Dear all,

Please find attached the latest set of watertable results for the Kamarooka Project site. I collected these yesterday. I have also included a couple of additional plots showing different ways of looking at the numbers. We are into serious watertable decline yet again after an interruption caused by the most welcome spring rains. In fact, we are back breaking records. Good old bore 8 in the centre of the 2004 plantation has fallen to a new low of 5.92 metres.

Sadly, however, the fall in bore 8 means our days of measuring watertable decline under the plantation are almost over. The bore was constructed in 2004 when the watertable was only a metre from the soil surface. The intent was to examine the influence of the plantation on the shallow groundwater. Bore 8 was constructed to a depth of only 6 metres with a one metre sump below this to catch any mud/sediment. I doubt we screened/slotted that last metre but I with check with the driller tomorrow. Given the (now) national significance of the site it would be nice to continue to track the impact of the trees on the watertable, but we would need to find around $3,000 to make that happen. Any ideas are most welcome!

The second graph I have provided illustrates the difference in elevation of the watertable across a traverse extending from the saline land (B5) in the south into the NUFG 2004 plantation (B8)in the north. The Y axis represents the height of the watertable relative to an assumed datum of 100 metres. The graph shows the trend in absolute height of the watertable, and not depth the from land surface. It indicates the watertable now falls about 2.5 to 3 metres upon entering the plantation.

The third graph I have provided shows changes in the hydraulic gradient between bore 5 on the saline land and bore 6 on the edge of the plantation (about 50 metres to the north). This is the gradient of the watertable measured between the two bores for the total period of record. In this instance it is simply the difference in watertable elevation divided by the distance between the two bores. A hydraulic gradient of 0.002 would for example, equate to a watertable fall of 2 metres per kilometre.

Hydraulic gradient is important because it is the only factor controlling groundwater flow to the plantation that is not fixed in time. The volume of groundwater moving from the saline land into the plantation under gravity is directly proportional to this gradient. If it doubles over time, then so does groundwater flow. The graph shows that the gradient has increased about 3 to 4 times since we first noted the watertable falling under the plantation. Clearly, the volume of groundwater flowing into the region of the plantation has markedly increased.

This exploration of the change in hydraulic gradient has to be seen in some context. I am using the two bores that are available to me to do the calculation. One of them (B6) is within the immediate zone of influence of the plantation. The other is outside the zone because it is further away from the plantation and not (yet) influenced by the watertable decline. My calculation remains valid, but I would clearly have attained greater values if the saline bore had been within the watertable depression established by the plantation.

In assembling this picture of the changing gradient I was more interested in the pattern than the absolute results. I was pleasantly surprised to see the gradient consistently increase from the time that we were first seeing the watertable fall beneath the plantation. I was also interested to see that the numbers reflected the general sense of changes that I get from collecting values in the field. That is, the gradient establishes in those periods when there is little recharge in the saline land, and is removed during those time when the rainfall is sufficient to top-up the groundwater in the saltland. Such rainfall events raise the groundwater and the shallow watertable quickly flattens. When the rainfall stops the trees begin to pull the watertable back down again re-establishing the gradient and the process repeats over time.

There is an interesting battle going on here between the trees on the one hand and recharge on the saline land on the other. When the former wins we see the watertable in the non-treed land along the immediate margins of the plantation begin to fall. When the latter wins substantive rainfall raises the watertable within the saline land rises and flattens so that the edge effect narrows.

So, the influence of the plantation on the watertables in the surrounding land varies over time in accordance with climate. The zone of influence moves laterally in and out in sympathy with rainfall events that cause recharge to the saline land. A kind of simple process that makes a lot of sense when you see the numbers.

Regards Phil