwater offset planting along the Kuku Stream as not meeting the additionality offsetting principle.
I do not agree with this perspective, I note the following:

    (a) All planting that forms part of the riparian planting offset package is clearly marked as freshwater offset planting on the relevant plans: for example the fencing and planting of the Kuku Stream as shown on the Planting Concept Plan Sheets 10-11 (Drawing No. 310203848-01-700-C1009 and C1010).

    (b) That reflects that the sequence of developing the proposed planting was for freshwater ecology planting requirements to be considered, and for me to identify the proposed appropriate locations for that planting. For example, I proposed the Kuku Stream freshwater ecology offset

planting site because it is on land to be acquired by Waka Kotahi allowing a 20 m wide area to be planted on each bank, currently has limited tall vegetation, and has fauna (including seven species of fish) that will benefit from channel shading and inputs of woody debris.

(c) As he explains in his evidence, Mr Lister considered the planting as proposed by me, and then recommended any additional planting needed to manage natural character effects.

(d) In any event, my view is that the additionality principle is primarily targeted at ensuring that offset actions are not actions that would have occurred in the absence of the project in question. For example, it would not be appropriate to claim pest control actions as an offset if there was already a planned pest control operation over the relevant area.

(e) I do not consider that the additionality principle means that riparian offset planting cannot also play a role in addressing the landscape and / or natural character effects of the project in question.

(f) In fact, where riparian offset planting is proposed for as close to the impact site as possible – as per the Kuku Stream offset planting – it is inevitable that planting will also have natural character and landscape benefits. In my view that is a positive outcome, and it would be artificial to then require additional land for riparian offset planting to be secured.

87. Finally, Mr Brown has requested a progress update on securing legal agreements with private landowners where riparian fencing and planting is proposed as part of the freshwater ecology offsetting package. To date, four landowners have signed "agreements in principle" and conversations with others are ongoing.

88. The landowners that have signed "agreements in principle" to date are:

(a) Waiauti Stream and tributaries:

(i) Parkes (95 m^2 or 0.6% of total offset area required);

(ii) Pilet (1,274 m^2 or 8.1% of total offset area required); and

(iii) Cording (608 m^2 or 3.9% of total offset area required).

(b) Manakau Stream:

(i) Pilet (2,668 m^2 or 17% of total offset area required); and

(ii) Butler (221 m^2 or 1.4% of total offset area required).

89. Offsetting sites on land that has been or will be acquired by Waka Kotahi in the Kuku Stream, Waiauti Stream, and Manakau Stream equate to 6,936 m^2 or 44.3% of total offset area required. Coupled with the 31% of the total offset area on private land with "agreements in principle", a total of 75.3% of the required stream offset area is confirmed or very likely to be confirmed. That demonstrates good progress in securing the necessary riparian land for the offset scheme, and in my view Waka Kotahi is well on track to securing the full area it requires.

Light Pollution

90. In paragraphs 16(i) and 39 Mr Brown requests that the riparian planting to mitigate the effects of light pollution be subject of a specific condition. Currently it has been assumed that the planting being undertaken under Condition DLV1 (landscape planting) and Condition RWB3 (natural character planting) will result in sufficient planting to mitigate the adverse effect of light pollution.

91. Further, in paragraphs 40 and 41, Mr Brown suggests some standards for such a condition, namely:

(a) a closed canopy to develop over the stream to be planted; and

(b) the planting to extend for a distance of 100 m upstream and downstream of the road corridor.

92. Riparian planting to mitigate adverse effects of light pollution is proposed for four stream sites and the situation at each is discussed below:

(a) Stream 39 will be to the west of the roundabout at the intersection of Ō2NL and Arapaepae Rd (SH57). The planting concept plan (Vol. 3., Drawing 8) shows ~300 m of planting upstream of the Ō2NL culvert, all within the designation. Downstream of the Ō2NL culvert ~150 m of planting is proposed although ~60 m of this is within designation and the balance outside the designation.

(b) Stream 39.1 is a tributary of Stream 39 that is to be permanently diverted to avoid the need for two culverts. The planting concept plan

(Vol. 3., Drawing No. 310203848-01-700-C1002) shows the entire length of this stream within the designation will be planted (~400 m).

(c) Stream 1 & 3 join just upstream of the existing SH1, where they flow through Culvert 2 in the vicinity of a roundabout that will provide access to Taylors Road from the current SH1. Upstream of Culvert 2, between the Culvert 2 and the Ō2NL culverts, and upstream of the Ō2NL culverts extensive planting is proposed as indicated in the planting concept plan (Vol. 3., Drawing No. 310203848-01-700-C1017). Currently, downstream of Culvert 2 no revegetation is proposed.

93. A new condition that requires light spill onto streams to be avoided via lighting design or vegetation canopy cover is now proposed (Condition RFE1A). The affected streams are all relatively small hence achieving canopy closure where required is realistic and achievable.

94. However, to specify a set distance upstream and downstream of the Ō2NL culverts for riparian planting is problematic. Where the section of stream in question is outside the designation (i.e., part of Stream 39 downstream of Ō2NL and downstream of Culvert 2 for Streams 1 and 3) on private land that is not being purchased for the Project, any such planting would require agreement from landowners, which cannot be assumed. In simple terms, it is not certain that a condition requiring a standard 100 m length of riparian planting can in all cases be met.

95. Further, given Ō2NL is currently at the concept design stage, we do not know exactly where artificial lighting infrastructure will be situated in relation to the Stream 39, Stream 39.1, Stream 1, or Stream 3 (or any other stream for that matter if lighting is deemed necessary during detailed design at other locations).

96. Given the streams are at various orientations to the road way, I suggest site specific characteristics such as distance of light poles from the channel, direction and level of light spill from the luminaires, and the types of lights being used need to be considered when determining appropriate lengths of stream to be planted address the adverse effects of artificial lighting. To this end an appropriately qualified ecologist needs to have input into the detailed lighting design process.

In-stream Monitoring

97. Mr Brown has provided comments and suggestions in relation to the proposed freshwater ecology monitoring condition (RFE4). Below I address each of these:

(a) RFE4(a) – This condition proposes the sites where in-stream monitoring will occur. Mr Brown is unclear what is meant by "existing monitoring". This refers to the ongoing water quality monitoring that is being undertaken at sites outlined in Technical Assessment H (Water Quality). The sampling of these sites was initiated during the investigations phase to inform the water quality technical assessment on Mr Hamill and is ongoing. Some of these water quality sites are suitable for deposited sediment and macroinvertebrate sampling, while others are not. Waka Kotahi is keen to commence this baseline monitoring as soon as possible (ideally in July 2023). It is proposed to have upstream and downstream monitoring sites on the following streams: Waiauti Stream, Manakau Stream, Waikawa Stream, Kuku Stream, Ohau River, and Koputaroa Stream. It is proposed to have only a downstream site on the following streams due to a lack of comparable upstream sites: Waitohu tributary (Stream 10) and Mangahuia Stream. As such sampling locations are in the process of being confirmed.

(b) RFE4(b) – Mr Brown suggests baseline monitoring should commence at least 24 months prior to work commencing in the affected catchment. While I agree that baseline monitoring should commence well in advance of any works, the imposition of a set limit could have the potential to delay construction (and I do not think that is necessary). Proposed condition RFE4(c) requires monthly monitoring of a range of habitat parameters, including deposited sediment, coupled with quarterly monitoring of macroinvertebrates. In my opinion it would be possible to adequately determine the state and variability of key variables (i.e., QMCI – derived from macroinvertebrate data) and deposited sediment in a shorter period. For example, it would be possible to obtain a reasonable estimate of variability of the macroinvertebrate community based on four to six quarterly monitoring rounds. Provided monitoring begins as soon as possible (ideally July 2023), there is enough time to achieve this prior to the desired construction start in 2025.

(c) RFE4(b. iii) – Mr Brown suggests this event trigger condition be directly linked to erosion and sediment control monitoring. I agree that any event-based monitoring require some form of trigger and this has been included in condition RFE4b)iii.

(d) Mr Brown considers that the RFE4 conditions lack any incident-based monitoring requirements. By "incident" I presume Mr Brown is referring to unforeseen circumstances such as uncontrolled discharge of sediment laden water (i.e., sudden failure of a sediment treatment device or human error) or discharge of other contaminants to a waterway (e.g., fuel spill, concrete spill). I support such a condition, but note condition RCM3 already addresses the management of incidents.

(e) RFE4(c) – Mr Brown states this condition only refers to routine monitoring and considers that it should also refer to baseline monitoring. This was always the intent and the wording of the condition has been updated to make this explicit.

(f) RFE4(d) and (g) – Mr Brown states these conditions refer to a comparison with baseline information, but that Waka Kotahi has proposed upstream and downstream monitoring so condition should refer to comparison with both baseline and upstream monitoring data. I agree and these conditions have been updated to make this clear and distinguish between locations where upstream – downstream comparisons are possible and locations where only a downstream monitoring site is available, hence no valid upstream – downstream comparisons are possible.

98. In updating condition RFE4, the following additional alterations have been made:

(a) In clause c)i. total suspended solids and turbidity have been removed from the list of parameters to be measured. The measuring of these parameters does not add useful information because:

(i) these sampling trips are focussed on measuring deposited sediment, and so will always be done at times when flows are relatively low and the water is clear;

(ii) these parameters are already being measured as part of the ongoing water quality monitoring programme (that also includes turbidity loggers at in four streams); and

(iii) water clarity will be measured, which is another measure of suspended material in the water column anyway.

(b) In clause f), which relates to post-construction monitoring, additional wording has been added to indicate that post-construction monitoring not be required if no change is observed during the routine construction-phase monitoring. The intent of this is to avoid monitoring continuing when there clearly has been no measurable adverse effect on the waterbody in question.

Sports Fish

99. Wellington Fish and Game requested that Ō2NL be required to develop "*site-specific management plans which clearly avoid or minimise harm to the habitat of sports fish and game birds*". Mr Brown supports the intent of such plans, but in paragraph 76 notes that any required monitoring must be linked to values that are recognised in the waterway affected by Ō2NL and that there would need to be certainty that any effect on the trout population at a river reach identified through this monitoring is able to be directly linked to the effects of the Ō2NL Project.

100. I have provided a detailed response to Fish and Game's submission in paragraphs 58 to 68 above.

101. Based on available information, I do not consider any site-specific plans and subsequent monitoring that specifically address effects on trout are required for the following reasons:

(a) Freshwater ecological monitoring (see Condition RFE4) tailored to detecting the effects of deposited sediment is already proposed and several other management actions are proposed to minimise the effects of the Project to the benefit of all freshwater species (see paragraphs 52 to 68 above).

(b) Trout are not known to spawn in any of the stream reaches within the Ō2NL designation or anywhere downstream of the designation. Of all the catchments that intersect with Ō2NL, the only with a "Trout Spawning" value in the One Plan is the Ohau River but all identified locations are tributary streams that are upstream of the Ō2NL Project.

(c) I cannot see how the effects of Ō2NL could ever be isolated from all the other various factors that may affect trout populations, such as large

flood events. Of the waterways crossed by Ō2NL only the Ohau River is mentioned on the Fish & Game website and described as "*A small river, the fishing is poor in the Forest Park but improves heading downstream. Again, vulnerable to flooding, fish numbers vary greatly.*" (https://fishandgame.org.nz/wellington/freshwater-fishing-in-new-zealand/fishing-locations-and-access/horowhenua-kapitit-coast-district). Hence, it appears Fish and Game themselves consider the Ohau River to be "vulnerable" to flooding, which results in fish numbers being variable. Flooding can be major driver of trout numbers as large flood events can result in high rates of fish mortality[5,6].

Fish Recovery

102. Mr Brown's recommends amendments to the proposed fish recovery condition RFE1, and below I respond to each:

(a) Mr Brown makes the point that the current wording of RFE1(a) relating to avoiding construction activities "at times when migratory species are present" is impractical as migratory species are always present in the affected waterways. He recommends that instead this is linked to the predicted migration period of the species known from each catchment and this be identified in the Ecology Management Plan. I agree with this suggestion and the RFE1(a) condition has been updated to reflect this.

(b) Mr Brown rightly states that the use of techniques to encourage fish, kōura, or kākahi to move out of the impacted reach cannot be relied upon as a standalone fish recovery methodology. This was never intended to be a standalone method and was always intended to be used in conjunction with more active fish recovery methods. The RFE1(b) has been updated to make this clear.

(c) Mr Brown states the use of a 50% recovery of individuals between the first and final rounds of recovery as a threshold to cease fish recovery efforts is not appropriate for Ō2NL. He understands this threshold has been copied across from the Te Ahu a Turanga project, where fish abundance and diversity was low. Mr Brown makes the point that the

[5] Jowett, I.G. & Richardson, J. 1989. Effects of a severe flood on instream habitat and trout populations in seven New Zealand rivers. *New Zealand Journal of Marine and Freshwater Research* 23: 11-17.
[6] Young, R.G., Wilkinson, J., Hay, J., & Hayes, J.W. Movement and mortalisity of adult brown trout in the Motupiko River, New Zealand: Effects of water temperature, flow, and flooding. *Transactions of the American Fisheries Society* 139:137–146

Ō2NL waterways have a wider range of species and greater numbers of individuals. Mr Brown suggests a 20% threshold for Ō2NL. A 20% recovery rate is less than the 50% proposed. I assume that Mr Brown is proposing an 80% rate of recovery, here rather than a 20% rate of recovery. I agree with Mr Brown that a higher recovery threshold would be more appropriate for Ō2NL and consider 80% suitable.

(d) Mr Brown states that condition RFE1 currently does not require any recording or reporting of catch data (i.e., species and numbers of fish relocated). He suggests this should be provided to Horizons/GWRC as part of compliance monitoring and any catch information should also be entered into the New Zealand Freshwater Fish Database (NZFFD). Quarterly reporting of fish recovery data has been added to condition RFE1, however the requirement to enter data into the NZFFD has not as this is not directly related to effects management. Additionally, all fish relocations will require a permit from Wellington Fish & Game, in case sports fish are captured. In my experience their permits require entry of fish data into the NZFFD anyway.

Culvert Design Peer Review and As Built Inspection

103. Mr Brown has suggested the detailed design for the culverts be independently peer reviewed by a freshwater ecologist who specialises in fish passage and following installation, an 'as built' inspection be undertaken.

104. Based on my experiences with culvert design on large roading projects, I agree with Mr Brown that independent peer review during the culvert detailed design phase is a valuable process given the expense and permanence of the structures being installed. I note that such an independent peer review process is a requirement of the Te Ara o Te Ata: Mt Messenger Bypass project, which is currently under construction. The requirement for a culvert design review has been added to the list of Freshwater Ecology Management Plan items in Schedule 7.

105. Following construction, a large amount of detailed information about the culvert and any associated aprons or ramps is required to be collected by Regulations 62, 63 and 68 of the Resource Management (National Environmental Standards for Freshwater) Regulations 2020. I question how this exactly differs from an "as built" inspection as this information will be able to be compared to the design plans to ensure the culvert that is built matches

those plans. I do not think a separate “as built” inspection process is required.

Fish Passage

106. Mr Brown queries the seven day limit for provision of fish passage in temporary diversions as described in proposed condition RFE2(a), and suggests this should only be two days.

107. The seven day period was chosen to allow constructors some flexibility and it is important to note that proposed condition RFE1(a) will apply here, hence avoiding periods when migratory species could be expected to be passing through the affected reach. More importantly, this condition would only be utilised in very small streams that have small catchments upstream of Ō2NL, and are hence not major migratory routes for fish. To give extra certainty, we have explicitly stated the waterways that are major migratory fish pathways where this condition would not apply (i.e., Kuku Stream, Ohau River, Stream 27.1, Waikawa Stream, Manakau Stream, Waiauti Stream) and have included these in an updated condition.

Constructed Channel Design

108. In paragraph 140 Mr Brown has suggested the consent conditions, and in particular Schedule 7 (which dictates what the Freshwater Ecology Management Plan must include), should explicitly require the creation of habitat complexity to replicate the natural stream morphology when permanent stream diversions are being created. I agree with Mr Brown as the creation of permanent diversion channels during the Ō2NL provides a rare opportunity to improve the physical habitat quality in several degraded waterways. Schedule 7 has been updated to cover this.

Mr Bryn Hickson Rowden (HDC/KCDC: Ecology)

109. In his section 198D report for HDC and KCDC, Mr Hickson Rowden expresses general comfort with the assessment of freshwater ecology values and effects, and the measures proposed to address effects.

110. In the table at paragraph 57 of his report, Mr Hickson Rowden suggests various alterations to proposed condition RFE1, which covers fish removal and recovery and to condition RFE2, which addresses fish passage. Below I respond to each:

(a) RFE1 b)i – request changing “or” to “and” to make it clear that the use of techniques to encourage fish to move out of impacted reach will not be the only method used at any locations. This was never intended to be the sole method and is complimentary to active capture and relocation efforts, hence I agree with this wording change.

(b) RFE1 b)ii – suggests deleting this condition unless it can be shown this method could reduce fish numbers to appropriate level prior to construction. As stated above this was never intended to be the sole method of fish removal/relocation used and would always just be complimentary to active capture and relocation methods. At some locations, especially the Waiauti Stream, the use of berley or similar to influence eels to move out of the construction zone is a realistic undertaking based on my field observations. This would be done prior to active removal such as trapping or electrofishing. I do not agree with deleting this condition.

(c) RFE1 d)iii – suggests some rewording of condition to make it clear that a combination of fish capture methods are required to be used and that any use of spotlighting will also include capture of fish. I agree with what is proposed.

(d) RFE e) and f) – suggests these clauses require rewording and caucusing between experts to determine appropriate effort threshold for fish rescue and recovery as they do not line up with current best practice. This has been addressed in my response to Mr Brown (paragraph 102 (c) above).

(e) RFE1 – suggests additional conditions to require reporting of species captured and upload of data to NZFFD. This has been addressed in my response to Mr Brown.

(f) RFE2 (b) – suggests adding reference to the NZ Fish Passage Guidelines in regard to design of culverts. I agree and this has been added to the list of Freshwater Ecology Management Plan items in Schedule 7.

111. In the table at paragraph 58 of his report, Mr Hickson Rowden suggests alterations to aspects of the REM condition set, which covers ecology management offset and compensation. Below I respond to each:

(a) REM4 – suggests this condition should list all potential pest plants that could be spread by the Project. I defer to the Project's terrestrial ecologist, Mr Goldwater to address this item.

(b) REM6 – suggests rewording and caucusing between experts to determine appropriate the timeframe for completion of offset planting. I defer to the Project's terrestrial ecologist, Mr Goldwater to address this item.

(c) REM12 – states the aquatic offset planting does not note the combined stream length, and this should be rectified. Based on current calculations the total length is 8,695 m but this is subject to change as discussions with landowners is ongoing.

Mr Stuart Farrant (GRWC/Horizons: Operational Stormwater)

112. In paragraph 48 of Mr Farrant's s87F report, it is suggested that where stormwater treatment wetlands discharge to natural waterbodies, the outlets should be designed as far as practicable to prevent or limit the ability of indigenous fish to enter the wetlands due to the expected presence of contaminants.

113. I agree with Mr Farrant that stormwater treatment wetlands may not provide optimal habitat for indigenous fish, however some fish species are able to persist in highly modified environments where they are regularly exposed to untreated stormwater runoff. For example, banded kōkopu, eels, and kōaro persist in highly urbanised catchments in Wellington where the majority of stream length is now buried in pipes and are subject to regular inputs of untreated urban stormwater runoff. In the case of Ō2NL, banded kōkopu and shortfin eel are the two species that would most likely find their way into constructed stormwater treatment wetlands.

114. While it would be possible to attempt to preclude fish from entering such constructed wetlands through outlet design, these species are extremely adept at negotiating barriers and would likely colonise treatment wetlands with suitable habitat anyway. The treatment wetlands and associated vegetation are going to provide habitat for various birds and invertebrates (terrestrial and aquatic), so I am not overly concerned if fish also colonise them.

115. In my opinion, from an ecological perspective, it will be more important to ensure outlet designs do not result in erosion and scour of the natural waterbody they discharge to, rather than to be a fish barrier.

Alexander Bryan Wilfried James

4 July 2023