

3 February 2010

Ref: CO6C/18965

MEMORANDUM

FROM: MAURICE DUNCAN (HYDROLOGIST)
TO: ANGELA DEAN
SUBJECT: CENTRAL PLAINS WATER RESOURCE CONSENT APPLICATIONS "HOLIDAY RULE"

Environment Canterbury request for comments on the Holiday Rule:

My Comments on the "Holiday Rule".

1. I have been asked by Environment Canterbury to model the effect of the proposed condition I will call the "Holiday Rule" as detailed in Minute 12, para 8.11.
2. Because the unmodified flow series is a daily series it is somewhat imprecise to model a series applying the "Holiday Rule" from 9 am to 9 pm, I have only modelled the effect of applying the rule on a daily (midnight to midnight) basis.
3. My initial results were different from those provided by the applicant's consultants, but we have worked together and resolved all the large differences, but for some combinations of year, abstraction scenario (available or predicted take) and flow band there are differences of a day or three. When these are worked through to the effect of the "Holiday Rule" the differences between us are only a day for some combinations of year, abstraction scenario and flow.
4. Over all, the maximum effect of the "Holiday Rule" is during a dry year when the rule has the desired effect for 4 days per year of moving the flow from the 40-50 m³s⁻¹ band to the 50-60 m³s⁻¹ band. In addition, the rule does have the desired effect of increasing the flow in the 40-50 m³s⁻¹ band by a few cumecs on some days, but not enough to take the flow from one band to another. Over the total modelled period (1967 to 2001) there is an average of 1 to 3 days per year depending of the abstraction scenario and flow band when the flow is shifted between bands. The details are given in Table 1.
5. While there are few days when the "Holiday Rule" would cause significant flow shifts, e.g., from one band to the next higher band, the larger number (but not quantified) of increases in flow within bands would decrease the reliability of the CPW scheme.

6. The "Holiday Rule" applies to about 100 days per year. The number is not precise as it varies from year to year depending among other things, as to whether fixed holidays such as Waitangi Day fall on a weekend or not. The "Holiday Rule" has significant effects on only, at most, 4%, of those days. If the "Holiday Rule" had been applied from a 9 am to 9 pm basis the effect may have been less than modelled.
7. The formulation of the "Holiday Rule" does not appear to account for the flow travel time between the take point and SH1. I presume that most use of the river is in the lower reaches and it is ~56 km between the Waimakariri Gorge and SH1 Bridges. The estimation of travel time between these places is complex, but it is likely to be between 12 and 24 hours and is likely to be variable. Thus application of the rule as suggested, with its 9 am to 9pm time frame, may not provide the intended benefits at the intended time.
8. To allow for a 12 to 24 hour travel time from the intake at the Gorge Bridge to the SH1 Bridge and to increase the flow in the lower river from 9 am to 9 pm, water would have cease being taken from about midday on the day before the holiday to about 9 am on the last day of a holiday, e.g., if the unmodified flow was forecast to become less than $76.1 \text{ m}^3\text{s}^{-1}$ for a weekend, then on the Friday the take would have to cease at midday and could recommence at 9 am Sunday to increase river flows during the daylight hours of Saturday and Sunday.



Maurice Duncan, Senior Scientist, NIWA.

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Table 1. Days flow is in flow bands for different scenarios and the effect of the "Holiday Rule".

Scenario	Flow band	Before CPW (days/y)				After CPW (No restrictions) (d/y)								Effect of "Holiday Rule" (d/y)		
						After CPW (24 h restriction at 76.1) (d/y)										
		67-01	70/71	89/90	95/96	67-01	70/71	89/90	95/96	67-01	70/71	89/90	95/96	70/71	89/90	95/96
		Average	Dry	Typical	Wet	Average	Dry	Typical	Wet	Average	Dry	Typical	Wet	Dry	Typical	Wet
		Period	Year	Year	Year	Period	Year	Year	Year	Period	Year	Year	Year	Year	Year	Year
Days total		12419	365	365	366	12419	365	365	366	12419	365	365	366	365	365	366
1:1 Sharing Max W/O BCIL Predicted	40-50 m ³ /s	70	49	102	33	82	57	113	40		53	112	37	-4	-1	-3
1:1 Sharing Max available		70	49	102	33	84	57	114	43		53	113	40	-4	-1	-3
1:1 Sharing Max W/O BCIL Predicted	50-60 m ³ /s	34	35	47	12	42	39	54	18		43	55	21	4	1	3
1:1 Sharing Max available		34	35	47	12	46	39	62	19		43	63	22	4	1	3
1:1 Sharing Max W/O BCIL Predicted	60-70 m ³ /s	35	19	33	7	33	18	32	11		18	32	11	0	0	0
1:1 Sharing Max available		35	19	33	7	36	28	34	18		28	34	18	0	0	0
1:1 Sharing Max W/O BCIL Predicted	70-80 m ³ /s	30	16	23	38	26	17	18	37		17	18	37	0	0	0
1:1 Sharing Max available		30	16	23	38	25	16	17	40		16	17	40	0	0	0