DRILLING FOR RESOURCES

An observation well network expansion program in B.C. aims to provide long-term info about ground water resources.

Nearly nine million Canadians – about 30 per cent of Canada's population – rely on ground water for domestic use, according to Environment Canada.

by STEFANIE WALLACE

The resource is often taken for granted, and as the age-old adage goes, you don't know what you have until it's gone. Many Canadians are in the dark about water resources, and the Regional District of Nanaimo in British Columbia is trying to change this with an observation well network expansion program.

The project started out as a partnership between the Regional District of Nanaimo (RDN) and the British Columbia Ministry of Environment. The program is run by the British Columbia Ministry of Forests, Lands and Natural Resource Operations (MFLNRO). The ultimate goal is to collect information on the quantity and quality of water in an aquifer and determine how it is affected by human activity. The program falls into one of the goals of the region's Drinking Water and Watershed Protection service: to improve information about the region's water resources.

Prior to the beginning of the program, there were 14 government-drilled and monitored observation wells in the region.

"The idea was to identify where there were gaps in the current ground water data in our region, and then to go out and see if we can collect more data to fill those gaps," says Julie Pisani, special projects assistant for Drinking Water and Watershed Protection program with the Regional District of Nanaimo. "Usually the ministry is responsible for drilling and maintaining the observation wells, but we saw this as an opportunity to create a partnership to achieve our goals under the drinking water and watershed protection program, to gather more data and fill

those data gaps."

The timing couldn't have been better. At the end of 2009, the Regional District of Nanaimo was awarded a Towns for Tomorrow grant from the provincial government. The grant provides funding to help communities in British Columbia address infrastructure needs in areas such as water and wastewater, recreation and culture, community development and more. This allowed for some existing wells to be added to the network in 2010 before the program began. In 2011, drilling for Phase 1 of the network expansion program began. Four wells were added in 2011 – two in Nanoose, one in Yellowpoint and one in Qualicum River Village, drilled by Drillwell Enterprises and Red Williams Well Drilling. Three wells were added in 2012 as part of phase 2, in Hilliers, Spider Lake and Qualicum Bay. Sonic drilling was involved in this phase, completed by Mud Bay Drilling from Surrey, B.C. The drilling in phase 3 was scheduled to be completed by the end of March, with plans to drill observation wells on Gabriola Island, Qualicum Beach and South Wellington. Qualicum Drilling is involved in this phase. Pisani told *Ground Water Canada* in an e-mail that drilling on Gabriola Island did not hit water, so that well will not be included in the observation well network, however, the RDN is currently looking for an existing well in the area to fit with monitoring equipment. In total, 16 new wells will be added to the network.

"The numbers don't add up because there are five additional wells that were added to the network that were not drilled," Pisani says. "They were, essentially, wells that existed on people's property that were not being used, so these people donated their well into the network."

In July 2010, Benson Meadows received monitoring equipment in an unsued well before the network expansion program began.
Photo courtesy Regional District of Nanaimo

The monitoring equipment was installed and added by the MFLNRO and those five wells are now part of the network. Additionally, one well received monitors in two separate layered aquifers that were within the same borehole, counting as two observation wells.

"We went through all the different aquifers where we currently have observation wells and identified the ones that we needed to have monitoring in," says Graeme Henderson, a ground water technician with the MFLNRO who has been a technical advisor for the project. Henderson says an internal review of the provincial observation well network was completed in 2009.

"We had a list of bedrock aquifers and sand gravel aquifers that were prioritized based on a whole slew of criteria. We had a consultant do a whole review. Using that as a backbone we worked with the Regional District of Nanaimo to suggest what aquifers would be best monitored to support our goals, which are the same goals as the RDN . . . to create a wide-ranging monitoring network so they can get a better handle on the ground water resource."

A request for quotation was administered for each phase from the Regional District of Nanaimo.

"We went with different drillers for each of the phases based on logistics and quotations," Pisani says. In the second phase of the program, the district partnered with the Geological Survey of Canada to complete the sonic drilling required.

"The Geological Survey of Canada was performing a study in the Nanaimo lowlands, covering our regional district, and completing sonic coring to try and study the aquifers and map them in our region," Pisani says. "We had a partnership with them in our second phase to do the well drilling and sonic coring concurrently."

Henderson provided monitoring equipment suggestions and installed pressure transducers in the wells. The device is deployed beneath the water and has a diaphragm in it that measures

pressure. An internal algorithm calculates the pressure into a water level, which is logged every hour and added to the provincial ground water network website for the public to see what's happening in the wells. Henderson calibrates the loggers, downloading and publishing the data. Some of the pressure transducers are equipped with satellite telemetry.

"At the wellhead there's an antenna and a solar panel and a signal is sent up to the government satellites, then bounced down to the Victoria server," Henderson explains. This eliminates the task of visiting the well and downloading the data, making the data available on the same day, rather than having to wait until Henderson completes maintenance rounds, which happen at least twice a year. When Henderson obtains and calibrates the water level and confirms that the data is valid, it will be listed online as validated data.The results of the project will be long term.

"We're hoping to monitor the aquifers where there were no observation wells before and get that water level data and collect it over the long term, with the overall goal of the data affecting land-use decisions, planning, development and overall public awareness," Pisani says. "All of this information is available online for the public to look at . . . to find out how each area is doing. Individual wells fluctuate with usage quite a bit, so these observation wells are helpful because they're pretty stable as there's no pumping going on out of that borehole."

Pisani says the RDN hopes this project piques the interest of surrounding communities, but at the end of the day it's often a matter of funding. The Towns for Tomorrow grant covered 75 per cent of the program's expenses, with the remainder covered by the Drinking Water and Watershed Protection service.

As part of another component of the expansion program, separate from the observation well network, the regional district put out a request for volunteers who were interested in wells on their properties to host water level loggers.

"The areas where we did the mail out were identified by another study we have going on, a water budget study," Pisani says. "We have hydrogeologist consultants putting together a water budget for all of the ground water and surface water in our region – mapping the aquifers and surface water sources and trying to quantify how much water is held in those sources, as well as how much water is coming out and from what land uses."

In general, Pisani says the community reaction to the observation well network expansion program has been positive. The RDN has links on its website that provide updates to the project so that residents can stay in the loop, and residents of the regional district were informed via a mail campaign that the project was happening in their community.

"There was some pushback from some of the residents, but we're talking to the public as they come by and assuring them that this is a monitoring program," Henderson says. "It's in everyone's best interest that we have a handle on how much ground water there is and what's happening to it in the long run."