BEFORE THE IHP

TOPIC: Proposed Plan Change 92 Enabling housing supply to the Western Bay of Plenty District Plan

UNDER	the Resource Management Act 1991
IN THE MATTER	of submissions and futher submissions
BETWEEN	**BAY OF PLENTY REGIONAL COUNCIL**
	Submitter
A N D	**WESTERN BAY OF PLENTY REGIONAL COUNCIL**
	Respondent

STATEMENT OF EVIDENCE OF KEITH DAVID HAMILL

DATED: 24/8/2023

Topic: Water Quality, Aquatic Ecology

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Qualifications, experience and background

1. My full name is Keith David Hamill. I am an Environmental Scientist and Director at River Lake Limited. My technical speciality is in water quality and aquatic ecology.

2. I hold a Bachelor of Science degree (Geography) from the University of Auckland (1992) and a Master of Science (1st Class Hons) in Ecology and Resource and Environmental Planning from the University of Waikato (1995).

3. I have 27 years' experience in the area of resource management and environmental science. I have the following experience relevant to this assessment:

   (a) Assessing the effects on water quality of highway construction projects by Waka Kotahi, including Ōtaki to East Levin, Te Ahu A Turanga: Manawatū Tararua Highway Project, and Huntly Bypass;

   (b) Leading the assessment for freshwater ecology and water quality for Mt Messenger State Highway 3 Bypass Project, (Waka Kotahi);

   (c) Preparing assessment of effects for comprehensive stormwater consents;

   (d) Led ecological monitoring to assess effects of the Kaituna River re-diversion and wetland creation project (2014-2021);

   (e) Numerous ecological and water quality investigations assessing ecological condition of streams and effects of instream activities and discharges.

4. I became involved in PC92 in July 2021 when I was engaged by Bay of Plenty Regional Council (BOPRC) to review water quality and aquatic ecology aspects of the draft Ōmokoroa Structure Plan and supporting technical reports. This included undertaking a site visit in October 2021.

5. I attended a teleconference meeting with Western Bary of Plenty staff on 14 March 2023 to discuss issues raised by BOPRC in their submission to PC92

6. A second site visit was planned for August 2023 to confirm observations related to streams and wetlands on the Bruning land, but land owner permission was denied.

7. My expert opinion covers submission points of the Bay of Plenty Regional Council related to my subject area. I will briefly address matters that have been agreed in general approach with WBOPDC as set out in the s42A Report (which has the status of evidence) and where we have not agreed on an approach, I set out more fully the reasons for my expert opinion.

8. Where I have not expressly stated in this evidence the reasons why I disagree with other experts or submitters in relation to more minor matters, that should not be interpreted as agreement.

9. I have read the Expert Witness Code of Conduct set out in the Environment Court's Practice Note 2023 and I agree to comply with it. I confirm that the issues addressed in this statement of evidence are within my area of expertise, except where I state I am relying on the specified evidence of another person. I have not omitted to consider material facts known to me that might alter or detract from my expressed opinion.

Scope of evidence/summary

10. My evidence supports the submission of BOPRC relating to:

    (a) Extending areas zoned as Natural Open Space (**NOS**) (submission 25.2);

    (b) Ensuring that the NOS zone is applied to waterbodies including those within 51 Francis Road, Lot 3 DP28670 and 467E Ōmokoroa Road (BOPRC further submissions 37 opposing submissions 31.3);

    (c) Mapping to identify wetlands, streams and freshwater ecosystems in close proximity to proposed stormwater (submissions 25.3 and 25.4, BOPRC further submission point 34 and 35);

    (d) Provision of a minimum 10 metre setback between new developments and rivers/wetlands (BOPRC further submission point 36, in support of submission 37.1).

11. The main points I wish to bring to the Panel's attention are:

(i) The stream and wetland systems in the area of Proposed Plan Change 92 (**PC92**) have ecological values that justify their protection – including protection under the National Policy Framework Freshwater Management (**NPS-FM**).

(ii) In order to retain good ecological values, streams need to have sufficient space for riparian vegetation and as a buffer during floods.

(iii) In general, the NOS zone should be applied to waterbodies and wetlands ecosystems.

(iv) The NOS zones proposed for 51 Francis Road is supported, but should be further widened where it is adjacent to the proposed industrial zone.

(v) The NOS zones proposed for 42 Francis Road are likely to provide sufficient buffer to allow for the protection of stream ecological values.

(vi) The NOS zone proposed for gully systems entering the upper Mangawhai estuary (Lot 3 DP 28670 and 467E Ōmokoroa Road) is supported, but should be further extended in several areas, including up the stream, to ensure it fully covers the margins of the Mangawhai estuary, wetland areas and stream section upstream of the raupo wetland.

(vii) With respect to Topic 2 Matters of Discretion 24.5.2, I support the inclusion of "*hydrological*" in the amendments as described in the evidence of **Mr Nathan Te Pairi** because of its important role in influencing ecological effects and stream health.

NATURAL OPEN SPACE

12. BOPRC sought relief in their submission (25.2) to: "*Ensure that the Natural Open Space zone is applied to waterbodies and freshwater ecosystems that require management and protection under the NPSFM, including the consideration of including waterbodies at 51 Francis Road, 42 Francis*

Road and the gully system above and below the area for proposed stormwater wetland E1 [1].”

13. WBOPDC has, since the submissions, proposed extensions of the proposed NOS zones for PC92 (which I support); my evidence relates to the NOS zones as proposed in July 2023.

51 Francis Road

14. The site at 51 Francis Road contains a gully system and tributary to the Waipapa River, which enters the Waipapa River about 200m further downstream. The tributary has a catchment area of 115 ha (predominately with horticultural and pastural landuse) and an estimated[2] mean flow of 24 L/s. The riparian habitat is predominantly grazed pasture and at the time of my site visit there was evidence of cattle pugging along part of the stream edge, nevertheless the stream is likely to provide ecological values for fish, and macroinvertebrates. Furthermore, there the stream has good potential for restoration. A common way to quantify gains or losses in stream values is to use the Stream Ecological Valuation (**SEV**) method (Rowe et al. 2008). In my view, stock exclusion and riparian planting along this stream would result in large improvements in ecological values, providing the restoration included a sufficiently wide riparian buffer (**Figure 1**).

15. The extent of the proposed NOS zone now fully includes the stream within the boundary of the plan change area, with the narrowest section approximately 16m wide. I generally support the proposed NOS zone in this area. Adjacent to the residential and most of the industrial zone it provides sufficient width both sides of the stream to not only protect the streams ecological values, but also allowing the opportunity for future enhancement of stream values (assuming suitable stormwater treatment). Ideally the NOS zone would be extended by about 6 to 10m along the south-west corner of the industrial area (**Figure 2**). This would provide a minimum 13m buffer from the stream edge and reduce the risk of development occurring on steep topography that has greater risks of erosion entering the stream. An extended buffer would improve both the

[1] Proposed stormwater treatment wetland E1 has also been referred to as P12. This area encompasses Lot 3 DP 28670 (also referred to as” Bruning Area”) and 467E Ōmokoroa Road.
[2] Based on modelled data developed by NIWA as part of the River Environment Classification (REC).

protection and restoration potential for this section of stream. I discuss in the last section of my evidence why riparian buffers are important to protecting the water quality and ecological health of streams and wetlands, with wider buffers more important on steeper slopes.

16. The stream reach immediately downstream of the proposed treatment wetland is confined and likely to be sensitive to increases in stream volume and changes to the flow regime that can result from large increases in impervious surface within catchments. In my view, future development within the catchment should employ water sensitive design practices to reduce “effective impervious surface” and minimise increases in surface runoff.

17. A common feature of urban development in a catchment is an increase in impervious surface causing an increase in both flood peaks and flood volume, streams become more flashy and this causes greater downstream erosion. As a result, urban streams are often deeper and wider than natural streams, their morphology becomes simpler and more uniform, and they have more fine sediment on the beds. This typically results in less diversity and abundance of macroinvertebrates and fish in the stream. This pattern of ecological degradation, along with effects of water quality contaminants in stormwater, has been referred to as the “urban stream syndrome” (Walsh et al. 2005). Significant ecological degradation of streams can occur when the total impervious area in the catchment is as low as 10% or less, but the response of individual streams is variable (Storey et al. 2013). Managing the effective impervious surface is an important tool for minimising the urbans stream syndrome because it reduces not just the large flood events but also the total volume of runoff and magnitude of small events (Storey et al. 2013, Baruch et al. 2016). This is further discussed in evidence by **Susan Ira**.

Figure 1: Tributary to the Waipapa River, 51 Frances Road. Near the proposed treatment wetland W1. The NOS zone has now been extended to include this stream section, which has good potential for restoration.

Figure 2: 51 Francis Road area NOS Zone proposed in PC92 (in blue-green) and my recommended extension to the NOS zone (in yellow) to better protect ecological values of streams

42 Francis Road

18. The site at 42 Francis Road contains a series of construct ponds terraced down the gully with pasture and willow along the margins (**Figure 3**). There is a small unnamed stream in the gully that flows between the ponds, crosses the driveway via a culvert[3], joins another small stream about 250m downstream and flows into the tidal reaches of the Waipapa estuary about 400m downstream of the driveway. The unnamed stream has a catchment area of 26 ha (predominately with horticultural and pastural landuse) and an estimated[4] mean flow of 5.5 L/s. There is a natural wetland in the lower end of the gully consisting of a swamp millet - crack willow (*Salix fragilis*) treeland. The stream upstream of the wetland is likely to be seasonally intermittent, although this has not been confirmed.

19. The extent of the proposed NOS zone appears to fully include the stream and wetland area. I support the proposed NOS zone in this area as it is likely to provide sufficient buffer between adjacent residential zones to allow for the protection of stream and wetland ecological values (assuming suitable stormwater treatment).

Figure 3: Ponded wetland at 52 Frances Road (near proposed W2a).

[3] The culvert was partially blocked at the time of the site visit in 2021.
[4] Based on the River Environment Classification (REC).

Lot 3 DP 28670 (Bruning Area) and 467E Ōmokoroa Road

20. The proposed NOS zone associated with Lot 3 DP 28670 (Bruning Area) and 467E Ōmokoroa Road contains a stream and wetland complex located in gullies on the Bruning land adjacent to SH2, that flows into Mangawhai Bay Inlet on Tauranga Harbour (**Figure 4**). The stream at its confluence with the estuary has an estimated[5] flow of 7.8 L/s. The wetland is dominated by raupo (*Typha orientalis*) which is a native wetland plant. Historic aerial photos from the 1940's suggest that the wetland is smaller than its original extent, and exotic pasture grasses have replaced a natural vegetation sequence from wetland to terrestrial plant species.

21. An ecological survey[6] of this site by Tonkin and Taylor (2020) ("**T&T**") identified the stream[7] has having 'High' habitat values with good potential galaxiid spawning habitat and good riparian margins. T&T (2020) also identified presence of fernbird (*Bowdleria punctata vealeae*) within scrub and rushes at the interface with the estuary. Fernbird has a threatened status of "At Risk – Declining" (Robertson et al., 2017) (**Figure 5**). They recommended that "*these reaches not be used in the storage or treatment of stormwater to reduce the risk of potential ecological impacts*". I agree with this assessment.

22. Fish records from the Freshwater Fish Database show that this and nearby streams entering Mangawhai Bay Inlet support: longfin eel (*Anguilla dieffenbachia*), shortfin eel (*Anguilla australis*), common bully (*Gobiomorphus cotidianus*), redfin bully (*Gobiomorphus huttoni*), banded kōkopu (*Galaxias fasciatus*), and inanga (*Galaxias maculatus*). Both longfin eel and inanga have a threat classification of "At Risk Declining" (Dunn et al. 2018).

23. A small stream connects the raupo wetland to a pond and possible wetland at the head of the gully (**Figure 6**). The upper section of stream leaving the pond may be seasonally intermittent, although this would need to be confirmed by a site visit during summer. The riparian habitat provides good potential for filtering of contaminants in runoff and buffering the downstream wetland from the effects of landuse. Although small it has high

[5] Modelled estimate from the REC.
[6] Using the Rapid Habitat Assessment (RHA) (Clapcott et al., 2015)
[7] The site code used in Tonkin and Taylor (2020) is "Omo E1 1"

potential for restoration by appropriate riparian planting because of its close proximity to the wetland and connection with its flood plain.

24. Seasonally intermittent streams meet the definition of "rivers" as defined by the Resource Management Act 1991, i.e. "*a continually or intermittently flowing body of fresh water*…". Consequently, intermittent streams also meet the definition of rivers for the purpose of the National Policy Statement for Freshwater Management (**NPS-FM**) including its objectives and policies. Evidence by **Mr Nathan Te Pairi** elaborates further on the application of the NPS-FM in this location.

25. The downstream receiving environment of the stream and wetland complex is the Mangawhai Bay Inlet. This contains a mosaic of indigenous estuarine wetland vegetation and is classified in the Regional Environment Coastal Plan (**RECP**) as an Indigenous Biodiversity Area – B (**IBDA**) with local significance. A recent study assessed the ecological state of Tauranga Harbour using the Estuarine Trophic Index (**ETI**) framework (Crawshaw et al. 2022). This found Mangawhai estuary had 'moderate' susceptibility to eutrophication (Band B). Sediment monitoring graded macroalgae cover as "very good" (i.e. low cover), heavy metal concentrations was "very good", nutrient concentrations was "good", and soft mud extent was "poor", with a high percent cover of muds in the upper Mangawhai Bay Inlet. Overall, Mangawhai Bay was classed as having moderate eutrophication due to nutrient inputs but parts were significantly impacted by fine sediment.

26. The proposed NOS zone over Lot 3 DP 28670 and 467E Ōmokoroa Road has been extended to provide **continuity** between the stream, its headwaters and with the Mangawhai Bay. Continuity of habitat from the estuary and along streams is important for maintaining multiple ecological values including fish migration and spawning. In my view, the NOS zone should be further extended in several areas to ensure:

    (a) that it fully covers the margins of the Mangawhai estuary; and

    (b) covers the current and historic wetland areas suitable for restoration; and

    (c) includes the stream and headwater section upstream of the raupo wetland on the Bruning area.

My proposed extension to the NOS zone is shown in **Figure 7**. The extension upstream of the raupo wetland is to allow for the protection of the stream values as well as retaining the ability of the stream and associated riparian zone to buffer water quality and hydrological effects from the proposed industrial zone on the downstream wetland and estuary.

Figure 4: Raupo wetland adjacent to SH2 on Lot 3 DP 28670 (Bruning Area) (facing east). This stream and raupo wetland system flows into the Mangawhai Bay Inlet.

Figure 5: Upper Mangawhai Bay Inlet facing south-east from 467E Ōmokoroa Road. The stream from the Bruning land enters from the upper right of the photo.

Figure 6: Small stream/wetland feeding the raupo wetland on Lot 3 DP 28670 (Bruning Area) (facing downstream).

Figure 7: Lot 3 DP 28670 and 467E Ōmokoroa Road NOS Zone proposed in PC92 (in green) and my recommended extension to the NOS zone (in yellow). The extensions are to better protect ecological values of streams, wetlands and the Mangawhai Bay Inlet. The (yellow) recommended extension in the top left extends towards the headwaters of the stream which then drains down to the estuary in the bottom – mid right

STREAMS NEED SPACE TO RETAIN ECOLOGICAL VALUES

27. Streams need to be given space to retain, or be restored to, high ecological values. The space is needed both to allow the stream to form a natural morphology (e.g. meanders), move over its flood plain, and for effective riparian buffers.

28. Floodplains not only reduce downstream flooding, but also retain sediment, nutrients and other contaminants. Furthermore, some fish utilise flood events to access flood plains for feeding (e.g. eel) or spawning (e.g. banded kōkopu).

29. Riparian vegetation plays an important role in maintaining stream ecosystem health. Riparian vegetation filters contaminants in surface runoff and groundwater, provides shade to moderate water temperatures, provide complex habitat for aquatic invertebrates and fish, habitat for adult phases of aquatic insects, and organic matter that acts as food for aquatic insects.

30. The **width** of a riparian buffer required to be effective varies depending on its purpose, the topography and the amount of contaminant removal or instream benefits required. On steeper topography buffer widths need to be wider to maintain effectiveness at filtering contaminants in runoff. Some studies have found riparian buffer widths of 5m can remove 50% of sediment, while buffers of 20 to 30m can remove close to 100% of sediment, total phosphorus and nitrate (Parkyn 2004) – but these removal rate vary with local factors. Parkyn et al. (2000) recommended a buffer width of 10 to 20m as the minimum necessary for the development of sustainable indigenous vegetation with minimal weed control, and to achieve many aquatic functions. The SEV and national habitat assessment protocols assume optimum riparian widths of greater than 20m and 30m respectively (Rowe et al 2008, Clapcott 2015).

31. Just as important as the **width** of a riparian buffer zone is the **continuity**[8] of a riparian buffer along the stream and particularly towards the headwaters. There are many examples of stream restoration projects where the benefits for aquatic life have not been fully realised due to factors including a lack of riparian width, a lack of protection in the upper

[8] As explained above in paragraph 26.

catchments or catchment scale influences (e.g. Vietz et al. 2016, Parkyn 2003).

32. Applying a NOS zone is supported as a mechanism to give streams the space required to protect existing ecological values, and to retain the ability to restore ecological values. Historical greenfield developments have often not had the foresight to protect space for streams, and this has resulted in many examples of degraded water quality, and reduced ecological and hydrological values (Vietz et al. 2016). While a whole catchment approach is often also required to protect our waterbodies (e.g. managing stormwater quantity and quality), actively setting aside space for streams and wetlands at the structure planning stage will, in my view, reduce the risk of repeating past mistakes where urban development has led to the loss of streams, wetlands and their ecological values.

24 August 2023

Keith Hamill

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