"I know my dam leaks – but where?"

By Lance Pendergast, QPIF*

Continuing drought and increased rainfall variability has prompted many irrigators to reconfigurate water storage infrastructure and adopt management strategies to minimise water losses.

All storages leak to some degree. Seepage losses of between two and 10 per cent have even been identified from storages on soil types regarded as suitable for storage construction. Without accurate storage measurement it is often difficult to ascertain the magnitude of storage loss due to fluctuations in storage level during pumping events. In addition, seepage rates usually vary in relation to storage head.

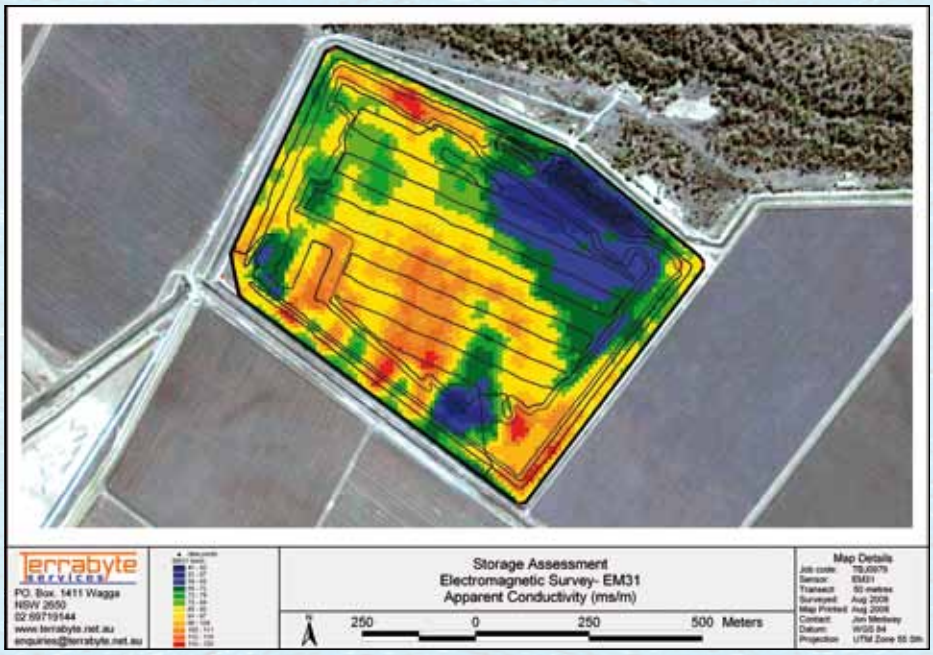
In recent years evaporation and seepage measurement technology has progressed to a point where meters are now commercially available for irrigators and consultants to accurately quantify storage seepage losses.

A recent electromagnetic (EM31) soil survey of a Central Queensland storage has highlighted the value of using this technique to identify soil variability within storages.

It was known that two relatively large storages 'had issues' when the property was purchased and consequently their use has been confined to within a relatively narrow range of circumstances. In the previous season the grower, with the assistance of the local water use efficiency officer employed under the Rural Water Use Efficiency 3 program, used a seepage and evaporation meter to quantify just how bad one of these storages leaked. The results confirmed the magnitude of the seepage losses.

An EM soil survey over the dry dam base of storage 2 was initiated by the operator after a thick underlying layer of sand was discovered during earthworks at a gate valve station (bottom left corner of image).

Electromagnetic induction (EM) instruments measure bulk soil electrical conductivity, which is related to soil moisture, clay content, mineralogy and salinity. Clay content and soil mineralogy are properties that greatly influence deep drainage. EM measurements can provide valuable information regarding floor formations susceptible to deep drainage.



Map of a central Queensland storage showing areas prone to seepage.

There are two EM devices most commonly used. The EM31 has a maximum depth penetration of six to seven metres while the EM38 has a maximum of one to two metres. When used in conjunction with targeted soil sampling to 'ground truth' the data, this technology has proven to be very useful in pinpointing localised leakage areas in storage floors.

The survey identified a number of specific areas that could be expected to be responsible for the majority of the losses. In this example the blue areas of lower conductivity indicate areas of high sand content where high seepage rates could be expected.

While available remedial actions to reduce storage seepage rates vary, all usually entail considerable investment. Hard data from both EM soil surveys and storage seepage assessments allow operators to test the economic feasibility of remediation options.

Before the survey, the farmers knew they had a problem but had no way of knowing the extent of the susceptible area. This survey has allowed them to pursue a cost benefit analysis of remediation options.

Options under consideration by the operator in this case study include applying compacted clay layers (the most commonly employed remediation tactic) or perhaps dividing the storage into cells to isolate those areas identified as most prone to leakage.

At present operators have the opportunity to have storage losses measured free of charge through the Cotton CRC funded On-Farm Storages Project.
To register for a free storage assessment contact David Wigginton on 0438 667 835 or david.wigginton@usq.edu.au.

***Queensland Primary Industries and Fisheries.**