

BEFORE THE HEARING PANEL

IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of the Proposed Waikato District Plan

**SUPPLEMENTARY STATEMENT OF EVIDENCE OF
CONSTANTINOS FOKIANOS (STORMWATER)**

Dated 3 May 2021

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INTRODUCTION

1. My name is Constantinos Fokianos. My qualifications and experience are set out in my primary statement of evidence dated 17 February 2021 (**primary evidence**).
2. The purpose of this supplementary statement is to respond to specific matters raised in the technical peer review statement by Mr Roger Seyb from Beca Ltd in Appendix 3.1 to the s42A report for Hearing 25: Zone Extents Huntly (**s42A report**). In addition, the supplementary statement responds to a comment made by Waikato Regional Council (**WRC**) regarding stop bank breach assessment.

SCOPE OF EVIDENCE

3. My evidence will address the following matters raised in the s42A report:
 - a) Flood risk assessment; and
 - b) Stop bank breach assessment-residual risk.

CODE OF CONDUCT

4. I confirm that I have read and am familiar with the Code of Conduct for Expert Witnesses in the Environment Court Practice Note 2014, and I agree to comply with it.
5. I confirm that this supplementary evidence is written within my expertise, except where otherwise stated, and that I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

RESPONSE TO TECHNICAL SPECIALIST REVIEW

6. The following paragraphs include the questions/comments made by the peer reviewer (Mr Seyb, Beca) as they are presented on page 3 of Appendix 3.1. I set out the questions raised by Mr Seyb below and provide a response to each of the matters raised.

Question/Comment 1

7. While the proposed new development floors would be protected against local flooding, the effects of adopting the flood management approach on existing land, drainage systems, water bodies/groundwater and buildings is unknown. Allowing the development may exacerbate and “lock in” hydrological effects in the local catchment for the long term.

Response

8. The proposed stormwater layout has been modelled and preliminarily sized to meet pre-development discharge flows. The level-for-level flood volume compensation approach also contributes to minimise/eliminate any adverse effects. The concern that the development "may lock in hydrological effects" is not supported by any calculations. My Stormwater Management Report appended to my primary evidence as **Attachment 1** along with its appendices provides all the information and hydrological and hydraulic calculations to support the high-level design.

Question/Comment 2

9. The assumptions around further development in the local catchment are unclear. For example, the Kimihia Lakes development submission identifies an initial phase of development but also flags the possibility of further residential development in the longer term. If it is decided to continue to defend the area of development, the local catchment analysis needs to

consider the long-term extent and intensity of development in the whole local catchment.

Response

10. The assumptions of the hydrological analysis are clearly shown on the map that is attached to the Kimihia Overall Catchment Stormwater Memo (Appendix B to Attachment 1 of my primary evidence). Amongst others, the assumption of 20% imperviousness has been made for the overall Kimihia Catchment. That corresponds to about 650ha of fully developed land within the overall catchment. The analysis was also based on other conservative assumptions that are referenced in the same map.

Question/Comment 3

11. What is the frequency and duration of local flooding due to the flood gates being closed and what are the effects of this? For example, access to property.

Response

12. The following information was provided by WRC in correspondence dated 24 September 2020:

Analysis of the Waikato River Levels records over the last 10 years resulted the following:

- a. The River Level is below RL 6.4 m for 58 days each year or 16% of the time. During these times, the floodgate operates at full capacity with no back water effect.
- b. The River level is below RL 7.10 m for 223 days a year or 61% of the time. During these times, the floodgate operates against back water head of 0.7 m. However, properties with ground levels of RL 7.5 m and higher should be able to drain efficiently.
- c. The River level is below RL 7.50 m for 277 days a year or 76% of the time. During these times, the floodgate operates against back water head of 1.1 m. Properties with ground levels of RL 8.0 m and higher should be able to drain efficiently.

13. The above information from WRC suggests that Area 1 (the area proposed to be rezoned Industrial) is generally well drained most of the year and that access to the property can be maintained.

Question/Comment 4

14. What is the frequency and effect of less extreme events on local flooding? I note that the 10 year Waikato River flood level (RL 9.87) is above the local catchment 10 year flood levels (RL 9.1 excl CC). This means a 10 year event in the local catchment could be prevented from discharging in a smaller event in the River and infers the duration of local flooding could be for an extended period.

Response

15. These scenarios have been assessed in the Stormwater Management Report (in Appendix D of Attachment 1 to my primary evidence). The size of the Waikato River catchment, in combination with a number of hydro-electric dams that regulate the river's flows, suggest that a scenario of a 10-year Annual Recurrence Interval (**ARI**) Waikato River event coinciding with Lake Kimihia's 10-year ARI event is almost impossible. Regardless, this scenario has been accounted for by assuming that floodgates are closed during a local 10-year event. Table No.4 of the Kimihia Overall Catchment Stormwater Memo (Appendix B of Attachment 1 to my primary evidence) provides the matrix of scenarios that were modelled, including the above.

Question/Comment 5

16. Once flooding occurs, how will the effects be managed? E.g. getting people to safety, access to property, potential contamination of water due to industrial materials and wastewater.

Response

17. The breach analysis showed that a proper emergency evacuation plan can be established and implemented for the proposed industrial area, as there is enough time for a response after the breach commencement, and the resulting depths and velocities of the flooding within the proposed development are manageable. During the next stages of detail design and as part of the consenting process, an emergency plan should be developed.

Question/Comment 6

18. Industrial land use often requires materials and plant to be stored outside. If the area was flooded, materials and plant can exacerbate hazards by blockage of drainage systems and contamination.

Response

19. A hazardous and floatable material management plan requirement should be imposed as part of the consenting process during the next stages of the development.

Question/Comment 7

20. The stop banks were originally constructed for rural land protection. Their fitness of purpose and risk profile for protection of urban development and resilience to increased future flood levels should be considered.

Response

21. This question should be referred to the Waikato District Council and WRC as it falls under their jurisdiction. The Stormwater Management Report is a document that provides information on technical matters and has assessed flood risk and recommended mitigation having regard to the existing stop

bank system. On this basis it concludes that the risks of flooding can be appropriately managed.

Question/Comment 8:

22. The local catchment cannot discharge until the flood gate is opened - which is dependent upon the Waikato River level being low enough to allow this (including periods well below full flood stage). If the Waikato River is elevated for extended periods, the local catchment's flood water sits behind the stop banks with any low lying buildings flooded and access being impeded. Identification of the range of periods when the gates would be closed, and consideration of the resulting effects is needed.

Response

23. The Stormwater Management Report addresses this matter by determining the minimum floor levels using the assumptions contained within the question/comment (Appendix B to, and Section 2 of, Attachment 1 to my primary evidence).

Question/Comment 9:

24. A constant river level in the Waikato is assumed. The flooding report author considers this conservative because it is expected that the river will only be in flood for a short to medium duration. This is not backed up by any hydrographs for river flooding.

Response

25. The Residual Flood Risk Analysis Memorandum (Appendix D to Attachment 1 to my primary evidence) reports that in the absence of a temporal pattern of the river's flood levels, a constant river level has been assumed. That is considered to provide more conservative results. Any hydrograph that

provides fluctuation of the water levels within a 36-hour period rather than a constant peak level is less conservative than the approach taken.

Question/Comment 10

26. A constant river level is assumed, without justification of potential changes due to factors such as climate change and upstream land use. That is, the river level could increase in the long term which would increase the risk of stop banks being breached and also the frequency of less extreme events which could require the flood gates to be closed for longer at lower stages.

Response

27. WRC is currently working on Waikato River modelling for future climate-adjusted scenarios. The results at the time of the report were not available. However, it is noted that this issue concerns all of the protected schemes affected by the Waikato River, including, residential and rural. Nevertheless, the Stormwater Management Report is suitably conservative in its approach.

Question/Comment 11

28. The breach of stop bank scenarios assumed a fixed width of stop bank breach – whereas a breach will initially consist of high velocity flows or piping of the stop bank, resulting in erosion which will widen the breach and increase the incoming flow rate of water. These factors reduce the time for peak flood levels to occur and the available time for emergency response.

Response

29. I disagree with this comment. A small initial breach would produce smaller initial flows and the gradual widening of the breach would result in an increase of the time for the peak flows to occur, rather than a reduction. The widths of the breach have been agreed with WRC staff and the time of the

breach development (6 minutes) is a very conservative approach that provides high peak flows very quickly.

Question/Comment 12

30. The depth and velocity of water at the breaches indicates a high hazard for the movement of people and vehicles in some places. How would this be managed?

Response

31. The breach points are on the stop bank, far from the proposed development. The management of the breach hazard at the areas of the breaches is not part of the scope of this proposal. It is also not responsibility of the submitter. The locations of breach are theoretical and were provided to me by WRC. Furthermore, the modelling results show that velocities and depths in the area of the proposed development have small values that produce small and manageable risk to the movement of people and vehicles.

WRC COMMENT

32. A The s42 report notes that the writer enquired of WRC about the flood risk associated with industrial land use compared with the current rural land use¹. WRC responded as follows:

The site is currently protected to 1% AEP and a lower level of service is generally required for industrial than for residential. However, we would like to see provisions identifying that a stop bank breach assessment is required for resource consent.

33. The s42A report writer agreed that provisions requiring a stop bank breach assessment should be included².

¹ At paragraphs 294-296.

² At paragraph 297 and Appendix 6.

34. A stop bank assessment has already been completed as part of the Stormwater Management Report (Appendix D to Attachment 1 of my primary evidence). The stop bank assessment (or residual risk assessment) memorandum was sent to WRC on 12 November 2020 for comments, however there has been no feedback received from WRC in relation to the memorandum to date.

CONCLUSION

35. In my opinion, all of the matters raised by the technical peer reviewer have been satisfactorily addressed through my primary evidence as explained above. I confirm my view that the proposed rezoning can be serviced within the local, regional, and national requirements regarding stormwater management.

36. On this basis, I confirm that in my professional opinion there is no stormwater management reason why the proposed plan provisions should be approved.

Constantinos Fokianos

3 May 2021