Rainfall event 3-5 February 2022

Report prepared by Val Wadsworth, Hydrologist 9 February 2022

The following is a summary of the rainfall event which affected northern parts of Marlborough, particularly the Rai Valley area, between the 3rd and 5th of February 2022.

MetService advice

MetService issued a watch for heavy rain on the morning of 2 February, initially for the Richmond and Bryant Ranges, this was upgraded to a warning that evening. On Thursday morning the affected area was extended to include Rai Valley, and the Nelson Lakes. Over the following days, the warning changed in timing, and amounts, as the weather system moved south, then north again across the West Coast and Buller regions. A summary of the warnings received is shown below (MetService warnings are generally issued about 10am, and 9pm each day).

Advice issued	Area	Period	Forecast
Wed 2nd am	Richmond/Bryant Ranges	6pm Wed – 11pm Fri	Heavy Rain Watch
Wed 2nd pm	Richmond/Bryant Ranges	11pm Wed – 3am Sat	200-300 mm
Thu 3rd am	Rai Valley/Richmond/Bryant/Nelson Lakes	10am Thu – 3am Sat	200-350 mm
Thu 3rd pm	Rai Valley/Richmond/Bryant/Nelson Lakes	8pm Thu – 3am Sat	170-280 mm
Fri 4th am	Rai Valley/Richmond/Bryant/Nelson Lakes	1pm Fri – 11am Sat	Further 150-230 mm
Fri 4th pm	Rai Valley/Richmond/Bryant/Nelson Lakes	9pm Fri – 9am Sat	Further 80-110 mm

In addition to these warnings, a watch was issued for the Marlborough Sounds on Thursday morning, which was upgraded to a warning on Friday morning (MetService differentiate between the Sounds, and the Rai Valley area). The forecast 100-130 mm for the Sounds did eventuate, with 147 mm recorded at Kenepuru Head.

The magnitude of the rainfall predictions across potentially the whole length Richmond Range raised concerns of a major Wairau River flood, and pre flood checks and procedures were initiated. Although the total forecast rainfall quantities had been reduced by Friday morning, it has to be pointed out that this was for a shorter 22 hour period and was in addition to the rain which had already fallen. If this rainfall eventuated, it would still have been sufficient to produce a major Wairau River flood of possibly 3,000 to 4,000 m3/s. These predicted flow figures are based on worst case scenario prediction methods developed following the July 2021 flood event.

Rainfall records

The rainfall occurred in two discrete parts, the first on the morning of the 3rd, and the second on the afternoon/evening of the 4th, the two were separated by about 18 hours of very little rainfall. This is shown in the graph at the end of this report.

The rainfall recorded at Councils Tunakino gauge was consistent with, and actually slightly higher than the MetService forecast, however there were much lesser amounts elsewhere. Anecdotal reports of damage indicate that the peak rainfall seems to have been confined to a small area north of Rai Valley. The rainfall caused slips, and road damage and closures, including the closure of SH6 to Nelson for several days.

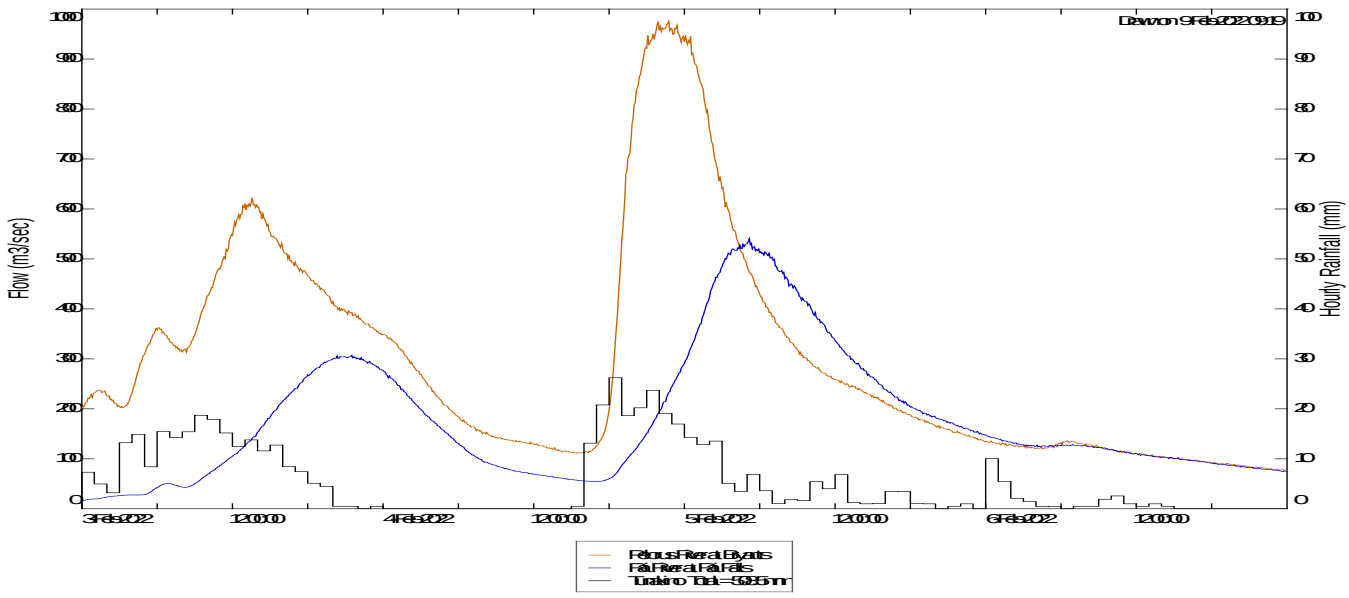
The table below shows the maximum rainfall amounts for the Tunakino gauge for various intervals, together with return periods for those figures, and figures for several other sites. While the 48- and 72-hour figures are significant, they are not exceptional. Much of the reported damage occurred in the first 24 hours of the event, and is inconsistent with the low probability shorter duration records from Tunakino, with numerous other previous events having recorded higher figures, including the July 2021 event.

It is possible that the Tunakino gauge may not have captured the peak rainfall, which from damage reports seems have been isolated to an area from Okiwi Bay to the Rai Saddle, and possibly the lower parts of the Whangamoa River. High rainfall gradients are illustrated by comparing the figures for Tunakino, Rai Valley NRFA, and Rai Falls. These sites are only separated by 7 km and 8 km respectively. A gauge at Wakapuaka in Nelson recorded just over 300mm for the event, similar to the Rai Falls rainfall. No hot spots are obvious in the affected area from rain radar images, however any localised rainfall on the northern side of the ranges here would be hidden from the radar by the topography.

Luckily rainfall on the Richmond Range was much lower than forecast, and there was only a minor flood in the Wairau.

Site	Interval	Max rain	Comments	Event total 2 Feb – 5 Feb incl.
Tunakino	72 hour 48 hour 24 hour 12 hour 6 hour 3 hour	505 mm 412 mm 246 mm 205 mm 129 mm 66 mm	ARI 65 year ARI 29 year ARI 5 year ARI 12 year ARI 8 year ARI 2.7 year	523 mm
Rai Valley NRFA	24 hour	184 mm		383 mm
Rai Falls	24 hour	126 mm	ARI 1.5 year	294 mm
Onamalutu	24 hour	66 mm	ARI 1.3 year	101 mm
Top Valley	24 hour	64 mm	ARI 1 year	150 mm

River flows

Flows in the Pelorus and Rai Rivers were not exceptional. Both rivers experienced a double peak as shown below, mirroring the rainfall pattern. The Pelorus peak flow was 964 m3/s, about a 2.5-year ARI event, and the Rai peak flow was 540 m3/s, about a 3.5 year event. These low probabilities are similar to the low return periods for rainfall at the Tunakino and Rai rainfall sites, again suggesting that it was very localised heavy rainfall which caused the damage north of Rai Valley.

The graph below shows hourly rainfall at Tunakino, and river flows in the Pelorus and Rai Rivers.