

BEFORE THE CANTERBURY REGIONAL COUNCIL

UNDER THE

Resource Management Act 1991

AND

IN THE MATTER

of application CRC190445 by the Christchurch City Council for a comprehensive resource consent to discharge stormwater from within the Christchurch City area and Banks Peninsula settlements on or into land, into water and into coastal environments

**SUPPLEMENTARY EVIDENCE OF
GRAHAM JAMES HARRINGTON FOR CHRISTCHURCH CITY COUNCIL**

Dated 1 March 2019

CHRISTCHURCH CITY COUNCIL
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INTRODUCTION

1. My full name is Graham James Harrington. I here provide supplementary evidence for the Christchurch City Council (**Council**) in response to the brief of evidence of Mr Robert Potts dated 20 February 2019 which was part of the response received from Mr and Mrs Rodrigues on 22 February 2019.
2. To assist responding to Mr Potts' new evidence I have further analysed modelling information about the effect of extreme weed growth in the Styx channel. That reanalysis has generated new information which I also present here.
3. I also take this opportunity to, for the avoidance of doubt, respond to two other matters. First, a matter raised by Mr Potts at the hearing on 9 November 2018; and secondly, a Mr Robertson's concern regarding water being diverted from the Ka Putahi and into the Styx.
4. My qualifications and experience are as set out in my evidence in chief dated 15 October 2018.
5. I again confirm that I have read and agree to comply with the Code of Conduct for expert witnesses contained in the Environment Court Practice Note (dated 1 December 2014). I confirm that the issues addressed in the statement of evidence are within my area of expertise. I have not knowingly omitted to consider facts or information that might alter or detract from the opinions expressed.

Mr Potts' evidence of 20 February 2019

6. Mr Potts' evidence recommends that the conditions of this consent require "restoration of drainage" by means of restoration of Barkers Drain. In paragraph 6 he says that groundwater levels are closely related to river water levels. He implies that this means that the stormwater discharge into the Styx River would increase surface water ponding in the Earlham St area, so the need for the drain is a consequence of the stormwater discharge.

7. I agree with Mr Potts that groundwater levels are closely related to river water levels. I do not agree that this means that stormwater discharges into the Styx from up-stream urbanisation are a primary cause of elevated groundwater levels and surface water ponding.
8. The main factor determining groundwater levels is the long term normal river level. Springs mostly in the upper catchment generate a fairly constant base flow in the river. However the ponded water level behind the tidegates in the Earlham St area is largely determined by the tide. Stormwater discharges in extreme events occur for relatively brief periods.
9. I agree with Mr Potts that drainage systems would assist to resolve the poor drainage at the Rodrigues property however I do not agree that the ponding is primarily related to the stormwater from urbanisation in the Styx catchment.

New information about weed effects at Earlham Street

10. In order to fully consider the facts relevant to responding to Mr Potts' brief of evidence dated 20 February 2019 I have reanalysed the Council's modelling of the effects of weed growth on flooding.
11. In my Evidence in Chief at paragraph 95 I described the above floor flooding risk at the Rodrigues' address in a 1 in 50 year event and my adoption of the evidence of Mr Eastman presented at the Styx Stormwater Discharge Consent CRC131249. In my evidence I stated that the above floor flooding from the Styx River would not occur in the 50 year flood rainfall event with future development, climate change and partial mitigation measures.
12. That statement remains true for the calibrated weed scenario, which is the one that was used in Mr Eastman's evidence and which was used for the water quantity joint experts' statement. For the purposes of the joint statement we tested the sensitivity of the model to different weed conditions for both a 10 year and a 50 year event. The joint statement records the main channel effects, particularly in the 10 year event.
13. The new information that I am here recording arises from me yesterday reviewing the results of running the 50 year high weed scenario for the

Rodrigues' property. The model in fact predicts that in that event, the river levels will be greater than the floor level. The model results indicate an increase in main channel flood level of approximately 100 mm in this high roughness scenario above the level in the earlier calibrated roughness scenario.

My analysis of that new information

14. This change in river flood level does not materially affect predicted flood levels at the Rodrigues' house. The model shows changes in flood level of less than 20mm at their house. This is because flood risk at the property in both these scenarios is dominated by tidal flows (from the 0.5m sea level rise) overtopping of the sand dunes from Brooklands Lagoon. I therefore conclude that future flood risk at the property will become increasingly dominated by sea level rise effects rather than urbanisation or weed effects.
15. Assuming that the high weed scenario lasts for three months, and that rainfall events happen in any part of the year, then the probability of this flood event occurring as a result of that high weed scenario is in the range of 1 in 200 year event.
16. The high roughness scenario is therefore not a direct comparison with the earlier calibrated average roughness scenario but does serve to show the effect of a high weed situation compared with an average weed situation which was modelled earlier.
17. My view is that the conditions of consent that are to now be proposed by the applicant address these potential effects by means of conditions that require the weed investigations that were recommended in the joint expert statement and through the earlier review of the Styx Stormwater Management Plan which the applicant is now proposing.

Mr Potts' evidence of 9 November 2018

18. I also note that on 9 November when Mr Potts was giving his evidence he quoted from a PDP report statement (para 16) that he said was relevant to stormwater discharge effects on flooding for the Rodrigues'. He had not

referred to that in his evidence in chief. In para 17 he continues that “prolonged elevated river levels, due to increased volume from upstream development, or from tide level increases, or both, will raise groundwater levels – they are related”.

19. I mostly agree with this statement however it is misleading to the extent that while upstream development may cause a larger volume to be discharged in a storm event, for most of the time the tendency for urbanisation is to cause a decrease rather than an increase in the much longer duration normal water levels and flows. These periods of the “normal water levels” between storms are much longer duration than the significant storm events and therefore would be the most influential factor on groundwater levels adjacent to the river.
20. As stated above, the most significant influence on the groundwater levels in the Earlham St area in my view is the tide. The tide influences the level at which the lower Styx River ponds every day and would thereby develop a natural equilibrium with the adjacent groundwater. In this respect sea level rise will be a significant factor in raising groundwater levels in the Brooklands area.

Mr Robertson’s concern with augmentation of the flow of the Styx River

21. When Mr Robertson was presenting his submission on 13 November 2018 he expressed a concern that the Council diverts artisan water from the Ka Putahi into the Styx and that this increases flood risks.
22. That diversion does occur but, in my opinion, it does not increase flood risks. The augmentation of flow in the upper Ka Putahi amounts to about 1% of the base flow in the Lower Styx River. There is currently no natural spring water at the augmentation point. If the spring water was present then it would not cease during a rainfall event. The catchment area above the augmentation point is very small and so the natural flow of surface water from this catchment would be unlikely to replace the augmented flow during a rainfall event if the augmented flow was turned off. Manipulation of this flow during rainfall events would risk dewatering the stream at its upstream end and damaging the stream life for a less than minor impact on flows lower down in the river.

GRAHAM JAMES HARRINGTON

1 March 2019

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