

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 further submissions

BETWEEN **BAY OF PLENTY REGIONAL COUNCIL**

Submitter

A N D **WESTERN BAY OF PLENTY REGIONAL COUNCIL**

Respondent

STATEMENT OF EVIDENCE OF KATHLEEN THIEL-LARDON

DATED: 25/8/2023

Topic: Stormwater and Flooding

STATEMENT OF EVIDENCE OF KATHLEEN THIEL-LARDON**QUALIFICATIONS AND EXPERIENCE AND BACKGROUND**

1. My full name is Kathleen Thiel-Lardon.
2. I am employed by Bay of Plenty Regional Council (Regional Council) as a senior environmental engineer/environmental engineering team leader. I have held this role since September 2015.
3. My area of expertise is stormwater and flooding.
4. I have the following qualifications and experience:
 - (a) I hold a Diplom-Ingenieur / Master's Degree in Science majoring in civil engineering. I obtained this qualification from the University of Rostock (Germany) in 2005.
 - (b) My degree has been assessed by the New Zealand Qualifications Authority as equivalent to a Bachelor of Engineering with Honours degree from a New Zealand University, Level 8, in May 2007.
 - (c) I have been registered as a chartered professional engineer in New Zealand since 22 December 2011, and I am a chartered member of Engineering New Zealand (formerly MIPENZ) since December 2011.
 - (d) I am a registered International Professional Engineer since 11 July 2019.
 - (e) I have approximately 17 years' civil and environmental engineering experience.
 - (f) I have worked in local government (Regional and City/District Councils) and consulting and thus have a broad knowledge of civil and environmental engineering practices. I have been involved with strategic asset planning and asset management, catchment management planning, flood risk assessments, subdivision and infrastructure design, including stormwater management, flood control, coastal protection, and soil conservation infrastructure.

5. I have been involved with the Plan Change since the pre-lodgement stage. My involvement included input into Regional Council's submission and ongoing discussions after lodgement and submissions.
6. 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 Western Bay of Plenty District Council (WBOPDC) as set out in the s42A Report (which has the status of evidence) and where an agreed approach has not been possible I set out more fully the reasons for my expert opinion.
7. 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.
8. 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

9. My evidence covers main topic areas of stormwater and flooding, and refers to the following submission and further submission point numbers.
 - (a) 25.8 [Stormwater Design standards - general]
 - (b) 25.18 [Stormwater Design standards - sub-catchment N1 Ōmokoroa Stage 3].
10. My evidence focuses primarily on mitigating increased runoff from any development/subdivision site required to address effects on off-site flood management infrastructure in Te Puke and/or other downstream infrastructure and landowners in Te Puke and Ōmokoroa.
11. The main points I wish to bring to the Panel's attention are:
 - The need to consider effects collectively necessitates a catchment or sub-catchment based approach because small increases may not be noticeable but can lead to large effects.

- Peak discharges and total runoff volume need to be managed to mitigate effects.
- Where a catchment-wide analysis does not exist, the default recommendation of the stormwater management guideline, is that it be designed to attenuate to 80% of the 1% Annual Exceedance Probability (AEP) pre-development flows and match the 50% and 10% AEP pre-development flows to ensure there are no downstream impacts from increased runoff (i.e. Rule 12.4.5.17 as amended).
- Adverse effects from incremental increases in the volume of stormwater could be reduced by identifying and incorporating the best practicable options for water sensitive urban design.
- Re 25.18: N1: District Council's "Ōmokoroa Stage 3 - Stormwater catchment Management Plan" dated August 2022 requires a future hydraulic assessment to be undertaken to determine whether sub-catchment N1 could require attenuation to be provided in Wetland N1 to protect the KiwiRail infrastructure which is identified as vulnerable to cumulative effects of development including flood risk. (Sub-catchment N1 drains towards the existing KiwiRail infrastructure and is largely undeveloped. The existing KiwiRail infrastructure lies within the coastal influence of the Tauranga Harbour and is susceptible to flooding. Existing flood storage within sub-catchment N1 may be displaced by development. Any development of the said sub-catchment without providing appropriate mitigation is likely to exacerbate flood susceptibility). The exemption in rule 12.4.5.17(a) leaves room for individual assessments per development site to be undertaken, which does not explicitly consider the cumulative effects of urbanisation on the railway embankment. For this sub-catchment, flexibility should only be assessed over the whole sub-catchment, not on a case-by-case basis, and the potential removal of natural ponding areas (flood displacement effects) needs to be assessed. I understand no method is identified in the plan change to address this specific issue of cumulative effects.
- A catchment-wide analysis prior to subdivision and development is recommended to avoid potential piecemeal outcomes and to assess and, if required, manage cumulative flooding effects that may result in

increased flooding risk to the railway infrastructure in sub-catchment N1 over time.

INCREASED RUNOFF / ON-SITE ATTENUATION

12. Effects from stormwater discharges are often only assessed as significant when considered cumulatively. Gradual increases in flow through development may not be noticeable daily. However, over time and as development within a catchment increases, these small increases in flow collectively combine, often leading to significant effects. The need to consider effects collectively necessitates a catchment or sub-catchment based approach.
13. Incremental increases in the volume and flow rate of stormwater from the plan change area, if insufficiently mitigated, have the potential to cause adverse effects. These adverse effects could include:
 - (a) An increase in velocity, flood depth, and flood extent resulting in:
 - (i) Increasing stream bank erosion and channel instabilities from faster or higher flows;
 - (ii) Larger areas that are flooded above the key flood hazard threshold for depth and velocity ($D \times V$) for people, property and infrastructure that may lead to (or contribute to) damage to property, disruption of day-to-day life to individuals and businesses, and the provision of community infrastructure.
 - (iii) A decrease of emotional wellbeing of affected downstream landowners and business owners.
 - (b) An increase in duration resulting in:
 - (i) Increasing stream bank erosion and channel instabilities from extended periods of elevated flows;
 - (ii) Increasing the length of time structures (such as bridges/culverts, road embankment and KiwiRail embankments) might be flooded above the key flood hazard threshold for depth and velocity ($D \times V$) that may lead to (or contribute to) a reduced performance of the

asset or failure of the asset and longer exposure to hazardous conditions.

14. The control of the additional volume of runoff created by PC92 is necessary to ensure that the intensification and/or change of land use does not adversely affect the receiving environment.
15. The Regional Council's Hydrological and Hydraulic Guideline (2012/02) and the BOPRC Stormwater Management Guidelines (2012, updated 2015) require peak discharges and total runoff volume to be managed to mitigate effects.
16. Flood attenuation controls are widely used within New Zealand urban areas with the aim to mimic pre-development flow regimes for multiple storm events and subsequently mitigate the effects of increased runoff due to urban development. The effectiveness of stormwater attenuation, however, is highly reliant on the catchment dynamics.
17. The above guidelines describe a catchment-wide analysis as a preferred method for an assessment. This is because peak discharge attenuation as a single flood indicator alone cannot reflect the flooding process properly. As such, the potential effects of increased volume are only partially understood.
18. A catchment-wide analysis should be undertaken for the reasons explained earlier relating to the cumulative effects of land use decisions on flooding, usually during structure planning. The WBOPDC has developed flood models which span the Ōmokoroa and Te Puke catchments. However, I understand there was insufficient time to undertake a detailed catchment-wide analysis as part of this plan change process.
19. Where a catchment-wide analysis does not exist, the default recommendation of the stormwater management guideline is that it be designed to attenuate to 80% of the 1% Annual Exceedance Probability (AEP) pre-development flows and match the 50% and 10% AEP pre-development flows to ensure there are no downstream impacts from increased runoff. This is the method which WBOPRC has chosen to pursue through the updated rule 12.4.5.17, but also provide flexibility to

provide for a different attenuation standard should supporting evidence be provided at the stage of subdivision.

20. Our submission point **25.8** identified that rule 12.4.5.17 (as publicly notified) was at odds with the various attenuation requirements of the existing catchment management plans and originally sought the removal of clause (a). Following further discussion with WBOPDC, I now better understand WBOPDC's rationale behind rule 12.4.5.17 (a), and I consider that the inclusion of stormwater standards, which is consistent with the default recommendation of the stormwater management guideline as detailed above, is warranted to ensure adverse flooding effects could be appropriately managed.
21. Adverse effects from incremental increases in the volume of stormwater could be mitigated by identifying and incorporating the best practicable options for water sensitive urban design.
22. Adverse effects from incremental increases in the flow rate of stormwater could be mitigated through the attenuation requirements contained in 12.4.5.17 (a).
23. Furthermore, by considering climate change over the next 100 years for sea level rise and rainfall intensity, the rule ensures that adverse effects on flooding could be appropriately addressed during the lifetime of the stormwater asset.
24. Our submission point **25.18** considered a lack of appropriate analysis of the potential effects of the increased runoff and, hence, added flood risk on the existing KiwiRail infrastructure in sub-catchment N1 Ōmokoroa Stage 3.
25. Having read the evidence of Mr Te Pairi and his amendments to 12.4.5.17, I am still not satisfied that this provision fully addresses the potential cumulative effects of subdivision and development and associated flood risk to the railway infrastructure, for the following technical reasons:
 - (a) Sub-catchment N1 drains towards the existing KiwiRail infrastructure and is largely undeveloped. The existing KiwiRail infrastructure lies within the coastal influence of the Tauranga

Harbour and is susceptible to flooding. There is existing flood storage within the catchment N1, which may be displaced by development. Any development of the said sub-catchment without providing appropriate mitigation is likely to exacerbate flood susceptibility.

- (b) The above is recognised in the District Council's "Ōmokoroa Stage 3 - Stormwater catchment Management Plan" dated August 2022. The plan states in Section 12.4 Water quantity, "*It is possible that sub-catchment N1 could require attenuation to be provided in Wetland N1 if the future hydraulic assessment referred to in Section 14.1 determines this to be necessary.*", and in Section 14.1 Concept "*As part of detailed design (including Wetland N1) for the area of the site contributing to Subcatchment N1 a hydraulic assessment should be undertaken.*" The plan makes note of potential scenarios and related pathways, including an upgrade to the culvert underneath the railway embankment and/or flood attenuation.
- (c) Rule 12.4.5.17 provides for one pathway through the attenuation and water sensitive urban design requirements. However, the current provision only recommends the attenuation of runoff and the potential loss of flood storage, leading to the displacement of flood waters, has yet to be assessed. In addition, the exemption in rule 12.4.5.17(a) leaves room for individual assessments per development site to be undertaken, which does not explicitly consider the cumulative effects of urbanisation on the railway embankment. I consider for this catchment, flexibility should only be assessed over the whole sub-catchment, not on a case-by-case basis.
- (d) I continue to recommend that a catchment-wide analysis is undertaken for this sub-catchment prior to any development to avoid any issues in relation to the catchment dynamics and allow the District Council to make an informed decision related to potential mitigation pathways and the efficiency of the designs.