ON THE LEVEL

Water Monitoring News and Updates

Solinst®

High Quality Groundwater and Surface Water Monitoring Instrumentation

IN THIS ISSUE

Summer 2017

Permit to Take Water Requirements: Solinst Dataloggers Can Help

Water-taking permits in Ontario are a hot topic of late. There was outcry when a large water bottling company outbid a small community for its own drinking water well! This prompted the Ontario government to commit to reviewing their permit renewal processes and fees.

But it's not just large water-takers who are subject to water use permitting. In Ontario, anyone taking more than 50,000 litres of water a day, from a surface water or groundwater source, must apply for a Permit to Take Water.

The Ministry of the Environment and Climate Change (MOECC) directs the Permit to Take Water program in Ontario. They oversee the application and approval process, as well as enforce permits and reporting requirements.

Permit to Take Water Application

When applying for a Permit to Take Water in Ontario, depending on the nature of the water taking, a hydrogeological study may be prerequisite as part of the application process. A Qualified Person (QP) must perform the study (e.g. professional geoscientist, hydrogeologist).

...continued on page 4

Levelogger Data Aids Karst Springs Initiative In Tennessee

Two "citizen scientists" in Tennessee have taken on the task of studying more closely, the vast network of karst springs in the state. Past research has done a good job in mapping and identifying these features, but there remains a knowledge gap when looking at which karst springs are the largest in terms of discharge, and the relationships between recharge and resurgence areas.

Brian Ham and Ben Miller started the Karst Springs Initiative in early 2016. Their aim is to add to current information, and increase the understanding of karst hydrogeologic systems in Tennessee using measured data.

Karst topography is a unique landscape made up of soluble rocks, such as limestone and dolomite. Because of their geology, karst systems are characterized by underground drainage systems, including caves formed by the dissolution of the soluble rocks. Karst springs are important monitoring points for water quality since they can represent the overall health of the entire recharge area/ groundwater basin.

Conducting High Flow Measurements

In March 2016, their first permanent gauging station was installed in the East Fork Obey River Rise—thought to be one of the biggest springs in Tennessee. A stilling well was installed to house a Solinst LTC Levelogger Junior water level datalogger. A Barologger Edge is installed nearby in a protective PVC enclosure. The dataloggers are set to record at 15-minute intervals. Depending on conditions, data is downloaded every 3 months.

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Levelogger Data Aids Karst Springs Initiative In Tennessee

(continued from page 1)

To begin the project, individual flow measurements were conducted at several springs to begin establishing a database of spring flows, which is now regularly updated with new measurements and data.

The flow data is being compared and used to determine the largest springs, and therefore, which ones to monitor more closely and continuously.

Levelogger Edge Installed in a Stilling Well

The water level data provided by the datalogger, together with flow measurements, are used to determine discharge at the spring. Individual discharge measurements will be used to create a rating curve and establish a relationship between water level and discharge. This will allow the range of discharges for that spring to be monitored and recorded over time using the continuous water level data from the Levelogger.

Recently, Solinst donated two Levelogger Edge dataloggers to help with the project. One of the Leveloggers has been installed in a gauging site at the upstream sink of the East Fork Obey River. The other Levelogger was installed at Big Swamp Spring near Spencer, Tennessee.

Since LTC Leveloggers also record temperature and conductivity, this extra data will be interpreted, along with the level data, to help determine groundwater basin recharge characteristics.

Further support has allowed the initiative to purchase more Solinst dataloggers. As of February 2017, five additional gauging stations have been installed.

Along with the continuous staging sites, Brian and Ben are out in the field taking individual discharge measurements about once a month at each spring. The aim is

Installing a Gauging Station

to capture various flow events, including low and high flow, to better establish their rating curves.

Brian and Ben's first major goal is to collect and analyze one full year of data from each spring. The data will be used to compare the springs to each other. All of the data combined will help expand knowledge of karst hydrogeology in the state, and provide data for continued research.

Eventually, the hope is to publish the findings and share the database of measurements to help others understand and protect these resources in the future.

Solinst thanks Brian Ham and Ben Miller for providing the details of their work. For more information on their initiative, visit: https://experiment.com/projects/karst-springs-initiative-documenting-tennessee-s-largest-springs

Setting Up For a Successful Barometric Compensation

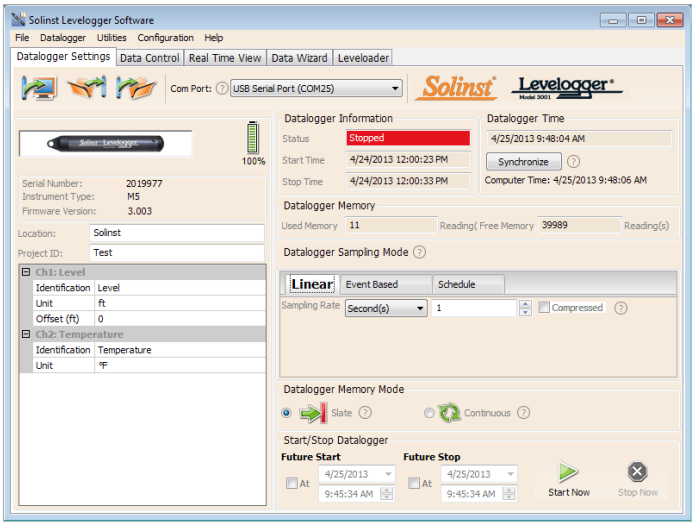
Leveloggers are self-contained; they measure total or absolute pressure. Because we want Leveloggers to provide fluctuations in water pressure only, their data must be barometrically compensated. To do this, barometric pressure must be subtracted from the Levelogger readings. This is why we recommend the use of a separate Barologger.

A successful barometric compensation begins even before your Leveloggers start collecting data. When first programming and installing your Leveloggers and Barologger, there are a few things to keep in mind:

The Leveloggers and Barologger should ideally have:

- the same start and stop times (the Future Start option is a convenient way to start all of your dataloggers at the same time),
- the same sampling interval,
- been synchronized to the same clock,
- and been installed within 300 m (1000 ft.) and 30 km (20 miles) of each other.

All programming is done in the Levelogger PC Software Datalogger Settings tab (or using the Solinst Levelogger App).



For more tips on performing a successful barometric compensation using the Levelogger Software Data Wizard, read the full article in our **ON THE LEVEL Blog**.

Designing the AquaVent Vented Cable

Vented pressure transducers provide true water level measurements without the need for barometric compensation. They function with the aid of a vent tube that terminates behind the transducer diaphragm, providing an automatic cancellation effect for barometric pressure.

When the vented tubing is protected and properly maintained, vented pressure transducers are accurate and can perform very well, especially in shallow applications.

With this knowledge in mind, when designing the AquaVent, Solinst took many steps to ensure the vent tubes remain dry.

From the beginning, the vent tubes are protected from moisture. Before the AquaVent Vented Cables are shipped, the vent tubes are blown dry with nitrogen gas, and capped. This ensures the vent tubes are dry when the product is received.

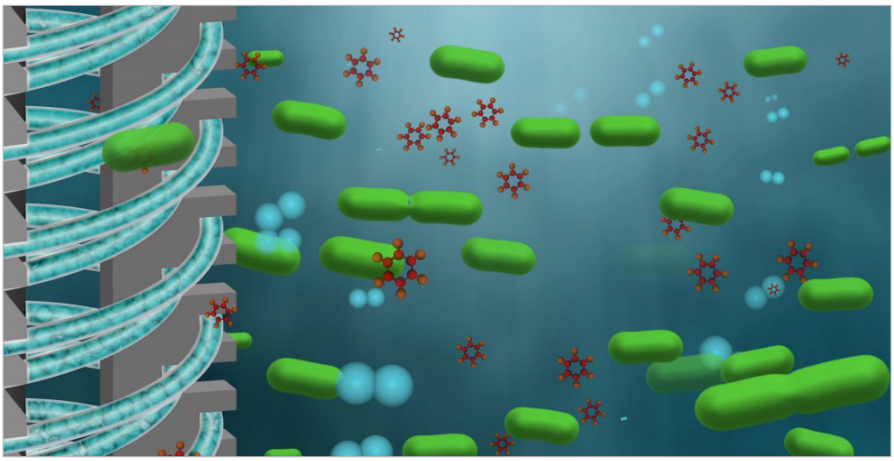
For permanent moisture protection, the AquaVent Wellheads contain multiple built-in desiccants and have a hydrophobic filter where the Vented Cable terminates at surface. The filter protects the cable, while still allowing air to flow through the vent tube.

To keep maintenance at a minimum, the hydrophobic filters and desiccants are designed to provide moisture protection over the lifetime of the instruments – no need for replacement.

The AquaVent logger contains a desiccant and hydrophobic filter where the Vented Cable connects. There is no need to replace the desiccant or filter, they are also designed to provide permanent protection, while still allowing air to vent to the transducer.

The Vented Cable connects to the Wellhead and AquaVent logger using stainless steel twist connections. These connections are secure, and provide a seal from moisture by use of o-rings.

For more information about proper use and maintenance of the AquaVent, read the full article in our ON THE LEVEL Blog.



Enhanced Aerobic Bioremediation & the Waterloo Emitter

The Waterloo Emitter™ was originally developed by the University of Waterloo, and is now manufactured by Solinst. The Emitter consists of a 51" long PVC frame wrapped with silicone or LDPE tubing. Emitters are sized to fit 2"- 6" wells. A pressurized air or pure oxygen tank is used to supply oxygen to the tubing.

When placed in a well, the Emitter's design allows water to flow through and around the device, providing good contact with the tubing, thus maximizing diffusion of oxygen into the groundwater.

Because groundwater flow around the Emitter is continuous, as is the flow of oxygen through the Emitter tubing. An equilibration point is never reached. This results in steady diffusion of dissolved oxygen into the groundwater without any decrease in concentration. This regulated supply is critical in preserving and enhancing the natural in-situ microbial population.

When oxygen is introduced into the Emitter tubing and placed in contact with groundwater, a concentration gradient is set up between the inside of the tubing and the groundwater. This gradient pushes molecular oxygen through the tubing in a controlled manner, where it is immediately available to microorganisms in the surrounding groundwater.

Enhanced aerobic bioremediation works best in certain environments.

Due to reliance on groundwater flow, Waterloo Emitters may be more effective in permeable conditions, such as in sands or gravel. In addition, Waterloo Emitters tend to be used outside the more heavily contaminated areas of the plume source zone, as they work well at remediating mid-weight petroleum products.

Waterloo Emitters work in-situ and have the advantage of being able to be used along side other more aggressive, traditional remediation practices.

Emitters have also been used as the primary tool for cleaning up a contaminated site, and installed as part of a multi-phase approach. For example, Emitters have been used for "polishing" a site after a primary treatment, and combined to complement other remedial technologies Emitters can also be used to biostimulate a site after it has been injected with microbes or other chemicals.

Traditional excavation or pump and treat technologies usually require more expensive and energy-consuming equipment. Typically, the treatment of this groundwater is done ex-situ or off site. This can be disruptive to other site activities. In contrast, Waterloo Emitters work in-situ, and harnesses existing environmental conditions to remediate contaminates in place.

Compared to other oxygen delivery techniques, Waterloo Emitters provide immediate bioavailability of molecular oxygen to microorganisms. A constant supply can also be more easily maintained. There is no oxygen lost due to bubbling, there are no slurries or chemicals to deal with, inject, or misapply, and no waste products are produced.

For more information about the Waterloo Emitter, read the full article in our ON THE LEVEL Blog.

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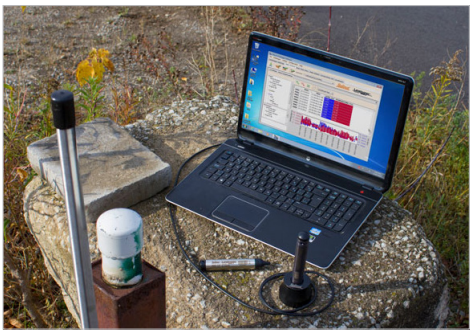

In cases where a groundwater well is the source of water extraction, a pumping test is a standard component of the study.

It is recommended that due to the frequency of water level recordings, and need for continuous measurements, a pressure transducer and datalogger are used.

Solinst AquaVent and Karst D water level dataloggers are great tools for use in pumping tests. They combine a pressure transducer and datalogger in one compact device, which are easy to deploy in wells.

They are very straightforward to program and start using Levelogger Software, and have the advantage of offering a customized sampling schedule to match the logarithmic time cycle recommended in guidelines.

When performing pumping tests in more than one well, it is advisable to reference each well to the same surveyed datum (e.g. sea level) to normalize all water levels across the study area.

Using Levelogger Software, AquaVent and Levelogger data can be adjusted to this fixed benchmark using the "Manual Data Adjustment Option" in the Levelogger Software Data Wizard.

Permit to Take Water Monitoring & Reporting

Once a permit has been approved, the water user must adhere to the mandatory monitoring and reporting stipulations set in their Permit to Take Water.

In addition to daily water use data, which must be reported annually (a necessity in all permits), the MOECC often requests corresponding monitoring data.

When dealing with groundwater wells, the MOECC usually demands the installation of a water level datalogger to record regular water level fluctuations over time.

Solinst AquaVent and Levelogger water level dataloggers are a great way for water users to meet their reporting requirements with ease.

Again, Solinst water level dataloggers are very easy to program with the sampling frequency as stipulated in the permit. They are designed for simple installation in wells, and have multiple user-friendly options for communication and data downloading.

Solinst water level dataloggers feature robust memory, so depending on your recording frequency, data may only need to be downloaded a few times a year. They are durable, low maintenance, and ideal for long-term, continuous water level measurement.

Solinst water level dataloggers make data reporting very efficient. After data is downloaded, it can be exported using Solinst Levelogger Software to an external spreadsheet program. The data is already organized and can be added to an annual report for electronic submission to the MOECC online reporting system.

The continuous water level data collected using water level dataloggers not only helps water users meet application and reporting requirements, it allows them to keep track of a valuable resource!

Read the full article in our **ON THE LEVEL Blog**, for more information and references.

The Discrete Interval Sampler Is A Great Choice For Groundwater Sampling...

The DIS shares the advantages of most no purge or passive samplers, including low costs, minimal labour, no power requirements, no compressor or control unit needed, and little agitation created in the well. The DIS has additional advantages:

- Sample is never pumped through tubing
- Sample is never mixed with water from different levels in the well or open hole
- Easy to transport, operate, disassemble and decontaminate
- Effective for collecting groundwater samples with any type of chemical constituents

A major advantage of the DIS is the narrow depth range within the well or borehole that the DIS obtains a sample from. Its design causes no movement during sampling. This makes the DIS ideal for sampling from specific points of inflow, or thin product layers, including DNAPLs or LNAPLs.

The stainless steel DIS is excellent for sampling all analytes, including sampling for Volatile Organic Compounds (VOCs). This is because the sample does not mix with water from different intervals, and does not travel through a long length of tubing, risking loss of volatiles. The sample has minimal contact with air, even as the sample is collected. The Sample release device is designed to minimize any offgassing.

The Discrete Interval Sampler is included in a table presented on the CLU-IN website, which provides a summary of the common analytes that can be sampled using various no purge samplers. The DIS is listed as able to sample for them all, including VOCs, as well as metals, anions, and MTBE.

For more information on no purge sampling principles and Discrete Interval Sampler operation, read the full article in our ON THE LEVEL Blog.

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