

1 February 2010

Ref: CO6C/18965

## MEMORANDUM

**FROM: MAURICE DUNCAN (HYDROLOGIST)**  
**TO: ANGELA DEAN**  
**SUBJECT: CENTRAL PLAINS WATER RESOURCE CONSENT APPLICATIONS DISCHARGE BYWASH WATER**

---

Environment Canterbury request for comments on Mr Leuthwaite's response to the CPW S42A report:

*"I am going through the recommendations made by the Officers at the CPW hearing with respect to bywash and emergency discharges. Walter addressed your concerns in paragraphs 10-21 in his evidence in response to the s42a reports (see link):*

[http://ecan.govt.nz/publications/Consent%20Notifications/10WLewthwaite\\_S42A.pdf](http://ecan.govt.nz/publications/Consent%20Notifications/10WLewthwaite_S42A.pdf)

*Do you recall whether or not you agreed with his comments"*

### **My Comments of Mr Leuthwaite's response.**

1. I have no concern about operational or emergency bywash flows into either the Rakaia or Waimakariri Rivers as the flow rates are relatively small in relation to normal flows.
2. I have no concern in relation to operational bywash flows flowing into the Selwyn River, as the concept is that such flows will infiltrate into wet lands, but I will comment on that later.
3. My concern is the safety aspect of the effect, and especially the cumulative effect, of emergency bywash flows in the Selwyn River. I accept Mr Lewthwaite's statement that the total flow rate would not exceed 21 m<sup>3</sup>/s, that the rate of increase in flow would not be instantaneous and there would be some attenuation of the flood wave if the bed was dry. Nevertheless the flood wave front on a dry river bed could move at faster than a walking pace. In addition as upstream emergency flows reached downstream wetted portions of if the river bed had flow the flood wave would speed up move at about 2 m/s if the water was 0.4 m deep.
4. During the summer up to a 40 km long reach from downstream of Colgate is dry for periods of up to 40 days. Even if the cumulative emergency flow was somewhat

diminished, the sudden appearance flows of over one cumec would be a cause of concern.

5. It cannot be assumed that people on the river would be familiar with river behaviour. People using the river on a fine day will not be expecting the relatively sudden appearance of a flood.
6. Mr Lewthwaite (his para 20) has misunderstood my proposed solution to deal with the emergency bywash flows. I accept the concept of wetlands for dealing with operational flows. My proposal was to add border-dyke or even wild flooding of farm land downstream of the wet land to dispose of the emergency bywash flows. All but one of the emergency peak flows listed in Mr Lewthwaite's table (following para 12) is of the order of the size of conventional border dyke headrace flows and should pose no design problems.
7. Disposal of emergency bywash flows by flooding farm land would avoid any issue of poorer water quality in the bywash flow compared with the receiving water. In practice for much of the time water sourced from the Rakaia and Waimakariri Rivers will be more turbid than Selwyn River water.
8. In my S42A report I noted that the infiltration rates in the wet lands dealing with operational bywash flows would have to have infiltration rates of 17.8 to 34.6 m/day. Infiltration rates of this order are only provided by clean gravel and coarse sand and for any sort of soil they are an order of magnitude less. The design has also not taken into account the effect of silt in the bywash water clogging up the bed and slowing infiltration rates. Such clogging often claimed to reduce infiltration losses from irrigation canals and water races on the Canterbury Plains and is a process that may take some time to occur.
9. Thus I am still concerned that the wet lands as proposed are undersized. There needs to be a condition that requires the infiltration rates of the proposed wet land to be measured and taken in to account in the design. There also needs to be a monitoring condition to ensure that the wetlands operate as expected and that during for normal bywash operational flows all the flow is infiltrated by the wetland. If all the flow is not infiltrated then the wetland would have to be enlarged.



Maurice Duncan, Senior Scientist, NIWA.

1 February 2010