Summary report for Ruamāhanga Whaitua Committee

The climate of the Ruamāhanga catchment

The Tararua and Rimutaka ranges have a large influence on the climate of the Ruamāhanga catchment. The ranges shelter the lowland plains from the predominantly westerly weather systems, and during summer this can cause high temperatures and dry weather. When westerly frontal rainfall systems pass over the region, the Tararua Range receives high rainfall but a 'rainshadow' occurs east of the range in the Ruamāhanga valley. Similarly, the ranges influence rainfall distribution during southeasterly (often ex-tropical cyclone) rainfall events: orographic enhancement of the air masses, as they are forced up and over the Tararua Range, can result in very heavy rainfall within the Ruamāhanga valley (Thompson 1982).

Temperature

The Ruamāhanga catchment has a temperate climate grading towards a Mediterranean climate in the central valley – i.e., warm, dry summers and cold winters. Table 1 shows the monthly average highest and lowest temperatures at East Taratahi (near Masterton). Average maximum temperatures range from around 12°C in July up to around 24°C in January and February; however, during extreme conditions (such as when warm, dry 'foehn' winds blow across the Tararua Range) temperatures may exceed 30°C in the Wairarapa valley. The valley can experience sudden changes in temperature, as is common in areas east of the ranges, and daily temperature variations of up to 11°C can occur (Thompson 1982). Frosts are frequent during winter and can also occur in autumn and spring.

Table 1: Monthly average maximum and minimum temperatures on record for East Taratahi (1982-2009). Data sourced from the National Climate Database.

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
East Taratahi	Average max (°C)	23.9	24.5	21.8	18.8	16	13.4	12.2	13.4	15.6	17.5	19.1	21.6
	Average min (°C)	10.9	11.4	9.7	6.9	4.6	3.1	2.7	3.4	4.8	6.6	7.6	10.1

Compared to the rest of the Wellington region, the Wairarapa (including the Ruamāhanga catchment) generally experiences hotter summers and colder winters. The average maximum summer temperature is 5°C warmer east of the Tararua Range compared to west of the range, and the average minimum winter temperature is 6°C cooler (Tait et al. 2002).

The number of sunshine hours in the valley varies seasonally from just over 100 hours per month in June and July up to 230-245 hours per month in January (Tait et al. 2002).

Wind

While the Tararua Range provides some sheltering to the Ruamāhanga valley, strong northwesterly winds can occur – particularly on the southern plains in the vicinity of Featherston and Lake Wairarapa. Spring is usually the windiest season. While westerly winds are predominant, the effect of the topography (forcing the air down the valley) results in local variations within the catchment. In Masterton, for example, the predominant wind is from the northeast.

During light-wind, clear sky winter conditions cold air drainage into the valley can occur overnight (particularly in the upper Ruamāhanga valley around Masterton) leading to the formation of low-level temperature inversions. Such inversions can restrict the dispersal of pollutants and therefore result in poor air quality.

Rainfall

Mean annual rainfall varies significantly within the Ruamāhanga catchment as a result of topographic influences. The highest rainfall occurs in the Tararua Range, with mean annual rainfall peaking at over 6000 mm in the highest parts of the range (Figure 1). Annual rainfall decreases dramatically with distance eastwards, with the lowest mean annual totals of 700-800 mm occurring around Martinborough. Most parts of the Wairarapa plains receive, on average, around 800 to 1000 mm of rainfall per year, and are the driest part of the Wellington region.

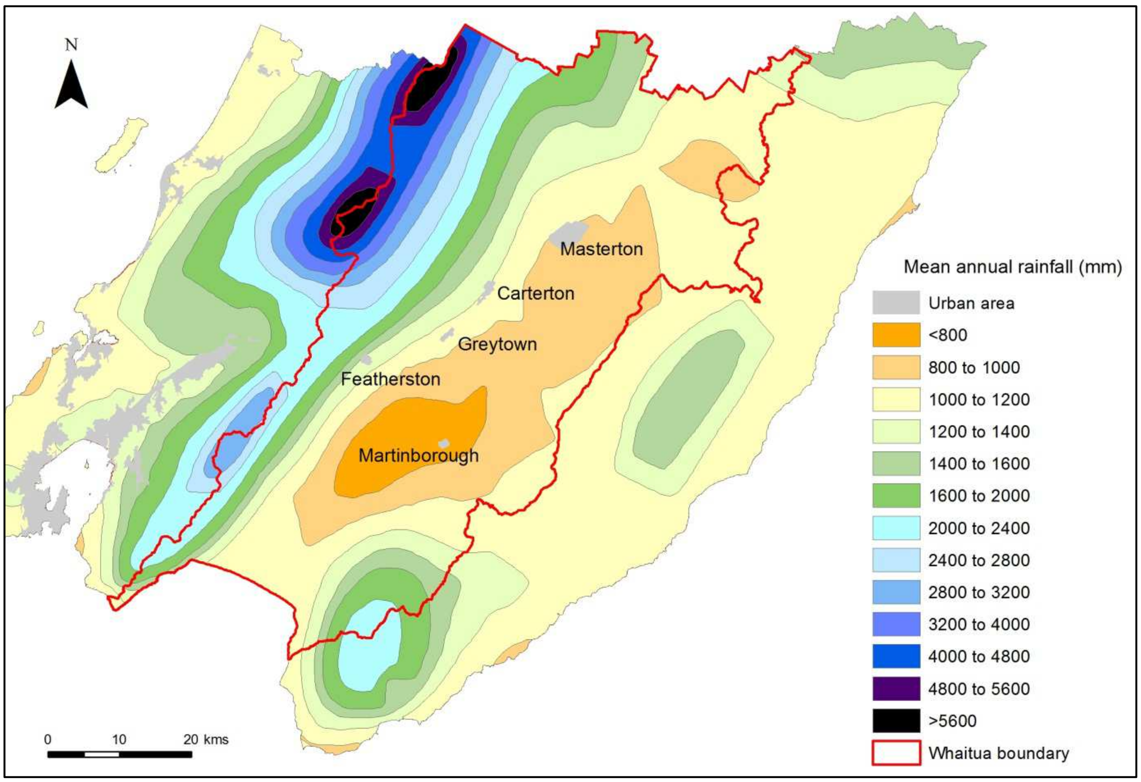

Figure 1: Mean annual rainfall in the Wellington region showing an outline of the Ruamāhanga catchment. Source: NIWA, based on 1981-2010 data

Rainfall in the Ruamāhanga catchment follows a seasonal pattern typical of temperate climates, with rainfall at its highest in winter and spring and lowest in summer (Figure 2). The wintertime maximum is a reflection of the increased frequency of depressions which cross the North Island during this period (Goulter 1984). A secondary peak in rainfall tends to occur in spring in the Tararua Range and its foothills – this reflects the westerly flows that prevail over New Zealand at that time of the year. The driest months in the Ruamāhanga catchment are usually January to March, during which period rainfall totals vary from about

150 mm in Martinborough to about 1300 mm in the tops of the Tararua Range.

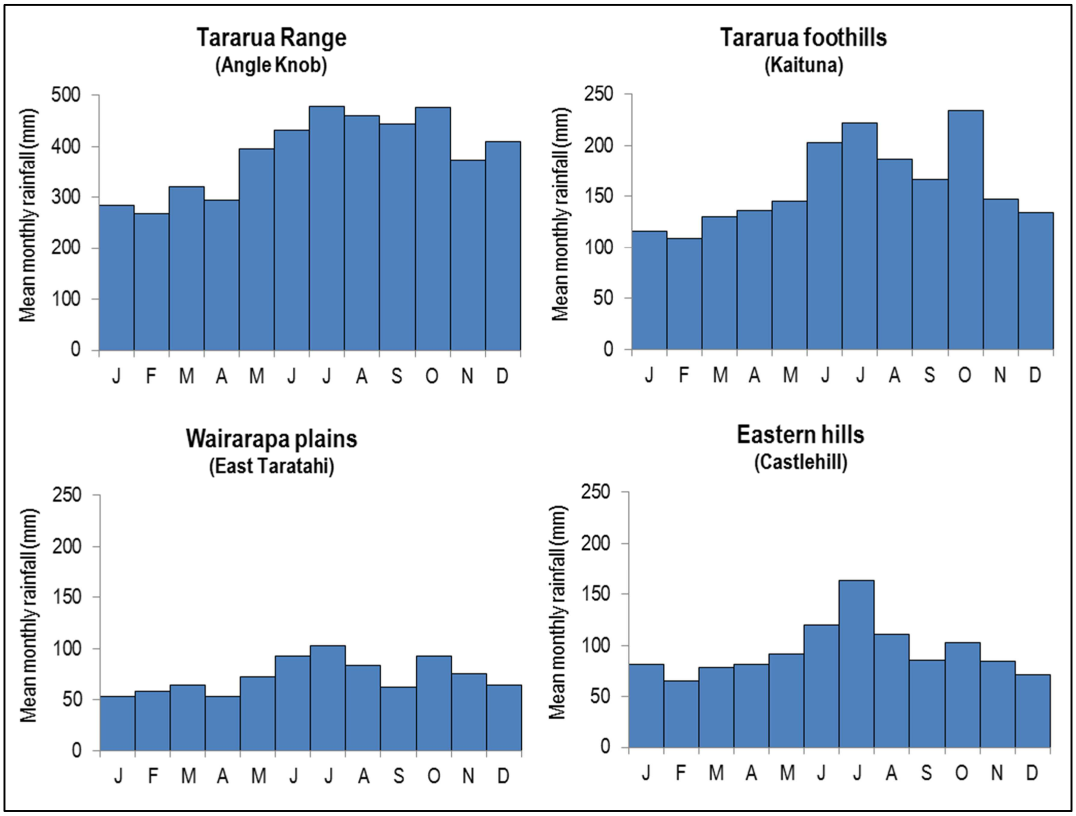

Figure 2: Mean monthly rainfall at various sites across the Ruamāhanga catchment, from the Tararua Range heading east to the eastern hills. Note the different scale on the y-axis of the Tararua Range graph. Source: Greater Wellington Hilltop database

Effects of the El Nino Southern Oscillation (ENSO)

The ENSO is a result of a cyclic warming and cooling of the surface of the central and eastern Pacific Ocean. Under normal conditions the climate of the south Pacific is influenced by northeast trade winds, cold ocean currents flowing up the coast of Chile, and upwelling of cold, deep water off the coast of Peru. At times, the influence of the cold waters wanes, resulting in a weakening of the winds in the South Pacific (El Nino). At other times, the injection of cold water becomes more intense than usual, strengthening the trade winds (La Nina).

Although both La Nina and El Nino can cause low seasonal rainfall in the Wairarapa, overall El Nino has a greater influence due to the enhancement of westerly conditions. However, during a La Nina summer, increased easterly conditions mean the Wairarapa plains can expect extended dry spells punctuated by heavy rain events due to the influence of ex-tropical cyclones. In general, if an El Nino event is present the chance of low summer rainfall in the Ruamāhanga catchment increases, and if a La Nina event is present the chance of low autumn rainfall in the Ruamāhanga catchment increases (Harkness 2000).

The frequency of El Nino and La Nina tends to be modulated by the Interdecadal Pacific Oscillation (IPO). Following a period of dominant El Nino conditions from the late-1970s to the late-1990s, which corresponds with a positive phase of the IPO, there has been a more recent tendency towards increasingly frequent and stronger La Nina episodes (Keenan et al. 2012).

Predicted impacts of climate change in the Ruamāhanga catchment

Based on 'mid-range' projections of climate change, there is likely to be little change in the mean annual rainfall of the Ruamāhanga valley. However, it is predicted that by 2090 Masterton (and presumably other locations in the Ruamāhanga valley) will receive slightly less rainfall during winter and spring, and slightly more rainfall during summer and autumn (Ministry for the Environment 2012). This may have implications for the hydrological system, e.g., aquifer recharge dynamics (Keenan et al. 2012).

Very heavy rainfall events are likely to become more frequent; over the next 50 years it is possible that the return period of heavy rainfall events will change by a factor of 2 – e.g., a 10-year return period rainstorm will become a 5-year return period storm. Despite this, the risk of drought is likely to increase, due to higher temperatures and a change in temporal rainfall distribution (Tait et al. 2002). Severe droughts (i.e., 20-year return period droughts) are predicted to occur twice as often in parts of the Wairarapa by the end of the century (Mullan et al. 2005).

More Information

Greater Wellington Regional Council monitors rainfall at 20 sites in the Ruamāhanga catchment, and climate variables (such as temperature and wind speed) in Masterton, Featherston several other sites in the catchment. The data can be viewed on the Greater Wellington website (www.gw.govt.nz) along with annual monitoring reports.

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