BEFORE AN INDEPENDENT HEARINGS PANEL IN CHRISTCHURCH

TE MAHERE Ā-ROHE I TŪTOHUA MŌ TE TĀONE O ŌTAUTAHI

UNDER	the Resource Management Act 1991 (the **RMA**)
AND	
IN THE MATTER OF	of the hearing of submissions on Plan Change 14 (Housing and Business Choice) to the Christchurch District Plan

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STATEMENT OF REBUTTAL EVIDENCE OF ROBERT BRIAN NORTON ON BEHALF OF CHRISTCHURCH CITY COUNCIL

STORMWATER AND FLOODING

Dated: 9 October 2023

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EXECUTIVE SUMMARY

1. PC14-enabled development will increase impervious surfaces therefore increasing both the flow and volume of stormwater discharged into rivers and tributaries. The degree of effect on flooding will depend on the scale and distribution of uptake, and effects will be suffered in all river catchments, including the Halswell/Huritini. Mitigations to counteract these effects will be difficult, expensive and risky to implement.

2. This rebuttal evidence responds to submitter evidence on:

   (a) the effects of PC14 enabled development on the Halswell/Huritini River; and

   (b) the waterway setback overlay QM.

3. Having considered submitters' evidence in relation to stormwater issues:

   (a) I largely agree with the majority of Mr Matthew Surman's evidence with regard to the Halswell/Huritini River. However, I do not consider that PC14-enabled development will have a disproportionate effect on the Halswell/Huritini catchment when compared to other river catchments within Christchurch City; and

   (b) I agree with Ms Stephanie Styles that the waterway setback overlay that is shown on the planning maps to extend into the Cavendish Village site should be removed.

INTRODUCTION

4. My name is **Robert Brian Norton**. I am a Senior Stormwater Planning Engineer employed by Christchurch City Council (**Council**).

5. I prepared a statement of primary evidence on behalf the Council dated 11 August 2023. My primary evidence addressed the effects of Plan Change 14 to the Christchurch District Plan (the **District Plan**; **PC14**). enabled development on stormwater and flooding and the Flood Ponding Management Area, High Flood Hazard Area and Low Transport Area Qualifying Matters arising from the submissions and further submissions on PC14.

6. I have the qualifications and experience set out at paragraphs 14 to 16 of my primary evidence, and I repeat the confirmation that I have read the Code of Conduct for Expert Witnesses contained in the Environment Court Practice Note 2023, and that my evidence has been prepared in compliance with that Code.

SCOPE OF REBUTTAL EVIDENCE

7. In preparing this rebuttal statement, I have read and considered the evidence filed on behalf of submitters, as that evidence relates to my primary evidence including:

   (a) Mr Matthew Surman on behalf of Environment Canterbury – Canterbury Regional Council; and

   (b) Ms Stephanie Styles on behalf of Summerset Group Holdings.

8. In this evidence I respond to the following issues:

   (a) the effects of PC14 enabled development on the Halswell/Huritini River; and

   (b) the waterway setback QM within the Cavendish Village site.

EFFECTS OF PC14 ENABLED DEVELOPMENT ON THE HALSWELL/HURITINI RIVER

9. Mr Surman summarises the sensitivity of the Halswell/Huritini River to three primary factors in paragraphs 10 to 12 of his evidence: stormwater peak flows, stormwater volume and groundwater flows (which I refer to as 'base flow', or the normal flow of spring-sourced water in the river during dry weather).

10. I am not familiar enough with the specific conditions and issues related to the Halswell/Huritini River in catchments outside the limits of Christchurch City to make any qualified statements about its unique characteristics. I recognise Mr Surman's expertise in this area and do not dispute any of his statements made in his paragraphs 21 to 27, or anywhere else in his evidence with reference to the Halswell/Huritini River within Selwyn District. However, the hydraulic and hydrologic principles of stormwater discharges and land drainage are universal and would generally apply to all river systems in Christchurch City.

11. The Council's strategy for stormwater quantity mitigation within the Christchurch City portion of the Halswell/Huritini catchment (approximately 38 square kilometres) is two-fold:

    (a) In the upper catchment (about half of the catchment – approximately 19 square kilometres, extending approximately from the city west margin Chattertons Road to around Carrs Road) development is primarily managed by disposal of stormwater into land via engineered infiltration systems. This has the effect of reducing surface water discharges from those developing catchments into Halswell River tributaries, in some cases significantly, particularly where there are thin layers of low-permeability silts overlying free-draining gravels (the semi-confined aquifer). Mr Surman refers to this practice of stormwater infiltration in his paragraph 31. The groundwater effects of widescale disposal of stormwater to land have not been well studied, however the practice is intended to recharge aquifers where impervious surfaces have impeded natural infiltration, thereby mimicking natural processes.

    (b) In the lower half of the catchment, the Council requires mitigation of greenfield development in the Halswell/Huritini River catchment using 'Full Flood Attenuation'. This means capture of the critical (60-hour) storm (usually in stormwater basins or ponds) with slow release of that stormwater into the receiving environment over a minimum of 4 days. This approach was developed by the Council[1] as a way of compensating for (reversing some effects of) past mitigation building practices utilising newly developed stormwater storage systems associated primarily with greenfield development. Full Flood Attenuation has the effect of reducing peak flows from a site for storm events up to and including the critical storm event. Developments utilising Full Flood Attenuation in the Halswell/Huritini catchment therefore do not contribute to the peak flows of the river at any location, for any storm intensity or duration. Full Flood Attenuation generally reduces peak flows rather than simply matching them for key storm events, and can be considered a variation on the concept of 'hydraulic neutrality'.

[1] South-West Christchurch Stormwater Management Plan (Golder 2011a)

12. In paragraph 28, Mr Surman states that *hydraulic neutrality "(…) means no increase in drainage or stormwater peaks of flowrates **or volumes** discharged"* (my emphasis added).

13. I disagree that this is considered an industry accepted definition of 'hydraulic neutrality', as all definitions I am aware of do not include a provision of controlling the total stormwater volume generated by a development[2]. Hydraulic neutrality recognises that increases in total volume of discharge from a development into the surface water network are typically unavoidable, and that mitigation methods should focus on controlling the **rate of release** of stormwater to most closely match the pre-development condition.

14. Mathematically, releasing a larger volume of water at the same rate as the pre-developed volume means longer periods of storage release, which will extend the time taken for a river to return to its baseflow state after a storm (when compared to the pre-developed catchment condition). Over time, this effect would increase the statistical 'mean flow' within the river. I therefore agree with Mr Surman's conclusions (his paragraphs 39, 40 and 45) that attenuation of stormwater with slow release to surface water contributes to prolonged drainage times for land and tributaries that rely on the river as an outfall.

15. This longer drainage period, in turn, can prolong the time it takes for flooded land to drain and dry out, disproportionately affecting low-lying areas and low-hydraulic-head situations. This effect is not unique to the Halswell/Huritini catchment, however, as there is low-lying rural land that can be affected by longer drainage times in both the Avon/Ōtākaro and Styx/Pūharakekenui River catchments (notably parts of Marshlands - approximately 47ha, Ouruhia – approximately 90ha and Spencerville/Brooklands – approximately 110ha).

16. Therefore, while stormwater attenuation with managed release to surface water can affect low-lying land near rivers, this effect is not unique to the

[2] "*To manage the additional runoff directly to your development, you need to ensure the maximum peak flow off your land is no greater than what it was pre-development. This is our definition of hydraulic neutrality.*" - Managing Stormwater Runoff Version 4, Wellington Water, June 2022.
"*In practice* (hydraulic neutrality) *includes ensuring peak flows do not wash away habitat and aquatic life, change a habitat or affect the receiving environment water quality*". Waitakere City Council Code of Practice for City Infrastructure and Land Development, September 2008.
"*Hydraulic neutrality has to be achieved by compensating for loss of flood storage associated with the development, and/or by managing the difference between the pre-development and post-development peak flows*" Kapiti Coast Low Impact Urban Design and Development Stormwater Guideline, 2012.

Halswell/Huritini. However, the scale of land (gross area and/or number of property owners) affected may be larger in the Halswell/Huritini than other river catchments.

17. In my opinion, there is very little that can be done practicably to reduce the total volume of stormwater generated by development. Options are generally limited to the below, and are partially referenced in Mr Surman's paragraph 53:

    (a) disposal of surface water to ground via soakage (where geologic conditions allow), which is already exercised by the Council; and

    (b) improving evapotranspiration by significantly increasing vegetated surfaces and/or tree canopy in urban areas ('green roofs', permeable or vegetated pavements, urban forestation).

18. There are various other ways to mitigate the effects of prolonged elevated water levels resulting from attenuation of storms, however in my view these measures may be economically impractical and/or pose high risks to the environment. Those include (but may not be limited to) the measures below, which are partially referenced in Mr Surman's paragraphs 53 and 65(c):

    (a) Widening of the river channel to reduce depth of flow.

    (b) Provision of additional storage systems to further reduce flows by holding water for very long period of time (potentially weeks or months).

    (c) Other engineered solutions such as large-scale riverbank bunding and pumping of surface water.

19. I agree with Mr Surman's paragraphs 53 and 63 that these measures would be difficult and impractical to achieve due to high cost, potential adverse environmental effects and significant shifts in common building practices and materials.

20. In his paragraphs 55 and 56, Mr Surman states that the Council will be required to upgrade its collective stormwater facilities to accommodate PC14-enabled growth in order to remain compliant with its Comprehensive Stormwater Network Discharge Consent (**CSNDC**) consent conditions. I agree that this is one option. The Council may also seek to amend its

consent conditions through a variation of the CSNDC to allow for increases in peak water levels.

21. I also agree with Mr Surman's paragraphs 58 and 59 that the Onsite Stormwater Mitigation Guide measures for small sites are unlikely to fully mitigate PC14-enabled growth (I have discussed the limitations of small onsite storage systems in paragraphs 60 and 61 of my primary evidence).

22. In his paragraph 65, Mr Surman discusses the potential for setting a limit on total impervious area. Presumably this would be done through changes to the District Plan. The Council has considered such a rule in the early stages of PC14 discussions but decided that any limit restricting impervious surface to the extent required to be effective would likely be considered contrary to the intent of PC14. My experience with MDRS development has been that most are unable to reduce impervious surface coverage below 70%, given the smaller size of typical sites, the desire to maximise building footprint and the need for driveway manoeuvring and desire for off-street car parking.

23. Potentially, I consider that additional District Plan rules requiring some combination of controlled impervious surface and/or use of readily available low impact design/green infrastructure (such as permeable pavement or green roofs) could form an effective mitigation strategy. The Council may wish to consider such measures in a future plan change.

Conclusion

24. With PC14-enabled development, increased impervious surfaces within greenfield or brownfield catchments will likely increase both flow and volume of stormwater into rivers and tributaries. The degree of effect will depend on the scale and distribution of uptake, and effects will be suffered in all river catchments, including the Halswell/Huritini.

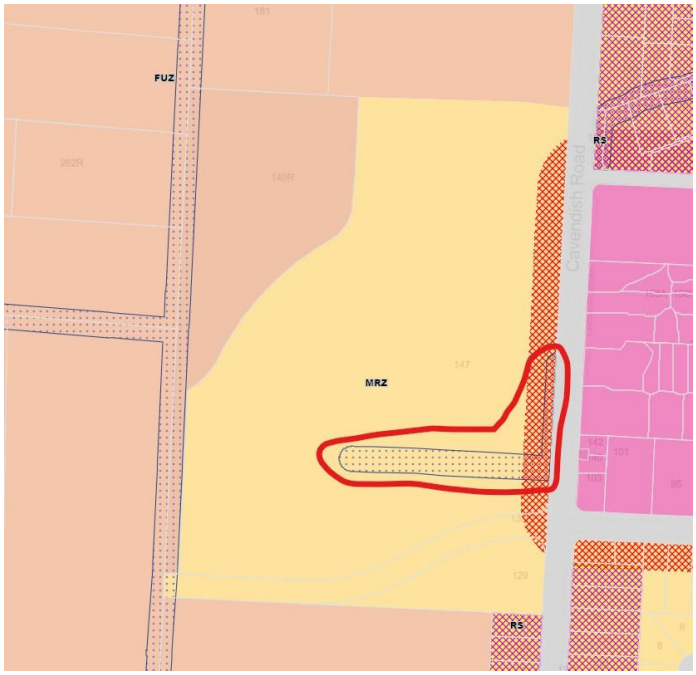
25. Other than my disagreement with the meaning of the term 'hydraulic neutrality', I either agree with or am not in a position to dispute any portion of Mr Surman's evidence. However, I do not consider that PC14-enabled development within Christchurch City will have a disproportionate effect on the Halswell/Huritini catchment over other river catchments. On that basis, I recommend that relief sought by Environment Canterbury on this matter be rejected.

WATERWAY SETBACK QM WITHIN THE SUMMERSET CAVENDISH VILLAGE SITE

26. I agree with Ms Styles' summary of waterways affecting the Cavendish Village site (her primary evidence paragraphs 7.28 to 7.30). The waterway setback which extends onto the site is related to waterway which has been decommissioned and removed under the consented development process. **This corrects paragraph 82 of my primary evidence**.

27. I recommend that the waterways setback overlay pictured below (Figure 1) on the proposed planning maps be removed.

Figure 1 – Summerset Cavendish Site - 137 Cavendish Road



Robert Brian Norton

9 October 2023