

Water Resources Update

December 2023



Report prepared by Charlotte Tomlinson, 9th of January 2024.

Data from the Marlborough District Council's Environmental Monitoring network was primarily used in preparing this report and supplemented with data from sites operated by the Marlborough Research Centre, MetService, NIWA, and FENZ.

Executive Summary

Low rainfall continued across most of Marlborough in December, with Blenheim recording 14.2 mm of rain, just 29% of the long-term December average. The north-west of the region was the only place to receive above average rainfall for the month, with Tunakino recording 345 mm, 47% higher than the December average of 234 mm. Total rainfall in Blenheim for 2023 was 462 mm, which is the 10th equal driest year recorded since 1930. The last 7 months of the year (June to December) all experienced low rainfall in Blenheim. The total rainfall in this period was 187.6 mm, which is the driest June to December period in the 94 years of rainfall record.

River flows were lower than average in December, again with the exception of the catchments to the north-west (Rai Valley area). The Flaxbourne River had a mean flow of 20 l/s in December, compared to an average of 160 l/s. Baseflow in the Flaxbourne has been in the lower quartile since late October, with water users restricted from taking water since mid-November. In the Wairau River, rain in the last days of 2023 topped up the river, with flows declining since. The Wairau is approaching the Class C shutoff of 30 m³/s at the time of writing.

Soil moisture was low at the start of December (17.5%) declining slightly to 15.5% by the end of the month.

A slow moving high pressure system is likely to dominate New Zealand weather until mid-January, with hot and settled weather. Mid to late January may see some rainfall (possibly heavy) in the North Island and the top of the South Island, although this is dependent on the movement of the high pressure system. Rainfall patterns are likely to be more variable than during strong El Niños in the past.

As of the 7th of January, the New Zealand Drought Index (NZDI) is showing both northern and southern Marlborough as 'very dry', with values just above 1.0. An NZDI value of 1.5 or greater indicates climatic drought conditions.

Looking ahead, the NIWA/MPI drought forecast shows very dry conditions (but not drought) are likely to continue in the 35 days (from January 7th to February 10th) in the southern Wairau Valley, lower plains, and parts of the Awatere Valley. This map is updated daily and can be found at <https://shiny.niwa.co.nz/drought-forecast/>.

Rainfall

December saw the lower-than-average rainfall we have been experiencing for several months continue in most parts of the region. A full list of monthly rainfall totals for the 2023/24 hydrological year at all sites can be seen in Table 1.

In Blenheim, 14.2 mm of rain was recorded, which is 29% of the long-term December average of 48.4 mm. This low rainfall contributed to a larger than average moisture deficit at the Marlborough Research Centre of -136.2 mm (the average for December is -91.0 mm). Monthly rainfall and evapotranspiration from July 2023 onwards can be seen in Figure 1 below, compared to the monthly average.

Weather systems originating from the north Tasman Sea brought rain to northern and western parts of the country in December, including north-western Marlborough where rainfall was higher than average. This included the Pelorus, Wakamarina, and Rai catchments. December rainfall at Tunakino totalled 345 mm, 47% higher than the average December rainfall of 234 mm (see Figure 2).

Total rainfall in Blenheim for the 2023 calendar year was 462 mm, making it the 10th equal driest year on record (1930-2023). The driest year on record is 2015 (382 mm), while 1995 is the wettest year on record with 1,003 mm of rainfall. Interestingly, the last 7 months of 2023 (June to December) have all recorded low rainfall, totalling just 187.6 mm. This is the lowest total for the June to December period in the 94 years of record (1930 to 2023).

Blenheim Monthly Rainfall & Evapotranspiration

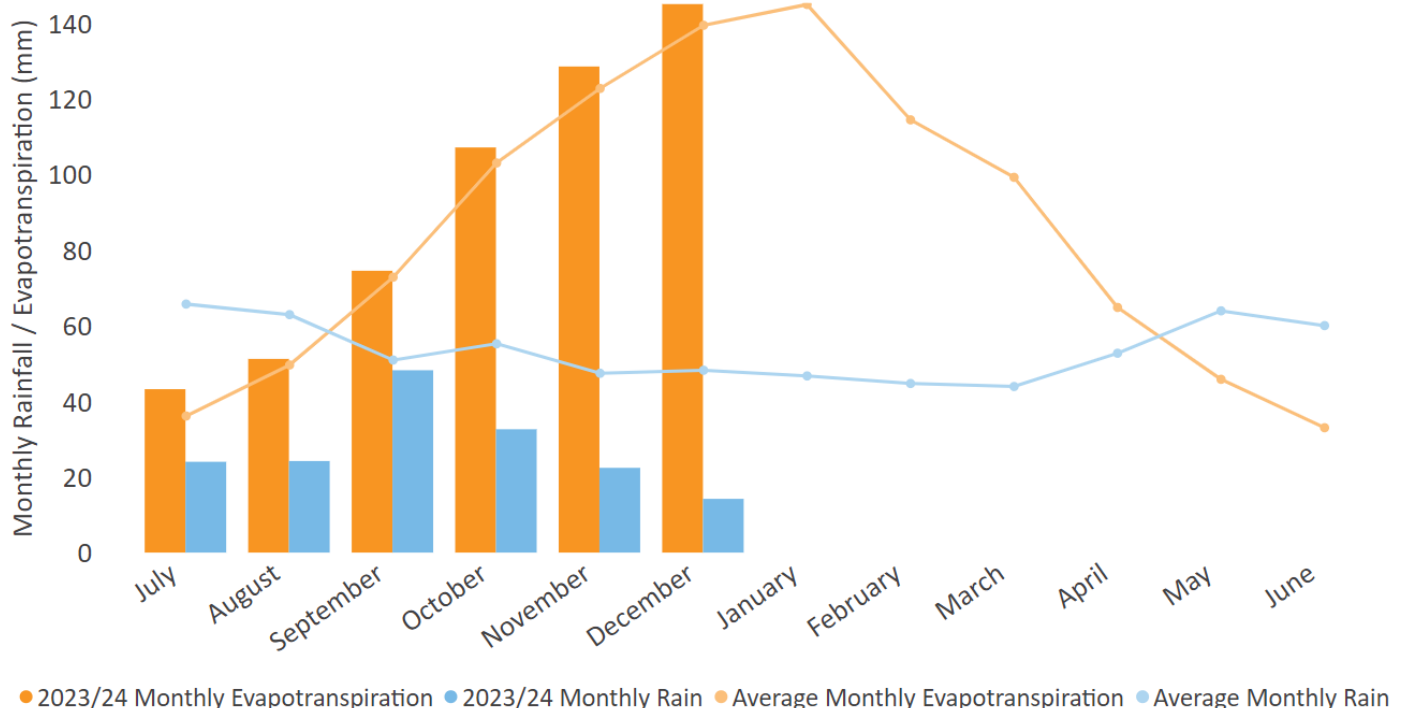


Figure 1. Monthly rainfall and evapotranspiration in Blenheim (Marlborough Research Centre) for the 2023-24 hydrological year, compared to average monthly totals.

Table 1. Monthly rainfall totals (mm) for the 2023-24 hydrological year at monitoring sites in Marlborough.

Site	July	August	September	October	November	December
Awatere at Awapiri	85	51	64	54	40	17
Awatere Glenbrae NRFA	44	18	53	48	20	24
Beneagle at Farm Stream	49		59	44	29	37
Blenheim at MDC Office	23	22	44	29	22	12
Branch at Branch Recorder	40	65	136	74	46	78
Branch at Mt Morris	34	70	193	168	94	176
Flaxbourne at Corrie Downs	104	12	56	35	16	23
Kaituna Rainfall at Higgins Bridge	41	76	116	121	45	104
Kenepuru Head NRFA	62	130	135	142	68	128
Koromiko NRFA	46	79	117	103	53	76
Lake Elterwater Climate	97	12	59	39	20	30
Lansdowne NRFA	46	64	80	45	42	18
Malings	56	101	227	239	59	129
Mid Awatere Valley NRFA	39	38	50	37	28	21
Molesworth NRFA	41	38	72	62	35	15
Omaka at Ramshead Saddle	44	55	68	47	56	52
Onamalutu at Bartletts Creek Saddle	64	147	165	98	55	84
Onamalutu at Hilltop Road NRFA	48	96	175	119	53	126
Picton Climate at Waitohi Domain	46	65	86	82	44	61
Pudding Hill NRFA	54	39	77	81	47	16
Rai at Rai Falls	44	119	234	183	102	273
Rai Valley NRFA	50	128	180	163	101	312
Rarangi at Driving Range	31	52	63	71	24	18
Red Hills	36	49	161	113	79	90
St Arnaud NRFA	57	70	120	125	97	146
Taylor at Taylor Pass Landfill	40	27	47	39	22	13
Taylor at Tinpot	85	48	99	52	46	49
Te Rapa	174	19	84	48	47	46
Top Valley at Staircase Ridge	43	77	184	91	106	111
Tor Darroch NRFA	47	61	114	100	89	71
Tunakino	72	159	169	142	103	345
Upper Clarence NRFA	106	31	50	37	49	10
Waihopai at Craiglochart	26	55	60	38	56	13
Waihopai at Spray Confluence	38	65	101	58	75	35
Waikakaho	49	59	73	71	36	32
Waikawa at Boons Valley	61	69	124	109	82	
Wairau Valley at Southwold	51	75	80	42	37	24
Wakamarina at Twin Falls	44	104	176	198	95	205
Ward NRFA	136	18	55	41	26	31
Wye at Charlies Rest	35	68	103	75	63	53



Figure 2. Monthly rainfall totals for the 2023-24 hydrological year from 6 key sites around Marlborough, compared to average monthly rainfall totals. Note the adjusted scale for the Tunakino and Top Valley sites.

River Flows

River flows were below average across Marlborough in December, with the exception of the north-west of the region where high rainfall sustained higher than average river flow throughout the month. The Rai River had a mean flow of 16 m³/s compared to a December average of about 11 m³/s. A summary of river flows for December 2023 can be seen below in Table 2.

Table 2. A summary of river flows in Marlborough for December 2023.

Site Name	December Mean Flow (m ³ /s)	December Long-Term Mean Flow (m ³ /s)	% of long-term mean	Flow Record Begins	Catchment Area (km ²)
▲					
Rai River at Rai Falls	15.99	10.94	146	1979	211
Pelorus River at Bryants	15.62	19.49	80	1977	375
Kaituna River at Higgins Bridge	1.82	3.30	55	1989	135
Branch River at Weir Intake	14.54	23.35	62	1958	551
Goulter River at Horseshoe Bend	3.58	7.61	47	2010	154
Waihopai River at Craiglochart	6.99	11.94	59	1960	745
Ohinemahuta River at Domain	0.39	0.77	50	2013	33
Are Are Creek at Kaituna Tuamarina Track	0.17	0.49	35	2007	32
Tuamarina River at Para Road	0.37	1.06	35	2004	100
Wairau River at Tuamarina	39.76	89.63	44	1960	3430
Omaka River at Gorge	0.39	0.76	51	1993	91
Taylor River at Borough Weir	0.06	0.31	18	1961	65
Flaxbourne River at Corrie Downs	0.02	0.16	11	2003	71
Awatere River at Awapiri	6.14	13.03	47	1977	983

The Flaxbourne River had a mean flow of 20 l/s in December, compared to about 160 l/s in an average December. Class A water takes cease below 25 l/s (0.025 m³/s) in the Flaxbourne River, and water users have been restricted from taking water since mid-November. Figure 3 shows the baseflow for the Flaxbourne River, which in the absence of any significant rainfall has been in the lower quartile from late October to present.

The Awatere River at Awapiri had a mean flow of 6.14 m³/s in December, which is 47% of the December long-term mean flow. A wetter catchment through winter saw baseflows above average until the beginning of October, when they started to decline (see Figure 4 below). Class C water restrictions are currently in place as the flow is below 5.6 m³/s.

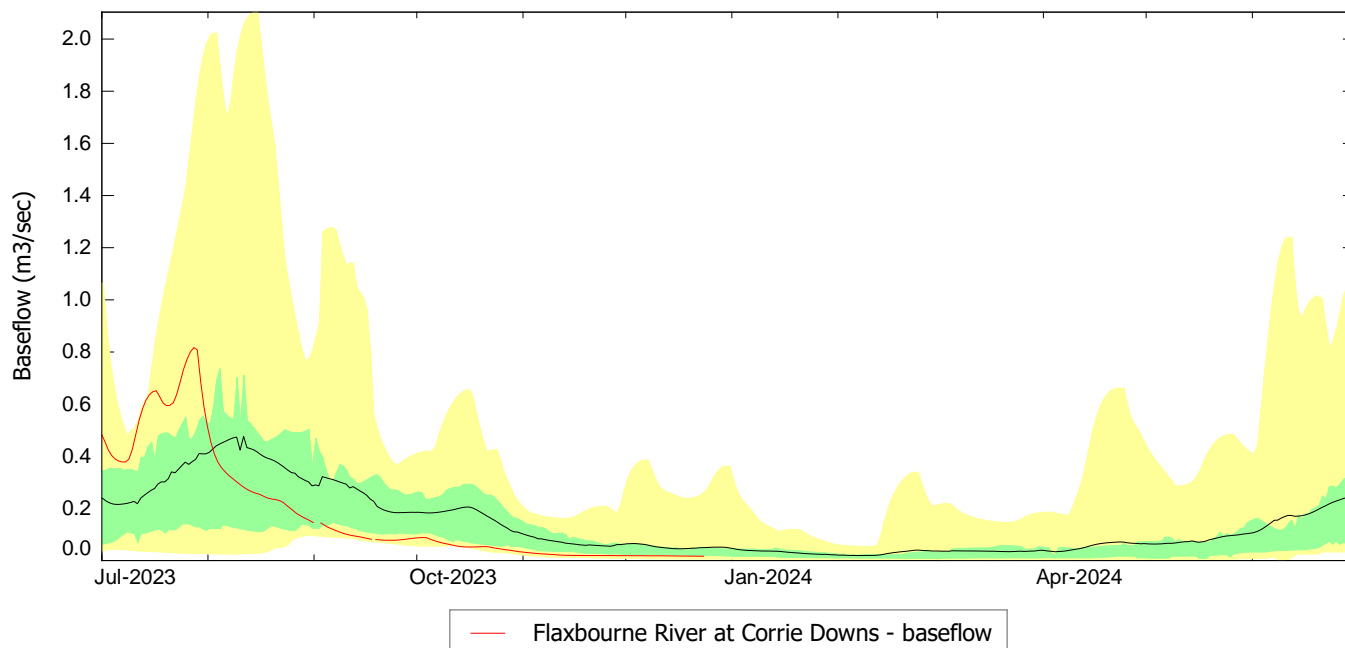


Figure 3. Flaxbourne River at Corrie Downs baseflow, from 1 July 2023 to 30 June 2024. The black line is average baseflow and the red line is the 2023 baseflow. The green section is the middle 50% of data and the yellow sections show the upper and lower quartiles.

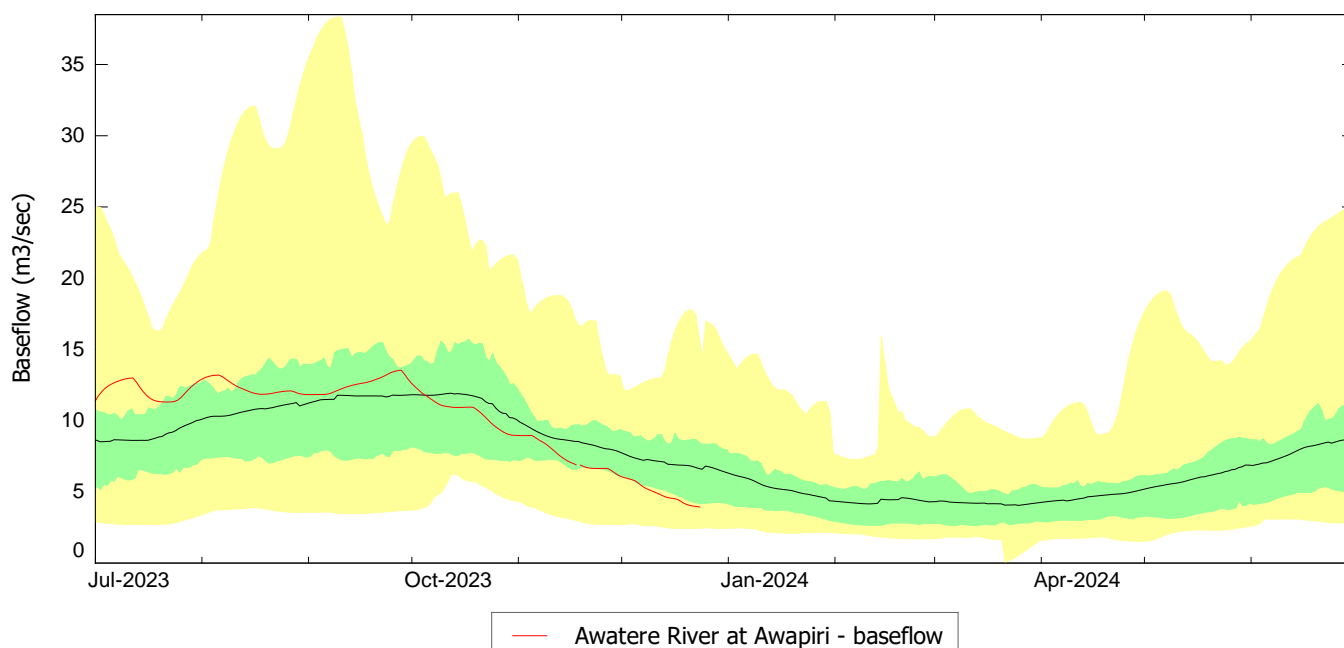


Figure 4. Awatere River at Awapiri baseflow, from 1 July 2023 to 30 June 2024. The black line is average baseflow and the red line is the 2023 baseflow. The green section is the middle 50% of data and the yellow sections show the upper and lower quartiles.

The Waihopai River at Craiglochart had mean flow of 7 m³/s in December, which is 60% of the average December flow. Baseflow has been slightly below average from early November onwards, and no water restrictions have been reached in the irrigation season so far.

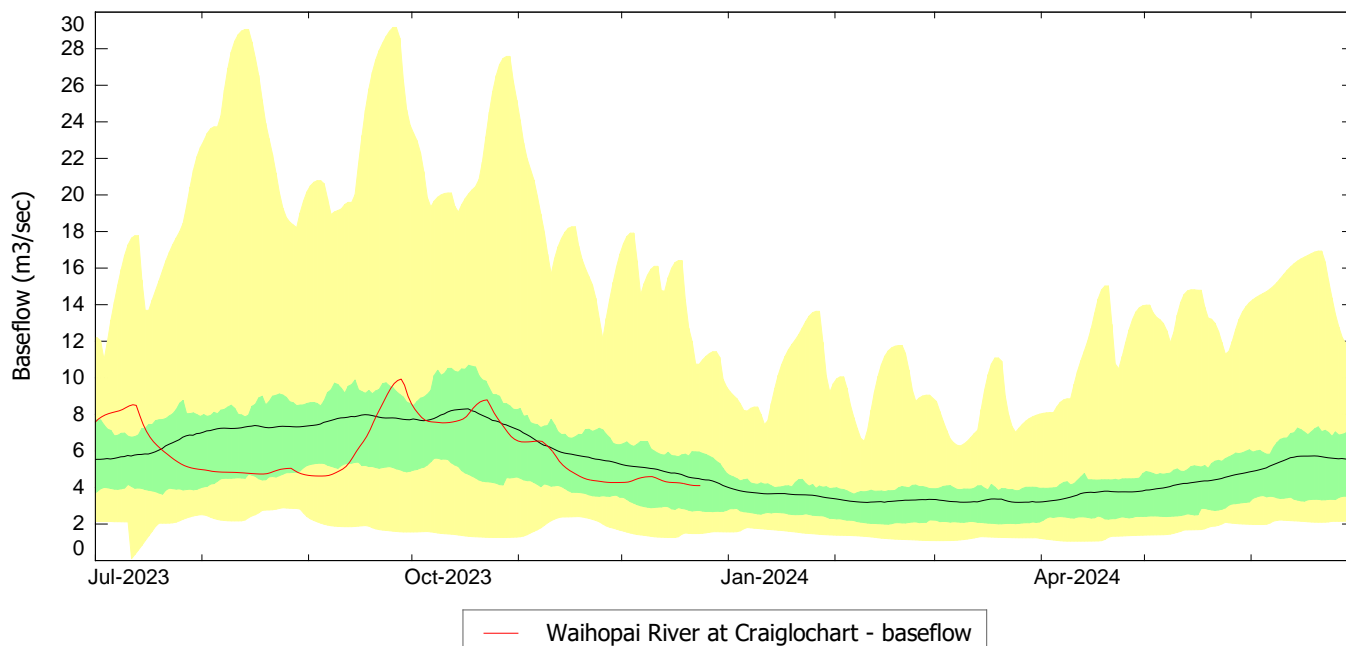


Figure 5. Waihopai River at Craiglochart baseflow, from 1 July 2023 to 30 June 2024. The black line is average baseflow and the red line is the 2023 baseflow. The green section is the middle 50% of data and the yellow sections show the upper and lower quartiles.

In the Wairau at Tuamarina, baseflow fell throughout November and then plateaued through most of December. Class C water permit holders were restricted from taking water on and off throughout December. Rain on the north bank and in the top of the catchment in the last few days of 2023 topped up the river flow. The flow has been receding in the first week of 2024, and as the flow approaches 30 m³/s again Class C restrictions are likely from about the 10th of January onwards.

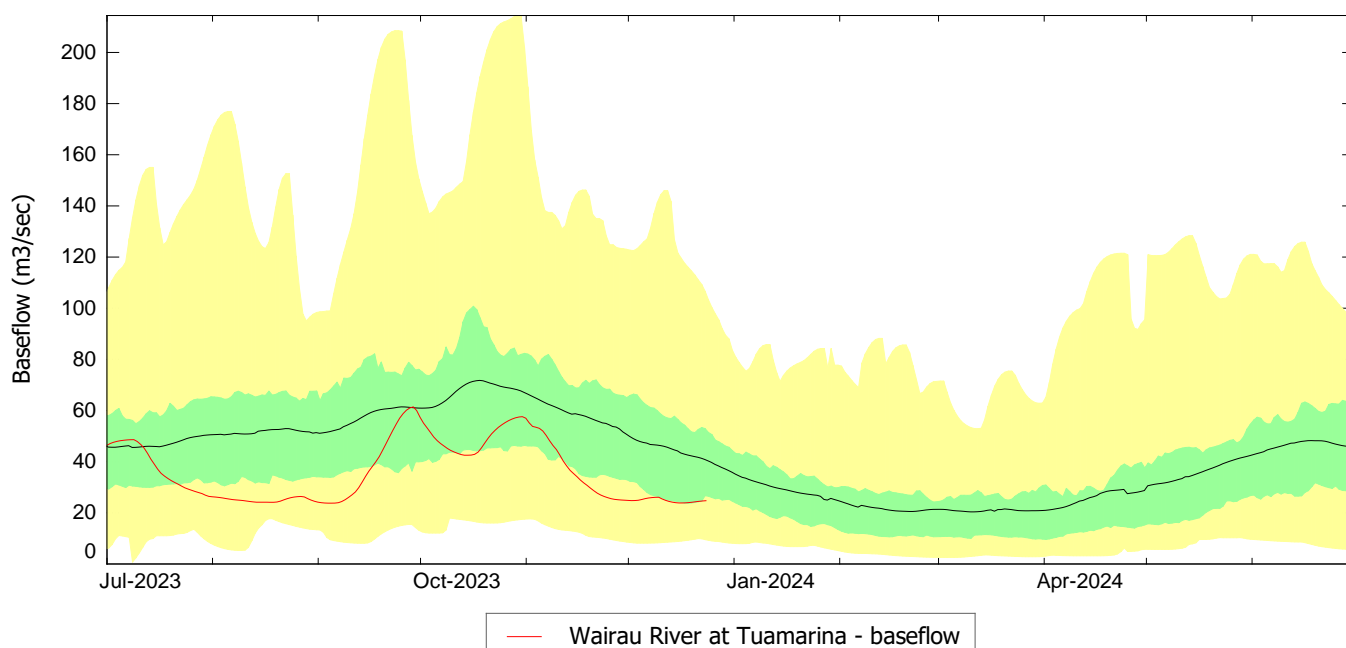


Figure 6. Wairau River at Tuamarina baseflow, from 1 July 2023 to 30 June 2024. The black line is average baseflow and the red line is the 2023 baseflow. The green section is the middle 50% of data and the yellow sections show the upper and lower quartiles.

Soil Moisture

Shallow soil moisture at the Grovetown Park weather station was 17.5% on December 1st, declining to 15.5% by the end of the month (see Figure 7 below). The average soil moisture for December 2023 was 16.5%, well below the long-term-average of 21.8%.



Figure 7. Shallow soil moisture in December 2023.

The soil moisture deficit map (Figure 8) shows most of the region’s soils are dry, with the driest soils around Blenheim and moving south-east, as is typical throughout the summer months. The soil moisture anomaly map (Figure 9) shows that soils are slightly drier than normal compared to average for this time of year.

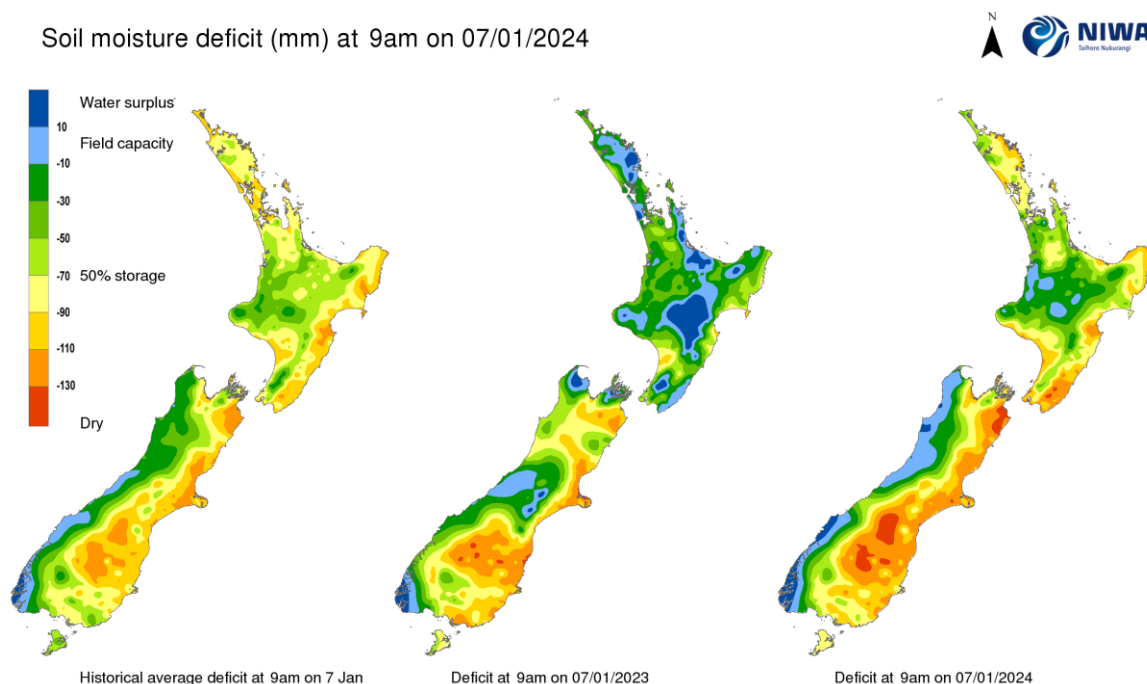


Figure 8. Soil moisture deficit maps of New Zealand, retrieved from NIWA on 07/01/2024

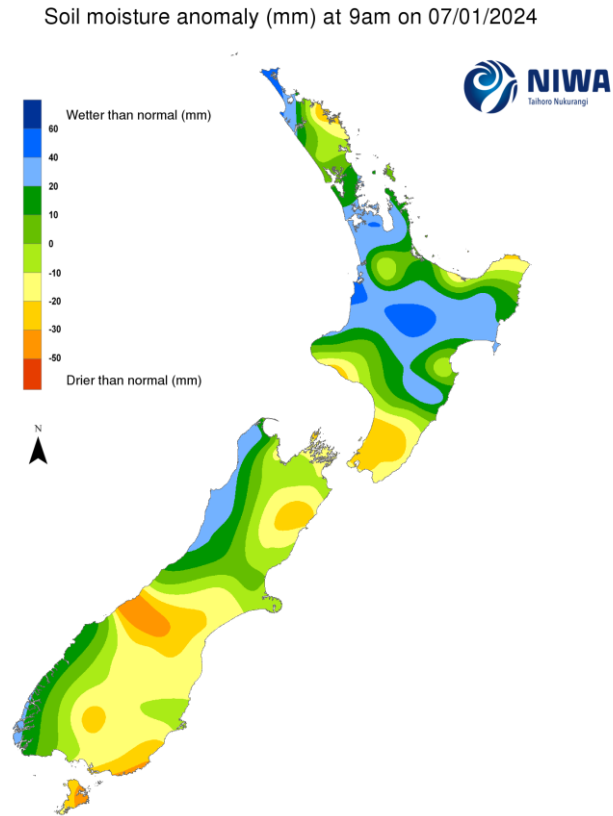


Figure 9. Soil moisture anomaly map of New Zealand, retrieved from NIWA 07/01/2024

Climate Outlook January – March 2024

El Niño is virtually certain to continue through to March, however unusually warm oceans globally mean current circulation patterns are not the same as those typically associated with El Niño. Air pressure is forecast to be above normal to the north and below normal to the south, causing more north-westerly winds than normal. Rainfall patterns are likely to be more variable than during strong El Niños in the past.

A slow moving high pressure system is likely to dominate New Zealand weather until mid-January, with hot and settled weather. Mid to late January may see some rainfall (possibly heavy) in the North Island and the top of the South Island, although this is dependent on the movement of the high pressure system.

The New Zealand Drought Index uses four common drought indicators to show how dry an area is: Standardised Precipitation Index, the Soil Moisture Deficit, the Soil Moisture Deficit Anomaly, and the Potential Evapotranspiration Deficit. For the 7th of January the NZDI values are just above 1.0, classifying both Northern and Southern Marlborough as ‘Very Dry’ (see Figure 10). An NZDI value of 1.5 or above is classified as a climatological drought.

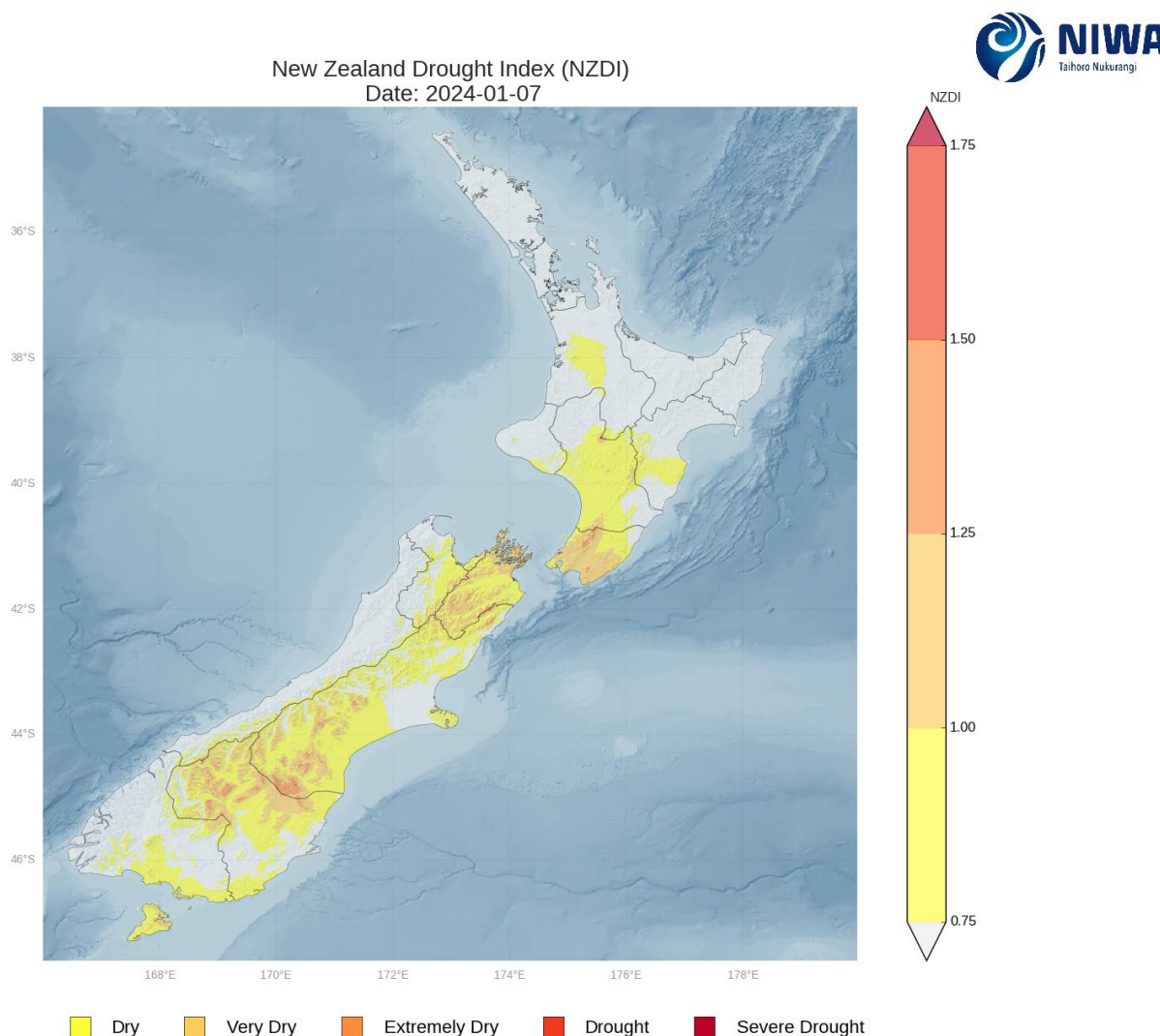


Figure 10. The New Zealand Drought Index (NZDI) for 07/01/2024.

The NIWA35 map shows that in all 3 scenarios below (Figure 11), there is no risk of drought occurring over the next 35 days. However large parts of the region could experience very dry conditions over this time period, and it is recommended to stay up to date with the latest predictions at <https://shiny.niwa.co.nz/drought-forecast>.

NIWA35
Risk of areas experiencing dryness or drought within 35 days
Model initiation: 00 UTC Sun 07/01/2024
Valid: 01 PM Sun 07/01/24 - 01 PM Sat 10/02/24 NZDT



"Dryness" refers to the categories of "Very Dry" and "Extremely Dry" in the NZDI categorisation. "Drought" refers to the categories of "Drought" and "Severe Drought" in the NZDI categorisation.

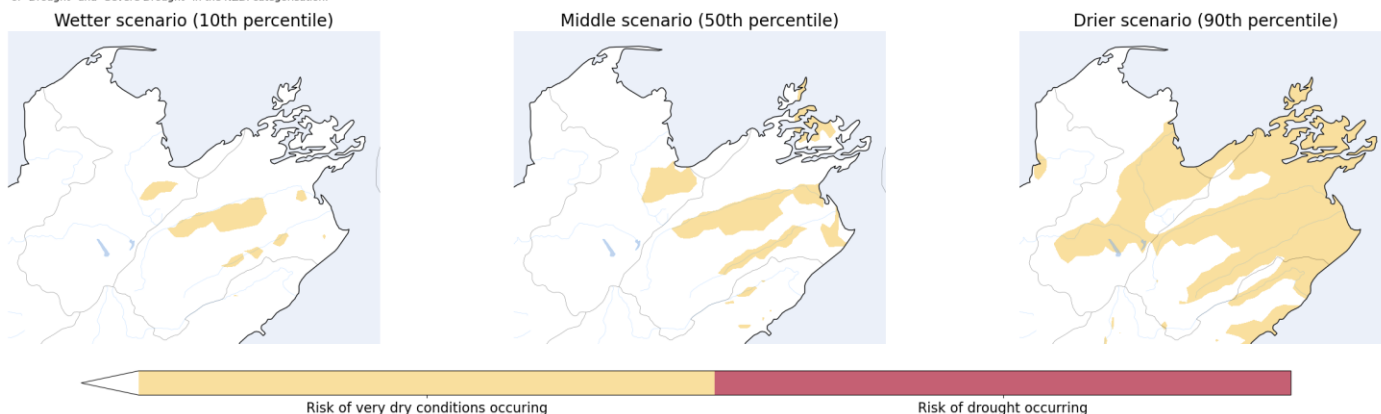


Figure 11. Marlborough/Tasman risk of areas experiencing dryness or drought within 35 days, from the 7th of January 2024 to the 10th of February 2024.

The predictions for Marlborough/Tasman from January to March are:

- Temperature – above average
- Rainfall – near or below average
- Soil Moisture – near or below average
- River Flows – near or below average