African Gold

The Mystery of Capital
What separates rich & poor?

GNSS RTN
Texas, New Orleans
& Philadelphia

Footsteps
Title industry changes

Harnessing a GPS Network

I t's a powerful system, this SmartNet North America. Launched by Leica on March 1, 2010, SmartNet is a subscription-based service offering GNSS Network RTK corrections throughout North America.

Geographically, SmartNet covers Ontario, Quebec and the Maritime Provinces in Canada, and some 15 states, including most of those on both coasts. Leica's goal is not necessarily to cover the 48 states with SmartNet. Rather, it is to grow the network into areas with a large enough subscriber base to support central IT and management functions.

SmartNet IT infrastructure is centralized at a facility in Boston with a full disaster recovery facility in Dallas. "As of the end of last year we had nearly 500 stations on line," says Wendy Watson, director of reference station operations for SmartNet. "And now we have approximately 2,000 subscribers who are using the system."

In addition to the stations directly in SmartNet, many affiliate networks use Leica technology. Some of these networks are linked to the SmartNet website; for network service in those areas, you can contact the administrators.

Leica also manages more than 200 independent stations under management and support contracts. The services offered by Leica range from full IT management, installation, network adjustments to monitoring and management of these stations. "The Reference Station group at Leica is highly qualified in IT, networks, and GNSS technology, so our services are sought out to help others manage their networks," says Watson.

SmartNet's first year of operations has been focused on improving the IT infrastructure for long term growth and on systematically upgrading the network to full GNSS capability. "SmartNet is continually assessing opportunities for expansion of coverage throughout North America," says Watson.

>> By Dan Brown

A survey technician collects a point using SmartNet. "We track every last valve, manhole, and section of pipe in our GIS system," says Larry Szarek, GIS manager for the Philadelphia Water Department.

Data from each station in SmartNet is streamed to the central servers in Boston. There, SpiderNet distributes the RTK correction data in multiple formats. When a customer subscribes to SmartNet, they are issued an ID and a password to be entered into their GNSS rover. They dial into the network via cellular phone service and when their identification is verified, the corrections are ready to begin streaming to the rover.

Watson says the cellular telephone network has definitely improved. "Plus, our data packets are not so big that cellular latency is an issue, but there are still areas that do not have cell coverage. Typically that's in rural areas where we may not typically have stations so it's not a pressing issue."

SmartNet features interoperability with respect to various manufacturers' receivers. "If they are capable of signing onto the Internet and capable of receiving data in the industry-standard formats, they can use the network," says Watson. SmartNet transmits in industry-accepted standard formats such as RTCM3x, RTCM 2.3, and DGPS 2.3(9.2).

When using proper survey techniques for GNSS, SmartNet provides accuracy to within 1 to 2 centimeters horizontal and 2 to 3 centimeters vertically. This level of accuracy makes networks very productive for many applications. Networks have traditionally been used in surveying, but other markets such as machine control, agriculture and GIS are now using networks as well.

"The majority of machine control applications can be done on networks,"

says Watson. "For some of the extremely fine grading or paving applications, it might be better to use another technology such as robotic total stations, because the vertical requirements are beyond those attainable through GNSS technology. In agriculture, networks are used to improve productivity and reduce costs when spraying, harvesting and planting.

For about five years, Vanasse Hangen Brustlin Inc., a Watertown, Massachusetts-based survey firm, has used SmartNet for a wide variety of survey projects ranging from highways and airports to utilities and military base projects. "We used it at the Newport News (VA) airport, and at many of the small airports in Virginia," says David Andrea, LS, survey manager for the firm.

One of the largest projects the firm completed recently is a 1,500-acre boundary survey in Virginia. "There were places where we could not use the rover because of tree cover," says Andrea. "But a great deal of that job was open so we utilized SmartNet to define the property border. It saved us a lot of time and money because we didn't have to run a conventional traverse."

How much time did it save? The survey took a month, and would have taken six weeks without SmartNet, Andrea said. He finds the accuracy of SmartNet to be within one-hundredth of a foot horizontally.

In this economy, you need every advantage you can get. Certainly network RTK can give you an advantage. Because more work in less time translates to more fees per month—a goal worth shooting for.

Philadelphia
Managing 6,800 Miles of Pipe

Certain parts of Philadelphia's water supply and wastewater system range up to 100 years or more in age. It's a very large system. Water supply requires approximately 3,200 miles of pipe and the city manages 3,600 miles of wastewater and stormwater pipe. Daily, the Philadelphia Water Department is handling repair and replacement projects for the system.

To manage the system, the department uses a GIS system and the SmartNet RTK network provided by Leica Geosystems. "We track every last valve, manhole, and section of pipe in our GIS system," says Larry Szarek, GIS manager for the department. "We use the GIS system for asset management, for planning, document management, work orders, applications and analysis. By analyzing the data, we could, for example, find inlets that would be prone to flooding based on various data layers that we have."

About six years ago, the city spent some $7 million to create the GIS system. Approximately 250,000 engineering drawings were integrated into one large network for water supply and sewers.

The department uses Leica Office software to take data from field collectors and put it into a form for use in the GIS system. Leica's software is compatible with ESRI software, which is the Microsoft of the GIS world. "The two biggest things that we use the

desktop software for are cartography (map making) and data editing," says Szarek. "Edits are being made daily to reflect changes from the field or improvements of the data. We have two to three full-time editors."

Szarek's GIS group takes design drawings for a proposed construction project and sketches them into the GIS system using editing tools. "Then, at a certain point we get a heads-up that one of these proposed jobs is complete," he continues. "The first thing that we will do is go into the GIS and mark everything as "active" instead of proposed, but it is still a rough sketch based on the plans.

"The next thing is that field inspectors draw up their field sketch of what the contractor did," Szarek says. "That is part of what they use to pay the contractor. We will get a copy of the sketch and identify some key assets that we want to get GPS readings on - things that we can see above ground, like a fire hydrant or a manhole.

"That GPS data is brought back to the office and put into the GIS," says Szarek. "It is rather like playing connect-the-dots to put in what was built out in the field. And it is a lot more accurate than a sketch. Now you have extremely accurate readings from the GPS. Horizontally those readings are sub-centimeter accurate."

Szarek says there is a long lag time between construction and the time his department gets a final as-built drawing. So because the department likes to keep the GIS system as close to real time as possible, GIS surveyors go out and get GPS readings on what has been built. "That way we can mark the sketches as active and have a very high degree of accuracy without having any surveying for as-builts," says Szarek.

How does Szarek like SmartNet for his GIS purposes? "It's great," he says. "Now when people are out in the field, if one antenna goes down, they just pick up the next closest one on the network and they don't even realize that it went down. They just continue working. It is all very seamless and transparent. SmartNet gives us the type of data we can plug right into our GIS system."

New Orleans
Surveying for the Great Wall

When Hurricane Katrina struck New Orleans in 2005, it was one of the five deadliest hurricanes in United States history. Since then, work has been under way to install protection for the city. Indeed, the U.S. Army Corps of Engineers has awarded more than 270 contracts to build a flood protection structure known as the Great Wall of New Orleans.

The structure will protect the city against flooding of the kind brought on by Hurricane Katrina. It is a 13-mile-long flood wall consisting of a 40-foot-high earthen berm on land and a huge concrete wall that extends about a mile across the Greater Intracoastal Waterway. Pile drivers, mounted on barges, are driving piles 200 feet into the waterway floor to serve as foundations for the wall.

Much of the construction layout surveying for the wall is being done by the survey firm of John E. Bonneau & Associates, Madisonville, Louisiana. "We started working on this project in the summer of 2009," says Brandon McCain, project manager for Bonneau. "We have used SmartNet and the static process of using the GPS to do all of our control for everything along the walls. For example, our data tells the contractors where to locate the barge and where to place the pilings."
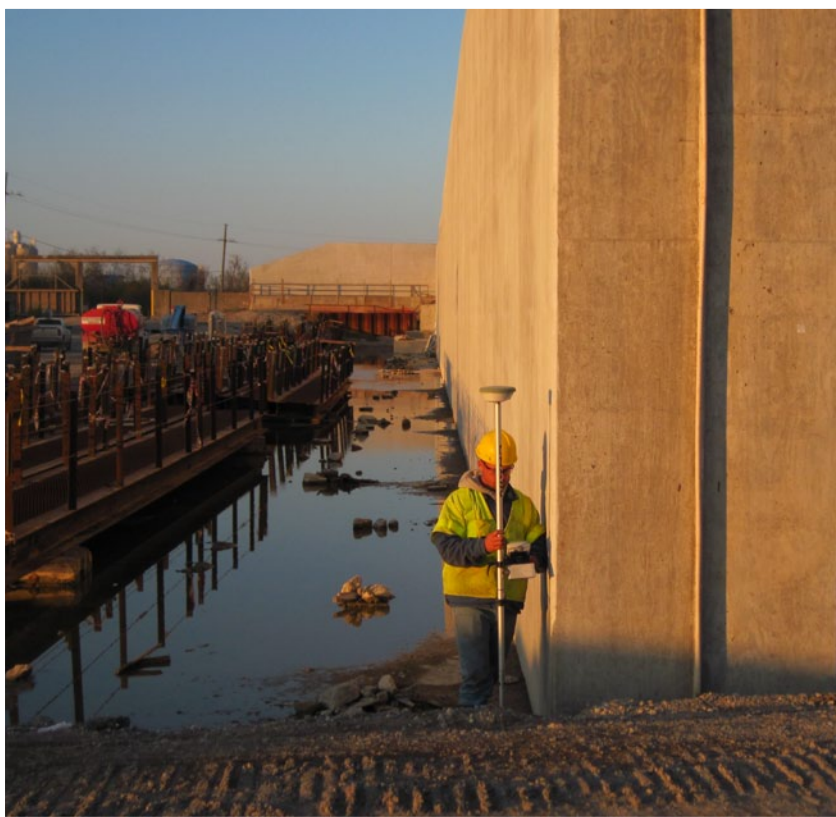
John E. Bonneau & Associates did much of the surveying for the Great Wall of New Orleans, a new flood wall to protect the city.

New Orleans

McCain estimates that SmartNet has saved his firm 20 to 30 percent of the time it would take for the wall surveying by conventional methods. "If you use conventional surveying methods and you set your control points, let's say those points get knocked down," says McCain.

"But if you have a good GPS system and a good network that has very good repeatability, which we have found with SmartNet, then you can go right back and establish two points and start surveying again—just like that," says McCain. "You don't have to rerun from some control that is far away and have a chance of human error. You can jump out of the truck and start surveying right away."

Bonneau uses the Leica RX1250X data collector with an ATX1230GG Smart Antenna receiver. McCain likes the data collector for its quickness and flexible features. "You can change interfaces very easily and check your data, and it's got a great interface for looking at what is going on in the field," he says. "You can look at your screen and get a bird's eye view of your project. Or you can inverse your points. It gives you an extremely wide range of features and it is extremely helpful, especially out in the field."

Baseline Corporation was given the job of surveying the hurricane-damaged roads on Bolivar Peninsula on the Texas coast.

Bolivar Peninsula
Making Quick Work at a Damage Survey

In 2008, Hurricane Ike struck the Texas coast near Houston and wreaked heavy damage on Bolivar Peninsula, a narrow strip of land that extends across Galveston Bay and East Bay. Last summer, the job of surveying the damage to roads on Bolivar Peninsula went to Baseline Corporation, a Houston-based survey firm.

"We were given four weeks to complete the job, and we got it done in two," says Donald Barnes, CST, GIS/GPS project manager for Baseline. In that short period, the firm documented the width of the roads and their condition so engineers could determine what needed to be replaced. "We located over 300 individual roads or streets," says Barnes.
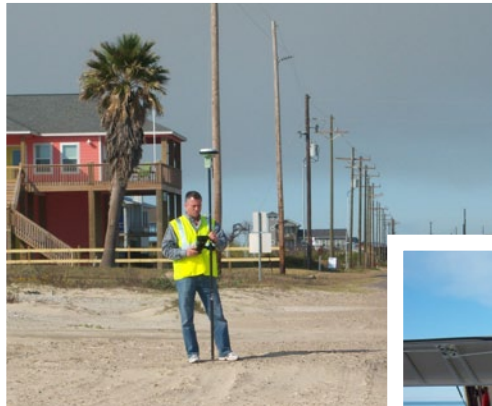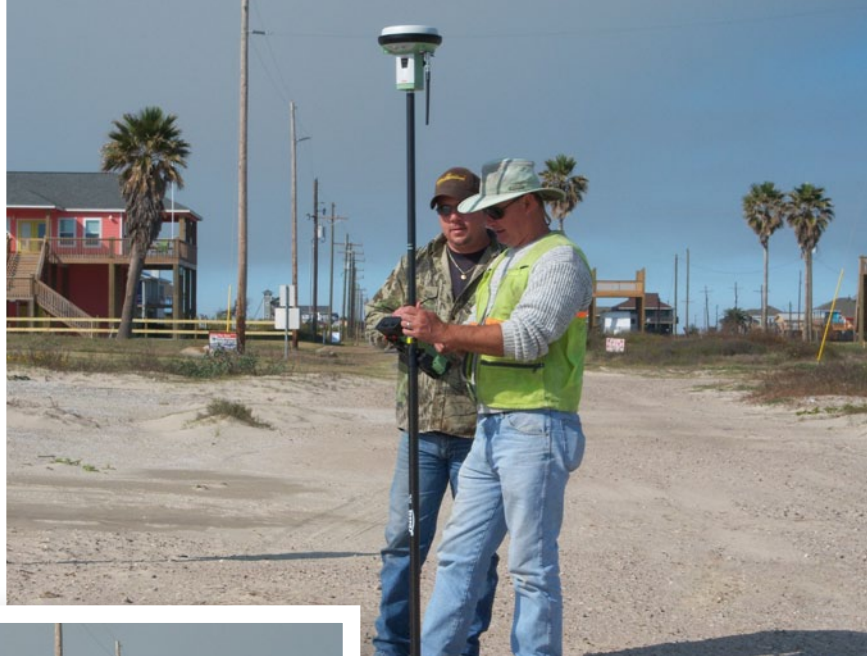
The key to Baseline's productivity was SmartNet, the RTK GNSS network from Leica Geosystems. With reference stations across much of North America, SmartNet permits surveyors to eliminate base stations and simply connect to the network to receive data corrections.

"SmartNet probably cut our time on that project by a third," says Pat Going, RPLS, president of Baseline. He allowed the extra two weeks in the bid because he was uncertain about cellular tower damage. But they had been rebuilt. "We just went down there with our Leica Viva rovers and tied in the edge of pavements and tied in all the washouts for quality control and determination of the cost to replace all of the roads that got washed out," says Going.

Going and Barnes said they studied various networks before deciding on SmartNet. "What sold us on the Leica was the repeatability and the traceability," says Barnes. "With other networks there is no way to trace anything that you have done. You're just surveying in the wind. With SmartNet I can pull up the data, look at what was shot, what time, and see my base line data. The data is traceable back to its origin."

Dan Brown is the owner of TechniComm, a technical writing provider based in Des Plaines, Illinois. TechniComm specializes in construction and survey topics.