

**BEFORE A HEARING PANEL
CONSTITUTED BY NELSON CITY COUNCIL**

IN THE MATTER

of an application by **CCKV Maitahi Development Co LP** and **Bayview Nelson Limited** for a change to the Nelson Resource Management Plan (Plan Change 28)

IN THE MATTER

of Part 5 and Schedule 1 of the Resource Management Act 1991

**STATEMENT OF EVIDENCE OF JOSHUA ANDREW MARKHAM
(FRESHWATER ECOLOGY)**

Applicants' Consultant:

Landmark Lile Limited
PO Box 343
Nelson 7040
Attention: Mark Lile
Email: mark@landmarklile.co.nz
Tel: 027 244 3388

Counsel acting:

John Maassen
— BARRISTER —

✉ john@johnmaassen.com
🌐 johnmaassen.com
☎ 04 914 1050
📠 04 473 3179

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Section A – Introduction and Scope of Evidence

Name, qualifications and experience

1. My full name is Joshua Andrew Markham. I hold the position of Principal Ecologist at Tonkin and Taylor Ltd.
2. I hold a Bachelor of Science (Ecology) from Massey University of Palmerston North.
3. I have over 10 years' experience in the field of ecology. In this time, I have worked across New Zealand in a wide variety of environments on projects for both the private and public sectors. From 2011 to 2013, I worked for Horizons Regional Council as Freshwater Field Ecologist; 2013 to 2015, I worked for Auckland Council as a Freshwater Ecologist advising on streamwork resource consent applications; 2015 to 2016, I worked for Golder Associates (now WSP) as a Senior Freshwater Ecologist and 2016 to present, I have worked for Tonkin & Taylor Ltd as a Senior / Principal Ecologist focusing on Landscape Ecology combining both Freshwater and Terrestrial Ecological aspects.
4. My relevant work experience has been to undertake and contribute to many ecological investigations within freshwater and terrestrial environments across New Zealand. I have worked in design and construction teams on large multi-disciplinary projects, regional council technical reviewer for resource consent application in terms of freshwater and terrestrial ecological aspects and undertaking technical compliance for large earthwork and streamwork projects.

Expert Code

5. While this is not an Environment Court hearing I have met the standards in that Court for giving expert evidence.
6. I have read the Code of Conduct for expert witnesses issued as part of the Environment Court Practice Note 2014 (Part 7). I agree to comply with the Code of Conduct. I am satisfied that the matters addressed in this statement

of evidence are within my expertise. I am not aware of any material facts that have either been omitted or might alter or detract from the opinions expressed in this statement of evidence.

Role in Project

7. CCKV Maitai Dev Co LP & Bayview Nelson Limited (“the Applicant”) engaged me for freshwater ecology technical expertise from Tonkin and Taylor Ltd. In the context of this evidence, I have been engaged to advise of freshwater ecological values and effects in relation to the PPC28 proposal.
8. I was a contributor and a technical reviewer of the Ecological Opportunities and Constraints Assessment (“the ecology report”), submitted as part of the Maitahi Bayview Private Plan Change 28 application (“PPC28 proposal”), which was prepared by Patrick Lees and Adam Purcell from Tonkin and Taylor Ltd.
9. I have undertaken a site visit and am familiar with the site and surrounding locality based on previous project experience in the Nelson Region.
10. I attended an informal meeting with Tanya Blakely (ecologist engaged by Nelson City Council (NCC)) and Ben Robertson (terrestrial ecologist engaged by the Applicant) on 6 April 2022 to discuss ecological matters related to the PPC28 proposal
11. I was involved in pre-hearing expert conferencing on 20 April, 10 May and 13 May 2022 with Tanya Blakely, Ben Robertson and Roger Young (ecologist engaged by Friends of the Maitai). This expert conferencing resulted in the Terrestrial and Freshwater Ecology Joint Witness Statement (“Ecology JWS”) dated 13 May 2022.

Scope of Evidence

12. I have reviewed the Section 42A Report prepared by Gina Sweetman, in particular Appendix M titled: Private Plan Change 28: Maitahi Bayview – Ecological Review, dated 19 May 2022, prepared by Tanya Blackely.

13. This evidence should be read in conjunction with evidence provided by Ben Robertson (terrestrial ecology), Stu Farrant (water sensitive design), Maurice Mills (stormwater) and Tony Milne (landscape).
14. I do not repeat the contents of the ecological report in full in my evidence. Specifically, in my evidence I cover:
 - a) Relevant freshwater ecology context in the executive summary;
 - b) The recommendations made by the ecological report and how the PPC28 proposal has responded;
 - c) Freshwater ecological concerns raised in the Section 42A report;
 - d) Freshwater ecological concerns raised in submissions; and
 - e) Conclusion.

Section B – Executive Summary

15. The Site is located within the Bryant Ecological District and the Nelson Ecological Region. The ecology report describes the freshwater ecological context and ecological values within the site and surrounding area.
16. Kākā Stream is a small stream with headwaters commencing in the upper slopes of Kākā Valley. It flows through a relatively steep upper catchment that enters a floodplain at its downstream extent before its confluence with the Maitahi/Mahitahi River.

Upper Kākā Stream

17. The stream bed consisting of a mixture of boulders, cobbles, and mixed gravels. Sediment cover of the stream bed is patchy, with isolated areas of increased sediment cover (> 70 %) in pools and slower flowing areas.
18. Habitats generally composed of undercut banks, overhanging riparian vegetation, large woody debris, and a diversity in water/flow characteristics (including pools, backwaters, riffles, and shallow runs).

19. Riparian cover consisted of mature rank pasture grass with isolated non-native large shrubs and/or trees along the riparian zone. The open pasture area provided no protection from stock access to the stream. The lower banks on both sides of these reaches were incised and relatively steep with some areas of bare exposed ground.
20. Both banks appear to have a high potential for erosion, especially during higher flow events, although no evidence of bank slumping was observed.

Lower Kākā Stream (downstream of the farmhouse culvert)

21. Generally contained high sediment cover (> 60 %) of the stream bed, with a substrate primarily composed of clay, sands, and muds. Closer to the farmhouse culvert (where continual flow was observed) small gravel and cobble substrates were evident.
22. Habitat diversity and abundance for freshwater fauna was low with only isolated areas of habitat providing potential refugia for freshwater fauna (e.g. from the pooled sections and the stable slow run habitat downstream of the farmhouse culvert).
23. Riparian cover consisted of mature rank pasture grass with isolated non-native large shrubs and/or trees along the riparian zone. The open pasture area provided no protection from stock access to the stream. The lower banks on both sides of these reaches were incised and relatively steep with some areas of bare exposed ground.
24. Both banks appear to have a high potential for erosion, especially during higher flow events, although no evidence of bank slumping was observed.

Freshwater Fauna

25. Sampling of the fish community was completed at multiple survey reaches throughout the entirety of the Kākā Stream within the site. Survey results showed that the fish community was sparse with only shortfin eel (*Anguilla australis*), unidentified eel (including elver), and an unidentified climbing *Galaxiidae* sp (most likely kōaro (*Galaxias brevipinnis*) or banded kokopu (*G. fasciatus*)).

26. Qualitative sampling of the aquatic macroinvertebrate community showed the upper reaches of the Kākā Stream included a number of cased caddisfly (e.g. *Pycnocentroides sp*, *Hudsonema sp*), mayfly (e.g. *Deleatidium sp*) and black fly larvae (*Austrosimulium sp*) which are common in faster flowing, cobbled streams with a closed canopy and indicators of good water quality. The opposite trend was observed in the macroinvertebrate community in the lower Kākā Stream which predominantly comprised of water boatmen (*Sigara sp*), back swimmers (*Anisops sp*), diving beetles (*Dytiscidae sp*) and non-biting midge (*Chironomidae sp*). Within *p*, all of which are indicators of poor water quality. Freshwater crayfish were also present.
27. The upper reaches of Kākā Stream provided relatively moderate habitat diversity and abundance for freshwater fauna when compared to the low habitat diversity and abundance for freshwater fauna in the lower reaches of Kākā Stream.
28. It is my opinion that the PPC28 proposal as outlined below has responded appropriately and provides a framework that will result in overall positive ecological outcomes for the Kākā Stream contributing to the Maitahi/Mahitahi River.

Section C – Evidence

Private Plan Change 28 (PPC28)

29. The ecological report included recommendations highlighting opportunities that would result in ecological and biodiversity gains for the Kākā Stream and Maitahi/Mahitahi River. These included:
 - I. A continuous riparian corridor that provides a natural buffer zone to the Kākā Stream. The corridor will be a minimum of 40 m wide, follow the natural topography of the site and support:
 - a) Channel meanders and flood benches;
 - b) Continuous riparian vegetation;
 - c) Eco-system function and habitat;

- d) Integrated stormwater wetlands; and
 - e) Public access via well designed walking/cycling paths (no roads except at crossing points).
- II. Management of the riparian corridor should include the exclusion of all stock, the trapping and removal of pest animals, natural regeneration of indigenous species, restoration planting, weed control, monitoring of threatened aquatic species and monitoring of biodiversity condition;
- III. Allow greater passage at all road crossings for native fish species known to inhabit the catchment;
- IV. Excluding non-native fish from the catchment by designing and constructing intentional built barriers with the specific objective of limiting or preventing the movement of certain fish species (e.g. trout) into the Kaka Hill Valley catchment;
- V. Rehabilitating natural swale and marshy floodplain areas with native wetland flora species;
- VI. Pre-treatment of stormwater inflows to the Kākā Stream will be consistent with good management practices;
- VII. Design, construct and maintain the lower Kākā Stream so that is correctly integrated into the environment so that catchment flora and fauna values are enhanced. Ecological outcomes should include:
 - a) A low flow channel for fish passage and temporal habitat availability;
 - b) Diversity in hydrological conditions (runs, pools, riffles) where appropriate; and
 - c) Diversity and availability of habitat (shaded margins, woody debris, etc).

30. The PPC28 proposal has responded to the above by:
- I. Providing an integrated approach resulting in ecological / biodiversity outcomes as shown in the Preliminary Section and Cross Sections in the evidence of Tony Milne:
 - a) Riparian width of no less than 40 m wide allowing for a naturalised channel pattern (meander and benching);
 - b) Integration of stormwater wetlands and public access within the riparian width;
 - c) Riparian planting including tall stature native species resulting in an increase of ecological function and positive ecological responses:
 - channel shading;
 - water temperature regulation;
 - allochthonous input of detritus; and
 - decrease in algae growth.
 - II. Providing a robust set of specific rules within Schedule X.9 for:
 - Water Sensitive Design;
 - Ecological and Stream Design; and
 - Storm Water Management.
31. I refer to the evidence of Ben Robertson (terrestrial ecology) for the integration of terrestrial biodiversity including pest plant and animal management, in which I agree with.
32. It is my opinion that the PPC28 proposal as outlined above has responded appropriately which provides the framework that will result in overall positive ecological outcomes for the Kākā Stream, the wider PPC28 area and will contribute to the increase of biodiversity value in the Maitahi/Mahitahi River.

Comments on Section 42A report

33. Concerns raised in Appendix M titled: Private Plan Change 28: Maitahi Bayview – Ecological Review, dated 19 May 2022 in relation to freshwater ecology matters include:
 - I. Requested further work to better understand the fish community of the Kaka Stream;
 - II. Identification of waterways on the structure plan;
 - III. Lack of sufficient space within the riparian margin to include stormwater treatment wetlands;
 - IV. Minimum riparian buffer width on each side of Kākā Stream;
 - V. Change in land use resulting in increased sedimentation and impervious surfaces, flash flows and loss of flow permanence; and
 - VI. Significant adverse effects on freshwater ecology from the development of the Kākā Stream flood plan.
34. I consider the fish survey of the Kākā Stream undertaken as part of the ecology report sufficient to inform this process. This information combined with best technical practice has been used to inform the conceptual design of the Kākā Stream and development of specific rules within Schedule X.9 relating to instream design, which will have a positive ecological result for the native fish community.
35. The proposed green-blue corridor along the Kākā Stream has been further refinement resulting in riparian widths of 56.9 m ranging to 128.5 m. Full dimensions and concepts of the green-blue corridor are shown in the landscape evidence of Tony Milne. I consider that the width of this corridor is sufficient to allow for future detailed design incorporating ecological function into the riparian margin (shading, allochthonous input, water temperature regulation and decrease in algae growth) and instream features within the proposed Kākā Stream realignment.

36. The proposed riparian widths along Kākā Stream are greater than the total width of 40 m recommended in the ecological report. The concept of the green-blue corridor has been informed by the proposed ecological enhancement, integrated stormwater management and water sensitive design, surrounding typology and the proposed structure plan. It is my opinion that this fully integrated approach has resulted in a better ecological outcome than setting minimum riparian widths on each bank.
37. Integrated stormwater management and water sensitive design principles have been incorporated into the proposed green-blue corridor along the Kākā Stream. It is my opinion that the dimensions and concepts of the green-blue corridor as shown in the landscape evidence of Tony Milne incorporates enough space for the full and future integration of stormwater management and ecological enhancement. For further information on the integrated stormwater management and water sensitive design in relation to the proposed change in land use, I refer to the evidence of Maurice Mills (stormwater) and Stuart Farrant (water sensitive design).
38. Within the JWS Ecology (13 May 2022, s3.6) all ecologists have agreed that the lower Kākā Stream is highly modified and impacted by current land use, and there is potential to achieve positive ecological outcomes through PPC28 for the lower Kākā Stream either in its current modified alignment or as part of the proposed realignment.
39. Schedule X.9 rule 12 sets out a provision for detail channel design as part of the Kākā Stream realignment to demonstrate adherence with best practice channel design guidelines. In summary best practice channel design should include stream type characterisation, channel characterisation (bank full width, flood plain connectivity, channel slope, velocity, meander radius, channel sinuosity), instream habitat features (where appropriate under-cut banks, woody debris, and bed profile (pool / riffle / run)). Based on the framework that this provision provides; it is my opinion that the proposed realignment would result in substantially greater ecological outcome when compared to its current alignment or being restored in its modified state.

40. A range of technical natural channel design guidance are available with a local example document being the Natural Channel Design Guideline prepared for Tasman District Council, dated October 2019. In planning evidence of Mark Lile (paragraph 128-130), Groom Creek (resource consent RM165404 & RM165418) is a recent example of a successful channel realignment designed to enhance water quality by reducing fine sediment and nutrients resulting in positive ecological outcomes. Although Groom Creek has a different design to what is envisaged by the framework in Schedule X.9 rule 12 and in others evidence, it is an example of how a stream channel realignment can be implemented adhering to Natural Channel Design Guidelines resulting in positive ecological outcomes.
41. In summary, the framework set out in Schedule X.9 rule 12 combined with evidence provided by Tony Milne (landscape) and Stuart Farrant (water sensitive design), Maurice Mills (stormwater) and the Groom Creek example provides sufficient confidence that the realignment of the lower Kākā Stream will result in positive ecological outcomes.

Comments on Submissions relevant to freshwater ecology

42. In submissions concerns have been raised about the continued sustaining endangered species that inhabit the Maitai Valley. The PPC28 proposal provides an extensive green-blue corridor that will be ecologically enhanced resulting in a gain in biodiversity value and ecological function. This green-blue corridor combined with the revegetation overlay as shown in the landscape evidence by Tony Milne with terrestrial ecological / biodiversity benefits described in evidence of Ben Robertson, will positively benefit any endangered species that inhabit the Maitai Valley by providing an increasing in high quality habitat within the wider landscape.
43. In submissions concerns have been raised about the realignment of Kākā Stream and the natural character of this stream and fish passage. As stated above, this is addressed by the PPC28 proposal by the framework of rules set out in Schedule X.9 which will guide future resource consents and detailed design needed for the Kākā Stream realignment and the wider PPC28 area.

Conclusion

44. I consider the PPC28 proposal provides sufficient information to understand the potential freshwater ecological effects for the Kākā Stream realignment and the wider PPC28 area. Technical information contained in the updated PPC28 proposal, in my evidence and the evidence of Tony Milne (landscape), Stuart Farrant (water sensitive design), Maurice Mills (stormwater) and Ben Robertson (terrestrial ecology) combined with the framework of rules set out in Schedule X.9 will provide the envisaged positive ecological and biodiversity outcomes sought.

Dated 15 June 2022



Joshua Andrew Markham