ON THE LEVEL

Water Monitoring News and Updates

Solinst®

High Quality Groundwater and Surface Water Monitoring Instrumentation

IN THIS ISSUE

Fall 2016

New! AquaVent Vented Water Level Datalogger

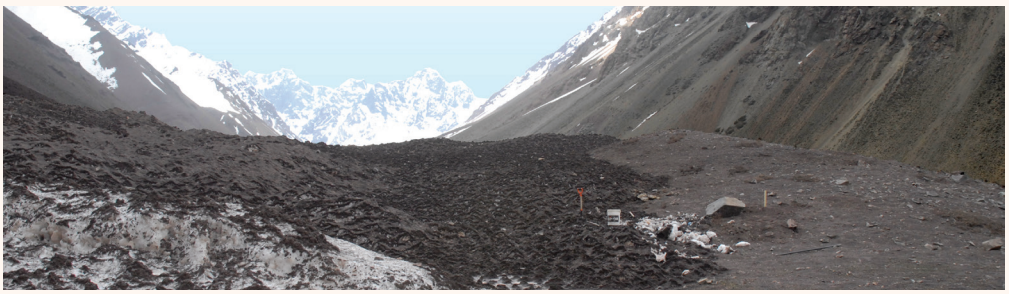
Features

- Vented pressure sensor for highly-accurate measurements: 0.05% FS
- Same reliability & durability as our Levelogger®
- Hydrophobic filters & permanent desiccants
- User replaceable batteries in wellhead
- Custom vented cable lengths to 500 ft.

Benefits

- Automatic barometric compensation reduces time needed for data processing
- Integrate into a third-party data collection system for remote real-time data
- Continuous, reliable water level data for long-term monitoring projects
- True water level readings for instant aquifer test results

Water Fund Project In Chile Tests Barologger Durability



The Nature Conservancy has created a unique method of preserving freshwater resources through Water Funds. Water Fund projects bring together private and public water users, to pay landowners for the conservation and protection of the freshwater sources they share. Water Fund projects have been replicated worldwide thanks to the support of their strategic partners: Inter-American Development Bank (IDB), FEMSA Foundation, Global Environmental Facility (GEF), and more than 200 local partners in several countries.

Paulo Petry, with the Nature Conservancy Latin American Region based in New Hampshire, coordinates environmental monitoring efforts for all Water Fund projects in Latin America.

Currently, the design stages of the Santiago Water Fund are in progress in Chile. With help from a grant provided by the HSBC Water Programme and the technical assistance of the Latin America Water Funds Partnership, a hydrologic study of the associated mountain wetlands has been initiated. The hope is to

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Water Fund Project In Chile Tests Barologger Durability

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demonstrate the importance of these wetlands in regulating and maintaining the high quality drinking water supply to Santiago.

The extensive monitoring program includes studies in three separate and distinct wetlands in the Upper Yeso watershed. The three types of wetlands will be compared in terms of their hydrological regime, data will be used to estimate their water storage capacity and yearly water yields.

To help monitor the hydrological regimes, Solinst Leveloggers are being used to measure both groundwater levels and stream flows from surface water runoff. Petry hopes that the data collected will help explain the relationship between groundwater storage during wet periods, and surface flow during the dry periods when runoff from snowmelt and glaciers is minimal.

Barologger Edge still functioning after being buried in ice for over 100 days.

After recommendations on their ease of use in various environments, Petry has been using Solinst Leveloggers since 2012 in numerous projects throughout Latin America. "The sensors are very easy to deploy and Solinst offers a variety of solutions for communication and programing. The software is easy to use, and in my case there is a version in Spanish that is very helpful to train our local field teams," said Petry.

Leveloggers and associated Barologgers have been installed since November 2014. The goal is to continue monitoring for another 5-10 years or beyond. Leveloggers measuring surface flow have been set to record data every 15 minutes during summer and every 30 minutes during winter months. Leveloggers recording in groundwater wells are set to log every 4 hours, year-round.

On November 17, 2015, the project team recovered a Barologger Edge that had become buried in ice after an avalanche. This Barologger was being used to record barometric pressure in synchrony with nine Leveloggers. It was found that the Barologger was in almost perfect physical condition and had never stopped recording data while buried.

Note: to see actual video footage of the Barologger being recovered, visit: https://youtu.be/flzuAeyyDyw

After downloading the data, it was deduced that the Barologger had been buried for about 100 days. The data showed temperature oscillation leading up to August 6, and suddenly flat-lined to a constant temperature of 0.27°C until it was recovered in November.

Even though the temperature data flat-lined, barometric pressure appeared to be normal when compared to data from the rest of the year (there was a 5 Mb reduction immediately after the avalanche occurred). After a series of tests, comparing this Barologger to other new sensors, it was shown to still work within the normal parameters of the instrument.

Overall, Petry has been very impressed with the durability of both Levelogger and Barologger instruments, "We had a couple instances of vandalism where the sensors were removed from the wells, hit by rocks and tossed away. When we found them they continued to work normally and did not lose any data." Durability definitely showed to be a very important factor during the avalanche event!

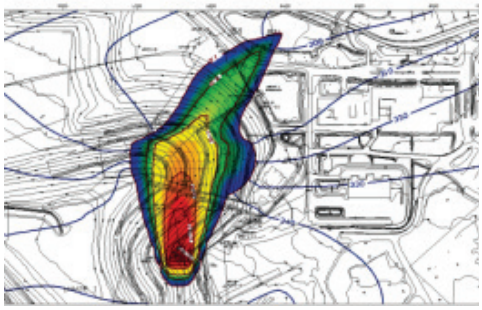
Although we are glad that the data was retained, and still able to be used for such a critical project, Solinst does not recommend subjecting Leveloggers or Barologgers to such extreme conditions – in this case, it was unavoidable! Always install Levelogger and Barologger instruments within their specified pressure and temperature extremes. Use outside these parameters could lead to non-repairable damage.

Solinst thanks Paulo Petry for providing the details of this project.

Waterloo Multilevel Systems Help Characterize Plume in Landfill Expansion

GZA GeoEnvironmental (GZA), a multi-disciplinary environmental consulting firm, designed and operates a pump and treat system at a large solid waste landfill in Rhode Island. GZA has been overseeing the system for the past ten years, and have successfully extracted and treated more than 10 million gallons of highly contaminated groundwater.

With the landfill facility set for a 100-acre expansion, their next task is to relocate the extraction well and treatment system. Before the remedial system can be moved, they needed to characterize the intended site, which is located downgradient of the proposed landfill - the location of a known chlorobenzene plume. The DNAPL (dense non-aqueous phase liquid) plume is located in fractured igneous bedrock (Scituate granite gneiss).



Chlorobenzene Plume Based on Initial Investigations and Modeling

Based on models and historical data, GZA conducted five deep bedrock explorations to further characterize the hydrogeologic properties of the subsurface, and determine contaminant distribution at the proposed pump and treat site.

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Leveloggers Used to Measure Groundwater Levels in Uganda

Hope 2 One Life is a non-profit organization that works in Uganda to help provide medical and water supplies to those recovering from the LRA civil war.

Thanks to sponsors and donors, Hope 2 One Life has installed eight drinking water wells equipped with reliable hand pumps throughout Uganda, and has plans to install a ninth with assistance from HydroSolutions.

Each of the installed wells is inspected annually and is tested for bacteria. During these visits, it can be seen how heavily the wells are being used for drinking water, as well as for raising livestock.

The wells do not contain any water measurement instruments, so they have not been able to track just how much water is being used on a daily basis, or over the course of a year. With more wells being drilled in the area, there is concern with groundwater overuse.

Levelogger Edge being installed in a well near Opit, Uganda.

Recently, Solinst donated two Leveloggers to help track the groundwater fluctuations in two of the wells. In November 2015, the first Levelogger was installed in a well at a FEM Farm in central Uganda. Those living on the farm, as well as the surrounding communities, rely heavily on this well.

The second Levelogger was installed in a well in northern Uganda, in a town near Opit. Here, there is a partnership with a local order of nuns to raise goats as an income-generating project to support their charitable causes in the area.

The Leveloggers are programmed to record water levels and temperature every 15 minutes. This will help monitor daily consumption and provide long-term and seasonal trends in water levels. By calibrating the outflow from each well when pumped, they are hoping to use the water level data to help estimate the volume of water pumped.

This data will help Hope 2 One Life and HydroSolutions evaluate sustainable groundwater yields in the area, and provide critical information for planning future well installations.

Solinst thanks Hope 2 One Life's Tom Osborne, President and Principle Hydrologist with HydroSolutions, for providing the details of these projects.

Solinst Telemetry Helps Assess Drought Conditions in North Carolina

The Water Resources Division of North Carolina's Department of Environmental Quality (NCDEQ) is responsible for protecting and managing North Carolina's surface water and groundwater resources.

More than half of North Carolina's population receives its drinking water from aquifers. With a large amount of the state's groundwater also being used for irrigation, livestock, mining, and other commercial and industrial uses, these demands on groundwater resources drive the need for optimal management of the state's aquifers.

In order to monitor aquifer supplies and properly assess the impacts of drought conditions, the Groundwater Management team oversees a statewide network of groundwater monitoring wells. Nat Wilson, the Groundwater Management Branch Chief, and his staff are responsible for maintaining and regularly measuring over 630 monitoring wells across the state.

Within the statewide network, there is a unique set of wells used for drought assessment. These wells were specifically selected as drought indicator wells, as they respond quickly to rainfall and drought conditions, and provide a good indication of the amount of available groundwater stored in the aquifer.

Because these wells respond so quickly, data needed to be collected and viewed more frequently. It was decided to outfit the drought indicator wells with telemetry systems in order to send data remotely over short time periods, eliminating the need to visit the sites more often.

Solinst Telemetry Systems were selected for these particular wells. Using cellular communication, STS Systems send data from connected Leveloggers (water level dataloggers) in the field, to a home station computer database at one of the Groundwater Management Branch offices.

Overall, Wilson says it is great to be receiving the regular data reports from each Solinst Telemetry equipped well, and that the data has been helpful in gauging drought conditions.

Solinst thanks Nat Wilson, Groundwater Management Branch Chief, for providing the images and details of this project.

5 Tips for Accurate TLC Meter Calibration

Solinst TLC Meters provide accurate water level, temperature and conductivity measurements. With use, a TLC Meter probe can become slightly degraded due to mechanical, biological, or chemical effects. If you find that your conductivity readings are outside the 5% accuracy range, you can perform a user calibration to get it back into shape. Here are a few tips to help ensure your calibration goes smoothly.

1. Clean your probe.

You should clean the probe thoroughly before the calibration, and in between each step/solution if you are doing a multi-point calibration.

To get the sensors clean, pop off the probe shroud. If there is calcium or other build-up on the sensors, you can use vinegar, diluted CLR, or similar, to get the sensors clean. Use a soft cloth or swab on the sensors. Always finish by rinsing the probe with distilled water. Clean the probe shroud and put it back on before you start the calibration.

If you are performing a multipoint calibration, rinse the probe with distilled water between each step, until the conductivity readings read ~20 µS or less on the TLC Meter. Then, rinse the probe with the next solution you will be using.

2. Use the right solutions.

First of all, you have to use the specified (**fresh**) conductivity solutions: 1413, 5000, 12,880, or 80,000 µS/cm.

For best calibration, we recommend you use a two-point calibration with solutions closest to what you expect to find in the field. Start the calibration with the solution below that range, then with the one above it.

3. Stay at the right temperature.

The deionized water, calibration solutions, and TLC Meter (probe) should be at the same room temperature, and should be maintained throughout the TLC Meter calibration. With the probe in air, note the temperature on the TLC Meter display before you start the calibration.

Once you have your probe in a solution, and are about to calibrate, wait for that same temperature to display on the TLC Meter. This will indicate the probe and solution are at the same temperature. Waiting for the probe to properly equilibrate can take from 30 seconds up to a few minutes.

4. Don't touch the bottom.

Simply put: do not let your probe touch the bottom of the container in which you are conducting the TLC Meter calibration.

You want the calibration solution to reach all areas of the probe sensors to get an accurate reading.

5. No bubbles allowed.

Tap, stir and shake the probe. You want to make sure there are no air bubbles trapped inside the probe shroud before calibrating. Air bubbles will result in an inaccurate calibration.

Stir the probe in solution to remove the bubbles – this can take from a few seconds to a couple of minutes. It is helpful to use a clear container for calibration, so that you can see the bubbles leaving the shroud. After stirring, wait for the probe to equilibrate to room temperature.

Video walks you through a 2 point TLC Meter calibration: https://youtu.be/DZaXOpV7OFs

Waterloo Multilevel Systems Help Characterize Plume

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Extensive in situ testing programs were conducted in the five boreholes, which were drilled to about 110 feet into bedrock. The results of the borehole testing, allowed GZA to identify the discrete bedrock zones to be monitored, which aimed to further delineate the extent of the plume. For this task, GZA chose to install permanent multilevel groundwater monitoring systems.

Five Solinst Waterloo Multilevel Systems were installed; each system has four monitoring ports at the identified depths. At each monitoring port, GZA installed a vibrating wire transducer to monitor water level fluctuations, as well as a double valve pump for groundwater sampling.

Waterloo Multilevel System installation with double valve pumps and vibrating wire transducers.

Over time, data obtained through discrete zone groundwater sampling and hydraulic monitoring provided high-resolution data that allowed delineation of the horizontal and vertical extent of the plume downgradient. This 3D data provided a clearer picture of the subsurface and was used to decide the best placement of the relocated pump and treat system.

It was noted that some major lessons learned during this project included the importance and value of discrete zone sampling and monitoring, and recognizing shallow versus deep hydraulic response in bedrock – both of which were achievable by the use of multilevel groundwater monitoring systems.

Solinst thanks Richard Carlone, Anthony Urbano, and Edward Summerly of GZA for sharing the details of their project.

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