Nelson City Council
te kaunihera o whakatū

File Ref: A2888782

When calling
please ask for: Paul Fisher
Direct Dial Phone: 0272944493
Email: paul.fisher@ncc.govt.nz

13 May 2022

Memo To: Gina Sweetman

Memo From: Dr Paul Fisher
Water Quality Scientist

Subject: PRIVATE PLAN CHANGE 28 MAITAHI BAYVIEW SEC 42A TECHNICAL REVIEW WATER QUALITY

INTRODUCTION:

1 My full name is Paul Richard Fisher. I am employed as a Water Quality Scientist.

2 I have prepared this review on water quality in respect of technical related matters arising from the submissions and expert caucusing on the Private Plan Change 28 (PPC28).

3 Specifically, this statement of evidence relates to the following matters.

3.1 Proforma 4. Engineered changes to the Maitai River floodplains and Kākā Stream realignment will create a flood risk for downstream residents and impact on the mana, habitat value and natural character[1] of these waterbodies.

3.2 Proforma 5. Ongoing sedimentation of the river from site works, and pollutants from increased stormwater runoff from the new suburb effects on Maitai swimming holes and Nelson Haven and related water quality submissions.

Qualifications and experience

4 I hold the qualifications of BSc (Hons) Environmental Science and PhD in Ecology (seabirds and fish ecology).

5 I have worked for Nelson City Council for thirteen years, with a range of freshwater roles responsible for the State of the Environment water quality and recreation bathing monitoring and reporting programmes and providing freshwater technical expert advice for resource consents, including adaptive management plans for sediment discharge monitoring from

[1] NPSFM 2020; freshwater quality is a component of ecosystem health and dependent on maintaining natural character and ecological flows, amongst other factors.

subdivisions; for council municipal water, stormwater and wastewater quality monitoring and network improvements and investigations; freshwater policy and planning including contributing to Nelson freshwater management unit working groups and the Whakamahere *Whakatū* Nelson Plan. I am also co-responsible for managing the Nelson regional estuarine monitoring programme and contribute to field work led by consultant estuarine ecologists. Prior to working at the council I have 15 years' experience as a research ecologist, predominantly surveying birds, fish and marine mammals for various studies and impact assessments.

6 I am a member of the NZ Freshwater Sciences Society and currently the Chair of the regional council Fish subgroup of the Surface Water Integrated Management (SWIM) special interest group.

Code of conduct

7 I have read the Code of Conduct for Expert Witnesses set out in the Environment Court's Practice Note 2014. I have complied with the Code of Conduct in preparing my review and will continue to comply with it while giving oral evidence before the hearing.

Review of water quality matters

8 I have been involved as a council officer in the Private Plan Change 28 (PPC28) Maitahi Bayview between CCKV Maitai Dev Co LP and Bayview Nelson Limited, since November 2020; attending a site visit and council workshop on the Plan Change in April 2021.

9 This review has included the following information sources:

9.1 All technical assessments provided that relate to water quality (https://shape.nelson.govt.nz/private-plan-change-28-maitahi-bayview) with particular reference to C6.-Environmental-Review; C5.-Ecological-Opportunities-and-Constraints-Assessment-Report' C4.-Geology-and-Geotechnical-Hazards-Report

9.2 Submissions on water quality related matters

9.3 Plan provisions

9.4 Joint Witness Statements to 12 May 2022

9.5 Inter tidal broad scale habitat mapping of Nelson Haven report (Stevens & Forrest, 2019)

Submissions and what they raised

10 Submissions that opposed the plan change for water quality issues:

10.1 The submissions considered the loss of stream natural character from urban development, and the control of erosion and sediment discharge to the Maitai river as the main issues. Based on the scale of the proposed earthworks, infill and narrowing of the flood plain, the duration of the development earthworks (over decades) and lack of detail outlining how the environmental outcomes would be achieved.

10.2 There was opposition to the plan change because the realignment of the Kākā stream will discharge at the Maitai at Dennes Hole, with the risk of sedimentation effects adversely effecting Dennes Hole, Black Hole and potentially Girlies Hole [recreation bathing holes], as well as the ecology and substrate downstream, and ultimately end up in the Haven estuary.

11 Based on the Plan Change being approved:

11.1 There was a submission requesting the plan change includes provisions and consent conditions to specify no zincalum materials used for roofing and monitoring of trace metals in settling pond soils, citing MDC- De Lux Development consent U160625 settling ponds is required.

11.2 Submissions supported the development based on the provisions providing protection and enhancement of freshwater quality through creation of wetlands, the realignment of Kākā stream, overland stormwater flows and groundwater recharge.

Outcomes from expert conferencing

12 Water Quality was included in the Flood modelling session on 6 May 2022 following previous topics on Planning, Water Sensitive Design, Stormwater and Flood Modelling. The main outcome from the caucusing session was that it was agreed to discuss all the interdisciplinary topics together because of their dependency on each other. Water Quality feedback from the Flood Modelling session is included in paragraph 44-46 below**.**

13 All planning experts agreed that RMA Schedule 1, Part 2, Clause 22(2) relevantly identifies that the level of detail should correspond with the scale and significance of the actual or

potential environmental effects anticipated from the implementation of the change. All planning experts agree that a higher level of assessment of effects is appropriate for a plan change compared to the more detailed level of assessment at a resource consent stage.

14 The LDM provides context and guidance for the higher-level assessment of the feasibility and achievability of the plan change proposal. A plan change does not need to show compliance with the detailed specifications of the LDM as this detailed level of assessment occurs at the subsequent resource consent stage.

Assessment of any remaining / outstanding matters.

15 **Freshwater Natural Character**

16 The proposed engineered infrastructure for utilities will include culverts and scour protection for roads, stormwater and flood conveyancing, and fish passage, which will have some impact on the natural character of the Kākā catchment and wetland features. In my experience of subdivision developments in Nelson, streams and wetlands designed and functioning as stormwater and flood attenuation assets do not achieve desired natural character or ecological outcomes as per the objectives of the NPSFM. Largely because developments are assessed on a case-by-case basis with no over-arching catchment scale freshwater or ecological plan to ensure instream and riparian habitat is representative of the stream character at a reach and catchment scale, based on geology, stream order, elevation, distance from coast and connectivity of habitats. The minimum standards in the NTLDM and NRMP enable large scale earthworks that modify catchment flow paths and soil-surfacewater-groundwater hydrology rather than working with natural landform. Inclusion of hard engineering in streams is required to protect utility assets, and riparian canopy structure and height can be limited by maintaining flood conveyancing requirements, depending on the channel design and riparian corridor with, inadequate to shade the wetted margins and provide fish spawning habitat and buffer the effects of the development.

17 If the PPC28 is approved the catchment development design provides an opportunity to improve ecological values incorporating natural channel design guidelines and demonstrate how the potentially competing objectives of flood conveyance and ecological habitat and freshwater management can be integrated into a functional and positive outcome. This could take the form of plan provisions and part of a Water Sensitive Design report for the catchment.

18 Natural character should be a key component of the water sensitive design, which will provide an integrated response across the PPC28 site prior to subdivision and minimise the need for three waters infrastructure, where appropriate.

19 The Environment Institute for Australia and New Zealand (EIANZ) provide guidance and a recognised framework for undertaking ecological assessments for terrestrial and freshwater environments, which provides a scientifically defensible approach to ecosystem management in the context of development. This framework is one approach that could be used to quantify the competing objectives of flood conveyance (and other design issues such as stormwater) with ecological habitat and function to demonstrate not net loss of freshwater values and guide the water sensitive design for water quality.

20 **Flood modelling and infill of the flood plain**

21 The development is proposing infill of the lower flood plain. The ecological function of floodplains can be expected to decline when hydrological connectivity to them (e.g. the frequency and extent of flooding) is reduced by infill. This is because floodplain inundation increases retention of particles and dissolved nutrients by increasing ponding and contact time with riparian vegetation and soil, reducing contaminant loadings downstream. Overall improving water quality and ecosystem health. In addition, some fish species such as eels utilise flood events as an opportunity to access the floodplain and to feed on terrestrial prey, and some fish species including kōkopu require elevated flows to provide access to spawning sites.

22 **Sediment and stormwater contaminants**

23 Erosion and sediment runoff can occur from exposed earthworks and natural weathering processes, resulting in suspended sediment discharges when precipitation occurs. The preliminary geological and geotechnical assessment with respect to residential infrastructure, described the Kākā catchment as a moderate risk level of geotechnical risk for liquefaction and lateral spreading for most of the floodplain, while a high risk was assessed for land on the flood plain immediately adjacent to the Maitai River. The report notes that further assessment to quantify the risk would be needed to support a resource consent application for residential development in areas of Holocene alluvial deposits as required by the fourth schedule of the RM Act 1991 and relevant rules of the NRMP.

24 The geological assessment did not identify large areas that show a significant susceptibility to soil erosion, however, that the steeper slopes (particularly those generally more than 30 degrees) may be susceptible to gully and sheet erosion if stripped of topsoil.

25 The southern boundary of the proposed development the Maitai River is actively eroding the alluvial soils by changes in water course separating land (avulsion) and undercutting banks. This is a result of the north-ward migration of the Maitai River over the last seventy years

and over the last forty years largely due to construction of stop banks and dense planting of trees that has been undertaken on the southern side of the Maitai River floodplain.

26 The Ecological report noted the lower reach (extending from the woolshed to river confluence) of the flood plain channel to comprise finer sediments (silts) with excessive deposition, likely a result of elevated sediments from stock and increased deposition due to flat grade.

27 The proposed infill of the Kākā catchment flood plain will change the flood response at the confluence with the Maitai river, incorporating areas where active bank erosion already occurs along with areas moderate to high (adjacent land on the Maitai river) geotechnical risk.

28 Specific risks of increased localised erosion from modifying catchment geomorphology and hydrology can be mitigated with geotechnical, flooding and stormwater input to planning, design and construction of residential subdivisions, which should be assessed more thoroughly at the Plan Stage to inform the feasibility and potential effects from the proposed development on water quality and ecology.

29 The Bay View and Kākā developments are not zoned within the Coastal Zone, defined by the NRMP. However, the Bay View discharges directly to the Haven and Kākā catchment, indirectly via the Maitai River.

30 In ecological terms, Nelson Haven is recognised as a valuable nursery area for marine and freshwater fish and has extensive shellfish beds and is very important for birdlife. Much of the historical salt marsh has been lost due to past reclamation, limiting the capacity of the estuary to trap and assimilate sediment and nutrient inputs (Stevens & Forrest, 2019).

31 The seaward intertidal flats are dominated by sandy sediments in good condition, whereas large parts of the upper tidal reaches of the estuary (336ha, ~38%) are dominated by substrate with mud contents >25%, a threshold above which ecological degradation of the sediment community is known to occur. Sediments with elevated mud contents also pose a significant risk to the estuary's extensive seagrass beds, which are some of the largest remaining in the region. These beds are particularly susceptible to sediment smothering, as well as impacts from reduced water clarity.

32 NIWA models of sediment inputs, based on existing landcover, indicate current sedimentation rates are ~4-5 times higher than natural levels, with ~94% of the sediment entering the estuary being trapped. Therefore, Nelson Haven is vulnerable to any additional fine sediment inputs from the catchment. In particular, the risk of larger scale episodic

inputs from land disturbance activities such as subdivisions, roading or forest harvesting need to be carefully managed at a catchment scale to avoid increasing sediment loads to the estuary.

33 **Legislation and Policy**

34 It is my opinion that the existing provisions in the Nelson Resource Management Plan, national policy and standards will not be sufficient to address all the water quality issues of concern at the time of subdivision or development.

35 This is because the NRMP Freshwater and Coastal Area rules do not adequately give effect to the changes in legislation with regard to setting activity and discharge limits to protect and maintain ecosystem health. "Reasonable" mixing zones (for terminal reaches of rivers), water quality limits (triggers) and contaminant loads are not well defined in the rules for stormwater discharges and how these translate to monitoring and compliance for freshwater and marine water quality standards in the receiving environment.

36 An integrated catchment approach to planning with comprehensive Water Sensitive Design, a fit-for-purpose Adaptive Management Plan and staged constructed development should provide assurance that water quality could be managed within design standards. The risk from extreme natural hazard events is present and should be considered in the catchment plan design; high intensity precipitation event(s) could lead to more extensive and prolonged flooding than modelled with potential erosion of formed earthworks and impacts on infrastructure.

CONCLUSION

37 The proposed provisions, the existing provisions in the NRMP and requirements of the NTLDM together may not be sufficient to address the effects of development, especially the catchment-scale and cumulative effects, and also where existing controls (e.g. flood overlays) may not correctly reflect the future developed form, high intensity rainfall events, erosion and flood extent.

38 It is my opinion that the individual technical assessments have been written in isolation and do not provide adequate detail or assurance that the Plan Change provisions and desired outcomes can be achieved to maintain and enhance water quality standards where required. Further caucusing is planned between experts to discuss a more integrated approach to the technical assessments to guide the Plan Change provisions, scope and detail. These interdisciplinary technical assessments should be undertaken as part of the plan change, providing information for master planning at a catchment-scale for stormwater planning

and flood risk management, and water sensitive design to promote freshwater management and other desired community and environmental outcomes.

RECOMMENDATIONS

39 **Further Information Requirements**

40 **Natural Character**

41 The technical reports supporting the application do not adequately address to what extent the development will maintain or improve the natural character of the Kākā and Maitai River catchments, which need to be considered as part of more holistic assessment of technical constraints, to guide the subdivision and Water Sensitive Design.

42 Spatial plans are required to show the locations and extent of roads, bridges, culverts and associated three waters infrastructure, natural stream channel, wetlands and open space riparian corridors.

43 **Flood modelling**

44 The hydraulic modelling and the resulting assessment of effects of floodplain infill should not be carried out in isolation, by only giving regard to flood risk. There are wider effects of floodplain infilling that include changes in hydrology fundamental to the ecology and water quality of the stream and catchment, sediment transport and riverbank erosion, which have not been addressed in the technical documents presented to support the proposed plan change.

45 Further information is required to assess the effects of the proposed development on key ecological hydraulic functions and geomorphology of the catchment, including maintenance of floodplain effectiveness, connectivity to hyporheic habitat and groundwater zones of the Maitai gravels to inform the water sensitive design,

46 Hydraulic modelling of Kākā Stream, using pre-development and post-development conditions, should be carried out now as an integral part in developing a whole-of catchment approach stormwater management plan for the plan change and Water Sensitive Design report to inform the consent application.

Stormwater Management

47 The applicant has not provided a Stormwater Management Plan. Any plan should include information to address low flow design and maintenance of fish passage and natural character and provide adequate detail to inform the device sizing and spatial plan of the

services. This information could be included in a Water Sensitive Design report, which would assist with developing a stormwater quality monitoring programme and an Adaptive Management Plan at the consent stage.

48 The stormwater design should have provision for first flush stormwater treatment and as best practice include: continuous flow and suspended sediment (or turbidity proxy) monitoring at discharge points to the Kākā catchment and the Nelson Haven (to be detailed at the consent stage) for the lifetime of the staged construction phases; with appropriate adaptive management responses aligned with water quality standards.