BEFORE THE HEARINGS PANEL

IN THE MATTER of the Resource Management Act 1991 ('the Act')

AND

IN THE MATTER of Proposed Plan Change 9 to the Hawke's Bay Regional Resource Management Plan

---

STATEMENT OF REPLY EVIDENCE OF KATHLEEN MARY KOZYNIAK FOR HAWKE'S BAY REGIONAL COUNCIL

CONTENTS

1. INTRODUCTION

1.1 My full name is Kathleen Mary Kozyniak.

1.2 I hold a Bachelors and Master of Science degree (1st Class) from the University of Waikato, majoring in Earth Sciences and Environmental Planning (1993) and a PhD (Mesoscale and Hydrometeorological Modelling for Flood Forecasting) from the University of Bristol (2001).

1.3 I am Principal Scientist - Climate and Air at Hawke's Bay Regional Council (**HBRC**) and have more than 20 years of experience in climate and air quality science. I have held my current position for 11 years. Prior to this, I held the position of Meteorologist at the New Zealand Meteorological Service (2002-2010).

1.4 During my employment at HBRC I was subcontracted to the Senior Science and Matauranga Team commissioned by the Ministry for the Environment to provide advice and critically review Our Atmosphere and Climate 2020 and Environmental indicators Te taiao Aotearoa. I was appointed by the Ministry for the Environment to the Technical Advisory Group providing advice on Our Atmosphere and Climate 2017 and appointed to peer review Our Air 2018.

1.5 I have authored or co-authored a number of technical reports which detail the current state, trends or investigative outcomes of climate, soil moisture and air quality for the Hawke's Bay Region.

1.6 I am a Class I Meteorologist certified by the World Meteorological Organisation. I am also a Certified Air Quality Professional and member of the Clean Air Society of Australia and New Zealand. I am a member of the New Zealand Hydrological Society, the Meteorological Society of New Zealand and the Hawke's Bay Branch of the Royal Society of New Zealand.

1.7 I have prepared this evidence in my capacity as an expert, and although this is not a court hearing I confirm that I have read and understand the Code of Conduct for Expert Witnesses contained in the Environment Court Practice Note dated 1 December 2014. I have complied with it when preparing my evidence, and I agree to comply with it when I give any oral evidence. Other than where I state that I am relying on the evidence of another person, my evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

2. PURPOSE AND SCOPE OF EVIDENCE

2.1 The purpose of this evidence is to present, in response to matters raised in submitter evidence, an analysis on the extent to which the ten-year period from 2010 to 2020, from which consent holder's water demand is to be determined and allocated, adequately represents the long-term record of rainfall in the Tūtaekurī, Ahuriri, Ngaruroro and Karamū (**TANK**) area, such that it captures the 5th percentile of readings (i.e. times of low rainfall) as a measure of meeting the 95th percentile of demand.

2.2 I provide narrative on matters raised by other witnesses only where I consider that what they are saying may not be correct or that it should be qualified.

2.3 For the avoidance of doubt, any failure to cross reference or specifically discuss any matter raised by other witnesses does not mean I agree with that evidence of the other witnesses.

2.4 My evidence will address matters raised in paragraph 18 of the evidence of Anthony Davoren for Heinz Watties Ltd.

2.5 My evidence addresses the following matters:

(a) Metered volumes during the ten-year period between 2010 and 2020 as the means to determine reasonable and actual use; and

(b) the representativeness of the ten-year period of high irrigation demand seasons, i.e. the 95th percentile season.

3. KEY FACTS AND ASSUMPTIONS RELIED ON

3.1 In preparing my evidence I have reviewed the following documents and evidence:

(a) Statement of Evidence of Anthony Davoren for Heinz Watties Ltd;

(b) policies and rules related to water allocation in Proposed Plan Change 9 - Tūtaekurī, Ahuriri, Ngaruroro and Karamū Catchments.

4. EXECUTIVE SUMMARY

4.1 Records from the longest serving rainfall sites in the TANK area provide context for rainfall accumulations experienced during the ten-year period from 2010 to

2020. Rainfall is a key driver of irrigation need and is used here as a proxy for demand.

4.2 Droughts in the summers of 2012-13 and 2019-20 were severe enough to be declared adverse events by the Ministry for Primary Industries. Rainfall during the irrigation seasons in one or both of those years represent periods of lowest rainfall in the ten-year period and fall within the 5th percentile of long-term records. On that basis, assessing actual and reasonable use on the 2010 to 2020 period does not appear unduly restrictive in setting water allocations to accommodate the 95th percentile of demand.

5. ASSESSMENT OF LONG-TERM RAINFALL RECORDS

5.1 In preparing my evidence, I have drawn on the following rainfall records:

(a) Napier Nelson Park daily rainfall, extending from 1870 to 2016;

(b) Napier EWS daily rainfall, extending from 2016 to May 2021; and

(c) Eskdale Hedgeley daily rainfall, extending from 1894 to March 2021.

5.2 The rainfall totals were extracted from the National Institute of Water and Atmospheric Research's (NIWA) Cliflo database using the Clifro R package. The Napier and Eskdale sites have the longest rainfall records of sites that remain open in the TANK area. Napier Nelson Park closed in 2016 but was replaced at the same site by Napier EWS. The locations of the sites are shown in Figure 1.

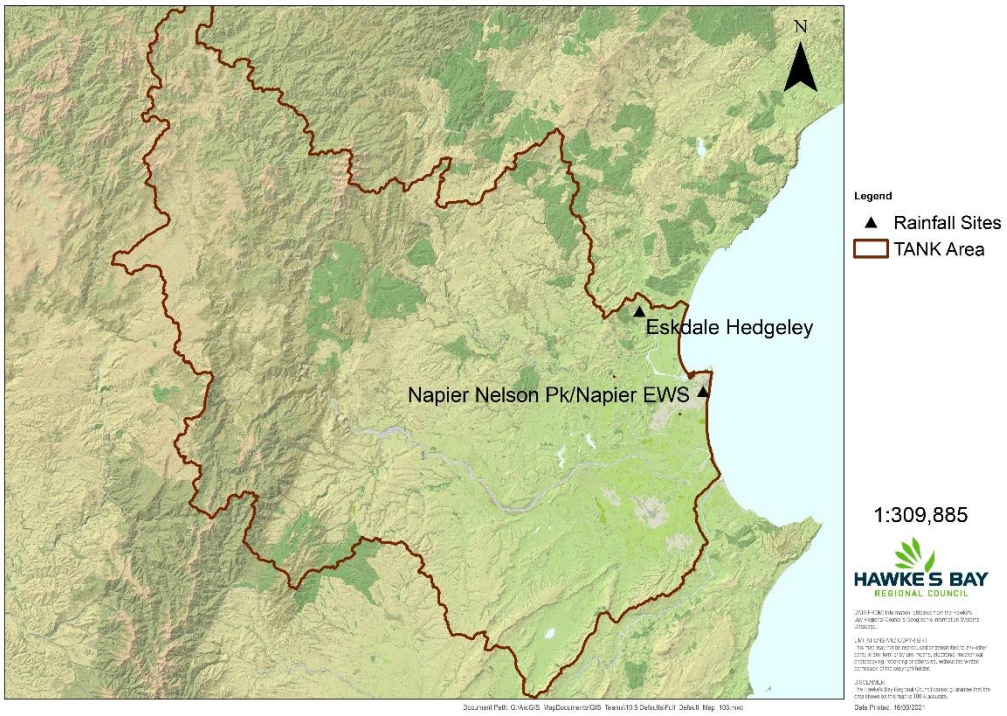

Figure 1: The locations of the Eskdale Hedgeley, Napier Nelson Park and Napier EWS rainfall sites. The TANK area is also shown.

5.3 The Napier and Eskdale sites provide long-term records of rainfall accumulations that allow rainfall totals during the 2010 to 2020 period to be placed in context. Rainfall is a key determinant of irrigation need and is used here as a gauge of likely demand.

5.4 Within the 2010 to 2020 ten-year period, two summer droughts were declared by the Ministry for Primary Industries as "adverse events". These were in 2012-13 and 2019-20. Rainfall totals over the hydrological year, i.e. July to June, of both 2012-13 and 2019-20, at both the Napier and Eskdale sites are compared to the 5th percentile in their respective records.

5.5 At Eskdale Hedgeley, the 5th percentile for the hydrological year is 652 mm, while the average is 1036 mm. The 2012-13 and 2019-20 hydrological years are the second lowest (817 mm) and lowest (763 mm) respectively within the 2010-2020 period, for years with complete rainfall records, and while both are below average, neither of the two are within the lowest 5th percentile of the long-term record (Figure 2).

5.6 At Napier, the 5th percentile for the hydrological year is 562 mm, while the average is 831 mm. The 2012-13 and 2019-20 hydrological years are the third lowest (651 mm) and lowest (565 mm) respectively within the 2010-2020 period, and

while both are below average, neither of the two are within the lowest 5th percentile (Figure 3). The 2019-20 hydrological year is however very close with a difference of only 3 mm.

5.7 Water allocations are to be expressed as an annual volume and for that reason rainfall over the hydrological year is included in this analysis for completeness. Of greater relevance though is rainfall over the hotter months. Water demand and the need for irrigation increases and shows greater year to year variation during spring to autumn. An assessment is therefore also made for the period October to April inclusive at both sites.

5.8 At Eskdale Hedgeley, the 5th percentile for the October to April period is 289 mm, while the average is 568 mm. The 2012-13 and 2019-20 October to April periods are the lowest (302 mm) and second lowest (323 mm) respectively within the 2010-2020 period of years with complete rainfall records, and while both are below average, neither of the two are within the lowest 5th percentile (Figure 4).

5.9 At Napier, the 5th percentile for the October to April period is 220 mm, while the average is 443 mm. The 2012-13 and 2019-20 hydrological years are the lowest (204 mm) and second lowest (254 mm) respectively within the 2010-2020 period of years with complete rainfall records. Both are below average, and the 2012-13 October to April period sits within the lowest 5th percentile (Figure 5).

5.10 It is noted in points 5.4 and 5.5, that rainfall in the 2019-2020 hydrological year is lower than 2012-13 at both sites. During 2019-20, October was relatively wet but rainfall during the following November to April period was very low. Therefore, the November to April period is also assessed alongside the hydrological year and the October to April periods.

5.11 At Eskdale Hedgeley, the 5th percentile for the November to April period is 238 mm, while the average is 493 mm. The 2012-13 and 2019-20 November to April periods are the second lowest (281 mm) and lowest (169 mm) respectively within the 2010-2020 period of years with complete rainfall records. Both are below average, and the 2019-20 November to April period sits within the lowest 5th percentile (Figure 6).

5.12 At Napier, the 5th percentile for the November to April period is 181 mm, while the average is 387 mm. The 2012-13 and 2019-20 hydrological years are the second lowest (176.8 mm) and lowest (138.2 mm) respectively within the 2010-2020 period of years with complete rainfall records. Both are below average and

both the 2012-13 and the 2019-20 November to April periods sit within the lowest 5th percentile (Figure 7).

6. CONCLUSION

6.1 A comparison of hydrological years and the October to April and November to April periods during the ten years between 2010 and 2020 has been made against long-term records extending over 100 years within the TANK area. The purpose was to determine if rainfall totals in the 2010 to 2020 period fall within the 5th percentile of readings (i.e. times of low rainfall) as a measure of meeting the 95th percentile of water demand.

6.2 The results show that one or both of 2012-13 and 2019-20 irrigation seasons (October to April or November to April) sit within the lowest 5th percentile at the Eskdale Hedgeley and Napier sites. Additionally, the 2019-20 hydrological year is within 3 mm of the 5th percentile of records at the Napier site.

Kathleen Mary Kozyniak
19 May 2021

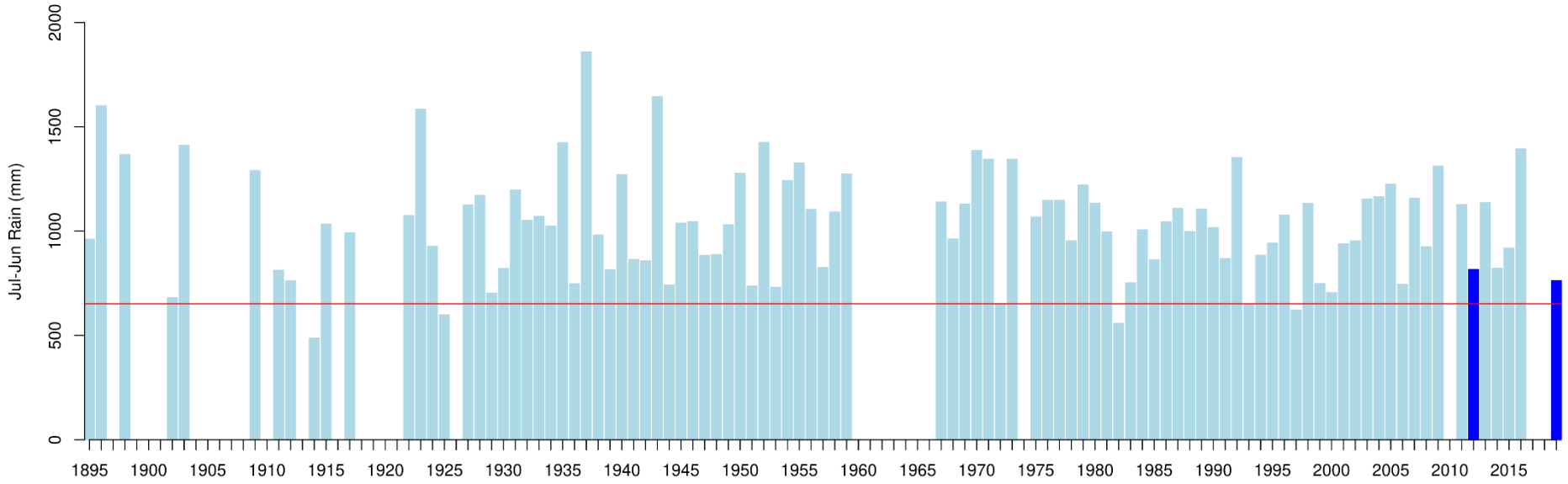

Figure 2: Time series of rainfall totals at Eskdale Hedgeley for the hydrological year (July to June) from 1894 to 2019. The 2012-13 and 2019-2020 hydrological years are highlighted in dark blue. The red horizontal line represents the 5th percentile of rainfall totals.

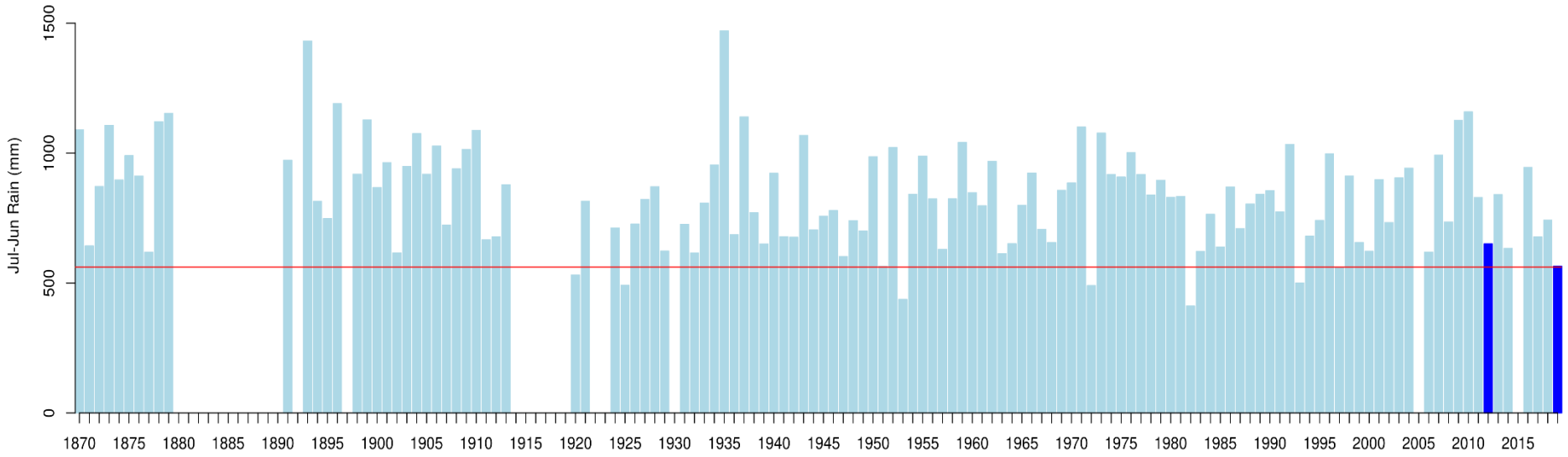

Figure 3: Time series of rainfall totals at Napier for the hydrological year (July to June) from 1870 to 2020. The 2012-13 and 2019-2020 hydrological years are highlighted in dark blue. The red horizontal line represents the 5th percentile of rainfall totals.

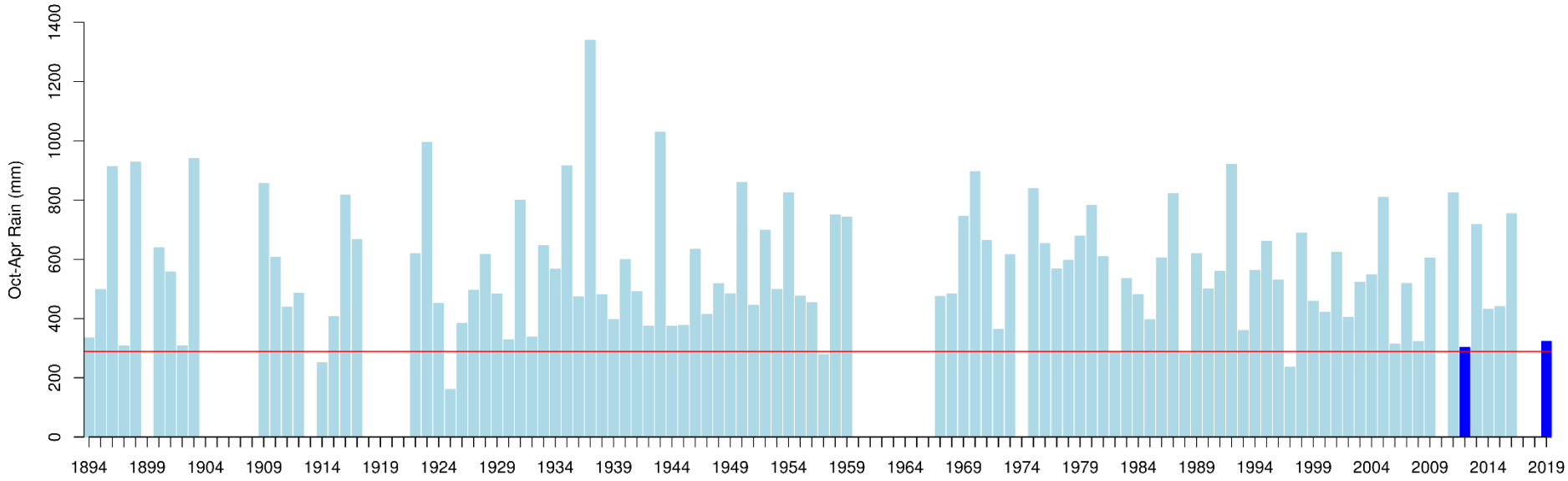

Figure 4: Time series of rainfall totals at Eskdale Hedgeley site for the months October to April inclusive from 1894 to 2019. The 2012-13 and 2019-2020 hydrological years are highlighted in dark blue. The red horizontal line represents the 5th percentile of rainfall totals.

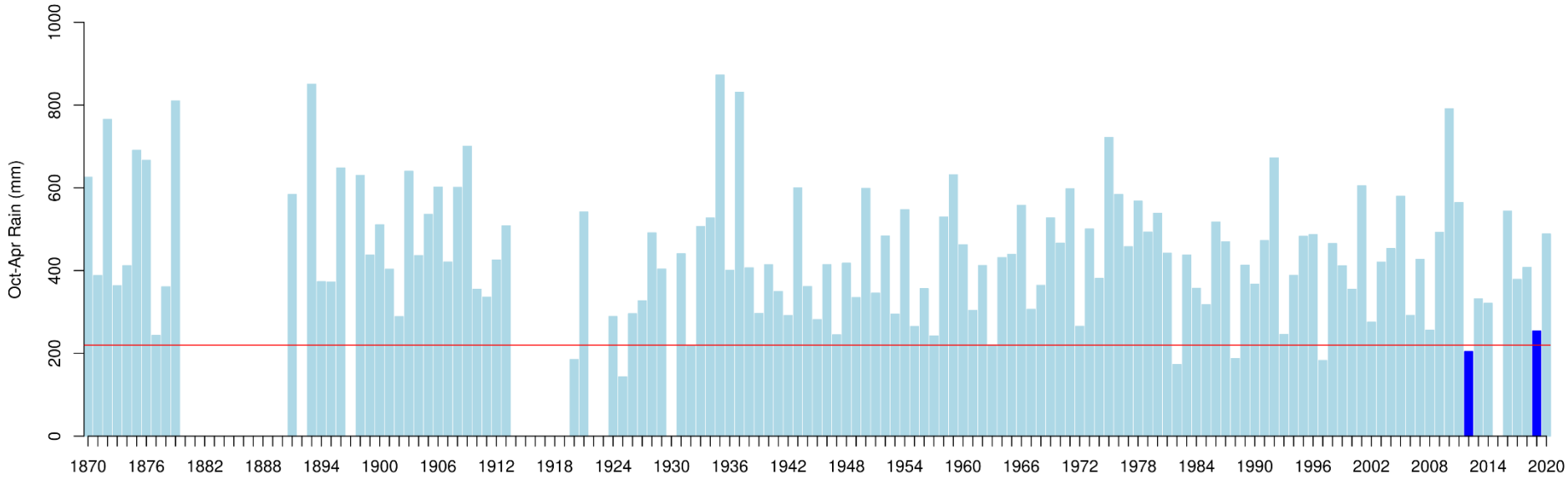

Figure 5: Time series of rainfall totals at Napier for the months October to April inclusive from 1870 to 2020. The 2012-13 and 2019-2020 hydrological years are highlighted in dark blue. The red horizontal line represents the 5th percentile of rainfall totals.

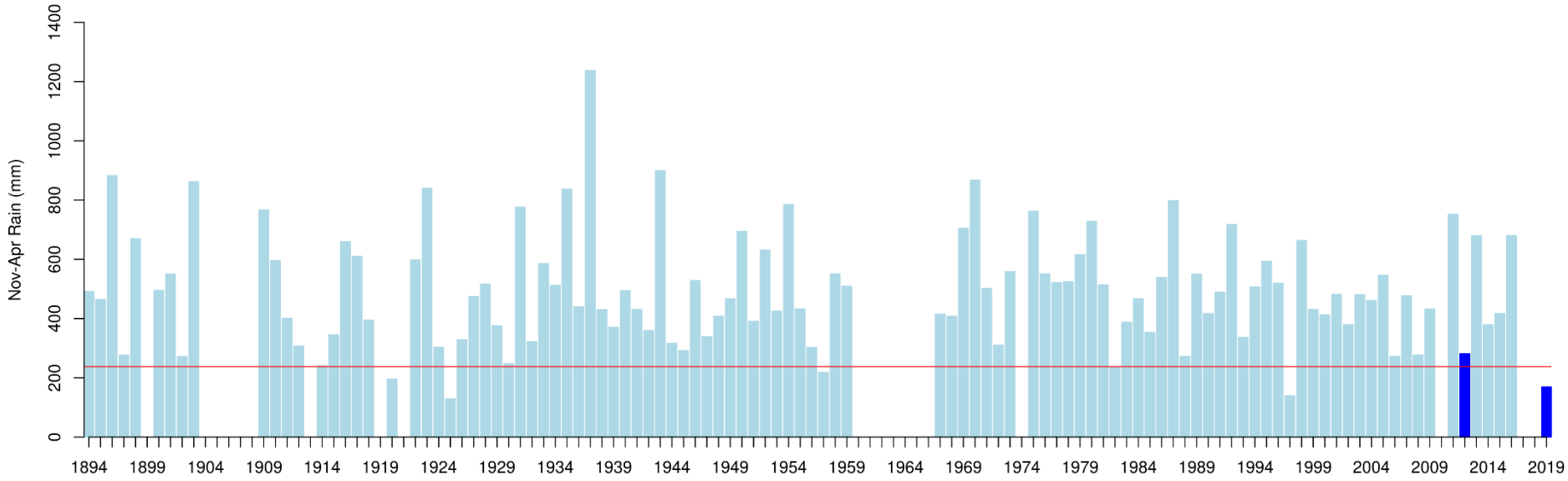

Figure 6: Time series of rainfall totals at Eskdale Hedgeley site for the months November to April inclusive from 1894 to 2019. The 2012-13 and 2019-2020 hydrological years are highlighted in dark blue. The red horizontal line represents the 5th percentile of rainfall totals.

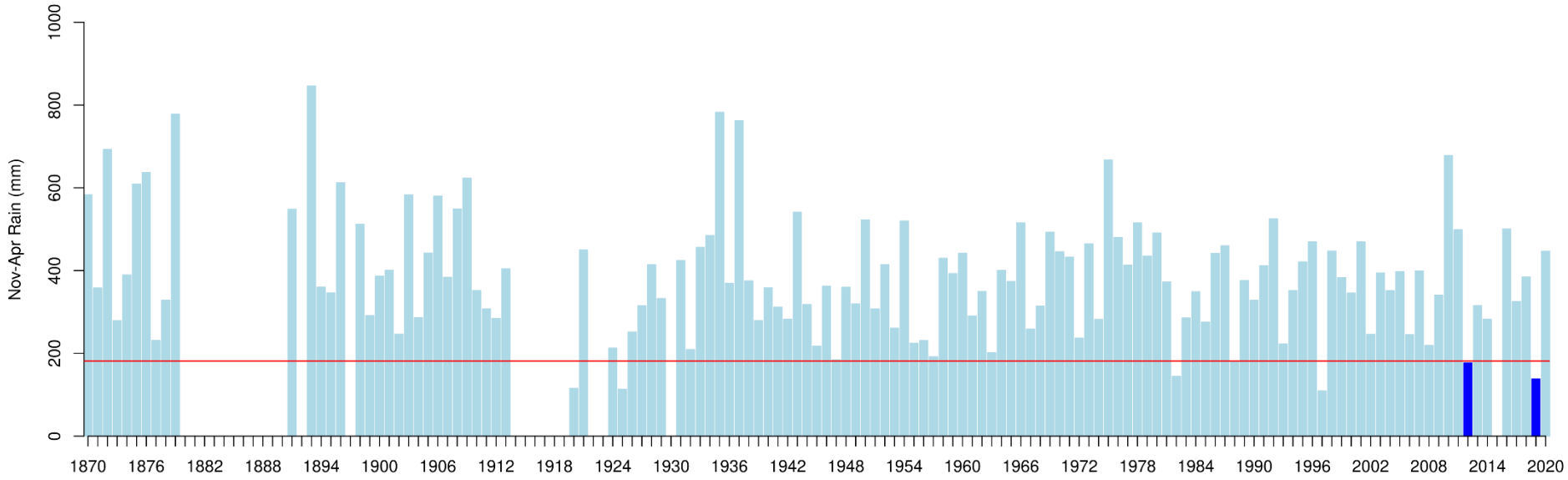

Figure 7: Time series of rainfall totals at Napier for the months November to April inclusive from 1870 to 2020. The 2012-13 and 2019-2020 hydrological years are highlighted in dark blue. The red horizontal line represents the 5th percentile of rainfall totals.