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**BEFORE THE CANTERBURY REGIONAL COUNCIL**

*in the matter of:* the Resource Management Act 1991

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

*and:* **Antonio and Kerrie Rodrigues...**  
*Submitter*

Summary of evidence of Robert Potts

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Dated: 9<sup>th</sup> November 2018

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## SUMMARY OF STATEMENT OF EVIDENCE

- 1 Flooding is very serious at this site as it remains there for prolonged periods, thus destroying soil/plant health by not allowing air into soil voids.
- 2 There is numerous discussion within the AEE regarding Best Management Practices (BMP), however, this is mostly to do with water quality and not water flows or volumes with regard to the Styx River. Best practice would be to not allow further filling within the flood management area and to attenuate future development to be neutral regarding effects downstream.
- 3 CCC modelling shows that in the existing developed scenario up to 800 mm ponding occurs within the property in a 2% AEP (50 year) event, with 400 – 600 mm at the house site. The proposed Global Stormwater consent allows an increase of 100 mm ( $\pm$  20%, thus in essence up to 120 mm increase) above 2012 levels. When considering that > 1,000 mm depth is considered a safety hazard, 800 mm + 120 mm is getting close to this trigger.
- 4 In response to a s92 question, CCC state. *All new stormwater systems and upgrades of existing systems are none-the-less designed with sea level rise of up to 1 m in mind. Either the capacity to manage sea level rise of up to 1 m is designed into the facilities or the potential to adapt the system to increasing sea level rise is embodied into the design*". However, this is not the case with the modelling of the Styx River where a sea level rise of 0.5 m has allowed for.
- 5 I agree with Mr Parsons assessment that tidal influences will impact on river flooding. I do not agree that sea level rise can be ignored and is outside the scope of these applications. Tide levels are part of the known environment and in the Styx River case impact on the critical duration of flood – 48 hours. SLR is a predicted issue to be taken into account in design, just as rainfall intensity increases due to climate change are taken into account.
- 6 CCC in their assessment of effects appear to be relying on the Brooklands area being abandoned. CCC state that Standard Detention accommodates expected growth but is promoting Partial Detention only to save costs and ignoring residents within Variation 48 designated land.
- 7 CCC recently granted consent for a neighbour of the Rodrigues on Earlham Street to build within the FPA. Other properties nearby have also been built with floors above the 0.2% AEP level and this has resulted in a lot of fill around the dwelling and out-buildings.

In addition, fill has been brought in by property owners adjacent to the Rodrigues and this has altered drainage patterns, not allowing ponded water, regardless of where it comes from, to drain away.

- 8 Management of weed growth and sedimentation is being relied on to reduce flooding effects and therefore needs to be locked into the SMP or conditions, i.e. when and how frequent dredging and weed removal occurs, or triggered by baseflow river levels.
- 9 I agree with the Officer's concern on the use of 2012 as the baseline year due to perception issues (as I have outlined above). The issue is the CCC assessment of effects is based on an allowing up to an additional +100 mm with 20% variability flood depth above the 2012 flood levels. However, the post-earthquake LIDAR information results in the "existing flooding" situation that is significantly greater than historical flooding, i.e. the Existing Development baseline they are starting with is not what has been seen in the past by residents.
- 10 I agree with the Officer regarding a 5-yr modelling review, or following events greater than 5% AEP (20 year).
- 11 There are no simple and inexpensive engineering solutions that will satisfy all the issues identified above, i.e. flooding from the Styx River directly or via the Brooklands Lagoon, although some will mitigate partially. Due to high groundwater and predicted sea level rise, possible mitigation measures to reduce flood risk at the Rodrigues property are limited and expensive. Flood nuisance should not be exacerbated by allowing 100 + 20 mm additional inundation within areas with dwellings. If the area is to be managed as a flood ponding area, then either the expensive mitigation options need to be implemented or the remaining dwellings abandoned.

#### **COMMENTS ON REBUTAL EVIDENCE OF MR HARRINGTON**

- 12 In Paragraphs 6 - 8 Mr Harrington provides an earlier decision of CRC131249. I consider it is up to the panel hearing this evidence to arrive at the decision on whether exacerbation of flooding is acceptable. The point I was making re Policy 4.17 is that it states that there will be no exacerbation of inundation of people's property and this is clearly not the case if the mitigation proposed results in additional flooding depth and area.
- 13 I agree with Mr Harrington that issues of flooding at the Rodrigues property are likely to be tidal and groundwater influenced. However, the flooding at the Rodrigues property occurs during and following rainfall events that elevate levels in the Styx River. These issues occur now and are therefore part of the receiving environment. Any exacerbation of flooding or prolonged elevated river levels due to

development upgradient should be avoided and this is within the scope of this application.

14 In Paragraph 10, Mr Harrington is correct regarding my Paragraph 28. It was poorly written and is misleading. The 200 – 300 mm difference is from Mr Harrington's evidence in chief and is due to the change in statistics for the 1% AEP high tide from 2011 to 2018.

15 I agree with Mr Harrington that this consent cannot manage sea level rise and nor can it manage earthquake effects. However, sea level rise has to be taken into account in the effects assessment (as it has been in modelling) and the lower land levels due to the earthquakes are part of the existing and predicted environment that the stormwater discharges into and thus effects need to be assessed and avoided , remedied or mitigated.

16 With regard to groundwater, a Patlle Delamore Report for Johns Road Horticultural that is developing land in the upper Styx catchment but discharge into the Otukaikino River state the following: *The groundwater levels observed are likely to be influenced by the water levels in all the drains around the site, including those that contribute flow to the Otukaikino to the north. This means that changes to drain flows or levels caused by vegetation growth, blockages, drain clearing or other maintenance works and diversions of water to the drain may be reflected by groundwater levels across the site.*

17 This is the same for the lower Styx River. Water levels in drains, the Styx River and Brooklands Lagoon will be reflected in groundwater levels. 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.

18 The groundwater pump suggested by Mr Harrington would need further investigation of the aquifer characteristics as to whether 1 L/s would be sufficient to lower groundwater. I suspect that upgrades to the drains would be required as these have been partly filled as part of the development in the area. Mitigation of flooding is a matter to be addressed by this application as the partial attenuation relies on additional ponding in the Brooklands area.

19 Additional pumping of groundwater however does not mitigate the predicted 120 mm raise in water level from partial attenuation.

20 I agree with Mr Harrington that the partial attenuation option sizing is quantified in the WWDG.

- 21 I am happy with the 10-yr review of SMP's but I consider that if the 5-yr model recalibration provides results that are unexpected, then this should trigger an earlier review of the SMP.
- 22 Mr Harrington has not eased my mind with regard to Cranford Basin. Mr Harrington comments what the Basin currently does – it attenuates flows to Dudley Creek in the Avon Catchment and provides no mitigation to the Styx Catchment. However, my concern has not been addressed. Why has the Basin area been included in the Styx SMP, as has Dudley Creek and other drains that currently drain to the Avon River.
- 23 The concern for flooding in the Lower Styx is if Cranford Basin and other areas add additional area to the Styx Catchment, as shown in plans, that it will release additional volume into Styx River and add to ponding. My question was, will what is proposed with Cranford Basin assist with Styx flood mitigation, or will it exacerbate? I am concerned that CCC may propose a swale from Cranford Basin to join up with Horners Drain. If this is the case, the Rodrigues would like to know if the additional catchment area shown in the SMP has been catered for in modelling.
- 24 I agree that weed growth higher in the catchment will have little impact on flooding at the Rodrigues property. However weed growth within the vicinity and downstream of Rodrigues property does impact on channel conveyance capacity and water storage levels and thus I do not agree that management of it is outside the scope of the application.

Dated: 9<sup>th</sup> November 3018



**Robert John Potts**