BEFORE THE HEARINGS PANEL

IN THE MATTER OF	the Resource Management Act 1991
AND	Proposed Plan Change 95 to the Western Bay of Plenty District Plan: Pencarrow Estate Pongakawa

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PRIMARY STATEMENT OF EVIDENCE OF SUSAN SOUTHERWOOD

ON BEHALF OF BAY OF PLENTY REGIONAL COUNCIL TOI MOANA

SUBMITTER NO: 27

STORMWATER AND FLOODING

Introduction

1. My full name is Susan Maree Southerwood. I am the Director of Yaku Consultants Limited an engineering consultancy. I hold a Bachelor of Engineering Degree from the University of Canterbury. I have approximately 30 years of engineering experience, including 13 years of technical auditing resource consents for the Bay of Plenty Regional Council (**Regional Council**).

2. I have been involved with Proposed Plan Change 95 (**PPC95**) since February 2023. I have visited the PPC95 site and have provided technical advice to Lucy Holden, BOPRC Senior Planner about PPC95.

Code of conduct for expert witnesses

I confirm I have read the Environment Court's Code of Conduct (Environment Court Practice Note 2023) and 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.

Executive summary and scope of evidence

3. Regional Council's submission raised the following stormwater/flooding concerns about the proposal:

    i. Stormwater soakage ability and groundwater levels (submission point 27.15)

    ii. Flood displacement effects (submission point 27.17)

    iii. Cumulative effects of increased stormwater volumes on the downstream Little Waihi Drainage Scheme (submission points 27.17 and 27.18).

4. I continue to have the following concerns:

    i. The suitability of the site soils for disposing of stormwater to ground by soakage.

    ii. The groundwater level at the site particularly during wetter years.

iii. The cumulative effect of the additional stormwater volume generated on the Puanene Stream and the Little Waihi Drainage Scheme.

5. I am of the view that further information in relation to soakage is required at this plan change stage so that appropriate mitigation options can be identified and properly provided for in the structure plan and plan change provisions.

6. In preparing this statement, I have read:

a) the plan change application and relevant accompanying documents and further information

b) relevant submissions and further submissions

c) the Section 42A hearings report released 11 October 2024

d) Geotechnical Investigation Report for Plan Change, CMW, 11 February 2022

e) Engineering Servicing Report Revision 7, Lysaght Consultants, 22 August 2024

f) Statement of Evidence of Daniel Hight (Engineering, Flood Hazard and Natural Hazards).

Ground permeability and stormwater soakage

7. The proposal is to discharge up to 210 square metres (m^2) stormwater per lot of impermeable surfaces to ground soakage. No soakage assessment has been provided and there has been a reliance on the design soakage for the adjacent subdivision that is located at higher elevations (although is shown to be in the same soil group).

8. Landcare's soil map (S-Map) shows soils to be poorly drained gley soils. The applicant's geotechnical report (CMW, 11 February 2022) confirms poor drainage, stating there are interbedded stiff to very stiff silts and loose to medium sands to 3.5m below ground level.

9. In my opinion, the applicant has not provided sufficient evidence that the soakage rate used in the calculation can be achieved. Table 6.1 of the Stormwater Management Guidelines for the Bay of Plenty Region (Guideline 2012/01) (**Stormwater Management Guidelines**) gives an approximate

infiltration rate of 210 mm/hour for sand but only 7 mm/ hour for a silt loam. If the soakage rate is not achievable, then the sizing of stormwater management devices (soakage crates, stormwater wetland) will need to be revised.

10. Mr Hight's evidence (paragraph 41) states that shallow soakage systems can be placed within smaller proposed lots. Lower lying areas will be built up; filling will be to a required compaction standard that will decrease the soakage ability unless there is a deliberate strategy to ensure that soakage can be achieved in defined locations for each lot.

11. The Lysaght geotechnical report provides a volumetric analysis of discharge from the site up to the 1% Annual Exceedance Probability (**AEP**) storm 24 hour duration. My preliminary calculations using the Rational Method did not align with the applicant's. The calculations have assumed that soakage is fully feasible for every lot up to the 10% AEP storm event and that soakage will occur through five sides of the soakage device. I do not agree that this is feasible. The Verification Method of the New Zealand Building Code (Clause E1 Section 9.0) considers the bottom area only for soakage; CIRTEX Rainsmart Stormwater design (which is a soakage crate system commonly used in New Zealand) also considers the bottom area only for soakage. Additionally, the soakage rate of 100mm/hour is too high for silt but acceptable for sand (the subject soil is a mixture of silt and sand: interbedded stiff to very stiff silts and loose to medium sands to 3.5m below ground level).

12. Based on the above, I consider that the applicant's soakage calculations in Appendix 3 of the Lysaght Report are not sufficiently conservative, and more runoff from the development will discharge into the Puanene Stream and the Little Waihi Drainage Scheme than the applicant has calculated.

Groundwater effects on stormwater soakage ability

13. The depth to groundwater is also likely to be problematic for stormwater soakage systems. The applicant's 2022 geotechnical report (CMW, 11 February 2022, page 10, Section 7.5) states:

> '*The depth of groundwater beneath the more elevated parts of the site is such that disposal of stormwater to ground soakage could be considered*

for building sites on the main plateau. Shallow groundwater below the more low-lying areas and the swales may preclude the use of ground soakage in these areas.

14. The structure plans show residential housing in the lower lying areas (which will be built up). The applicant confirmed original groundwater measurements with further testing in August 2024: groundwater varies from 1.6m to 4.5m, with an average depth to groundwater of 2.6m. Filled low-lying areas will be compacted, which will decrease the soakage ability unless there is a deliberate strategy to ensure that soakage can be achieved in each lot.

15. Mr Hight's evidence (paragraph 27) states that depth to groundwater is approximately 3m and therefore is not expected to constrain ground soakage. Geological Cross-Section A (Drawing 02 in Appendix A of the geotechnical report) shows that at this section, groundwater is at this level. However, Table 3: Groundwater Depth Summary, in the Lysaght report indicates two of seven locations where groundwater was 1.8m or less below ground level. In wetter years, the groundwater level is likely to be higher, which is likely to constrain ground soakage.

16. Based on paragraphs 7-15 of this evidence, I consider it likely that soakage will not be feasible for every lot due to either high groundwater or low soakage rates. This means that the applicant's calculations in Appendix 3 of the Lysaght Report are not sufficiently conservative, and more runoff from the development will discharge into the Puanene Stream and the Little Waihi Drainage Scheme than the applicant has calculated.

Cumulative effect on Puanene Stream from increased discharges from the development site

17. Increased stormwater flows from residential development can lead to several adverse effects on streams:

    i. Increased peak flows: development increases impervious surfaces, leading to higher and more rapid runoff during rain events. This results in higher peak flows in streams.

    ii. Altered flow patterns: increased stormwater discharges can change the natural hydrologic regime, with more frequent high flow events even

during regular rainfall conditions.

iii. Erosion and channel changes: higher peak flows and more frequent high flow events can increase stream bank erosion and channel downcutting. This can widen and deepen stream channels over time.

iv. Sedimentation: eroded sediment is deposited downstream, potentially smothering stream habitats.

v. Flooding effects: higher peak flows and runoff volumes increase the risk and severity of downstream flooding.

18. Section 7.1.1 of the Stormwater Management Guidelines recommends the post-development peak discharge for the 100-year storm for a new development is limited to 80% of pre-development peak discharge. This is the minimum standard required for all new developments in the Bay of Plenty (unless there is no risk of downstream flooding). As such, I consider that the applicant should provide this level of mitigation in accordance with the Stormwater Management Guidelines.

Cumulative effect on Little Waihi Drainage Scheme from increased discharges from the development site

19. Stormwater from the proposed development discharges into the Little Waihi Drainage system. The proposal will result in increased stormwater discharging into the Little Waihi Drainage Scheme (paragraphs 7-16 of this evidence). This will cumulatively add to the flooding effect on the Drainage Scheme.

20. The proposal claims to mitigate stormwater discharge from the development site to predevelopment flowrates up to the 1% AEP climate change flow. However, the proposed stormwater wetland provides limited volume mitigation, and the proposal largely relies on soakage. I consider that more stormwater will discharge to the Little Waihi Drainage Scheme than has been calculated by the applicant.

21. Section 7.1.1 of the Stormwater Management Guidelines recommends the post-development peak discharge for the 100-year storm for a new development is limited to 80% of pre-development peak discharge. This is the minimum standard required for all new developments in the Bay of Plenty

(unless there is no risk of downstream flooding). As such, I consider that the applicant should provide this level of mitigation in accordance with the Stormwater Management Guidelines.

22. The additional stormwater runoff could be mitigated by reducing impermeable surfaces in the development and/or enlarging the wetland to enable it to detain more water. This type of mitigation may affect other elements of the structure plan, including the locations of nearby house lots and reserves. As such, it is important that this matter is fully investigated and resolved at the plan change stage, and not left to the stormwater consent stage when subdivision consents may have already been granted and there may no longer be sufficient space for an appropriately sized wetland or to reduce the impermeable surfaces.

23. In addition, I recommend the applicant carries out soakage testing across the site to confirm soakage rates.

Floodplain displacement

24. Parts of the plan change site are in low-lying floodable areas; these areas are proposed to be filled to bring them above the floodplain. The proposal will displace up to 21,000 cubic metres (m^3) of floodplain due to infilling these floodable areas.

25. Section 4.9 of the Bay of Plenty Hydrological and Hydraulic Guidelines (Guideline 2012/02) (**H&H Guidelines**) states that the maximum allowable difference between pre- and post-development flood levels is 15mm. This is a standard requirement across the Bay of Plenty.

26. The applicant states that, due to the large floodplain, the effect of any displacement from this proposal is negligible; the applicant has calculated the flood displacement effect as approximately 0.5mm.

27. Based on the requirements of the H&H Guidelines that mitigation must be provided when post-development flood levels are 15mm or more, I accept that no mitigation is required for flood displacement effects from the proposal.

Overland flowpaths through the site

28. I am satisfied that the applicant has shown that overland flowpaths to convey up-catchment flows can be adequately accommodated.

Conclusion

29. The stormwater proposal relies on the ability to soak in soils that are likely to have limited soakage potential. Without the ability to soak, runoff will be added to the downstream Little Waihi Drainage Scheme.

30. Based on the Stormwater Management Guidelines, increased stormwater discharge from the proposed development should be mitigated to a minimum standard of 80% of pre-development peak discharge.

31. It is important that the stormwater management and mitigation options are investigated and resolved at the plan change stage, and not after lots have been subdivided, when there may no longer be sufficient space for an appropriately sized wetland or other reasonable mitigation options.