

**BEFORE INDEPENDENT HEARING COMMISSIONERS APPOINTED BY THE  
WAIMAKARIRI DISTRICT COUNCIL**

**IN THE MATTER OF**

The Resource Management Act 1991 (**RMA** or  
**the Act**)

**AND**

**IN THE MATTER OF**

Hearing of Submissions and Further  
Submissions on the Proposed Waimakariri  
District Plan (**PWDP** or **the Proposed Plan**)

**AND**

**IN THE MATTER OF**

Hearing of Submissions and Further  
Submissions on Variations 1 and 2 to the  
Proposed Waimakariri District Plan

**AND**

**IN THE MATTER OF**

Submissions and Further Submissions on the  
Proposed Waimakariri District Plan by **Mike  
Greer Homes NZ Limited**

---

**EVIDENCE OF GREGORY MARK WHYTE  
ON BEHALF OF MIKE GREER HOMES NZ LIMITED REGARDING HEARING  
STREAM 12E**

Dated: 5 March 2024

---

Presented for filing by:  
Chris Fowler  
PO Box 18, Christchurch  
T 021 311 784 / 027 227 2026  
chris.fowler@saunders.co.nz

## INTRODUCTION

- 1 My name is Gregory Mark Whyte.
- 2 I hold a Bachelor of Civil Engineering degree from the University of Canterbury, which I gained in 1996. I am also a Chartered Professional Engineer with the Engineering New Zealand (ENZ), which I have held since 2003.
- 3 I hold the position of Managing Director at DHI Water & Environment New Zealand. I have been in this position since February 2020 and with DHI since March 2008.
- 4 I have over 28 years of experience in urban water and water resources engineering and modelling. I have experience within both local government and consulting environments. I have led studies and been involved in hydrological and hydraulic modelling across New Zealand, Australia and the United Kingdom. My current role involves managing and running DHI New Zealand, with small teams in Australia and the United States, with various roles, including project director, project manager, modelling technical expert, hydrological and hydraulic investigations, peer reviewing, and strategic advice on modelling and modelling training.
- 5 I have a long history of stormwater modelling with Waimakariri District Council (**WDC**). We (**DHI**) undertook a pilot of the District Wide modelling for the Cam River in early 2009. From 2009 to 2020, I have continued to be involved in WDC's stormwater modelling, providing services as a consultant. We (DHI) have been closely involved in the development of the District Wide models over that 10-year period, either building and validating the models or peer reviewing the models. The most recent work for WDC which was completed in 2019/20 also involved reviewing some localised township models for Rangiora, Kaiapoi, Woodend and Oxford.
- 6 My role in relation to the Waimakariri Proposed District Plan and Variation 1 is as an independent expert witness to Mike Greer Homes NZ Limited (**Mike Greer Homes**) on flood hazard matters.
- 7 Although this is not an Environment Court proceeding I have read the Environment Court's Code of Conduct and agree to comply with it. My qualifications as an expert are set out above. The matters addressed in my

evidence are within my area of expertise, however where I make statements on issues that are not in my area of expertise, I will state whose evidence I have relied upon. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed in my evidence.

8 I completed a site visit on 27<sup>th</sup> February 2024.

#### **SCOPE OF EVIDENCE**

9 In my evidence I address the following:

- (a) The context of my evidence;
- (b) A description of the receiving environment;
- (c) A summary of the proposal;
- (d) A description of surface flooding and proposed flood mitigation;
- (e) An assessment of the potential effects on surface flooding;
- (f) Statutory assessment of the proposal; and
- (g) Commentary on matters raised by Section 42A report.

#### **SUMMARY OF MY EVIDENCE**

10 The proposed flood mitigation strategy for the site is to fill to a level to ensure land to be used for housing and new buildings are above the 0.5% flood event including a 500 millimetre freeboard for new buildings.

11 Filling of the site is a robust mitigation method as it does not rely on gates or weirs or pumps to remove or control floodwater.

12 Post-development flood levels on the site, excluding the stormwater management area shown on the ODP, are expected to be RL 3.04-3.06 metres predominantly with a depth of 0.1 to 0.5 metres and a maximum depth of 0.8 metres for a 0.5% event.

13 Along Main North Road (**MNR**) there has been an increase in flood extent over a 215 metres length of road and a maximum increase in water depth of up to 0.065 metres.

14 A water level difference map has been created by subtracting the pre-development maximum water levels from the post-development maximum water levels which shows that there are some areas where it does not now

flood and some areas where it does not now flood. New areas of flooding are mostly confined on the Site, except for new flooding along MNR. Otherwise all neighbouring properties show no change or a decrease in flooding when comparing the pre-development surface/topography to the post-development surface/topography.

- 15 The maximum depth of increased water depth of 0.8 metres is localised to small areas within the roading network shown on the ODP.
- 16 Most of the land to be used for housing (shown as Medium Density Residential Area on the ODP) is above the 0.5% event. However there are sporadic, and isolated areas of increased depth of up to 170 mm on small parts of the land to be used for housing.
- 17 It would be possible to raise the site further to reduce onsite flooding. This could have displacement effects offsite and would need to be investigated by further modelling.
- 18 Offsite, on the surrounding properties, there will generally be a decrease in flood levels. The exception is on MNR where the flood extent will increase with an associated maximum water level increase of 0.065 metres.
- 19 It is anticipated that the extent and water level increase along MNR can be mitigated by providing a small amount of additional on-site water storage to offset the increase. This would require further earthworks design and modelling work.
- 20 Overall, I consider that refined earthworks design would likely enable the proposed rezoning to be acceptable from a flood hazard perspective. Further modelling investigation will be done in the next month using refined earthworks design. This work will be shared as a technical report with Council (and filed as supplementary evidence in due course) to further refine the effects of the proposal on flood hazard.

## **CONTEXT**

- 21 My evidence is in respect of a submission by Mike Greer Homes on the Waimakariri District Council notified proposed District Plan (**PDP**) and a submission by Mike Greer Homes on Variation 1 to the PDP.
- 22 Mike Greer Homes's submissions seek to rezone the subject site from Rural Lifestyle Zone to Medium Density Residential Zone. My evidence relates to

the rezone proposed by Mike Greer Homes and covers aspects relating to surface flooding.

- 23 The site of the proposed rezoning (the **Site**) totals 14.20ha and is located south of Kaiapoi, 1.0 km from the Kaiapoi Town Centre fronting the Main North Road (**MNR**) along the western boundary and the railway line adjoining the eastern boundary. The Kaikainui and Courtenay Streams form the Site's northern and southern boundaries. The Site is currently used for farming and contains a dwelling in the south-western corner. The is accessed from the Kaiapoi Town Centre via William Street south which gives direct access to the western edge of the Site along MNR.
- 24 In 2019/2020 two district wide flood hazard models, North Ashley and South Ashley and the local urban flood hazard models for Woodend, Kaiapoi, Oxford and Rangiora were updated in preparation for use in the WDC Proposed District Plan. The results from these models are available online through a WDC website and also through Canterbury Maps. All of this modelling was peer reviewed and accepted by WSP consultants.
- 25 Subsequent to the above work a second study was commissioned by WDC to investigate some breakout scenarios from the Ashley River. Breakouts to the North-East and the South-West were considered. Only breakouts to the South-West are relevant for the Mike Greer Homes site.
- 26 The local urban flood hazard model for Kaiapoi does not include the Site area so the relevant model to use results from and to carry out site specific analysis is the South Ashley district wide model.
- 27 The existing Site is subject to flooding from localised flooding from the wider contributing catchment area. The existing site is not subject to flooding from the Waimakariri River as it is protected by the primary stopbanks to a greater than 0.2% AEP (500 year) flood event. The site is also not subject to flooding from a breakout from the Ashley River due to its distance from the Ashley River.

## **THE SITE**

- 28 The site is located between Main North Road and the Main Truck Railway Line to the North and South respectively. The north of the site is bounded by the Kaikainui Stream and to the south, Courtenay Stream. To the south-west of

the site is the Waimakariri River, approximately 0.8 kilometre away. To the north-east is the Ashley River, approximately 12 kilometres away.

29 The site is very flat and slopes approximately from North to South.

### **THE PROPOSAL**

30 The Outline Development Plan (**ODP**) for the proposed rezoning shows the location of key features within the site and is attached at **Appendix A**. Overall the proposal is anticipated to enable development of approximately 186 new dwellings on the Site together with associated internal roading network, stormwater management area, and esplanade reserves along the Kaikainui Stream and the Courtenay Stream.

31 Mike Greer Homes proposes the following flood mitigation for the Site:

- (a) Filling the Site to elevate ground levels above the 0.5 % (200 year) flood event level and construction of new buildings at or above the 0.5% flood event minimum finished floor level.
- (b) Constructing a stormwater system to collect and convey runoff generated within the Site to the receiving drainage system.

32 Minimum finished floor levels for new buildings within the Site are anticipated to be above the 0.5% event, incorporating an allowance for predicted climate change plus 500 mm freeboard.

33 Runoff from the Site is proposed to be managed by a piped and/or swale stormwater system. This system will flow into new stormwater treatment pond/s located to on the eastern side of the Site. The ponds will discharge into the Kaikainui Stream and/or the Courtenay Stream.

### **FLOOD RISK ASSESSMENT**

34 The raising of ground levels over the Site has the potential to redirect floodwater that now flows north to south or alternatively later in the flood event, that backflows from downstream. It may also create a displacement effect that could affect neighbouring properties. These matters are discussed in my evidence below.

35 Filling the Site is a robust mitigation strategy as it is not dependant on any mechanical gates or weirs or pumping of flood water.

## Pre-Development Modelling

- 36 Figure 1 and Figure 2 below show pre-development flooding for 0.5% event on the Site for both maximum Water Level and Maximum Depth. The maximum Water Level for the 0.5% flood event is between RL 3.05 and 3.10 metres. The maximum Flood Depth for the 0.5% flood event varies from 0.05 metre to over 2.50 metres.

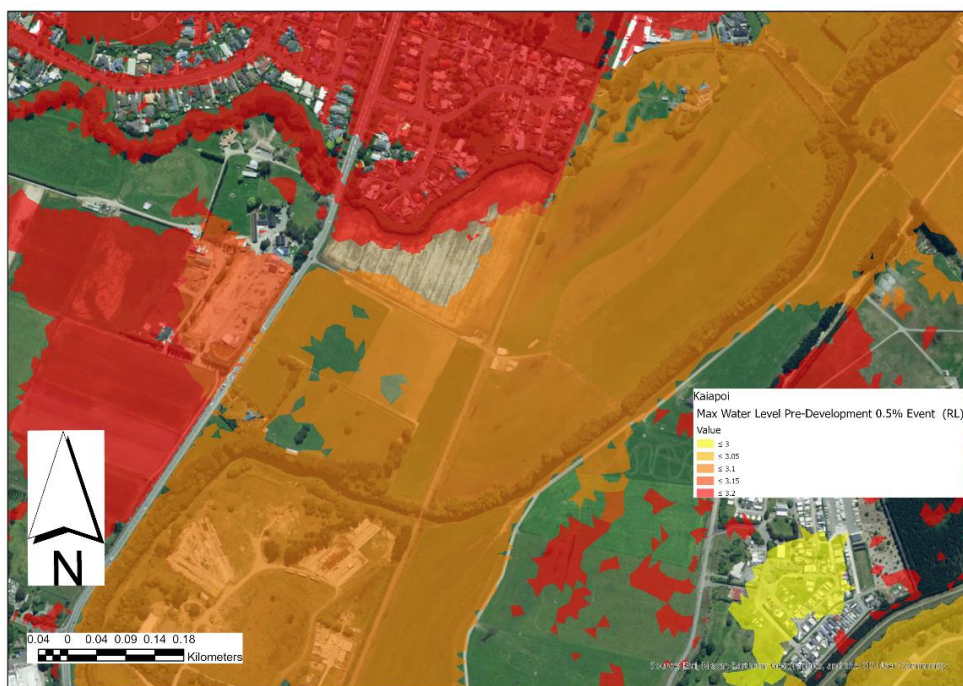


Figure 1 - Maximum Water Level for 0.5% event for Pre-Development

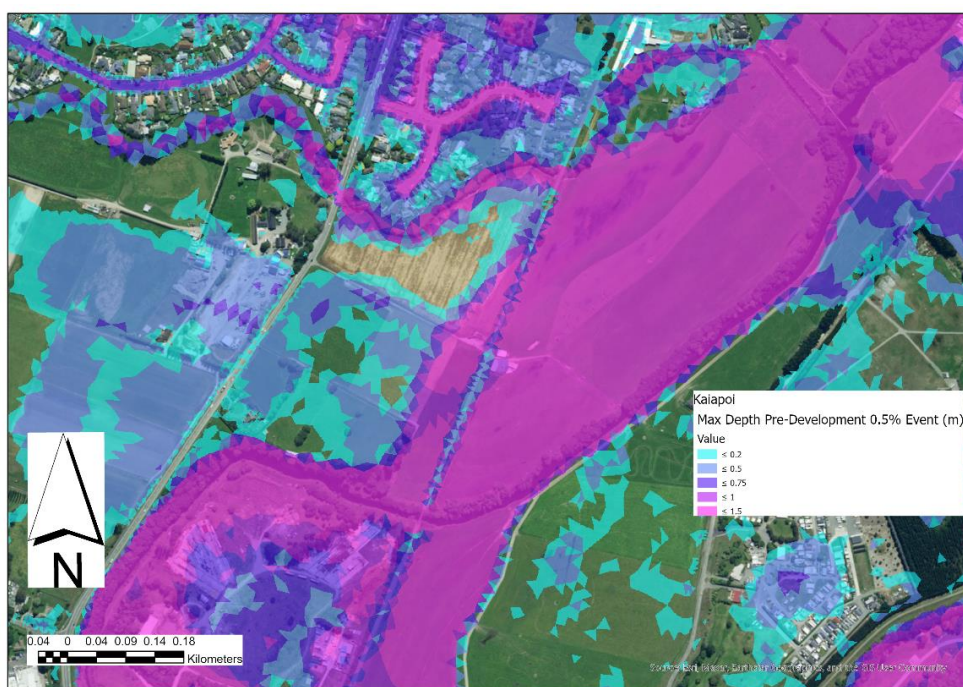


Figure 2 - Maximum Depth for 0.5% event for Pre-Development

### Post-Development Modelling

- 37 Figure 3 and Figure 4 below show post-development flooding for a 0.5% event applying a proposed development surface for the Site. This proposed development surface has been incorporated into the South Ashley District wide model and a model simulation has been completed.
- 38 Maximum water levels on the Site have generally dropped to between RL 3.04 and 3.06 metres. Maximum flood depths range from 0.05 to over 2.50 metres.
- 39 The exception to this is along MNR where there has been an increase in flood extent over a 215 metres length of road and a maximum increase in water depth of up to a maximum of 0.065 metres.

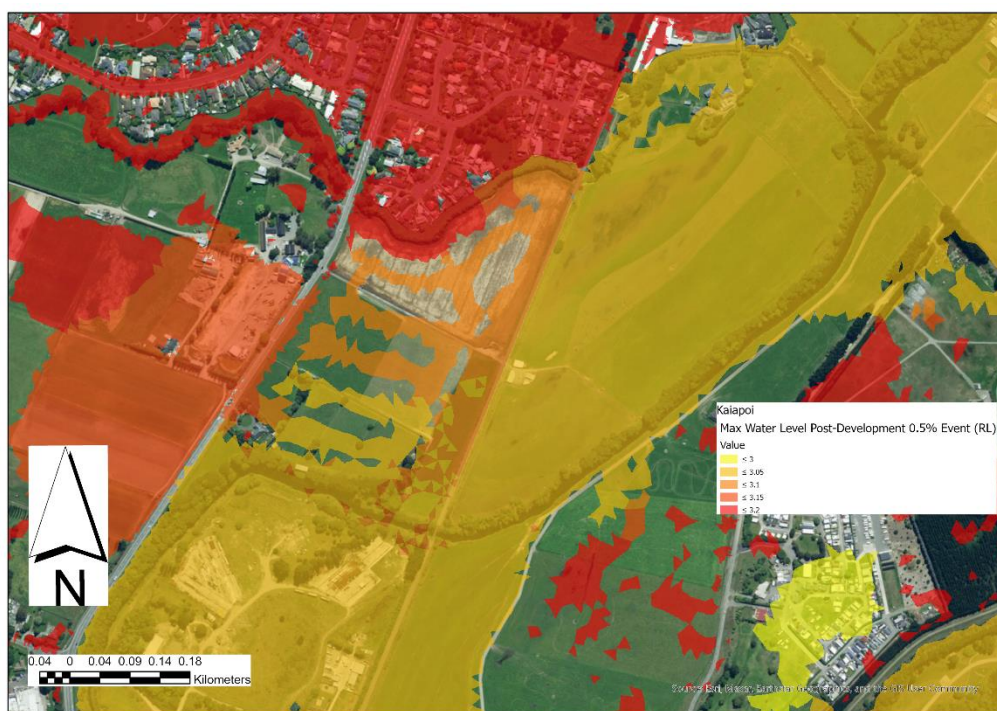


Figure 3 - Maximum Water Level for 0.5% event for Post-Development



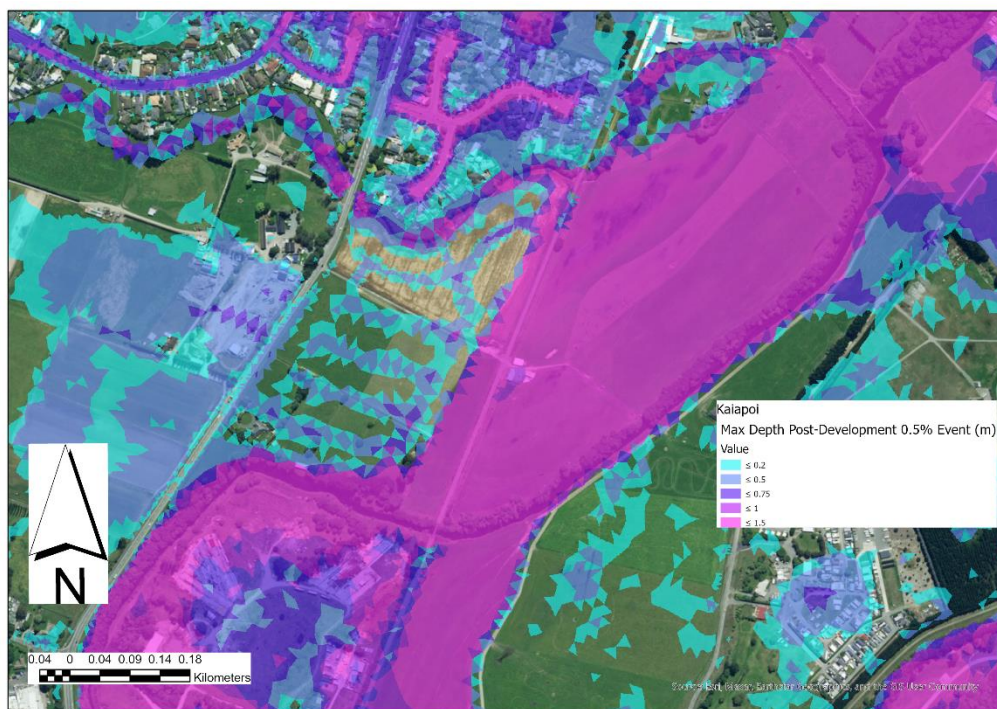


Figure 4 - Maximum Depth for 0.5% event for Post-Development

### Water Level Difference between Pre & Post Development Modelling

40 Figure 5 below is a water level difference map that has been created by subtracting the pre-development maximum water levels from the post-development surface" maximum water levels. If the resulting water level difference in some areas or cells is negative this means there has been a reduction in maximum water levels.

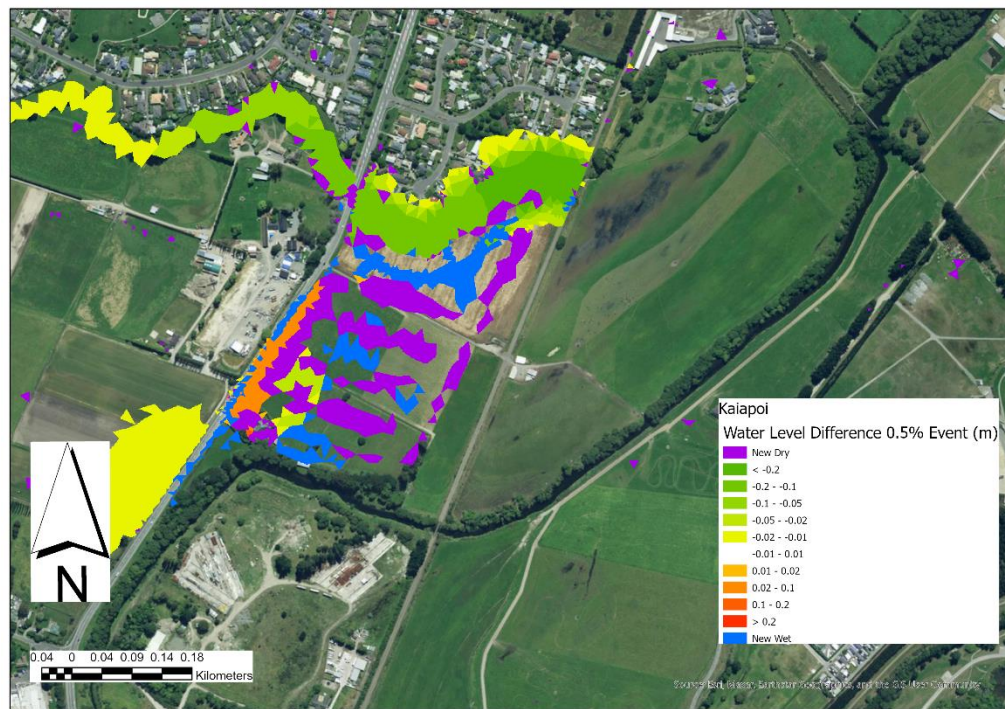


Figure 5 – Water Level Difference between Pre & Post Development for a 0.5% flood event

- 41 Figure 5 shows that there are some areas where it does not now flood and some areas where it does now flood. New areas of flooding are mostly confined on the site, except for new flooding along MNR. Otherwise all neighbouring properties show no change or a decrease in flooding when comparing the pre-development surface/topography to the post-development surface/topography.
- 42 Post-development flood levels on the site, excluding the stormwater management area shown on the ODP, are expected to be RL 3.04-3.06 metres predominantly with a depth of 0.1 to 0.5 metres and a maximum depth of 0.8 metres for a 0.5% event.
- 43 The maximum depth is localised to small areas within the roading network shown on the ODP.
- 44 Most of the land to be used for housing (shown as Medium Density Residential Area on the ODP) is above the 0.5% event. However there are sporadic, and isolated areas of increased depth of up to 170 mm on small parts of the land to be used for housing.

- 45 It would be possible to raise the site further to reduce onsite flooding. This could have displacement effects offsite and would need to be investigated by further modelling.
- 46 As mentioned, the offsite consequence of raising the Site is an increase in flood extent along the MNR with a maximum increase in water depth of 0.065 metres.
- 47 Increases in flood extent and water level along MNR due to the filling of the site are expected to be able to be mitigated through refining the earthworks design. This would need to be investigated by further earthworks design and modelling.
- 48 Overall, I consider that refined earthworks design would likely enable the proposed rezoning to be acceptable from a flood hazard perspective. Further modelling investigation will be done in the next month using refined earthworks design. This work will be shared as a technical report with Council (and filed as supplementary evidence in due course) to further refine the effects of the proposal on flood hazard.

## **CONCLUSION**

- 49 My evidence addresses surface flooding and proposed flood mitigation associated with submissions by Mike Greer Homes on the PDP and Variation 1 that seek to rezone land south of Kaiapoi from Rural Lifestyle Zone to Medium Density Residential Zone. My conclusions are provided in my Summary section above.
- 50 Thank you for the opportunity to present my evidence.

Greg Whyte  
5 March 2024

Proposed Outline Development Plan for the Site

