

# Brampton Surveyors Connect for Powerful Productivity

In 1834, a small group of industrious people established the tiny hamlet of Brampton, located on the outskirts of Toronto, Canada. It was little more than a tavern with a few local farms at the time, but with progress and vision, the hamlet would soon emerge as a leading farming and agricultural community, best known as the Flowertown of Canada because of its large greenhouse industry. Today, Brampton is still a leading flower producer, among other industries, and among the largest and fastest-growing urban centers in Canada, with a population of more than 450,000 people and an average annual growth of more than 6 percent.

In these modern times, Brampton surveyors draw inspiration from their creative and dedicated ancestors as they strive to do their part to build and maintain the infrastructure necessary to support a continually expanding and evolving commercial and residential community. Every year, the Brampton Engineering & Construction Division's Surveys & Mapping Section is called on to support some \$80 million annually in major capital reconstruction, ranging from major road widening and rehabilitations to storm sewers and curbs—all with just a handful of surveying experts.

Doug Lawr, supervisor for city of Brampton's Surveys & Mapping Section says, "Like most cities, we're challenged to do more with less. Technology is our equalizer. In the last decade, it's become much easier to meet growth objectives thanks to the rapid advance of RTK and robotic technology. Because of these advances, our team of five surveyors is able to do the



▲ The city of Brampton staff relies on GPS for speedy surveying and, more recently, a comprehensive reference station network for online, all-the-time project control.

same amount of work as municipalities with two to three times more staff."

## Road to RTK

The Brampton Surveys & Mapping Section has always looked to technology to speed and improve accuracy for jobs that ranged from topographic work for engineering projects, construction layouts, quality assurance and checks for consultant projects, assisting other public works divisions, and many more tasks common to a municipal survey department.

In the 1990s, at the height of Brampton's population growth, the Surveys & Mapping Section became the first municipality in Canada to invest fulltime in GPS to improve mobility of crews throughout the rapidly growing city. Surveys & Mapping owns four smart rovers that include RX1250Xc controllers with ATX1230GG smart antennas and two TCRP1203 robotic total station systems with SmartStation GPS capabilities.

"GPS, and specifically RTK, significantly improved our productivity simply by offering us greater mobility with equivalent accuracies as compared to more conventional methods," says Lawr. "In the beginning, we'd set up the GPS in pairs, one as a base station and the other GPS as a mobile unit to set project controls on our various sites throughout the city. Little did we realize that this was just the beginning of something even better. Now we can use our four GPS units independently with all them tied into a reference station network."

In early 2008, Don Edgar, technical sales representative with Leica Geosystems, approached Brampton about joining the Southern Ontario SmartNet reference station network. The Southern Ontario SmartNet reference station network was first implemented in 2005 and continues to grow. Currently the network consists of 10 GNSS reference stations spaced 30-70 kilometers apart in and around the greater Toronto area, and a total of 40 GNSS reference stations in southern Ontario. It is available 24 hours a day, 7 days a week with broadcast correction service available to most network-ready RTK receivers.

The network is enabled by Leica Geosystems, which provides corrections at the centimeter level in RTK mode or sub-meter DGPS and with raw data for post-processing. Data from each of the reference



▲ On the outskirts of Toronto, Brampton is among the largest and fastest-growing urban centers in Canada. Its Engineering & Construction Division's Surveys & Mapping Section supports \$80 million annually in major capital reconstruction.

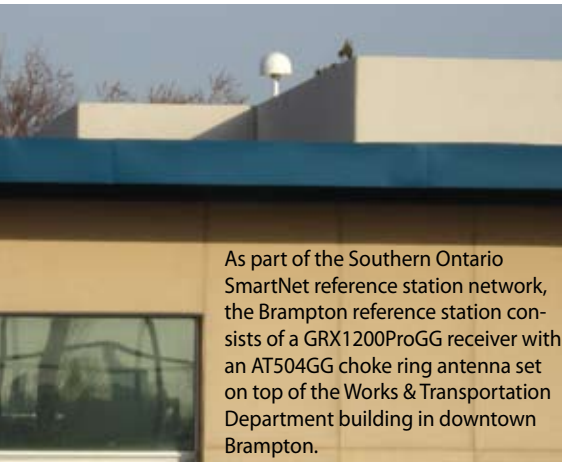
stations is received over the internet at a highly secure location in Toronto, where it is processed using Leica SpiderNet network calculation software and made available to users when they log in or as 1-second RINEX data from a FTP download site.

Brampton's Works & Transportation Department had recently moved to a new building that was an ideal location for another reference station to fill out the SmartNet network. Lawr made the proposal to management and they agreed. He procured a spot on the new building to install a GRX1200ProGG receiver with an AT504GG choke ring antenna. The location provides

coverage of most of Brampton and offered Lawr and the other surveyors almost immediate benefits.

Lawr explains, "By hosting a base station in one of our buildings, we essentially doubled the number of RTK rovers in the field at any given time while increasing our coverage area. We

had 24/7 access to this base station and others in the network. Therefore we could take our GPS units that were working in pairs, and use them as single units working off SmartNet to realize exceptional reliability, equivalent accuracy as compared to conventional base station/rover setups, and long-range performance capabilities when combined with our good field practices."



As part of the Southern Ontario SmartNet reference station network, the Brampton reference station consists of a GRX1200ProGG receiver with an AT504GG choke ring antenna set on top of the Works & Transportation Department building in downtown Brampton.



▲ During the \$12 million Queen Street East widening project, Brampton surveyors relied on the reference station network to set all project control for the site and collect pre-engineering topographic data. They used GPS to shoot more than 13,000 topographic points over the course of 10 weeks.

Today, Brampton surveyors rely on the reference station in Brampton, as well as those in surrounding communities such as Etobicoke and Milton, to achieve about 98 percent coverage. The Brampton reference station location is also valued by other SmartNet partners, hosts, and subscribers. Amar Kalsi, sales coordinator with Leica Geosystems in Canada, says, "We're getting about 95 percent daily use rate for the Brampton reference station on the network, which includes Brampton surveyors and a number of other public and private surveyors in the area."

## Queen Street Connection

Over the last year, Brampton surveyors have relied on the SmartNet network for a range of projects, from simple topographic studies to complex arterial roadway expansion projects. Perhaps the most visible to-date is the \$12 million Queen Street East widening project. Located in an old urban area, Queen Street is the main east-west corridor through Brampton. The widening project will expand Queen Street to six lanes from Centre Street to Highway 410, about three kilometers, to accommodate the AcceleRide bus transit system with queue jump lanes.

Lawr's group was charged with setting all project control for the site and collecting pre-engineering topographic data to help meet the environmental assessment and detail engineering proposals and bidding deadlines. Using the SmartNet reference station network and all four of the GPS receivers, the surveyors established 50 project control points, all within one week. They then shot more than 13,000 topographic points over the course of 10 weeks.

Using the SmartNet correction data, the surveyors used all four GPS units to work independently at the Queen Street job site. "Each morning, surveyors would set up and turn on the GPS, and by the time they walked to a project control station to perform a check they had satellite lock and correction data and could begin to collect topographic details. All this happens in a matter of a few minutes," says Lawr.

Each topographic position takes approximately three to five seconds to record. Every couple of days, the data is uploaded to a computer for backup and processing. Lawr adds, "All our data is collected in real-time so there is no need to do any post-processing. The data files are joined together, edited for any errors, then processed in our CAD and survey software into a graphic picture ready for the engineering design."

Throughout, the Brampton surveyors were able to achieve less than 2-centimeter accuracies in vertical. "We simply couldn't have done this job with the necessary speed, accuracy and ease without GPS and SmartNet," says Lawr. "Our guys love the mobility of the GPS receivers and the centimeter accuracy that they can achieve."

The Queen Street project planning and design effort is now complete, but the Brampton surveyors' role in the project is just beginning. Construction of the Queen Street East widening project is scheduled to commence in summer 2009. Throughout the construction phase the survey section is responsible for providing quality assurance, verifying that the layout is in accordance with the plans as they rush to prepare this important corridor to handle rapid transit buses by September 2010.

Lawr concludes, "GPS and the SmartNet network have literally revolutionized our jobs, allowing us to expand our services to meet community growth initiatives. We're excited about the future, expanding our wireless capabilities to make better use of GPS data from the field, and finding new ways to apply the technology with accuracy and speed." ▼

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