

Date: 14 December 2007

To: Leo Fietje, Principal Consents Advisor, Environment Canterbury

From: Walter Lewthwaite, Environmental Engineer, URS

Subject: Central Plains Water Enhancement Scheme
S92 request regarding groundwater mounding

In your letter of 2 November 2007 to the Central Plains Water Trust you asked for further information about mitigation and monitoring for groundwater mounding effects. Your comment was:

Please provide proposals for monitoring and mitigation for any adverse mounding effects on soil, on the existing natural and man-made drainage network, on the operation of septic tanks and stormwater disposal systems, especially those within heavier soils in the area fringing Lake Ellesmere.

Context

You have already received extensive reports, produced by Aqualinc Research Ltd, that show the expectations for groundwater mounding, increased flows in streams and drains in the lower plains, and depths to groundwater including alterations to existing patterns.

Our view is that the scheme will approximately restore the balance and patterns of groundwater flow, levels and fluctuations that existed around 1990. This is based on a comparison of the net amount of groundwater withdrawn for irrigation in the central plains since 1990, and the modelled amount of recharge that the scheme will provide to the groundwater system, leading to an expectation that these two figures will be roughly equal. We expect the major movements in groundwater levels with the scheme will continue to be dominated by natural variations in rainfall from year to year and flows in the alpine rivers, as they have been in the past.

It is also clear that in areas that could potentially be affected by groundwater mounding there are already extensive drainage networks in place, with generally enough capacity in both the main trunk drains and in secondary feeders to handle an expected increase in baseflow produced by the Central Plains scheme.

Hence we expect the impact of the scheme will be small and it will recreate a situation that has been experienced in the recent past and is reasonably well known. However we accept that there are likely to be occasions and places where people will be adversely affected and the scheme will have an obligation to avoid, remedy or mitigate, including monitoring.

Existing utilities

The following are the utilities etc that could be affected:

- Ten recognised (i.e. rated) drainage schemes within the central plains, with a total length of drains of 470 km providing the main drainage outlets for 37,300 ha of the plains, including small urban areas. These drainage schemes are predominantly in the lower plains, i.e. below State Highway 1, but there is one (the Hororata) further up the plains,

- Further drains and streams outside the rated schemes, particularly the Waikewai, Lee, Tent, Jollies and Crews streams discharging to the coast between Taumutu and the Rakaia River,
- An extensive network of secondary drains that discharge into the main trunk channels,
- Reticulated sewerage in Christchurch, Tai Tapu, Lincoln, Springston, Prebbleton, Rolleston, Burnham, Dunsandel, Leeston and Southbridge, with their treatment or disposal systems,
- Septic tanks on individual farms, and within communities further up the plains such as Kirwee, Darfield, Sheffield, Springfield, Coalgate, Glentunnel and Hororata,
- Piped urban stormwater systems in Christchurch and the main rural centres.

Monitoring

Between consenting and implementation of the scheme CPWES proposes to complete a baseline survey and report covering these facilities. This survey would include:

- Inventory of drains and streams, their location, sizes, etc,
- Inventory of sewerage systems (reticulated and individual septic tanks),
- Conditions of these facilities, their capacities, maintenance activities, dates of installation, histories of water-level related issues,
- History of their flows and other information on groundwater levels,
- Existing management and administration arrangements,
- Current costs of maintenance and operation.

This baseline survey and report would be largely compiled from existing records and reports from ECan and Selwyn District Council, including their asset management plans.

For on-going monitoring it is proposed that:

- Existing arrangements for monitoring flows and groundwater levels be continued for all utilities (There are extensive networks and programs of monitoring currently conducted by ECan regarding stream and drain flows and groundwater levels, and by SDC regarding the sewerage systems that have established a database for an initial baseline report, and these should be continued),
- Changes in groundwater consents and use of groundwater throughout the plains, and water use from a CPWES supply be monitored and assembled into an annual report (This would be a cooperative exercise between CPWES and ECan),
- Groundwater modelling continue periodically, including upgrading and rerunning a suitable groundwater model, to aid understanding of contributions to effects from the scheme and natural events.

Remedial and other mitigatory actions

In those locations where it can be demonstrated that there are adverse effects as a direct consequence of CPWES the following solutions should be considered for case-by-case adoption:

- Tolerate a limited amount of short term flooding. The present drainage schemes have not been designed to prevent inundation of land in heavy rainfall events, and a similar scale of ponding, thought to be up to about 12 hours in some places, should be acceptable post-CPWES,
- Widen or deepen trunk drains to increase their capacity. Over most of the rural land it will be practical to widen or deepen trunk drains, and this will enable them to provide the extra capacity to accommodate the calculated increase in baseflows,
- Install more drains to provide a more intensive secondary feeder system. Where groundwater levels rise between streams and trunk drains it will be feasible in many locations to install more drains to take water to the trunk systems, using open or subsurface drains as appropriate.

For urban situations there will be less tolerance of short term flooding, particularly in dwellings, but the principles of monitoring and remedial actions will be similar. Further solutions that might have to be considered will include:

- Pumped solutions,
- Contributions to the costs of managing increased flows or of infiltration reduction programs in sewerage reticulation systems.

A further longer term solution, that could be considered if it becomes necessary, is a reduction in the amount of irrigation within the scheme. This is unlikely to be considered in the short term and it must be seen as a future contingency only if it is crucial, as it could affect the financial viability of the scheme.

Decision making mechanisms

It is clear that the principle of adaptive management will be a necessary feature of future management of groundwater mounding, i.e. situations will have to be considered and solutions implemented case by case as the scheme develops. With variations that occur in geohydrology over short distances, uncertainties in fine points of groundwater modelling and unknown future developments in groundwater usage in the plains, it is impossible to establish in advance the needs of particular locations. This will be especially important for secondary drains and urban situations.

A core issue will be to determine in both broad guidelines and on a case-by-case basis the cause of drainage situations and therefore responsibility for costs of mitigatory actions. CPWES proposes by way of condition that a panel be established with the responsibility to address this matter and recommend solutions to CPWES and affected parties. It is proposed that this panel should include the following people:

- A representative of CPWES management,
- A representative of drainage management from the lower plains,



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- An engineer with expertise and experience in both large scale and localised solutions to land drainage,
- An engineer or scientist with expertise and experience in Canterbury groundwater systems.

In addition it is considered that a review panel should be appointed to arbitrate in the event of disagreement with the recommendations of the drainage panel. This arbitration panel should have technical and legal expertise.