GROUNDWATER MONITORING FOR SALINITY IN THE LODDON DRYLAND PLAINS REGION

Several generations of groundwater monitoring networks (for salinity) have progressively been established across the Loddon Dryland Plains since the 1960s. In total, this amounts to in excess of 400 monitoring bores, though monitoring rationalization has seen a sizable proportion of these made redundant or subject to reduced monitoring frequencies.

Monitoring mostly relates to measurement of groundwater pressure in the Loddon Deep Lead system (or deep aquifer) and overlying Shepparton Formation (shallow or watertable aquifer). Specific monitoring is also in place to assess the impacts of irrigation infrastructure. Some high density monitoring networks, such as at Kamarooka and Serpentine, are the legacy of detailed research studies into groundwater processes.

In the analysis presented here, groundwater monitoring along the upland fringe is included, enabling the 15 year data record from the Kamarooka slopes to be considered. The fundamental purpose of long term groundwater monitoring is to recognize trends in waterlevels and to understand their relationship to land use change. This also includes assessing the response of the watertable to recharge control and salinity mitigation measures.

CURRENT GROUNDWATER TRENDS

Of concern is the pattern of generally rising watertable trends observed across the Loddon Plains. Rising watertables are substantially related to rising deep lead pressures, the latter occurring as either a gradual linear rise (e.g. bore no. 51439 at Calivil) or a step rise (e.g. bore no. 51640 at Bridgewater). To some extent, rates of rises in deep lead pressures have tapered, in part due to local groundwater pumping influences (e.g. bore no. 88239 at Pompapiel).

Available data indicates significant long term watertable rises in the mid and lower reaches of the Kingower/Korong Creek sub-catchments (e.g. bore no. 26996 at Borung). Further north-west, towards Boort, moderately deep watertables (10-30 m) are also characterized by long term linear rises, all be it slight. The high linearity of these rises suggests that lateral flow from adjacent high watertable areas is the mechanism involved, rather than direct recharge (that would lead to greater seasonal hydrogaph fluctuations).

On the central Loddon Plains (Bridgewater to Jarklin), shorter hydrograph records (mostly from the early 1990s), and seasonally fluctuating shallow watertables result in inconclusive trends at this time. The exception appears to be a distinct zone of rising trends east of the Loddon River, as well as in the Bears Lagoon, Jarklin and Calivil areas.

Though watertables are generally 5-8m deep beneath the Patho Plains, slight to moderate linear rising trends are prominent (e.g. 97151 at Torrumberry North). It is uncertain at this stage whether a recent significant decline in deep aquifer pressures (e.g. bore no. 97150) will enable the watertable in this area to at least stabilise.

A high proportion of rising trends also occurs in bores in the middle reaches of the Bendigo Creek catchment. (e.g. bore no. 5069 at Milloo). Moderately rising linear trends continue to occur on the Kamarooka slopes (e.g. bore no. 75), a consequence of excessive recharge on the lower cleared slopes.

IMPACT OF CLIMATIC VARIATION ON TRENDS

An important factor in groundwater trend interpretation is rainfall variation. Since the 1982 drought, cumulative rainfall across the Loddon Dryland Plains has been slightly to markedly above average (50 to 500 mm depending upon the rainfall station). Moreover, since the mid 1940s, there has been a regional trend of above average rainfall conditions across much of southeast Australia. Nevertheless, since 1990 (except for Yarrawalla South), near average overall rainfall has occurred across much of the plains. Despite this, slight to moderate long term rising trends have continued across much of the area. It would appear that factors in addition to excessive annual rainfall are necessary to explain rising regional watertables, such as impacts from adjacent irrigation areas, and changes in catchment hydrology (e.g. excess runoff, and stream flow).

COMMENT ON GROUNDWATER PROCESSES

Groundwater hydrographs suggest that the watertable and underlying Loddon Deep Lead are significantly recharged on the plains between Bridgewater and Serpentine. It appears that groundwater pressure rises are in part caused by infrequent flood events (seen as step rises in bore no. 51640 near Bridgewater).

In contrast, west of the Loddon River and on the Patho Plains, vertical recharge to the watertable aquifer is less significant. Instead, groundwater rise is largely the consequence of the accumulating lateral flow where a continuous head of pressure is provided by adjacent elevated watertables. North of the Serpentine latitude, elevated deep lead pressures limit downward drainage from the watertable, further exacerbating watertable rises and eventual salinity.

FURTHER INFORMATION

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This information can be viewed on NRE website
http://www.nre.vic.gov.au/catchmnt/salinity/dryland