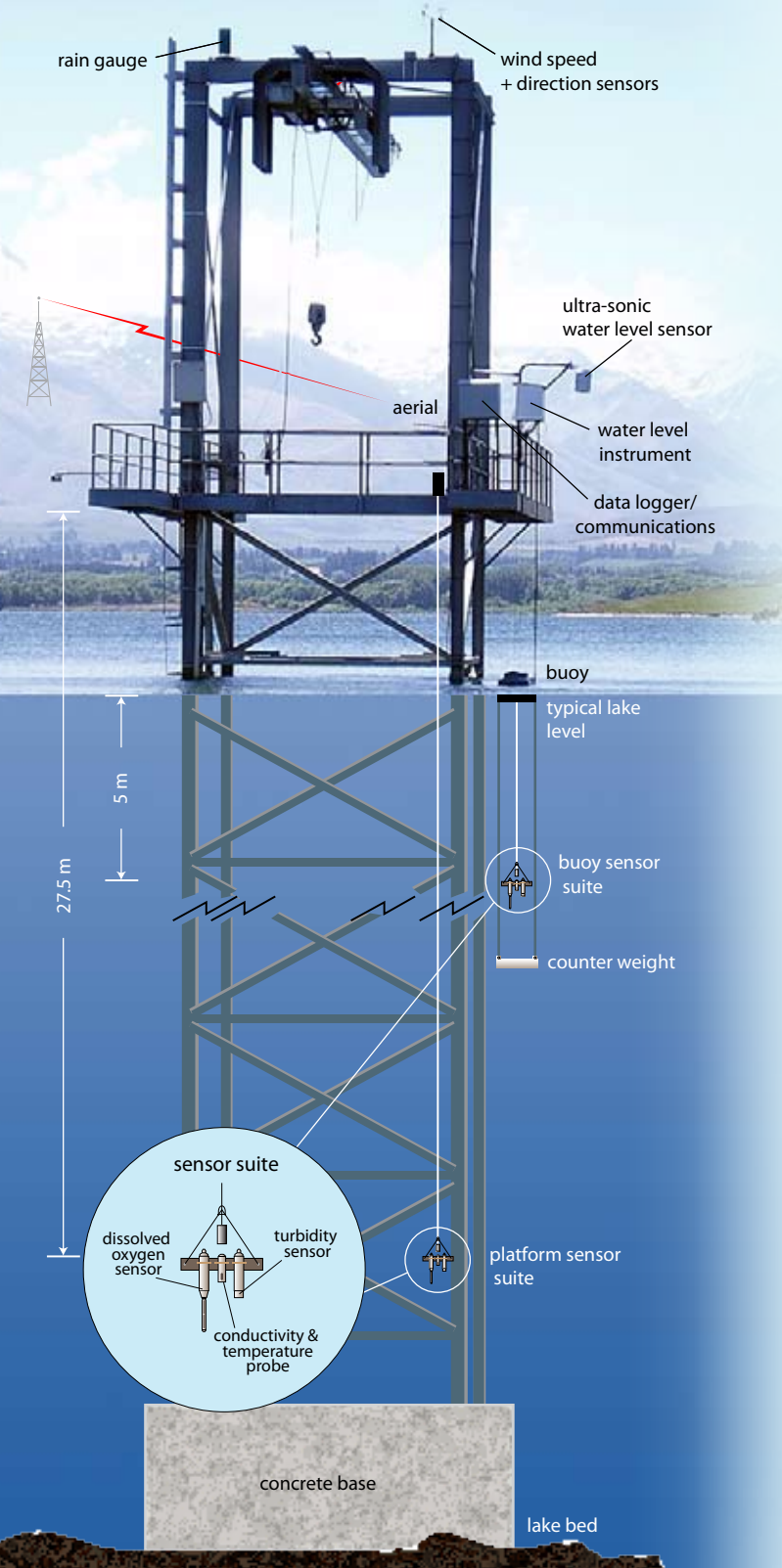
update

NIWA
Taihoro Nukurangi

Instrument Systems

collecting data, delivering solutions

Lake Opuha instrument upgrade safeguards the environment



Lake Opuha, near Fairlie, Canterbury, is a man-made lake developed to provide water storage for irrigation. Opuha also has a small hydroelectric power generation plant and excess water may be used to generate electricity, supplied to Contact Energy. The lake is 330 metres long, has an area of 710 hectares, storage capacity of 91 million cubic metres, and a command area of 16 000 hectares.

To satisfy Environment Canterbury's resource consent conditions, the lake's owner, Opuha Water Ltd, must continuously monitor water quality and quantity in both the dam, and in the river, a short distance downstream of the dam tailrace. NIWA has set up a total of seven monitoring sites around the lake, and recently upgraded instruments to enable near-real time access to data via the internet. This makes rapid management intervention possible, so that prescribed environmental conditions in the lake and downstream can always be met.

For example, at the lake tower, key parameters monitored are dissolved oxygen, turbidity, conductivity and water temperature, water level, wind speed and direction, solar radiation and rainfall. The upgrade includes newly available dissolved oxygen sensors. Optical measurement technology on these sensors means that data generated are more reliable and stable, increasing accuracy and reducing operational costs.

Data from all seven sites are recorded on dataloggers and sent to NIWA's Flosys server via cellular internet connection. The data are then sent to Environment Canterbury, and to the dam operators, who run the day-to-day operation of monitoring stations, manage all data, and post results on their website. If water conditions in, or downstream from, the lake change, action can be taken to adjust conditions. For example – if dissolved oxygen drops below 40%, an aeration system can be turned on; if the temperature difference in the lake between the buoy and the platform sensors exceeds 3°C, spill can be increased to reduce the temperature stratification effect.

Opuha Water Ltd is 100% owned by irrigator shareholders. Environmental Consultancy Services Ltd, Timaru, carry out the day-to-day resource consent compliance monitoring for the owners.

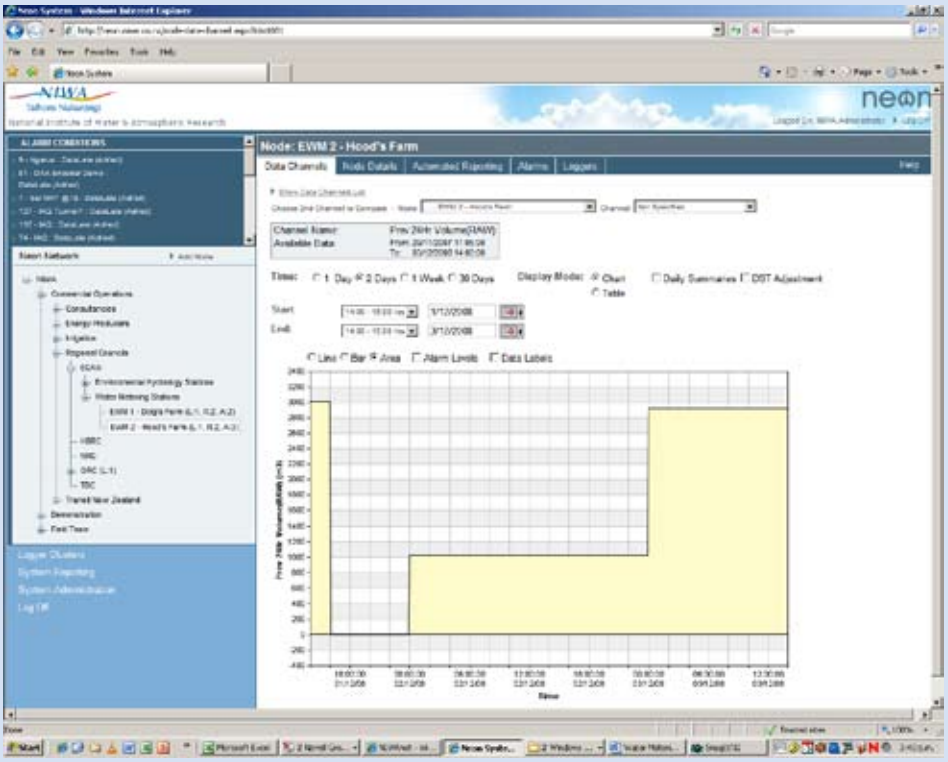
Two suites of water quality monitoring instruments operate from the tower, at two depths, each comprising dissolved oxygen, turbidity, and conductivity/ temperature sensors. The first is at a fixed depth, 27.5 metres below the platform. The second suite of sensors is mounted on a floating buoy suspended below the platform, and maintains a consistent depth of 5 metres below the water surface.

Water metering telemetry trial – one year on

In November 2007 NIWA installed two water-metering systems for Environment Canterbury (ECan), as part of an automated irrigation water-metering trial. Since then we have been regularly monitoring our equipment's performance, and are delighted with the results.

ECan is investigating better ways to manage the sustainable and equitable allocation of water to irrigators, power generators, and other water users. Its priority is to protect the environment by ensuring acceptable water levels and flows in aquifers and natural waterways. The metering of abstractions is a critical part in this management.

At each of two North Canterbury sites, we connected a Neon-based internet protocol (IP)-telemetered datalogger to a flow sensor, already fitted to a water pipe in an operational irrigation system. Since installation, water flow data have been consistently pushed to the Neon server, and from here, a range of historical and near-real time data are available simultaneously to ECan and others with an interest in the trial.



Example of information provided by the Neon system – the total volume (in cubic metres) of water supplied over a 36 hour period.

The Neon system is proving to be very reliable, out-performing systems set up by other companies involved in the trial. Another important attribute is that it is highly scalable. This allows a water-metering application to grow naturally as an irrigation scheme expands, whether it's monitoring one point or several hundred. As the scale increases, the economies just get better and better.

New technology improves oxygen measurement

Dissolved oxygen levels in water provide a fundamental indicator of environmental health. We are now installing a new monitoring instrument, based on fluorescence technology, to monitor dissolved oxygen, with excellent results.

The 'D-Opto' emits flashes of light at a specific wavelength and this excites a fluorescing material within the sensor. This lights up with an intensity proportional to the dissolved oxygen concentration. The light is sensed, converted to a number which represents its intensity and logged. The sensor is proving to be very accurate, with minimal long-term drift – less than 1% a year. It is also low maintenance.

Until now, most environmental dissolved oxygen sensors have used an electrode covered by a semi-permeable membrane. They are not well suited to continuous monitoring, have been unreliable, and need regular maintenance – a costly exercise if a sensor is in a remote location and/or only accessible by boat. The D-Opto provides us with a significantly better alternative.

We're changing to e-newsletters

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Best wishes for 2009 from the NIWA Instrument Systems Team.

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