BEFORE THE INDEPENDENT COMMISSIONERS

IN THE MATTER	of the Resource Management Act 1991
AND	
IN THE MATTER	of Variation 2 (Hinds/Hekeao Plains Area) to the Canterbury Land and Water Regional Plan by the CANTERBURY REGIONAL COUNCIL

EVIDENCE IN CHIEF OF FRANK SCARF ON BEHALF OF CENTRAL SOUTH ISLAND FISH AND GAME COUNCIL
15 MAY 2015

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Qualifications and Experience

1 My full name is Frank Scarf and I reside in Timaru. I am an hydrologist and hold an New Zealand Certificate of Engineering (Civil) and a Bachelor of Science (Mathematics). I am now retired but continue to provide hydrological advice from time to time to Fish and Game (Central South Island), particularly in relation to water resources assessment, modelling and management rules.

2 Throughout my working life spanning more than 45 years, I worked in hydrology, water resources management and related fields. During the 1990s, I was employed in various senior management positions within the Canterbury Regional Council including Southern Area Manager and Group Manager (Regulations and Consents). Throughout the 1980s, I filled the position of Water Resources Manager with the South Canterbury Regional Water Board.

3 I confirm that I have read and agree to comply with the Code of Conduct for Expert Witnesses (December 2014). This evidence is within my area of expertise except where I state that I am relying on what I have been told by another person. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

4 This evidence is based on hydrological records provided by Environment Canterbury and on my personal knowledge of the Ashburton Hinds drainage area, hereafter referred to as AHD area, and its water resources from living and working in the Canterbury area for the past 27 years.

5 My evidence addresses the following:

(a) Rainfall, evapotranspiration, and water deficit in the AHD area

(b) potential water demand to service AHD

(c) water resources of the AHD area

(d) previous water resource management

Opening Remarks

6 I have narrowed my evidence and remarks to that area bounded by the Ashburton River and the Hinds River and from the coastline inland to SH1. This AHD area includes some 21000 ha of which an estimated 18000 ha is irrigable, the remainder being public roads and farm yards and tracks.

7 A similar such drainage area occurs between the Hinds River and the Rangitata River (the HRD area) and comprises about 10-15000 ha. While I understand that water allocation and reliability problems are developing similar to that which has occurred in the AHD area, I am not sufficiently well informed to comment in any detail.

8 Thus the reason for confining my evidence solely to the AHD area.

Rainfall, Evapotranspiration and Water Deficit in the AHD area

9 Average annual rainfall ranges from 650 mm at Longbeach to 750 mm in Tinwald. Rainfall is evenly distributed throughout the year. Irrigation season (Sept- Apr) rainfall totals about 500mm, and once every 10 years this may be as low as 340mm.

10 Evapotranspiration for mixed crop/ pasture averages about 850 mm annually of which about 750 mm occurs during the irrigation season Sept-Apr. Therefore irrigation season water deficit, that is the difference between seasonal evapotranspiration and seasonal rainfall, is estimated to average about 250mm and once in 10 years the deficit may be as high as 400 mm.

11 Turning to the Natural Regional Resources Plan and Schedule WQN9 (Figure WQN12.2) indicates an effective irrigation season rainfall of about 320 mm which is similar to that shown in paragraph 9.

12 Assuming a soil profile available water of 130 mm, the total seasonal demand (WQN9 Table 7) to meet plant water requirements nine years out of ten is about 860 mm.

Potential Water Demand to irrigate the AHD area

13 The water required to service a total irrigable area of 18000 ha based on 320 mm seasonal rainfall and 860 mm seasonal demand is assessed to be 97.2 million cubic metres ((860-320)x10x18000= 97200000 cubic metres).

14 At a peak demand rate of 0.4 l/s/ha this equates to 7.2 m^3/s.

Water resources of the AHD area

15 During the late 1970s, the then South Canterbury Catchment Board[1] conducted a study to assess the water resources of the drains and shallow groundwater in the AHD area, including the lower Hinds River.

16 At that time there were 132 water consent holders in the district authorised to take 2.85 m^3/s (1.72 Mm^3/wk) for irrigation of about 11000 ha of the 18000 ha contained within the district. Of this 50% was obtained from shallow groundwater wells and the remainder was obtained directly from the drains. Actual water use ranged from 10% of consented take in wet years to about 30% in dryer years. Most consent holders were using small rotorainer or gun equipment with water demand rates of 5-25 l/s.

17 The Board exercised a policy of common expiry date for defined water resource areas, for example, Ashburton River, Rangitata River, Ohapi Creek, and for the AHD area including the lower Hinds River. For the AHD area, all water take consents were scheduled to expire in June 1980.

18 Significant resource shortfalls were already occurring in Deals, Windermere, Home Paddock and Spicers drains while other drains were coping reasonably well given the comparatively low irrigation demands

[1] South Canterbury Catchment Board 1980: Ashburton Hinds Irrigation District - Preliminary water allocation 1980-85. Report prepared by F Scarf.

of the time. However, that status was not known until after completion the water resource assessment.

19 Many of the farmers' properties spanned and had access to two or more drains. The common expiry date and the resource assessment enabled the Board to reallocate the water resources within the area so all property had access to some irrigation water. All irrigable land was assigned an allocation. Total allocation (A+B) was limited to 70% of the mean flow for each drain. While it was not possible to resolve all of the shortfall demands, the process was deemed as being fair and equitable at the time.

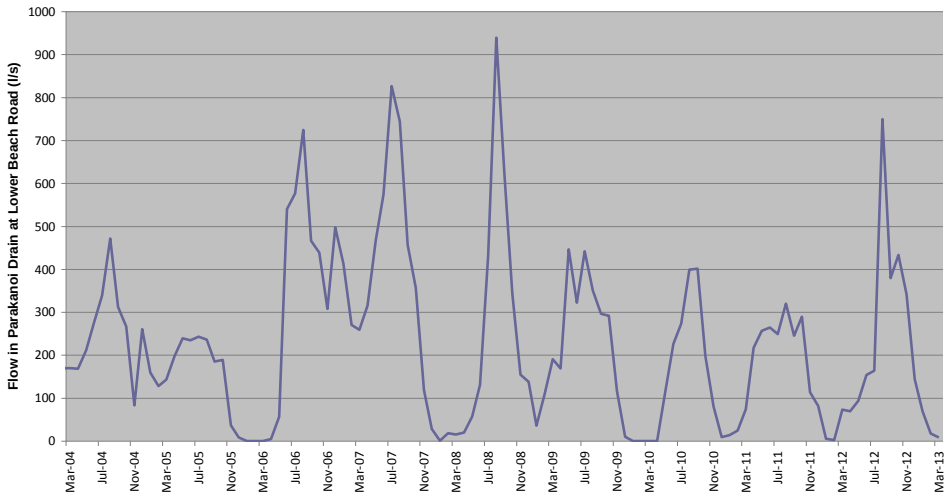
20 Table 1 summarises the water resources minimum flows and allocation limits established following the 1970-1980 water resources assessment.

21 A similar such study has been undertaken by the Regional Council in recent years. Separate flow recording sites were established on Windermere, Parakanoi, Flemington and Blees drains at Lower Beach Road. Records extend for about 2 years from Mar 2011 to Mar 2013 except for the Parakanoi where the flow record dates from Feb 2004 to Mar 2013. Flow was also recorded for the Hinds River at Poplar Road from Oct 2010 to Mar 2013.

22 Examining the Parakanoi record it is noted that flows are reduced to zero every year (Figure 1(a)), except for 2006/07 when heavy rainfall at the end of December replenished groundwater storage and reduced irrigation demand over the summer. This seasonal reduction to zero was not known to have ever occurred pre 1980 and for this reason I attribute the trend solely to increased irrigation abstraction, both direct from the drain and from surrounding hydraulically connected groundwater occurring within 20m of surface.

Figure 1(a): Parakanoi Drain- Mean monthly flow at Lower Beach Road

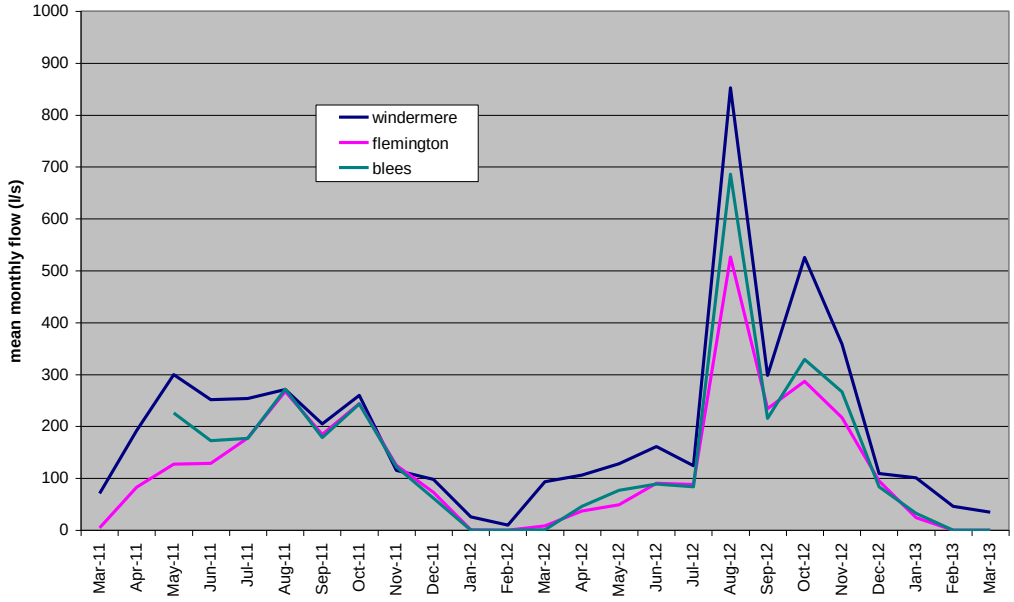
(Base data- Courtesy of Canterbury Regional Council)



23 The same pattern occurs in Windermere, Flemington and Blees drains (Figure 1(b)) as well. Like the Parakanoi, they too were not known to go dry in the summer. Streamflow gauging records indicate that pre 1980, the flow would recede to about 60% of mean annual flow which is generally typical of natural springfed streams throughout Canterbury.

Figure 1(b):Mean monthly flow at Lower Beach Road for other AHD drains

(Base data -Courtesy of Canterbury Regional Council)



24 Unfortunately the recent flow records are impacted by upstream irrigation abstraction. This is not a criticism. It is not easy to ascertain

robust low flow resource information for a downstream minimum flow site when such abstraction is occurring upstream.

25 Because upstream abstraction has skewed the natural summer low flow distribution, this in turn impacts the mean flow assessment and provides an estimate less than that which would have naturally occurred. In recognition of this, I isolated the data recorded between 1 May to 31 October for each of the four study drains. Average flow recorded during that period and their comparison with the pre-1980 mean flow assessments are shown in Table 2.

Table 2: Average flow (l/s) recorded 1 May-31 Oct

Drain	Yrs of record	Average flow 1 May-31 Oct (2011-2013)	Mean flow pre 1980
Windermere	2	300	300
Parakanoi	9	360	400
Flemington	2	200	320
Blees	2	230	230

26 From these analyses, I consider the pre 1980 assessments of mean and mean annual low flow are possibly a little high in some cases, for example, the Parakanoi and Flemington but in general they provide the better assessment of natural flow conditions, particularly mean annual low flow.

27 Before leaving this section, I note with concern the abandonment during the 1990's of the common expiry date policy exercised by the previous authority for water permits. Where previously any new applicant could expect that any consent to take and use water granted would expire with all others at the next common expiry date, not withstanding that the consent might be comparatively short term. Through abandonment of the policy we now have a staggering of expiry date, which makes introduction of changes to water allocation/management rules and

conditions on consent more difficult without creating precedent among neighbouring consent holders.

Post 2020, minimum flows and allocation limits

28 The water resources of the drains are in my opinion over allocated. The extent of the over allocation can be seen by looking at the 2004-14 allocation level shown in my Table 1 and comparing that with the proposed allocation limit, together with the mean flow and MALF data obtained from the earlier 1970-80 survey. There are some major differences between the proposed allocation limit shown in Policy 13.4.19 and that currently consented.

29 Currently consented allocation commonly exceeds the estimated mean annual flow of the drain in many cases. With such over allocation it is not surprising the Council continues to record zero flow in drains such as Windermere (allocation 3xmean flow), Parakanoi (1.5xmean flow) and Blees (1.5x mean flow) during the summer months. To be fair, Windermere is included in the Eiffelton Irrigation Scheme whereby deep groundwater is pumped into Home Paddock, Deals and Windermere drains for distribution to farmers along those drains. It appears that part of the allocation summarised in Table 13(e) includes utilisation of that deep groundwater component.

30 Turning now to the proposed variation and policy 13.4.18 which states:

> *'In the Lower HindsRiver/Hekeao Plains area and with the exception of the Lower Hinds River/Hikeao and until 30 June 2020, any water permit granted to replace an existing permit will be subject to the minimum flow and allocation limits in Table13 (e)'*

and 13.4.19 which states

> *'After 1 July 2020 a minimum flow of 50% 7DMALF and an allocation limit of 20% 7DMALF will be applied to all water permits granted to abstract surface water from the water bodies listed in Table 13(e), or to abstract groundwater with a*

direct, high or moderate stream depletion effect on those water bodies, unless there is a collaboratively developed flow and allocation regime that has been included in this Plan through a Schedule 1 RMA process.'

31 Fish and Game supports these provisions. I understand the intention is that after 2020, a collaboratively developed flow and allocation regime will effectively replace 13.4.19 and Table 13(e) and on that basis I have not extended my analysis beyond what may happen after 2020. Fish and Game supports the collaborative process with the Hinds Working Party and I am hopeful that the Party will come up with ways and means to address existing over allocation issues.

32 It will be up to the Regional Council to ensure policy, rules and methods that are timely, fair and equitable to all parties, including existing consent holders and instream environmental flow requirements. In my opinion, the fairest way to do that would be to review all relevant consents at the same time, which I understand Environment Canterbury has the discretion to do under current legislation and authority.

Frank Scarf
13 May 2015

Table 1: AHD area - Water resources,minimum flows and allocation limits (l/s)

		1970 -1980 Survey				2004-2014 Survey				Proposed 2020	
Drain/stream	**Site**	mean flow (l/s)	annual low flow (MALF)	minimum flow (l/s)	Allocation limit (A+B)	mean flow (l/s)	Annual low flow (l/s)	minimum flow (l/s)	Consented Allocation (l/s)	Min flow 50% MALF (l/s)	Consented allocation 20% MALF
Taylors	New Park Road	170	100	50	70			25	513	50	20
O'shaughnessys	Poplar Road	160	100	50	90			25	426	50	20
Deals	Poplar Road	110	70	30	100			70	347	35	14
Windermere	Lower Beach Rd	300	180	90	190	200	0	10	690	90	36
Home Paddock	Lower Beach Rd	130	80	40	120			40	333	40	16
Parakanoi	Lower Beach Rd	400	240	120	290	230	0	30	588	120	48
Dawsons	Lower Beach Rd	60	30	20	40			10	35	15	6
Spicers	Lower Beach Rd	160	100	50	110			10	184	50	20
Williams	Lower Beach Rd	70	40	20	30			10	30	20	10
Flemington	Lower Beach Rd	320	190	100	210	125	0	25	547	100	38
Blees	Lower Beach Rd	230	140	70	140	145	0	25	349	70	28
Wheatston	Andersons Rd	170	100	50	120			25	200	50	20
Laghmor	Boundary Rd	50	30	15	20			15	40	15	6
Carters	Boundary Rd	50	30	15	20			15	40	15	6
	Total	**2380**	**1430**	**720**	**1550**			**335**	**4322**	**720**	**288**
Hinds River	Poplar Road	1220	770	370	230	1265	240	700	1522	770	
Groundwater					2195						
	Total	**3600**	**2200**	**1090**	**3975**						

Notes:

Newtons	McLennons Rd	110	70
Windermere Cutoff	SH1	290	170

Notes:

Numbers in red are rough approximations

Allocation and flow data -courtesy of ECan