BEFORE A HEARINGS PANEL
APPOINTED BY NELSON CITY COUNCIL

IN THE MATTER **of Private Plan Change 28 – Maitahi Bayview**

AND IN THE MATTER **of Clause 21 of the First Schedule of the Resource Management Act 1991**

EVIDENCE OF DALI SULJIC FOR SAVE THE MAITAI INC

STORMWATER

DATED 27 JUNE 2022

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INTRODUCTION

1. My full name is Dali Suljic. I am an engineer employed by Tektus Consultants, based in Auckland.

EXECUTIVE SUMMARY

2. PPC28 provides for development within the catchment of Kākā Stream that flows through the Kākā Valley to the confluence with the Maitai River. The Kākā Stream main channel and its tributaries are likely to experience increased stream bank erosion as a result of hydrological changes resulting from development of the catchment.

3. The downstream receiving environment of the Maitai River has high community values, with walking tracks and swimming holes. 'Dennes Hole,' a valued swimming hole, is located immediately downstream of PPC28, at the confluence of Kākā Stream and Maitai River. Kākā Stream is reported to be home to several 'non threatened' native fish species. Kōaro, an 'at risk-declining' species, may also be present. There are several 'threatened' native fish species reported to be present within the Maitai River as well. In my view, stormwater discharges necessary to implement PPC28 are associated with a sensitive receiving environment.

4. In my opinion, the assessments and the Stormwater Management Plan ("SMP") supporting PPC28 provide insufficient information to enable an appropriate understanding of the nature of discharges from the development, and the sensitivity of receiving environments to the associated adverse effects. More comprehensive assessments are required to understand the sensitivity of the receiving environments, the existing site hydrology and the relationship to ecology, geology, and topography. As the natural systems and processes are not adequately understood, it is not possible to frame the extent of the actual or potential effects of future developments and form the Water Sensitive Design ("WSD") response mechanisms (representing the current state of technical knowledge) with a high likelihood of managing these effects appropriately.

5. In my view, the assessments and the SMP supporting PPC28 have not adequately considered the effects of earthworks, susceptibility of existing streams and natural

channels to erosion, or the sensitivity of the receiving environment to the changes in stormwater runoff quality and quantity from the proposed development. Therefore, the proposed stormwater management framework supporting PPC28 fails to demonstrate that its implementation through future resource consent stages can achieve a post-development balance in hydrology that will ensure the protection of streams from erosion, and the maintenance and enhancement of existing freshwater systems and values, including amenity. Consequently, there is a high risk that PPC28 in its current form will fail to practically achieve the National Policy Statement for Freshwater Management 2020 ("NPSFM"), Nelson Regional Policy Statement ("NRPS"), and the Nelson Resource Management Plan ("NRMP") objectives and policies, particularly in their collective aim to protect and enhance the natural functioning ecosystems.

6. In my opinion the proposed SMP and the "Ecological outcomes and freshwater" principles contained within Schedule X.9 lack clarity on specific stormwater management requirements and the implementation standards that will support Nelson City Council ("NCC") and future developers to achieve the environmental performance standards set by PPC28.

7. In my view, PPC28 proposes development within a sensitive receiving environment and as such the level of detail supporting the plan change should reflect this. The proposed zoning and density should be based on the environmental capacity of the existing environment to support the proposed changes in land use. This is reinforced through the NPSFM with its requirements for decision making within environmental limits and founded on the hierarchy within Te Mana o te Wai that ensures the health and wellbeing of water is protected, and that human health needs are provided for before enabling other uses of water.

8. The stormwater management framework should embed WSD throughout to drive and limit the development parameters, to ensure the protection and enhancement of the environment. In my opinion, PPC28 does not follow best practice for the implementation of a WSD approach and there is high likelihood that the proposed development will cause adverse stormwater related environmental effects that will not be adequately identified and controlled through subsequent resource consent processes.

QUALIFICATIONS AND EXPERIENCE

9. I hold a Masters of Engineering (Civil and Environmental) from Cardiff University, Wales. I am a chartered member of Engineering New Zealand and Chartered Professional Engineer with a practice area in hydrological and hydraulic modelling and design of stormwater systems for land development. I have 9 years of experience as a civil engineer in the land development sector in New Zealand. I have specific expertise in stormwater management, modelling, and design, involving projects ranging from small scale residential and commercial developments to large scale greenfield subdivisions and plan changes. I have carried out work on behalf of both local government and private consultancy sectors.

CODE OF CONDUCT FOR EXPERT WITNESSES

10. Although this is not an Environment Court process, I have read the Environment Court's Code of Conduct for Expert Witnesses, and I agree to comply with it. My qualifications as an expert are set out above. I confirm that the issues addressed in my evidence are within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

INVOLVEMENT IN PPC28 AND INFORMATION RELIED UPON

11. I was engaged by Save the Maitai Inc ("STM") in December 2021 to review the PPC28 application documents and prepare a technical assessment and evidence, specifically in the context of stormwater, for the initial submission and subsequent hearing. I carried out a site visit on 28 April 2022.

12. I have read the following application documents:

    a. Landmark Lile Ltd, Private Plan Change Request to the Nelson Resource Management Plan, Schedule X.9 Ecological outcomes and freshwater, 24 August 2021

    b. Structure Plan and Planning Maps [Attachment B]

c. Te Aranga Environmental Consultancy, Maitahi and Bayview Private Plan Change Request Iwi Engagement Summary, December 2020 [Attachment C1]

d. Tonkin & Taylor Ltd, Geology and Geotechnical Hazards Report, March 2021 [Attachment C4]

e. Tonkin & Taylor Ltd, Ecological Opportunities and Constraints Assessment, March 2021 [Attachment C5]

f. Morphum Environmental Ltd, Preliminary Structure Plan Environmental Review, Maitahi & Bayview Development Private Plan Change Request, 13 April 2021 [Attachment C6]

g. Tonkin & Taylor Ltd, Infrastructure and Flooding Report, March 2021 [Attachment C7]

h. Tonkin & Taylor Ltd, Private Plan Change Request 28 – Maitahi Bayview Response to Request for Further Information, 20 August 2021 [Attachment C7]

i. Tonkin & Taylor Ltd, Additional flood hazard information – PC28, 5 May 2022

j. Statement of Evidence of David Wilson – The Urban Engineers, NCC Consultant, Water Sensitive Design

k. Statement of Evidence of Kate Purton – Beca, NCC Consultant, Stormwater and Flood Risk

l. Statement of Evidence of Dr Paul Fisher – NCC, Water Quality

m. Statement of Evidence of Tanya Blakely – Boffa Miskell, NCC Consultant, Ecology

n. Statement of Graeme John Ridley – Ridley Dunphy Environmental Limited, NCC Consultant, Erosion and Sediment Control

o. Statement of Evidence of Maurice Mills – Tonkin & Taylor, Applicant Consultant, Infrastructure

p. Statement of Evidence of Stu Farrant – Morphum Environmental, Applicant Consultant, Water Sensitive Design

q. Statement of Evidence of Joshua Markham – Morphum Environmental, Applicant Consultant, Freshwater Ecology

r. Statement of Michael John Parsonson – Southern Skies Environmental Limited, Applicant Consultant, Erosion and Sediment Control

s. Statement of Evidence of Mark Lile – Landmark Lile, Applicant Consultant, Planning (including amendments to Schedule X, V2, 15 June 2022)

t. Tonkin & Taylor Ltd, Stormwater Management Plan, June 2022 (including Appendix A – D)

13. I attended expert conferencing sessions on flooding on 29 April 2022, WSD on 2 May 2022, stormwater (including flooding, WSD, and water quality) on 6 May 2022 and in relation to the draft SMP document prepared by the applicant on 27 May 2022. Two Joint Witness Statements were prepared as a result, to which I am signatory, Flooding (2) and Stormwater (2) dated 6 May 2022 and Flooding (3) dated 25 May 2022.

EVIDENCE

Introduction

14. PPC 28 seeks to enable urban development of land within a sensitive receiving environment in the Kākā / Maitai Valley, along Botanical Hill and Malvern Hill through:

a. Rezoning approximately 287 ha of land from Rural and Rural-Higher Density Small Holdings Area to Residential, Rural-Higher Density Small Holdings Area, Open Space Recreation and Suburban Commercial.

b. Introduction of a new Schedule X to the NRMP with an accompanying Structure Plan. The Schedule would provide for Comprehensive Housing Developments in the Residential Zone – Higher Density Area and subdivision in the Residential Zone as non-notified restricted discretionary activities.

c. Amendments to Chapter 7 – Residential Zone.

d. Amendments to Chapter 9 – Suburban Commercial Zone.

e. Amendments to Chapter 12 – Rural Zone.

f. Proposed realignment of Kākā Stream, to be authorised in future through a separate resource consent application.

g. Amendments to the Road Hierarchy Planning Maps.

h. Amendments to the Planning Overlay Maps.

15. PPC28 does not propose amendments to any regional plan provisions.

16. PPC28 includes a SMP that supports the plan change and provides a high-level summary of the proposed stormwater management approach. The SMP is intended to provide guidance to the applicant and NCC on the management of stormwater for the future land use scenario by informing designers and decision makers on the requirements and outcomes for the PPC28 area.

PPC28 site and receiving environment

17. The proposed PPC28 area includes Kākā Valley and the Kākā Stream. The valley is generally dominated by steep topography and natural gullies that serve as tributaries conveying surface water from the surrounding terrain to Kākā Stream. Approaching the confluence with Maitai River, the Kākā Stream integrates into a floodplain environment and ultimately discharges to 'Dennes Hole', a popular swimming area.

18. The upper reaches of Kākā Stream appear to be diverse with a generally stable main channel that shows minor signs of localised erosion, which may be attributed to changes in hydrology from the historical clearance of bush to create

pastoral land. The lower reaches, flowing through the floodplain, appear to have been historically modified and straightened to facilitate agricultural uses, and are showing visible damage from stock access.

19. The hydrology of the Kākā Stream catchment appears to be complex with several connecting natural gullies showing signs of surface and subsurface flow transitions and areas of saturated beds with hydrophilic vegetation resembling a wetland environment. Several native fish species are found within the Kākā Stream and the Maitai River freshwater environment.

Scope of evidence

20. My evidence assesses:

    a. The adequacy of information provided to support PPC28.

    b. Effects of PPC28 in relation to stormwater, with a focus on WSD representative of the current state of technical knowledge, and in particular the Kākā Stream catchment hydrology, stream erosion, and water quality.

    c. The extent to which PPC28 will give effect to the NPSFM, NRPS, and NRMP objectives and policies (as relevant to stormwater management).

21. I have identified where my assessment differs from the applicant's or from the s 42A report.

Adequacy of information

22. I understand that at the stage of a proposed plan change to rezone an area and include new plan provisions specific to that area, the information that is provided in support of the application must be in such detail as corresponds with the scale and significance of the actual or potential environmental effects anticipated from the implementation of the change. I am aware that there are future resource consent processes that will enable consideration of detailed effects.

23. In my opinion, the information provided by the applicant to support PPC28 is inadequate. I consider that the following information should have been provided:

a. Robust technical assessments to establish the existing hydrological regime and enable an understanding of the functioning of the natural system including soil infiltration and water retention capacities, presence of groundwater, streams and wetlands, and the relationship to the site's ecology, geology, and topography.

b. Comprehensive technical assessments to establish the sensitivity of the receiving environment and enable the quantification of its susceptibility to the nature and scale of proposed changes in land use including stream erosion assessment and stormwater discharge limits on urban contaminants that will protect the freshwater fauna (fish and macroinvertebrates) and amenity values (swimming holes).

c. Detailed assessments to establish the extent of actual or potential effects of the proposed development under PPC28 that are specific to the assessment of the existing hydrological regime and the sensitivity of the receiving environment including the effects of earthworks on the existing hydrology and the capacity to implement hydrology mitigation measures.

d. Establishing the extent of future developable areas and a corresponding stormwater management framework, giving effect to Te Mana o te Wai, that addresses all aspects of stormwater in the context of managing the recognised effects of the proposed development, including hydrology, stream erosion and water quality. This should be supported by:

    i. Specific stormwater management expectations and requirements for distinct catchments and areas.

    ii. Conceptual sizing and location of key centralised stormwater management devices and reserves.

    iii. Establishing and mapping of regenerative blue-green networks including riparian margins and esplanade corridors.

e. Establishing a SMP implementation framework that clearly sets out how the stormwater management provisions and requirements will be implemented through the future resource consent stages.

24. Because that information has not been provided, it is not possible to assess whether the proposed SMP is appropriate in all its aspects, or whether it can be implemented for future developments within the PPC28, at resource consent stage, in a way that the outcomes set by the SMP can be practically achieved on a catchment-wide scale. I address the key elements of concern through my evidence.

Assessment of effects

Outline

25. The urbanisation and development of greenfield areas fundamentally change the site hydrology and the quality of stormwater runoff. In simple terms, urban pollutants are created, less water soaks into the ground, and water tends to run off in greater volumes, faster, and sometimes to different receiving points compared to pre-development conditions.

26. In summary, changes can be attributed to the removal of vegetation, earthworks, construction of impervious surfaces, and the changes in land use. My evidence specifically focuses on the effects of earthworks, impervious surfaces, and land use changes.

27. Earthworks include stripping of topsoil, removal of deeper organic soil areas particularly in gully zones, bulk cut to fill operations, and can also include the implementation of geotechnical stability measures including shear keys, subsurface drainage systems and soil capping. Cut to fill operations, particularly the placing of engineered fill material, reduces the soil infiltration capacity due to the level of soil compaction required to create stable developable land. The stripped topsoil is predominantly re-instated (in areas where impermeable surfaces have not been established) at shallower depths that reduce water retention capacity and can also reduce infiltration capacity depending on the level of topsoil compaction. Installation of subsurface drainage systems (to control groundwater levels) and implementation of soil capping measures can be required in areas where this is paramount to achieve geotechnical stability such as at the base of filled gullies, shear keys, retaining walls, and on steep slopes. This leads to a reduction in soil infiltration capacity and the rapid draining of subsurface water.

Overall, comprehensive bulk earthworks and geotechnical stability measures have a profound impact on existing hydrological conditions.

28. Impervious surfaces are created with the construction of roads, housing, and ancillary hardstand areas. These result in a further reduction of soil infiltration and retention capacity by effectively capping the underlying soils and preventing the interchange between surface water and groundwater.

29. The cumulative effects of land development practices, including earthworks and creation of impervious surfaces, lead to the following impacts on the receiving environment:

    a. Reduction in groundwater recharge and levels, and impacting natural flow regimes within streams and wetlands, particularly during periods of little or no rain. For streams, the changes in baseflow regimes can result in a complete or partial transition between permanent, ephemeral, and intermittent flow characteristics. For wetlands, it can result in seasonal drying and changes in biodiversity.

    b. An increase in surface water runoff magnitudes, durations, and frequencies, resulting in the increased erosion and destabilisation of stream banks.

30. The transformation of land use from rural to urban changes the nature, level, and form of contaminants in surface water runoff. Urbanisation leads to the development of urban contaminant-generating surfaces and activities (with contaminants including suspended solids, heavy metals, hydrocarbons, gross-pollutants, microplastics, and elevated temperatures) that are attributed to the reduction in natural filtering and cooling processes of stormwater runoff, introduction of traffic and increase in vehicular movements, exposed pavement and building materials, littering, and land management practices relating to open spaces and landscaped areas (use of fertilisers, pesticides, and herbicides). This contaminant composition and loading can lead to the degradation of the receiving environment, affecting the health of freshwater habitats and associated amenity values.

31. WSD is a progressive approach to stormwater management that is now representative of the current state of technical knowledge and best practice in this field, both nationally and internationally. When adopted and comprehensively implemented early in the land development cycle, it has genuine potential to address the wide-ranging hydrological effects of urbanisation in a more sustainable and resilient manner. The implementation of WSD is referenced in the Nelson Tasman Land Development Manual ("NTLDM"), which also references the Auckland Council Water Sensitive Design for Stormwater Guideline Document 2015/004 (GD04) and the Manaaki Whenua Applying Low Impact (Water Sensitive) Design in Nelson Tasman (2016).

32. A WSD approach is well defined in GD04:

> *An approach to freshwater management, it is applied to land use planning and development at complementary scales including region, catchment, development and site. Water sensitive design seeks to protect and enhance natural freshwater systems, sustainably manage water resources, and mimic natural processes to achieve enhanced outcomes for ecosystems and our communities.*

33. GD04 builds on the key WSD principles and how these can be applied at multiple scales. The document also reflects on good practice specific to greenfield development:

> *A WSD approach in a greenfield environment directs development to appropriate areas of a catchment, and provides for intensified or clustered development in these locations to minimise land disturbance and earthworks. The result is an effective balance of protected and enhanced natural environments and associated ecosystem services to support the proposed development, and more broadly the life supporting capacity of our communities.*

34. A simplified checklist was developed as part of the Manaaki Whenua Applying Low Impact (Water Sensitive) Design in Nelson Tasman (2016) document that summaries some notable considerations for developing WSD at a Structure/Framework Plan for greenfield land. This is shown in Figure 1, included below.

Appendix 8 – Water Sensitive Design draft checklist of considerations

WSD Element	Structure/ Framework Plan		Small multi-unit/site development / single site	Rural/ country side living
	Greenfield land	Existing Urban		
Intensifying previously developed areas in preference to new areas where possible	✓	✓		
Identifying natural features including natural drainage patterns, overland flow, intermittent and permanent streams and vegetation	✓	✓	✓	✓
Identifying wider environment values, features and considerations	✓			
Protecting existing vegetation and streams (including margins) during development	✓	✓	✓	✓
Minimising the use of heavy machinery in riparian corridors and other natural / open space areas	✓			✓
Minimising the extent of earthworks and change in contours , soil compaction, topsoil removal and modification of natural drainage patterns	✓			✓
Re-establishing and enhancing streams, vegetation and riparian margins including connectivity	✓	✓	✓	✓
Using vegetation and natural features in management and reduction of runoff	✓	✓	✓	✓
Rehabilitating soil infiltration properties following completion of earthworks	✓	✓	✓	✓
Reconciling site layout with natural drainage patterns and site features	✓			✓
Protecting flood plains and overland flow paths from development	✓	✓	✓	✓
Minimising impervious area footprints, including roads	✓	✓	✓	✓
Clustering development and impervious areas and creation of coherent open space/vegetated areas	✓	✓	✓ (multi-unit)	
Minimising aggregation and concentration of stormwater flows	✓	✓		✓
Maximising infiltration of stormwater and use of permeable surfaces	✓	✓	✓	✓
Diverting runoff away from stormwater networks to vegetated areas	✓	✓	✓	✓
Using open space/grass areas for temporary stormwater detention and/or stormwater treatment	✓	✓		
Avoiding the use of high contaminant generating building materials	✓	✓	✓	✓

Identifying stormwater management areas to be set aside from development as Green Infrastructure Zones	✓	✓		
Designing road layouts to provide for efficient traffic movements and multiple values including amenity and stormwater management by the use of trees and other green infrastructure features	✓	✓		
Minimising requirements for stream crossings and other structures within streams	✓	✓		✓
Using stormwater for non-potable use, including passive irrigation of landscaped areas and vegetation, car washing, toilet flushing	✓	✓	✓	✓
Using vegetation for shading to reduce thermal impact	✓	✓		
Providing public access to natural features and watercourses	✓	✓		
Designing and managing areas that may be prone to litter generation (public congregation and other activities) to minimise litter discharge	✓	✓		
Considering sequential design and mitigation elements when discharging into sensitive receiving environments	✓	✓		
Using green infrastructure for stormwater management including bio-retention devices and similar for stormwater treatment	✓	✓	✓	✓
Identifying communal stormwater management devices and infrastructure and provision for their lifelong ownership and cost effective maintenance and operation	✓	✓		

Figure 1 –Draft checklist of considerations for developing WSD at different scales. Image reproduced from Manaaki Whenua Applying Low Impact (Water Sensitive) Design in Nelson Tasman, 2016.

35. Manaaki Whenua Applying Low Impact (Water Sensitive) Design in Nelson Tasman (2016) highlights a comprehensive WSD approach that includes fundamental early-phase considerations of minimising the extent of earthworks and change in contours, soil compaction, topsoil removal, and modification of natural drainage patterns. In my view, PPC28 has not considered this (or if it was considered, it has not been applied).

36. While both GD04 and Manaaki Whenua Applying Low Impact (Water Sensitive) Design in Nelson Tasman (2016) are only considered as guidelines, the stormwater management approach outlined through the two documents closely aligns with the NRPS objective WA1.2.1 as well as the NRMP objectives and policies summarised in SMP Table 3.1. In my view, the framing of the proposed SMP does not follow best practice for the implementation of a WSD approach.

37. PPC28 includes the development within the catchment of Kākā Stream. In my view, stormwater discharges within PPC28 are associated with a sensitive receiving environment.

38. At the downstream end of PPC28, Kākā Stream joins the Maitai River, which has high community values including walking tracks and swimming holes. 'Dennes Hole' is located at the confluence of Kākā Stream and Maitai River, immediately downstream of PPC28. The proposed development can lead to a degradation (gross pollutants, safe national bottom lines for water quality) of the existing amenity values, and increased stream bank erosion of the Kākā Stream main channel, and its tributaries.

39. The Tonkin & Taylor Ecological Opportunities and Constraints Assessment (C5) identified 'non threatened' native fish species including Shortfin eel and Northern freshwater kōura within the Kākā Stream. Kōaro, an 'at risk-declining' species, may have also been observed but was unconfirmed due to size. The Catalyst Group prepared an Updated Aquatic Sites of Significance report (June 2017) for NCC where several 'threatened' native fish species were reported to be present within the Maitai River including Longfin eel, Torrentfish, Kōaro, Inanga, Lamprey, Bluegill bully and Redfin bully. Threats to these species were identified and, among other causes, included water quality degradation, suspended sediments, loss of high-quality aquatic invertebrates, and loss of flow in upland streams. The proposed development can lead to the degradation of the quality of stormwater discharges to the Kākā Stream and Maitai River that have the potential to adversely affect the freshwater fauna.

40. In my opinion, there is insufficient information provided to enable the understanding of the sensitivity of the receiving environment, the existing site hydrology, and its relationship to ecology, geology, and topography. As the natural

systems and processes are not adequately understood, it is not possible to frame the extent of the actual or potential effects of future developments and the WSD response mechanisms of PPC28 to manage these effects respectively. I address these concerns in detail in the paragraphs below.

Hydrology

41. The SMP acknowledges the complexity of the Kākā Stream catchment with many tributaries transitioning from above to below ground with a high likelihood of being dry through periods of low rainfall. It goes on to attribute this to existing soil properties that appear to be dominated by fractured rock and colluvium, and deposits of free draining material in the side gullies. No additional assessments were carried out as part of PPC28 to validate these observations and no consideration was given to the presence of groundwater in the area.

42. I have referred to the Manaaki Whenua Soils Map Viewer platform that indicates the soils in the area are likely to be "well drained" with "moderate over slow" permeability characteristics. Consequently, this carries a high likelihood of adverse effects from earthworks and creating impervious surfaces relative to the existing soil properties and hydrological regime.

43. The stormwater management provisions that respond to the development of areas with varying natural permeability and groundwater conditions are fundamentally different to achieve a post-development balance in hydrology that will ensure the protection of the receiving environment. For example, where the steeper slopes of Kākā Valley are reasonably permeable, then the development of those areas that precludes infiltration to ground can have adverse effects on the existing hydrology. In contrast, where the steeper slopes have limited permeability, but there are highly permeable soils located at the base of the connecting gullies, or the floodplain, then precluding infiltration to ground in these areas will have a far greater adverse effect on the existing hydrology then on the steeper slopes. Under the WSD umbrella, the former example would in principle favour the implementation of at-source infiltration requirements, whereas the latter example would favour a centralised infiltration approach. Therefore, in order to follow a WSD approach, catchment-wide considerations are necessary at this plan change stage, with area and site-specific requirements

and implementation standards included in the SMP so that the cumulative effects of future staged development can be avoided.

44. Nevertheless, to mitigate the effects of development on the existing hydrology, in the context of stormwater runoff volumes and groundwater recharge, the SMP proposes to implement:

    a. *Retention and reuse for non-potable water supply of 5mm runoff for all roofs areas, where feasible.*

    b. *Retention and infiltration to ground of 5mm runoff for roads and hardstand areas, where located within recharge zones as defined by the NTLDM.*

45. Item (a) proposes rainwater tanks for individual lots, whereas (b) would result in the use of specific devices that achieve stormwater infiltration to ground, such as bioretention swales and raingardens.

46. However, what is considered "feasible" for the implementation of water re-use is not discussed or stipulated in the SMP and leaves this open to wide range of potential "infeasible" conditions. Furthermore, the recharge zones under the NTLDM are limited to areas with low-risk slope stability issues and a permeability rate of at least 5mm/hr. The SMP acknowledges that the majority of PPC28 is likely located outside of this recharge zone definition.

47. As a result, both of the key targeted stormwater outcomes for PPC28 (reuse via on-lot tanks and retention to ground) have the potential to be deemed "infeasible" and "impractical", undermining these fundamental targets.

48. In my view, the proposed stormwater management requirements do not demonstrate that they can achieve a post-development balance in hydrology that will ensure the protection of the receiving environment, nor that they can be practically implemented through future resource consent stages. There is a high likelihood that the development under PPC28 will fail to mitigate the adverse effects of increased stormwater runoff volumes in this regard.

49. The SMP further proposes revegetation of open spaces to *enhance stormwater attenuation potential*. I agree with Mr Farrant that revegetation increases evapotranspiration and infiltration to shallow soils, which better represents a

natural hydrological regime, however this has not been quantified in the SMP. As such, it is not clear what level of hydrological mitigation will be achieved with the proposed revegetation or how it will be implemented through the future resource consent stages. I note here that, based on the SMP Appendix A figures and the site visit, a large proportion of the areas proposed for revegetation on the slopes of Kākā Hill are already vegetated, which when compared to pasture decreases the scale of benefits in the context of increasing evapotranspiration and infiltration to shallow soils. In my view, the SMP does not demonstrate that the proposed revegetation, in conjunction with the proposed hydrology mitigation measures for impervious surfaces, can mitigate the adverse effects of increased stormwater runoff.

50. The SMP recognises that the proposed development can lead to increased stream bank erosion within Kākā Stream and its tributaries unless carefully managed through the implementation of retention practices. It also acknowledges that determining the scale and severity of effects requires a detailed geomorphological assessment, however this is proposed to be deferred to the resource consent stage. In my view, a stream erosion assessment is key to enable the framing of the required stormwater management provisions in line with a WSD approach and must be done at a catchment-wide scale to avoid cumulative effects of staged development.

51. The assessment would demonstrate that the specific design criteria targets set on hydrology mitigation requirements of more frequent rainfall events, in the form of retention (runoff volume reduction) and detention (peak flow reduction and slow release), can ensure stream erosion is not exacerbated beyond its natural rates due to any anticipated post-development changes in frequencies, magnitudes, and durations of stream flows. Based on the SMP regulatory and design requirements, the implementation of retention practices is likely to be very limited. The requirements are also silent on the specifics around the implementation of detention for roads and hardstand areas. In my opinion, the SMP provisions do not demonstrate that the Kākā Stream can be protected from erosion resulting from the development under PPC28.

52. The SMP proposes to retain and enhance intermittent streams. The location of these streams is not shown, and it is not clear what provisions will ultimately drive

the definition of an intermittent stream through the resource consent stages. There is also no reference in the SMP as to the definition, management, and retention requirements of any ephemeral streams or natural overland flow channels, despite these generally being integral to the functioning of intermittent streams. Overall, it is not clear which existing gullies will be retained and which filled. The recognition of free draining existing soil materials in the side gullies of the Kākā Stream indicates that the existing gullies may be paramount to the implementation of WSD principles and the corresponding stormwater management response to the adverse effects of the proposed development on existing hydrology.

53. The nature of earthworks required to fill a gully, and enable the formation of developable land, is generally associated with stripping of topsoil and often deep organic materials accumulated in the bases of gullies, and compaction of fill on top. In my experience, depending on the condition of the underlying soils, underfill drainage is also likely to be installed. In the context of this site, this would significantly affect the permeability and water retention capacity of the gully relative to its natural state. This would consequently affect the hydrological response of the upstream catchment draining to each gully, including the areas outside of the proposed development extents. The SMP fails to recognise these effects and there is a high likelihood that development under PPC28 would adversely change the existing catchment hydrology.

54. For the reasons above, it is my opinion that in conjunction with the implementation of hydrology mitigation requirements for impervious surfaces, the key streams, tributaries, or natural overland flow paths that warrant retention and protection to ensure any effects of future development on existing hydrology are mitigated, need to be assessed at the plan change stage. These need to be included on the planning maps and protected with clear minimum riparian margin requirements.

55. The SMP only recognises two wetlands, however several areas of saturated beds with hydrophilic vegetation resembling a wetland environment were observed onsite. These were predominantly located at the mouth of the gullies connecting into Kākā Stream and were also recognised on the geomorphology plan included in the Tonkin & Taylor Geology and Geotechnical Hazards Report (C4).

Furthermore, the Statement of Evidence of Tanya Blakely also indicates the potential presence of wetland habitats in the gullies. In my view, it is important that the presence of these wetlands is assessed at the plan change stage as the presence of wetlands could fundamentally change the stormwater management provisions and the potential development extent in these areas.

56. The SMP briefly discusses the topography of the existing site, however it does not link this to the likely impacts of earthworks that will be required to support the development under the proposed zoning and density.

57. I have carried out a slope assessment using the available LiDAR data from the Nelson and Tasman region captured between 2008 and 2015. Figure 2 below shows the produced slope map including Kākā Valley with gradients exceeding 1-in-5 (20%) in brown. I have overlaid the approximate extents of the proposed residential/commercial zoning under PPC28 to highlight the proportionality of future development in the steeper areas. NTLDM limits the maximum longitudinal gradients for different orders of roads. Local Roads and Residential lanes are limited to 1-in-7 (14.3%) and 1-in-6 (16.7%) respectively. Relative to the proposed density, it is likely that relatively high levels of earthworks and retaining (in tandem with potential geotechnical stability measures), will need to be carried out to support PPC28 for a large proportion of the proposed development. This can significantly change the hydrology and affect the existing hydrological features. A further associated concern is the potential for bulk earthworks consents to be applied for independently of ultimate land use consents, which has the effect of predetermining the feasibility of stormwater management approaches and can preclude the implementation of best practice WSD. In my view, the SMP does not broadly recognise the topography constraints and has failed to demonstrate that that the actual and potential effects of earthworks on hydrology can be managed through the proposed regulatory and design requirements.

58. Furthermore, the SMP proposes a stormwater management approach that utilises at-source green infrastructure. These include bioretention devices, raingardens, tree pits, vegetated swales, and wetlands. The implementation of these devices is closely linked to topography, particularly for the roadside applications, where successful implementation is generally limited to a longitudinal gradient of 1-in-

12.5 (8%). In my view, linking back to the topography challenges within the PPC28 area, the SMP has failed to demonstrate how the proposed green infrastructure devices can be practically implemented through the resource consent stages.

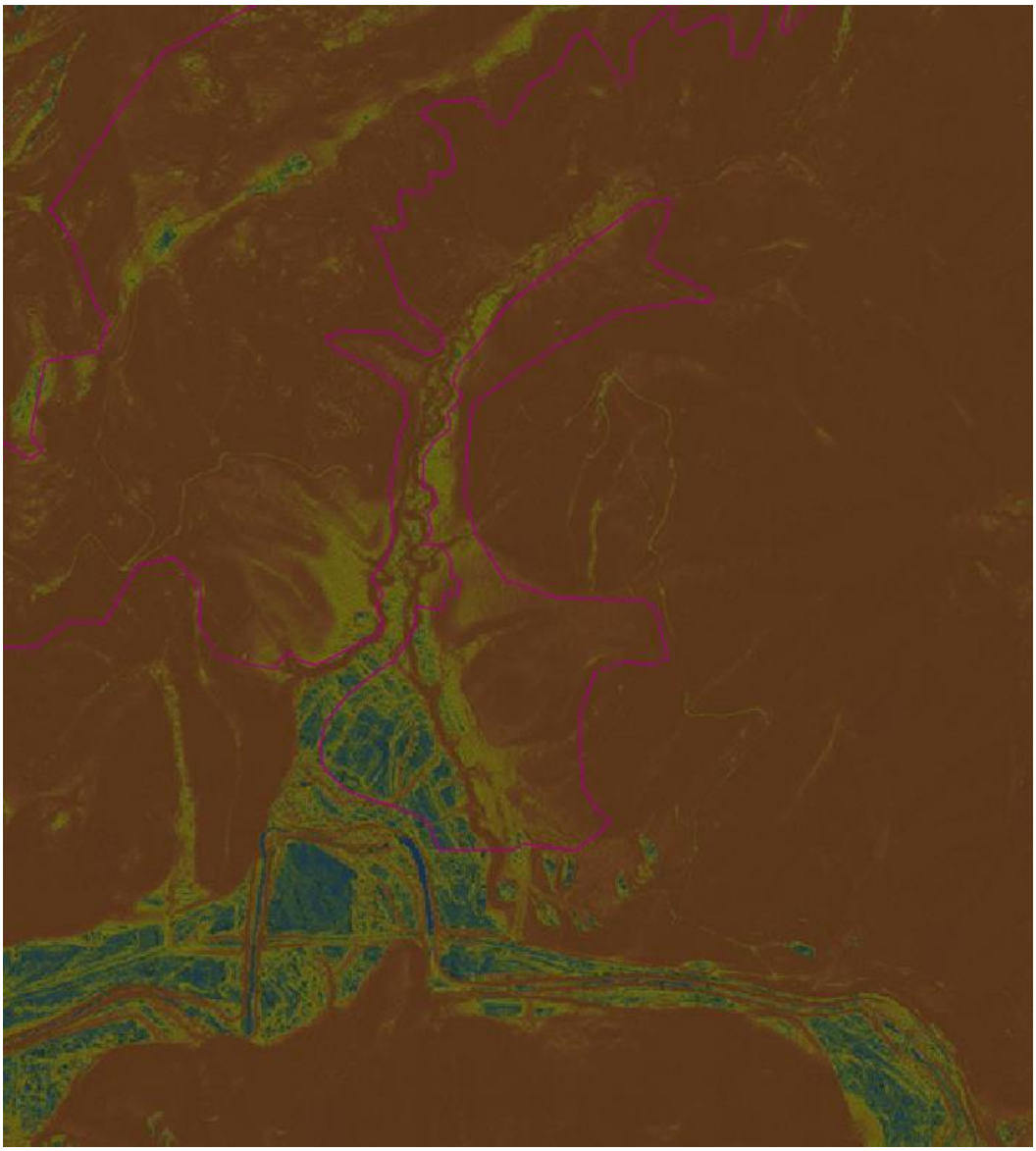

Figure 2 – Slope map of the Kākā Valley, colour coded with gradients up to 1-in-20 (5%) in blue (flat to moderate), between 1-in-20 (5%) and 1-in-5 (20%) in yellow (moderate to steep) and exceeding 1-in-5 (20%) in brown (steep to very steep). Approximate PPC28 residential/commercial development extents are delineated in purple.

Water Quality

59. There is no specific regard given to the downstream receiving environment in terms of the level of stormwater runoff quality treatment required to respond to the proposed changes in land use. Specifically, there is limited consideration of

the nature of discharges from a water quality perspective and there is no consideration of the sensitivity of the freshwater receiving environments to the likely nature of the discharges. Furthermore, there is no framework for determining the necessary interventions to avoid and mitigate the discharges relative to the particular sensitivities. This includes the environmental limits and the minimum standards to ensure the values of receiving environment are maintained or enhanced.

60. The proposed SMP does not specifically recognise or consider the presence of several native freshwater species, or the community values of the receiving environment including 'Dennes Hole', which is used for swimming and located immediately downstream of PPC28. I acknowledge that several water quality indicators associated with current agricultural use will likely be improved (albeit those improvements may be required in any event under Stock Exclusion Regulations and National Environmental Standards applicable to farming), however this does not guarantee that the subsequent elevation in contaminants associated with urban environment will not result in stream health degradation.

61. In line with the WSD principles, the appropriate level of water quality treatment needs to be relative to the sensitivity of the receiving environment. This may consequently require a higher level of water quality treatment design criteria and a treatment train approach to target a range of contaminants of concern, in both particulate and dissolved format, and provide treatment to the appropriate level that will ensure the protection and enhancement of the receiving environment. Consideration of environmental limits and clarity in intervention frameworks with a hierarchy of prioritising the health and well-being of water first is fundamental to giving effect to the NPSFM.

62. For the Kākā Stream catchment, the SMP proposes the following water quality treatment requirements:

    a. *Use of inert building materials for roof areas, where feasible.*

    b. *Water quality treatment for roads, hardstand areas, and driveways by minimising generation of contaminants as much as reasonably practical and with the use of green infrastructure.*

63. Inert building materials under (a) are defined in the SMP as to being limited to exposed surface coating of metallic zinc/copper of any alloy containing greater that 10% zinc/copper and exposed treated timber surface with zinc/copper containing algaecide. The SMP estimates in the order of 16.5 hectares of new roof areas will be created within the catchment as part of future development. Inert building materials do not eliminate contaminants, they only limit their use to a certain percentage. Furthermore, the effects of roof runoff on temperature and generation of microplastics from painted surfaces are also not considered. Runoff from 16.5 hectares of new untreated roof areas will have cumulative effects on stormwater quality. It is not clear how elimination/treatment of contaminants will be achieved for roof areas when considering these cumulative effects (i.e. introducing a relatively large area of roof surfaces that does not treat but only somewhat limits the generation of contaminants). Under (b), the SMP is silent on the specific water quality treatment requirements for roads and hardstands, however it is acknowledged that Schedule X.9 specifies 80-85% of mean annual volume resulting from 3-month ARI event to be passed through vegetated treatment devices. There is no evidence provided as to how this design standard was developed and the level of treatment it will achieve.

64. The key stormwater quality requirements for PPC28 (inert building materials, minimisation of contaminants, and green infrastructure) have the potential to be deemed "infeasible" and "impractical," undermining these fundamental targets. Examples of reasons why those requirements may be considered infeasible include building/development costs, OPEX costs, topography challenges for constructing green infrastructure, etc.)

65. Overall, it is not clear how the proposed stormwater management provisions and requirements on water quality treatment were developed, and the inadequacies in these provisions as discussed above mean there is a high likelihood that the existing freshwater systems and their amenity values will not be protected and enhanced.

Schedule X.9 Principles

66. Complementary to the SMP, PPC28 also relies on the implementation of best practice "Ecological outcomes and freshwater" principles contained within

Schedule X.9. These are intended to be used at the subdivision and development design stage. In my view, the level of detail provided in the SMP, along with the preceding technical documents, does not provide confidence that these principles can or will be successfully implemented. I have highlighted some specific concerns regarding the proposed Schedule X.9 principles:

a. The use of wording "where possible" under principles (2a) and (6), "where practical" under principle (9), and "where feasible" under principle (11) is not robust and can be subject to different levels of interpretation at future stages. These terms mean other priorities (which are not described, but could include, cost, infrastructure requirements, availability of materials, etc.) can outweigh environmental outcomes, contrary to Te Mana o te Wai. This can lead to cumulative environmental effects as the future developments progress. The level of information supporting the plan change should be sufficiently detailed to address these risks to the extent that such wording is not needed and can be removed.

b. There is insufficient detail provided on the existing site hydrology and the proposed stormwater management provisions that respond to the effects of the proposed development to demonstrate that principle (4) can be successfully implemented at the resource consent stage.

c. There is no information provided that demonstrates how the design standard under principle (5) was developed and whether the level of water quality treatment it will achieve is appropriate relative to the sensitivity of the existing receiving environment.

d. Principle (6) should be to an extent implemented at the plan change stage to validate the capacity to achieve the post-development groundwater recharge and maintain the pre-development hydrology regime on a catchment-wide scale.

e. The requirements under principles (9) and (10) should be carried out at the plan change stage so that any centralised devices that are paramount to achieving the environmental outcomes of PPC28 can be identified and located. This is to ensure a catchment-wide consideration of stormwater

management practices that avoid potential cumulative effects of staged development.

f. Principle (13): natural wetlands should be identified at the plan stage as they can fundamentally change the stormwater management provisions and the potential development extent in areas surrounding and draining to natural wetlands.

g. The use of word "minimising" for stream loss under principle (14a) is not robust and can be subject to different levels of interpretation at future stages. This can lead to the elevation of cumulative environmental effects as the future developments progress. The level of information provided at the plan change stage should identify the streams and tributaries that will be protected and enhanced.

h. Principle (16) only gives regard to the managing of earthworks outside of the proposed residential areas in a way that minimizes compaction and changes to the hydrologic response of flows to Kākā Stream and its tributaries. The management of earthworks is a key WSD principle and should be implemented across the plan change area including the proposed residential areas.

i. The use of word "maximising" for the implementation of water re-use under principle (17) is not robust and can be subject to different levels of interpretation at future stages. This can lead to the elevation of cumulative environmental effects as future developments progress. The requirements on stormwater re-use should be clearly set at the plan change stage so that such wording can be removed.

Section 42A report Evidence

67. I generally agree with the conclusions and recommendations of the Section 42A report Statements of Evidence of David Wilson, Kate Purton, and Dr Paul Fisher. In particular:

a. I agree with David Wilson that the WSD process has not been completed to the level of detailed required to support PPC28 to ensure the protection of the sensitive receiving environment.

b. I agree with Kate Purton that the existing NRMP provisions and proposed PPC28 provisions do not provide adequate control on future developments to ensure cumulative effects on the receiving environment in the context of stormwater can be managed and mitigated.

c. I agree with Dr Paul Fisher that further information is required to assess the effects on key ecological hydraulic functions and the geomorphology of the catchment to inform WSD, including modelling of Kākā Stream hydraulic conditions. I also agree that spatial information of key stormwater management devices should be provided as part of an SMP.

68. Although the proposed SMP was provided subsequently to the Statements of Evidence of David Wilson, Kate Purton, and Dr Paul Fisher, this has not changed my opinion on their evidence.

Applicant's Evidence

69. I disagree with Stu Farrant that PPC28 in its current format will achieve the water quality treatment levels for stormwater to best practical standards, particularly with respect to the sensitivity of the receiving environment. I also disagree that the proposed provisions on retention and detention are adequate to protect the receiving environment from any potential adverse effects of increased flows from development. My reasons are set out above.

70. I disagree with Maurice Mills that the SMP has demonstrated that the proposed level of water quality treatment will ensure that the effects of urban development within the PPC28 area can be appropriately managed to maintain and protect downstream freshwater values. My reasons are set out above.

CONCLUSION

71. PPC28 proposes development within a sensitive receiving environment of the Kākā Stream and Maitai River.

72. In my opinion, the assessments and the SMP supporting PPC28 provide insufficient information on the implementation of WSD and in particular the consideration of effects of earthworks on hydrology, susceptibility of existing streams and natural channels to erosion, and the sensitivity of the receiving environment to the changes in stormwater runoff quality and quantity from the proposed development.

73. In my view the proposed stormwater management framework supporting PPC28 fails to demonstrate that its implementation through future resource consent stages can achieve a post-development balance in hydrology that will ensure the protection of streams from erosion, and the maintenance and enhancement of existing freshwater systems and values, including amenity.

Dali Suljic

27 June 2022