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Waikato River Adare Flood Hazard Report

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AWA ENVIRONMENTAL

Prepared by Awa Environmental Limited

for The Adare Company Limited

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Document History

Version	Date	Description	Author	Reviewed
1	02/11/2017	Review	TonyTrueman	Craig Martell
2	29/03/2018	Preliminary Issue	Tony Trueman	Tony Trueman
3	17/05/2018	Review	Tony Trueman	Tony Trueman

Contents

1 Introduction

AWA Environmental Limited has been provided with various flood hazard data from Waikato Regional Council as either ArcGIS shape files or reduced level (R.L) data. The R.L data corresponds to the two locations shown in Figure 1. The higher R.L level relates to the southern location, the lower R.L the northern location. The R.L effectively grades down from South to North between these two locations. Both levels are shown on all plans for comparison.

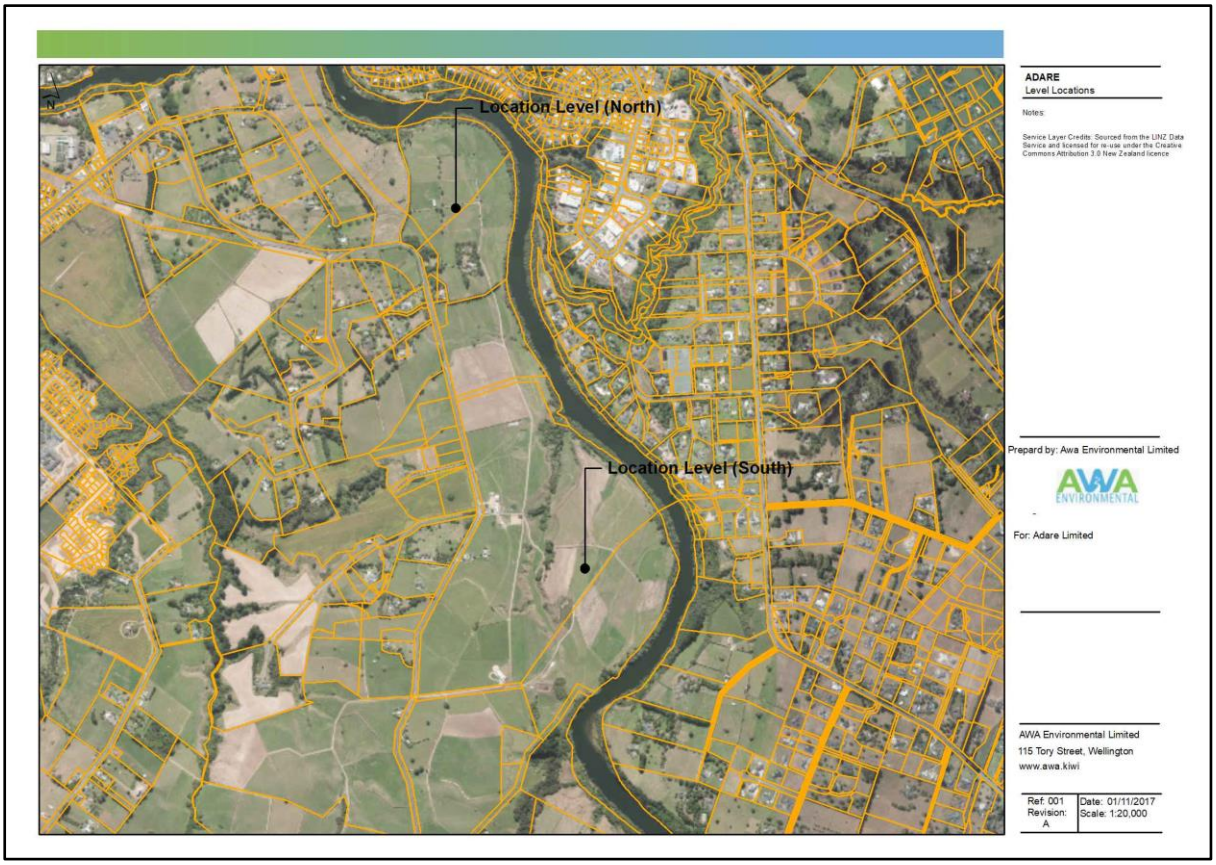


Figure 1 Approximate location of R.L levels

2 1% AEP River Flooding Assessment

The extent and levels of the 1 % AEP flood event in the Waipa and Waikato Rivers are based on 1D flood modelling undertaken in 2009 which has been extrapolated to produce a 2D flood extent. The modelling does not include the predicted effects of climate change on rainfall intensity and sea level rise.

2.1 1% AEP Flood Hazard Extent

The flood hazard extent representing the 1 % AEP flood event in the Waipa and Waikato Rivers, excluding the effects of Climate Change, is shown in Figure 2. This was provided by Waikato Regional Council as an ArcGIS shape file. The extent is not contiguous with an area not defined along the boundary of the Adare block.

Figure 2 Flood Extent 1 % AEP Flood Event Excluding Climate Change

2.2 1% AEP Flood Hazard Levels

The flood hazard level representing the 1 % AEP flood event in the Waipa and Waikato Rivers, excluding the effects of Climate Change, is shown in Figure 3. These levels are between R.L 19.1m to 18.5m. As the R.L's decrease from South to North the flood level is closer to R.L 18.5.

Figure 3 Flood Level 1 % AEP Flood Event Excluding Climate Change

3 Development Levels

3.1 Climate Change

The inclusion of climate change and the associated increase in rainfall intensity and sea level rise will result in increased flood extents and levels associated with the 1 % AEP flood event.

The existing Hamilton City Council Operative District Plan, Chapter 22 Natural Hazards, provides an overview of minimum floor heights and freeboard.

This report states, on any site that is fully or partly affected by any Flood Hazard Area (excluding the Culvert Block Flood Hazard Area) the following minimum freeboard heights shall be complied with, which are additional to the top water flood level of the 1% annual exceedance probability event as shown in Table 1.

Table 1

Building Use	Minimum Freeboard Height
i) Residential buildings (including attached garages)	0.5m
ii) Commercial and industrial buildings	0.3m
iii) Non-habitable residential buildings and detached garages	0.2m

In the absence of any levels associated with a climate change event AWA would recommend an allowance of 1 metre be added to the flood hazard extents and levels to represent a design level.

The revised 1% AEP flood extents and levels including an associated allowance of 1 metre is shown in Figure 4. These levels are between R.L 20.1m to 19.5m. As the R.L's decrease from South to North the flood level is closer to R.L 19.5.

3.2 1% AEP Flood Hazard Levels Including Allowance

Figure 4 Flood Level 1 % AEP River Flood Event Including 1 m Allowance

4 Dam Burst Flooding Assessment

4.1 Karapiro Dam Location

The Karapiro Dam is located upstream of the Adare development as shown in Figure 5.

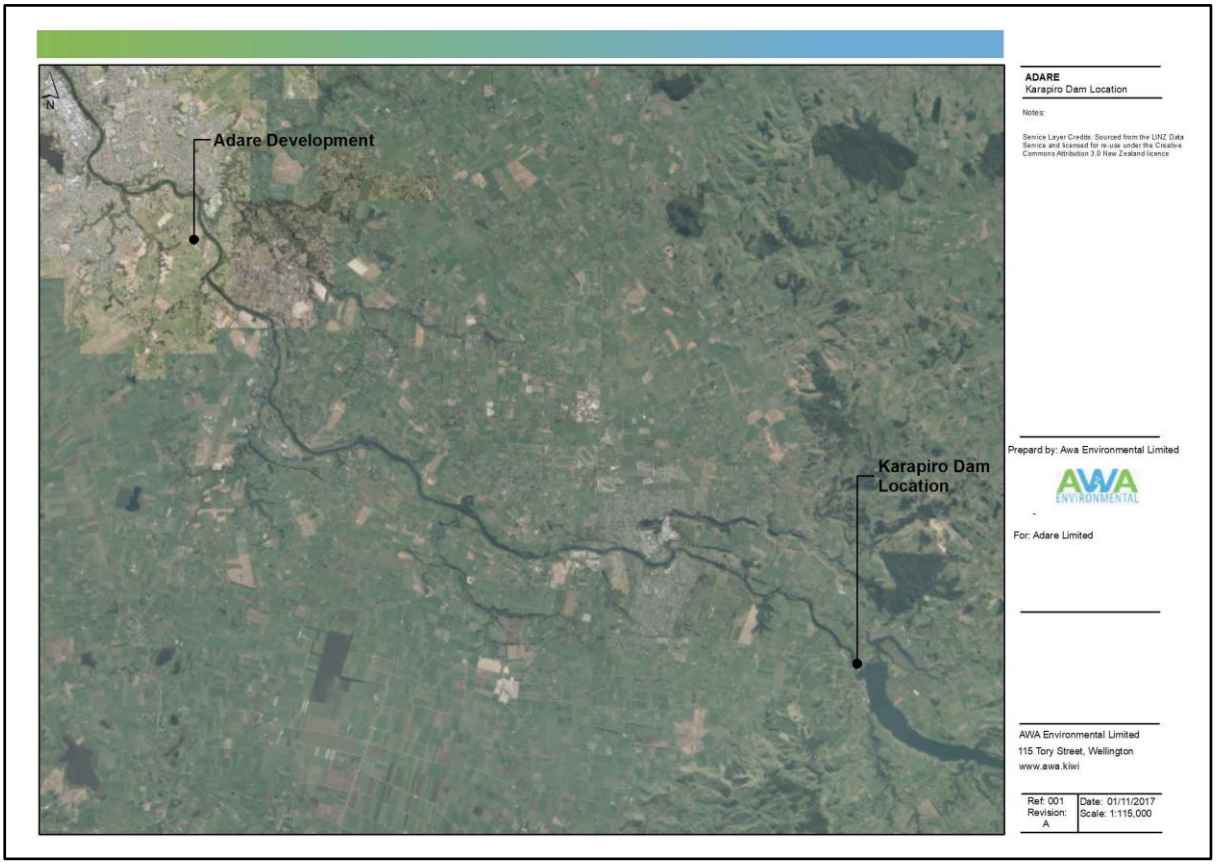


Figure 5 Karapiro Dam Location

4.2 Karapiro Dam Burst Overview

The Karapiro dam break cross sections and levels have been taken from the 1989 Works and Development Services Corporation report 'Karapiro Dam: Report on dam break analysis" by G. Webby, which was undertaken for the Electricity Corporation of New Zealand Ltd.

The dam break scenario used was sliding of either of the gravity abutments at the dam leading to catastrophic collapse of the dam structure (assuming a linear failure over 0.1 hours) due to earthquake shaking. An initial lake level of RL 53.25 m was assumed. Mean annual flows were used for the initial conditions between Karapiro and Ngaruawahia (228 cumecs) and Ngaruawahia and Huntly (328 cumecs). The dam burst was modelled to cause peak outflows of approximately 15,400 cumecs.

Levels were modelled using DAMBRK (a numerical finite difference model) over 62 cross sections (from Karapiro to the Huntly Power Station were stage-flow relationships were available for up to

1700 cumecs to inform boundary conditions). Hydraulic roughness values (Manning n) for channels were taken from previous studies or inferred from aerial photographs.

4.3 Karapiro Dam Break Flood Levels

The dam burst flood levels have been extracted from cross-sections located close to the two locations shown in Figure 6. The levels grade down between the two locations from RL 27.0 in the South to RL 26.3 in the North as shown in Figure 7.

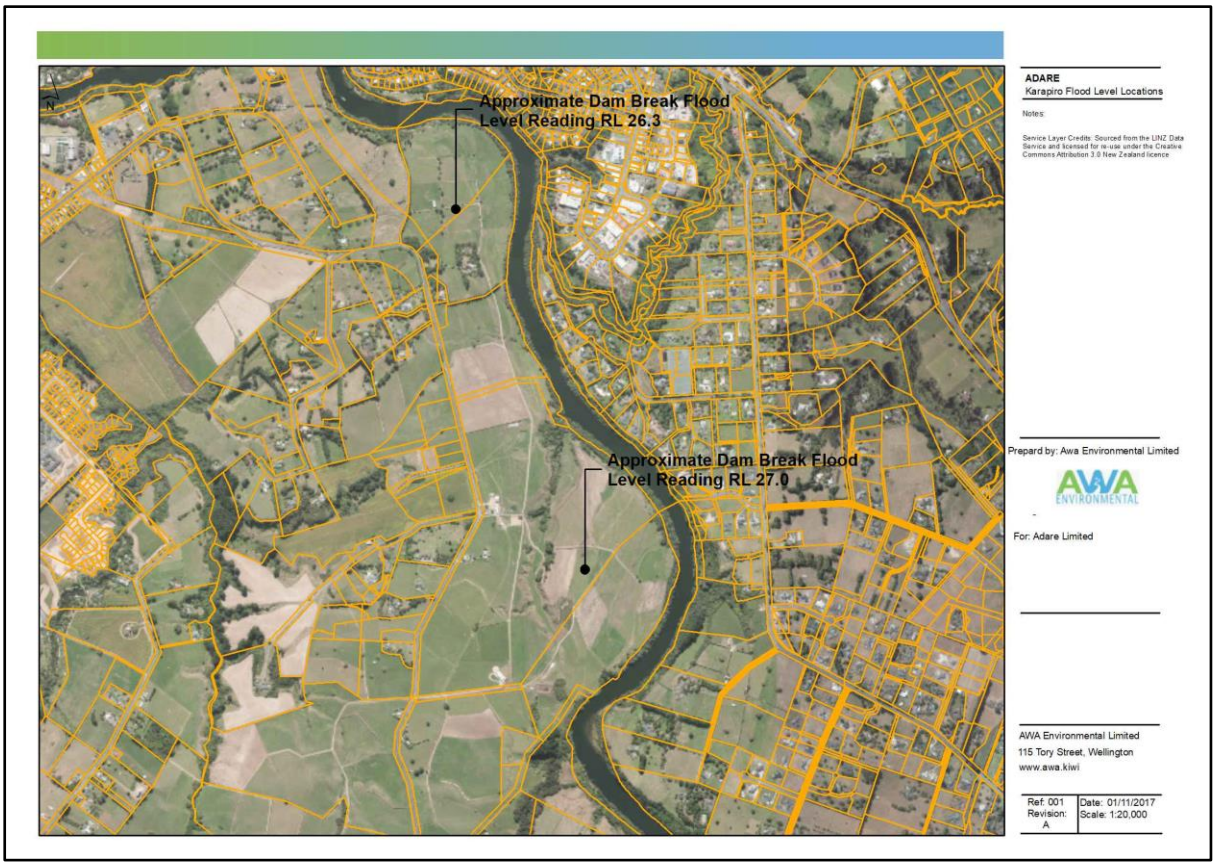


Figure 6 Dam Break RL Levels – Approximate Locations

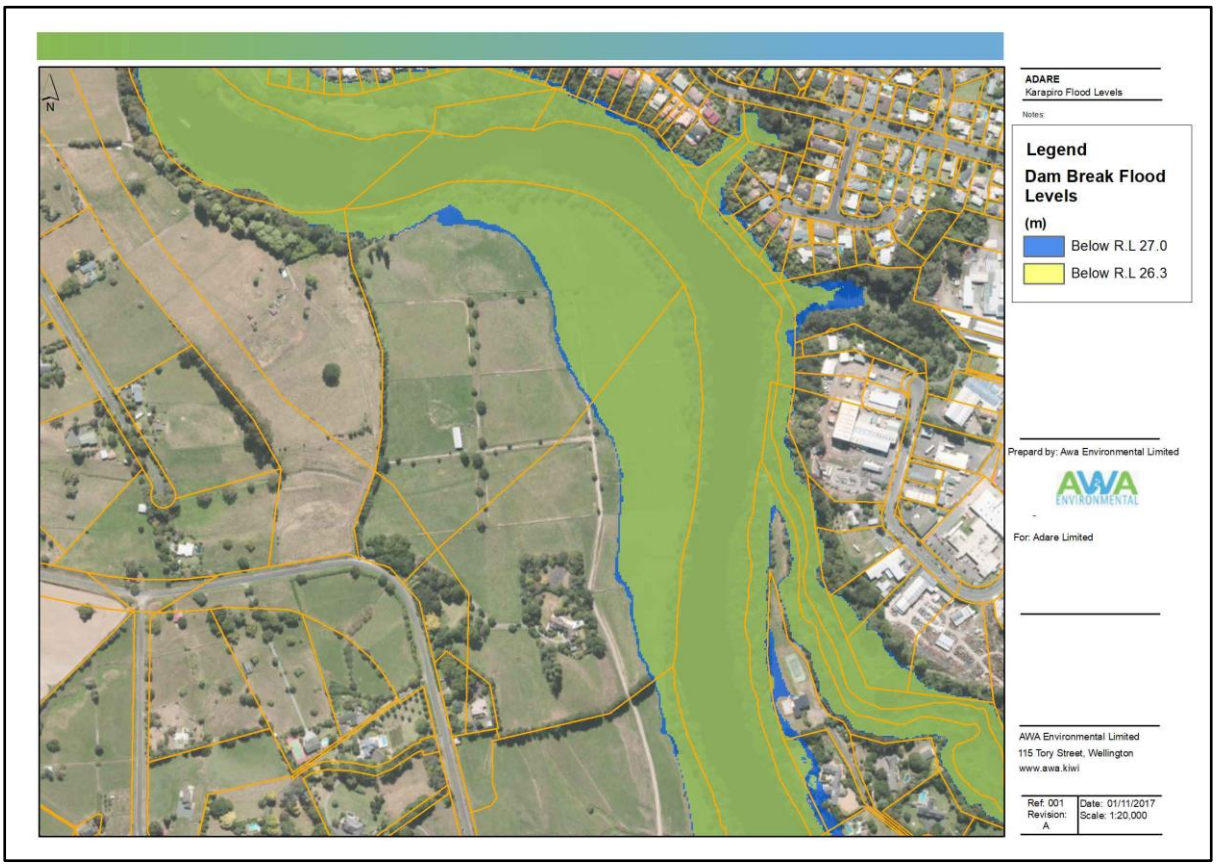


Figure 7 Dam Break Flood Levels

The dam burst flood levels through Hamilton City have been extracted from cross-sections located close to the locations shown in

Figure 8.

The levels have been extracted from a 15 metre Digital Elevation Model (DEM), NZDEM_SoS_v1-0_05_Auckland_gf, downloaded from Koordinates. As this DEM is coarser than the LiDAR derived DEM covering the Adare property the extents will not be as accurate. However, they should be sufficient to gain understanding of the downstream effect of the Dam Burst flooding through Hamilton City. See Figures 9 – 13.

The dam burst flood level extents grade down between the reading level locations.

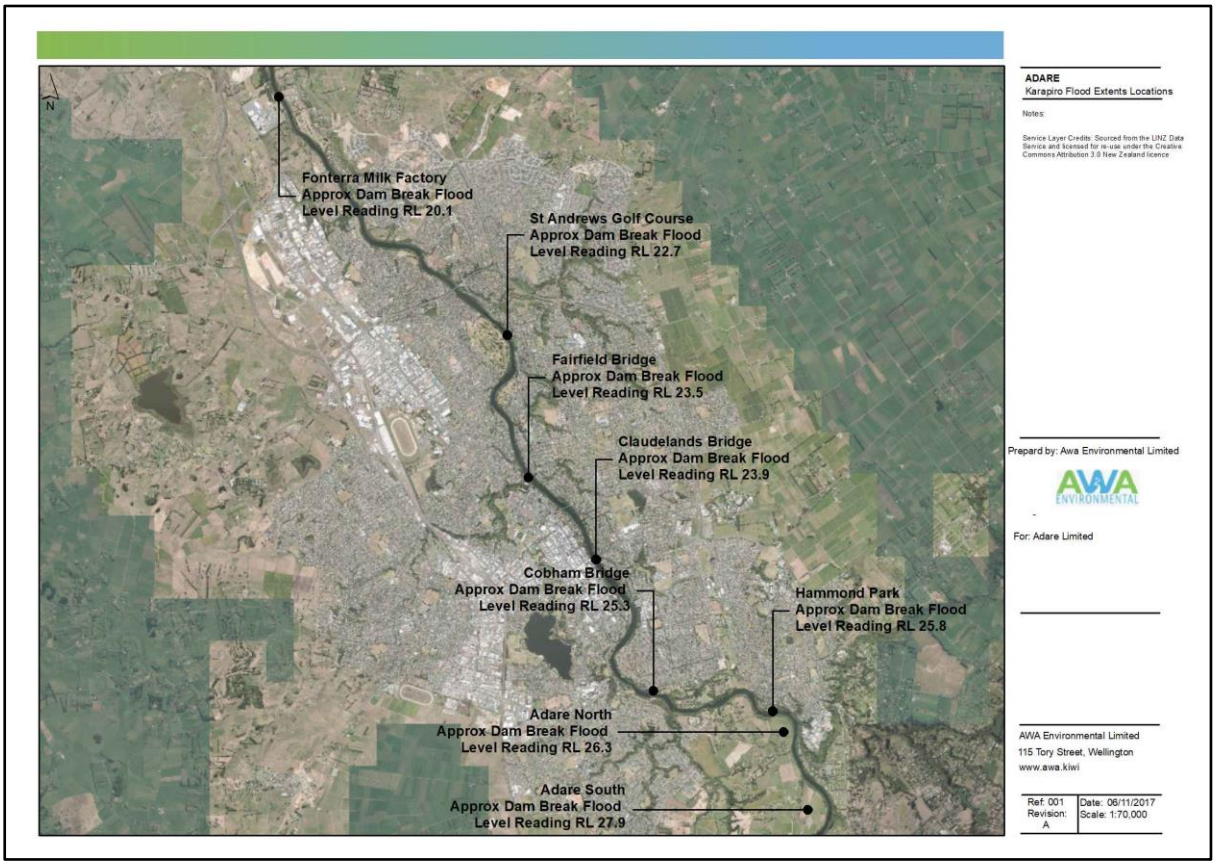


Figure 8 Dam Break RL Levels – Approximate Locations Through Hamilton City

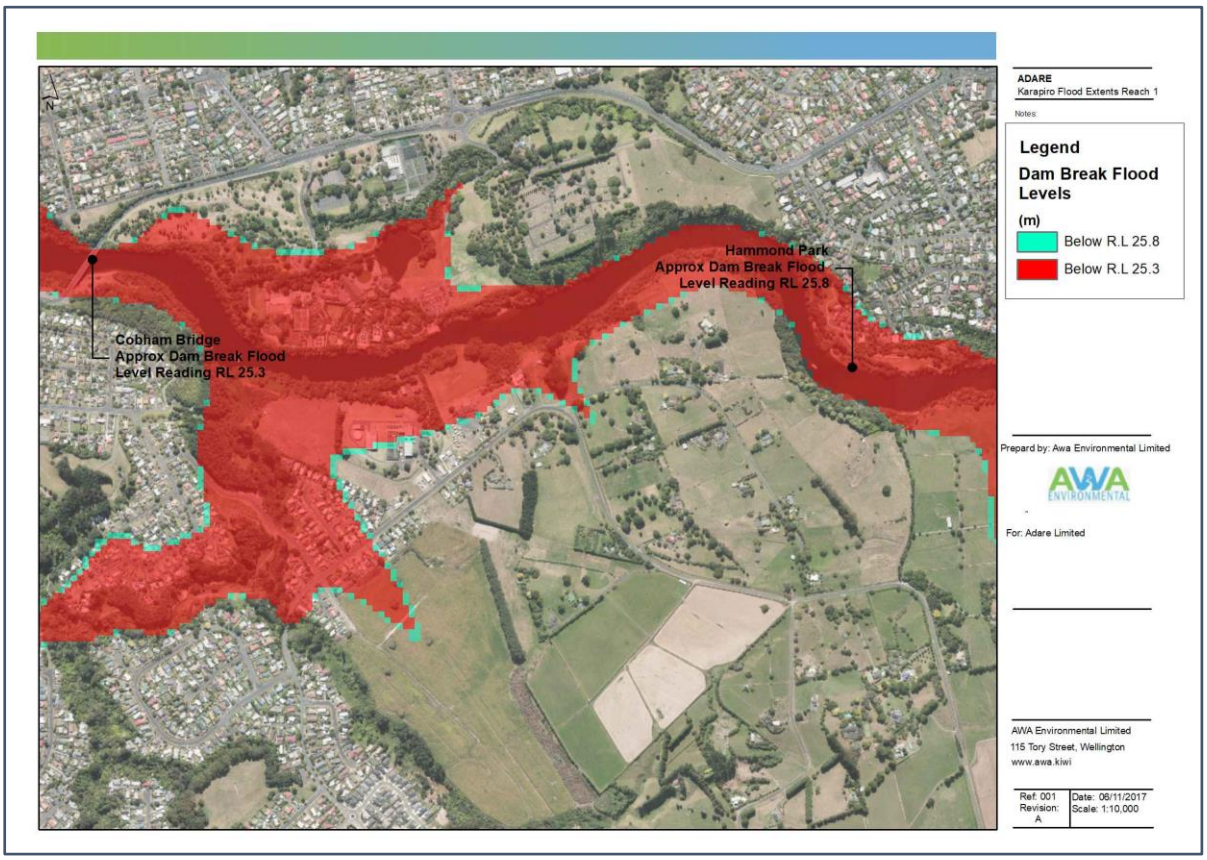
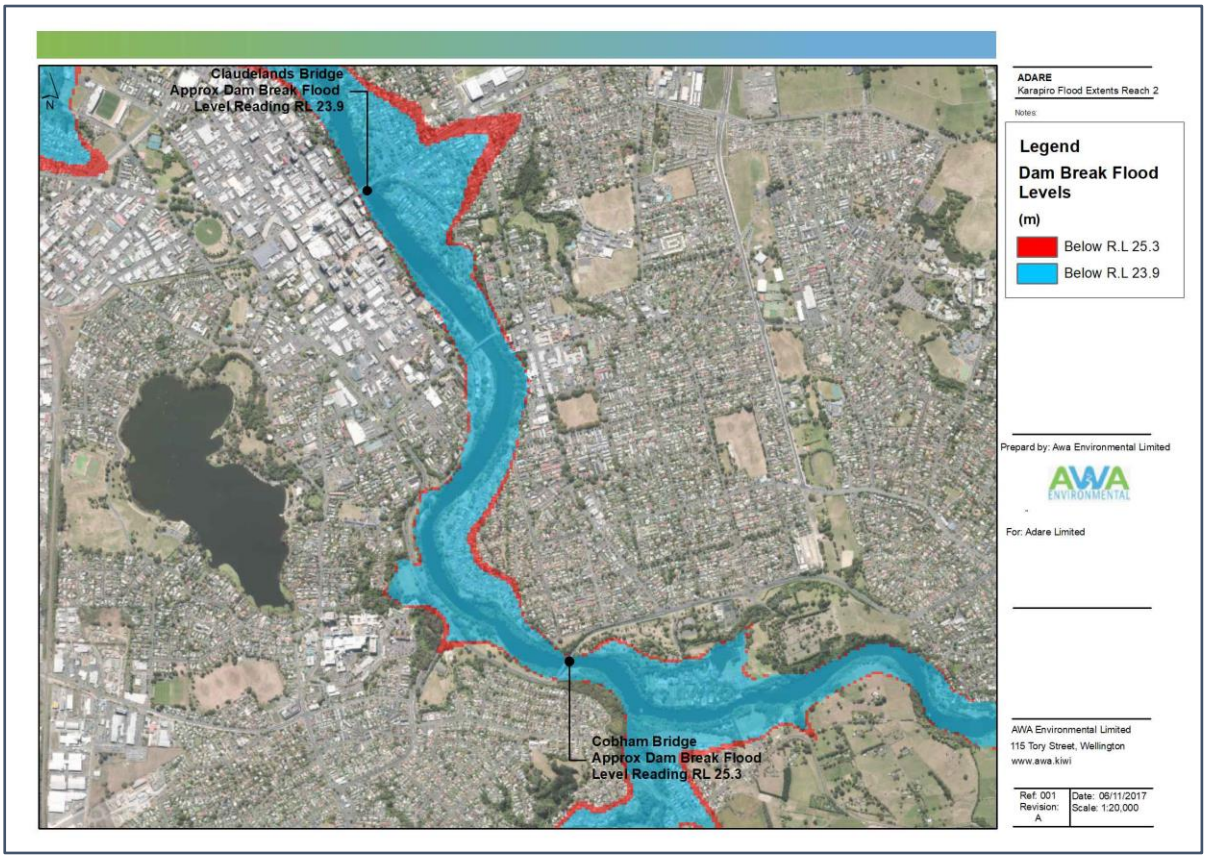


Figure 9 And Figure 10 Dam Break RL Levels – Reach 1 And 2



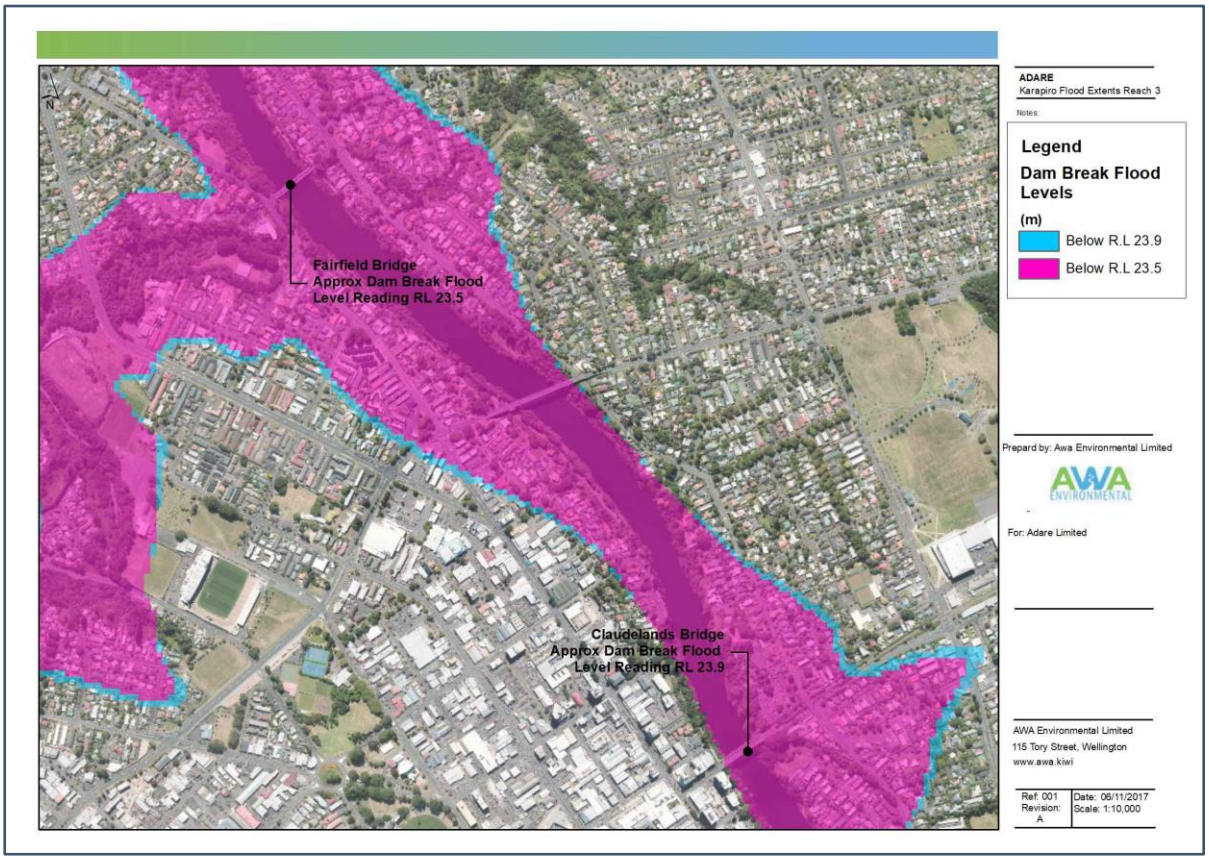
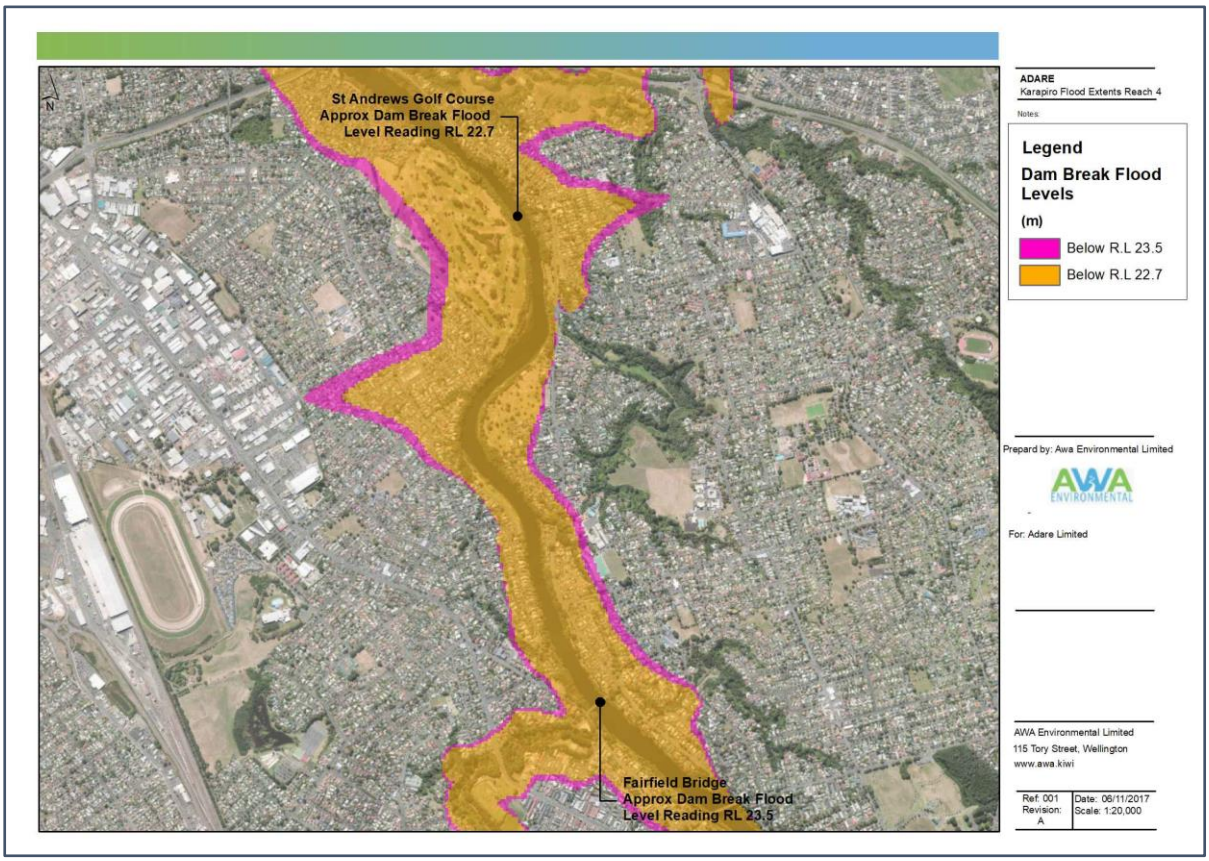


Figure 11 And Figure 12 Dam Break RL Levels – Reach 3 And 4



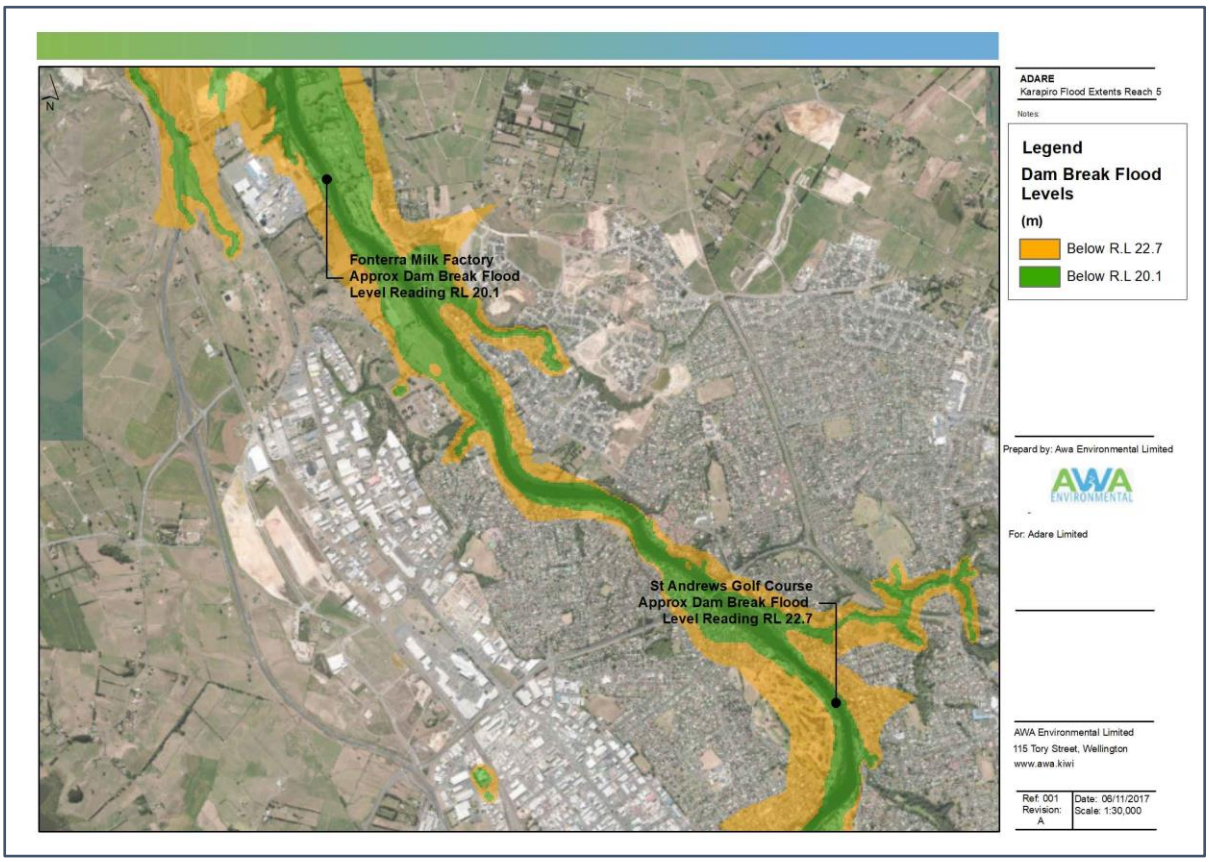


Figure 13 Dam Break RL Levels – Reach 5

5 Conclusion

In the absence of any levels associated with a climate change event AWA would recommend an allowance of 1 metre be added to the flood hazard extents and levels to represent a design level. This will result in flood extents and levels of R.L 20.1 to 19.5 as shown in Figure 4.

Waikato Regional Council have indicated that development within the dam break flood extent does not need to be avoided and the likelihood of a dam burst event is considered outside of the planning timeframes, the information is held primarily for emergency response purposes. This is in line with AWA's experience as we would consider it would be very unusual for a dam break scenario on a major dam to be the driver for setting the extent of residential development.