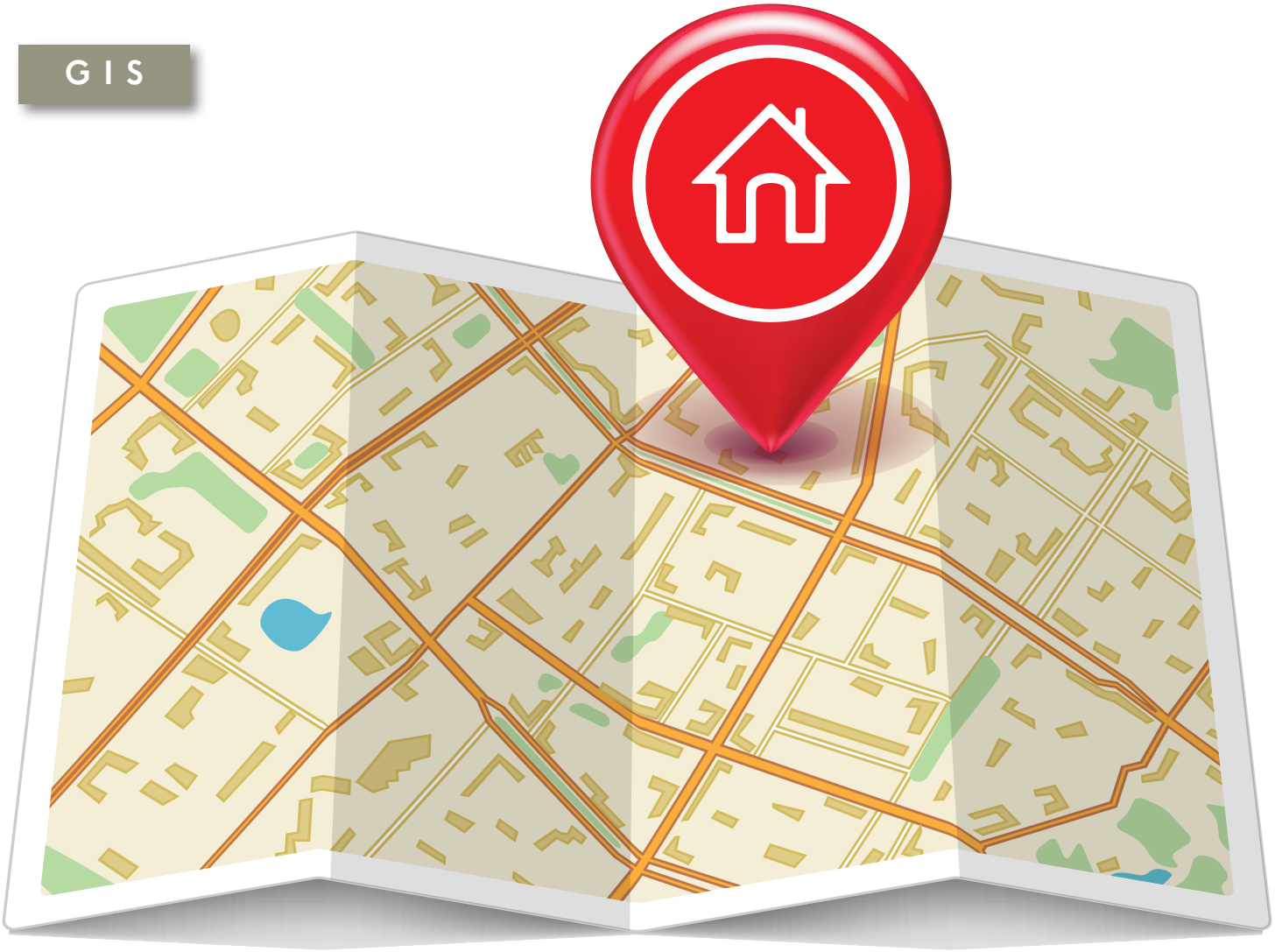


THERE'S A MAP FOR THAT

Why GIS might be the most important technology in utilities today

In a world that seems increasingly virtual, no business is more firmly rooted in the real than a utility. The first thing you ever hear about most utilities, whether in its name or in its description, is the area it serves. And in those areas, almost every aspect of a utility's business—delivering gas, maintaining or expanding infrastructure, responding to incidents, working with customers—is dependent on location. That's why geographic information systems, or GIS, might be the most important technology transforming the utility business today.

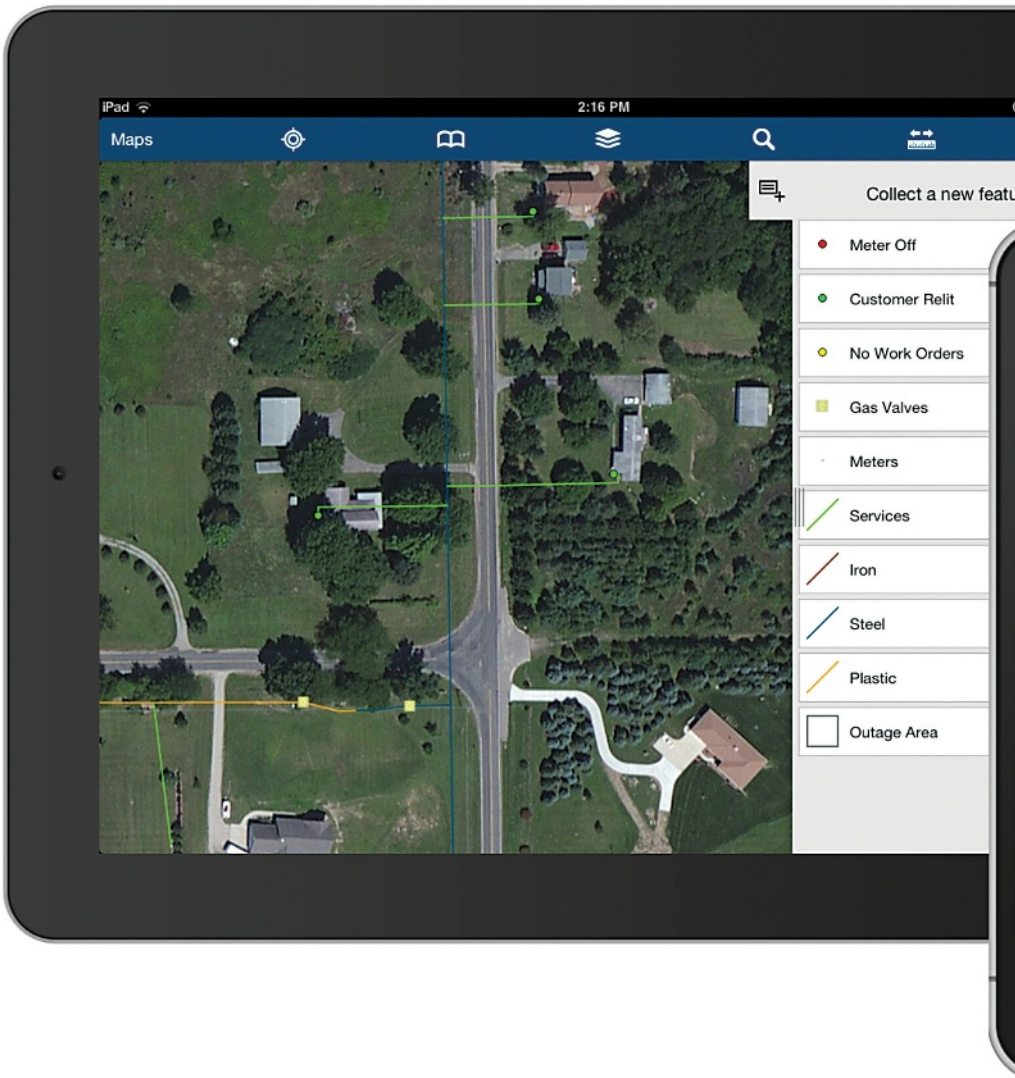
The role of GIS is expanding beyond network management into marketing, customer service, workforce management, environmental management, engineering and design, regulatory compliance, and more. Vital information that was trapped in paper maps and electronic databases and spreadsheets is finally finding its proper place. In the process, utilities are making better use of their assets and workforce, and safety, reliability, and incident response are improving by leaps and bounds.

In this package, two key vendors and a utility describe the state-of-the-art in GIS and the direction in which the technology is going. —*Richard Sine*

ESRI:

UNFOLDING NOW: THE FUTURE OF GAS UTILITIES

By Tom Coolidge



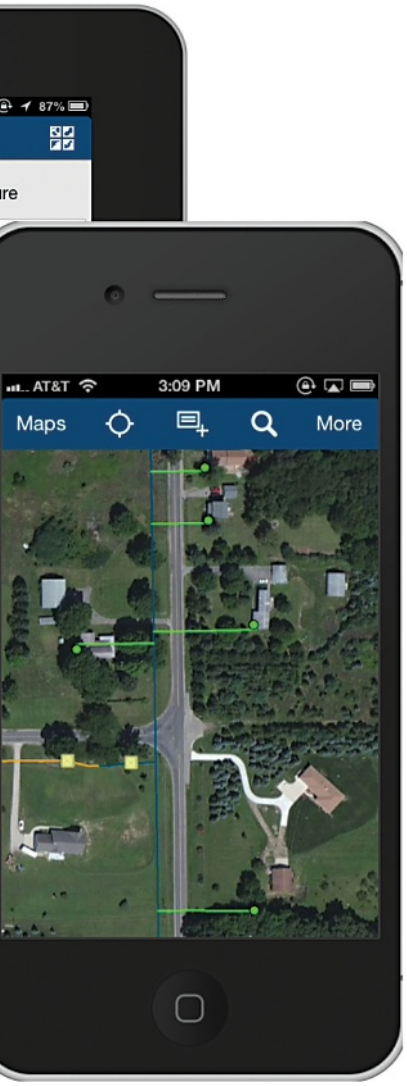
Leaders in gas utilities today use GIS technology to solve business problems in important new ways and areas. More than ever, staff throughout a gas utility can see information and work with data through an intuitive map interface. This allows them to work and think more naturally, spotting trends, patterns, and answers better than before.

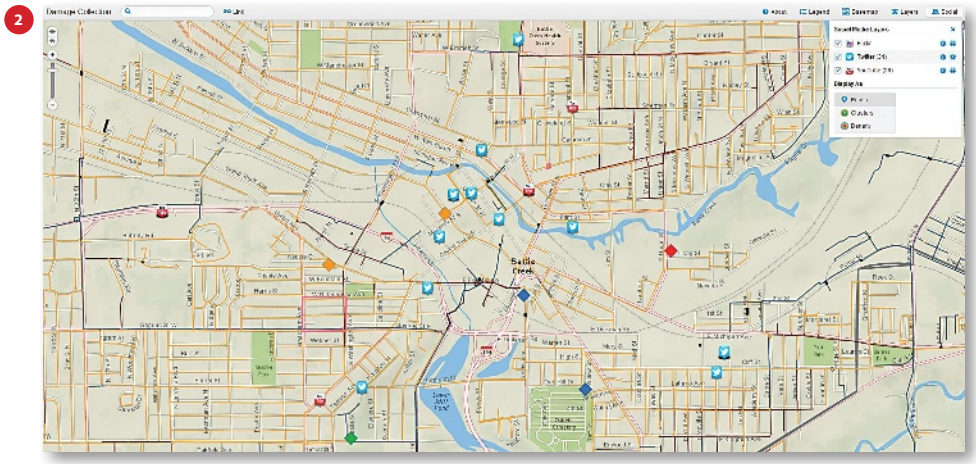
Consider these four recent advances in GIS

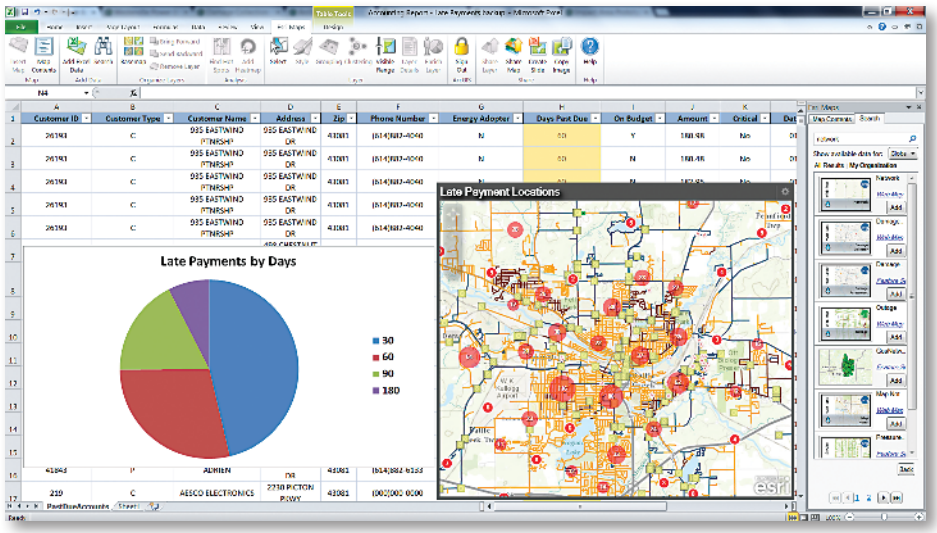
One: Tailored-for-purpose applications signal the start of a new era of GIS use. These apps are easy to create, quick to deploy, and simple to use. Previously, the norm was for each GIS application to support many purposes. This meant each app needed to be a superset for many jobs and tasks, and any one user would only ever need part of it for any given job or task. Now, rather than searching for the specific function within an application for a given job, users can instead get just the app they need, when they need it, wherever they are. (See Figure 1.) Even better, these tailored-for-purpose applications mirror at work what employees use at home on their own smart devices, making GIS applications intuitive and reducing training time.

Two: GIS is no longer just about space. It's also about time, even real time. Many within a gas utility need to know what is going on as it happens. This full grasp of the "now" is key to those who need to factor the current state of things into their thinking for decision making and activity planning. For years, sensor networks such as SCADA have provided control staff with current conditions, allowing them to promptly make adjustments that help ensure a gas network always performs as expected. More recently, other feeds from social networks such as Twitter as well as government and other authoritative sources have added further real-time resources to aid gas utility awareness within and around the service areas. Staff throughout a gas utility now can create any combination of these and other sources in dashboards and other integrated views wherever they are working to see all relevant information in an instant. (See Figure 2.)

Three: Business analysts—who spend much of their day using tools such as business intelligence from major providers including SAP, IBM, Microstrategy, and Microsoft, searching for patterns and relationships in tabular data—can now get live maps and analysis tools from GIS within their BI or Microsoft Office software. (See Figure 3.) These new capabilities can turn unstructured and structured data into powerful intelligence. Business users can ask simple or complex questions of their data and get insightful answers using location as the new analytic key. Moreover, business users can work with these new capabilities within the software they use every day in a natural way. This is a major advance. Live maps are coming to business users in the software they use every day. All of this is now possible through software configuration. No customization is re-







quired. This opens exciting new possibilities for employees in areas such as accounting, sales, marketing, and customer service.

Four: The tailored-for-purpose apps, real-time GIS, business intelligence integration, and much more are all part of a platform that can unify the whole gas utility. Not only can each employee work better individually, but they also can now collaborate better with others. This enables new workflows and new ways of working. (See Figure 4.)

Add to this the fact that the platform is built to interoperate with other enterprise systems, and the impact of modern GIS for gas utilities becomes even clearer. Indeed, all these advances are occurring as gas utilities embrace GIS as an enterprise system, much the same as an enterprise resource management system or customer information system. Among these enterprise systems, GIS plays a unique role as it is often the "glue" that combines the various data sources into one. Geography is a utility's greatest common data denominator. In this corporate environment, GIS professionals and their IT colleagues play a pivotal role. They provide leadership, governance, security, application development services, and information publishing services.

Why are these four advances so important? Because they enable increased safety, better financial performance, decreased risk, and improved customer service. Some gas utility operators might not be aware of all that GIS can do for gas utilities. Now is the time to take full advantage of GIS. ◆

Tom Coolidge is Global Pipeline and Gas Utility Industry manager for Esri, a major supplier of GIS mapping solutions.

Figure 1: Tailored Apps: The Collector app allows field workers to capture the location and basic information about features and then send it all immediately back to the office. It is available for iOS and Android devices..

Figure 2: Real-time Assessment: Utilities can use dashboards to integrate real-time damage assessment and social media feeds to provide the public with an up-to-the-minute picture of the state of a service area.

Figure 3: Business Analytics Dashboard: Without leaving the Excel environment, business users can analyze data, such as late-paying customers, in a location-based context that uses clustered point maps or heat maps to quickly understand the density of point features..

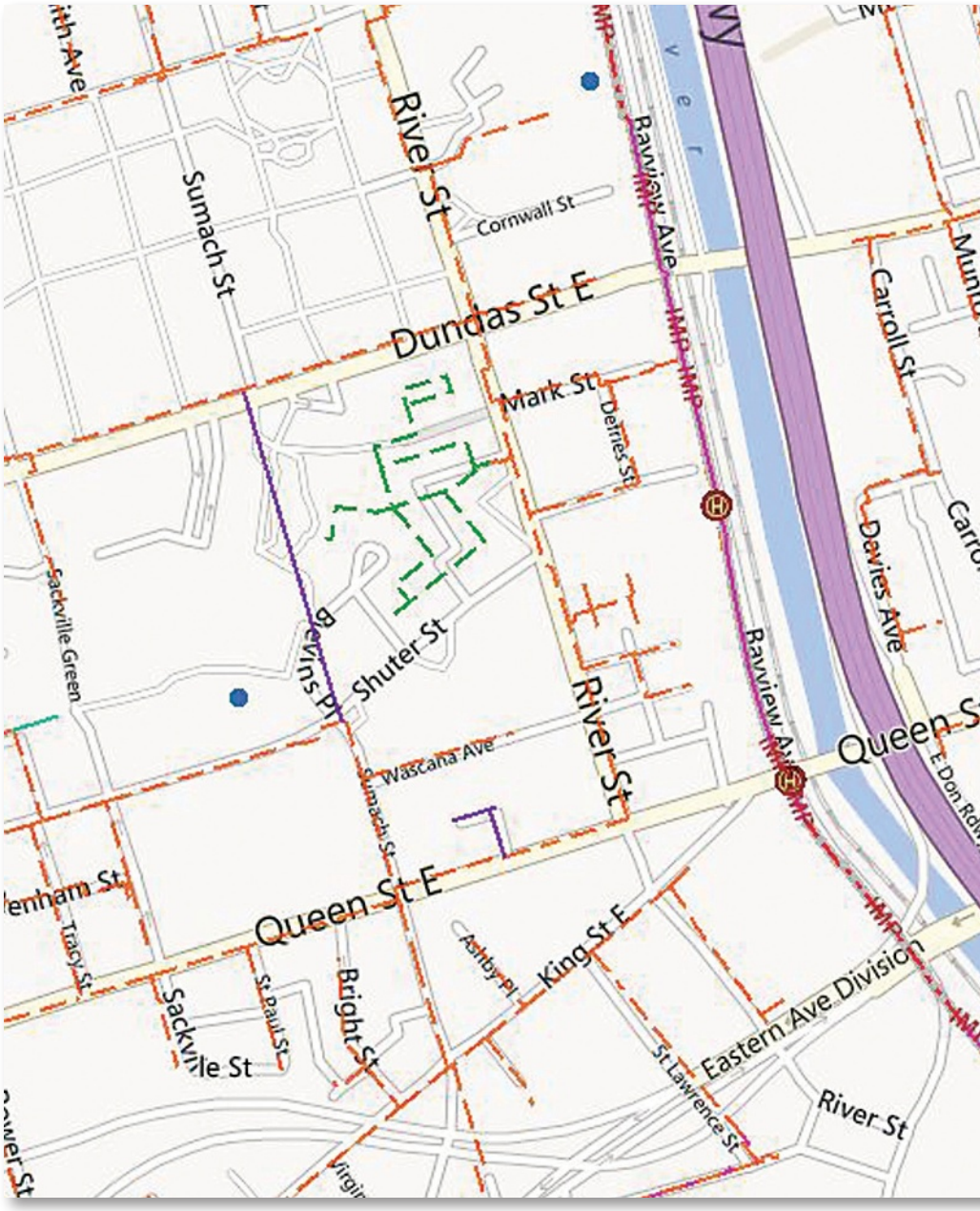
Figure 4: DIMP Results: The DIMP Results Dashboard integrates maps with a variety of data sources related to network integrity to create a real-time operational view.

GIS

ENBRIDGE GAS DISTRIBUTION:

REAL-TIME ASSET MANAGEMENT

By Catherine McCowan



At Enbridge Gas Distribution, having access to accurate and reliable asset information is crucial to our company's success. We're Canada's largest natural gas distribution company, owning and operating more than 36,000 kilometers of pipeline, primarily in Ontario. We introduced ESRI's GIS in 2011, leveraging spatial analysis and using location information.

The landscape in which we operate is changing. Customers, residents, politicians, and regulators now want more information and have more questions about the safety and reliability of energy systems like ours. In areas of high urban density, risk management is a top concern. Regulators increasingly want to know why new infrastructure is needed and when it will be utilized. Capital investment requires a defined purpose, identified need, and planned timing.

Further, as information technology and operational technology converge, the large of amount of data being created needs to be managed and interpreted in real time. Smart systems and the systems that process their data will support future decisions.

We can now show our own work as well as that of third parties alongside the gas infrastructure in the GIS system. Visualizing work request distribution enhances risk assessment and mitigation activities and helps us monitor and manage third-party work around our critical mains. Our network operations center monitors these work requests for proactive risk assessment and mitigation.

By building cascading network analysis models for decision making, GIS allows for planning network analysis and risk management. In the event of an emergency, models can be built in near real-time to assess the impact on the network.

A GPS system was implemented as well, with performance standard inspectors capturing information about the location of gas network assets as well as the land base features through a handheld device. In the past, data would have been collected with a measuring tape and a clipboard. By reducing the time it takes to collect data, inspectors now also have more time to inspect assets and help ensure they're in good condition, further mitigating risks.

GPS improves the accuracy of measurements, and wireless data download and upload makes the information available faster. Data captured through GPS is now visible in our GIS and other systems in about an hour. Having asset information available in near real time allows us to more readily respond to requests from the public, regulators, or excavators.

Figure 5: Work Requests. Screen shot shows work requests on one of Enbridge's vital mains in Toronto, as well as other work requests within one kilometer of the vital main. The various colored lines are the gas mains. The brown circles marked with an "H" are work requests on the subject mains, and the blue circles are other work requests.

One of the most important things we do each year to maintain the integrity of our distribution system is to provide excavators with information on the location of our natural gas pipelines. We're part of Ontario One Call, a program that provides a single point of contact to get locates for many utilities in the province (not unlike the "Call Before You Dig" 811 program in the U.S.). Each year, we're asked to provide approximately 500,000 locates, which means our information must be accurate and up-to-date.

The consolidation of information from different systems has helped provide a unified view of work activity and asset information. We're able to identify high-consequence areas by bringing the main data together with the municipal data. If our integrity team wants to know where the assets are in comparison to hydro corridors and subways, they can pull this information and identify areas more prone to potential stray electrical current or other risks. Leak inspectors can combine the use of GPS with our GIS maps to confirm that they have completed the planned leak survey. They can also provide accurate location information to the crew that will investigate the leak further.

Moving forward, there are many new ways we hope to better leverage this technology, including leveraging vehicle GPS to respond to emergencies; leveraging municipal data to support expansion and reinforcement plans; and integrating asset information with environmental information, such as third-party excavation and natural and built features, to better understand risk. We're also planning an initiative to use GPS to replace paper as-built drawings.

In order to realize the benefits of this abundant, safe, reliable, and economical energy source and to maintain public confidence in what we do, information management and security will continue to be critical and platforms like GIS will become an important tool in asset information decision making. ◆

Catherine McCowan is manager of Asset Systems at Enbridge Gas Distribution in Ontario.

3-GIS:

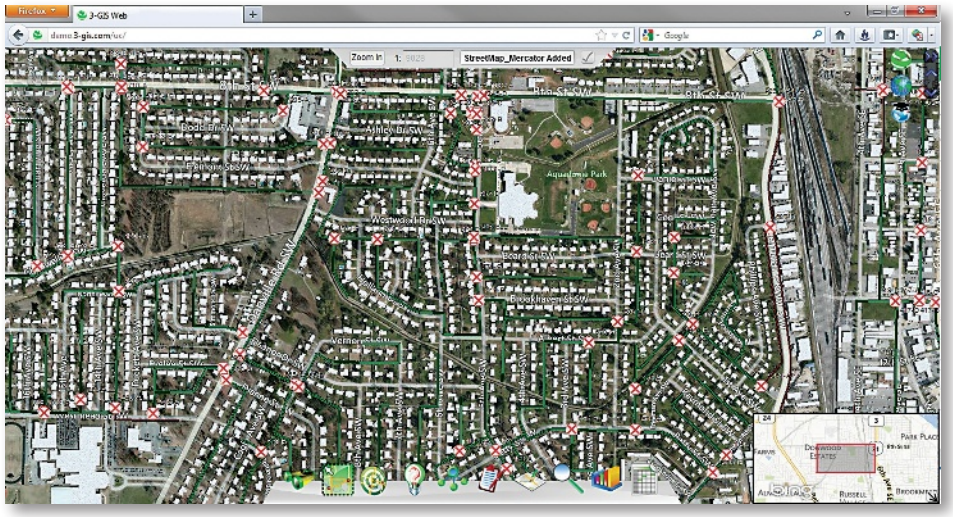
EASIER, FASTER COMPLIANCE

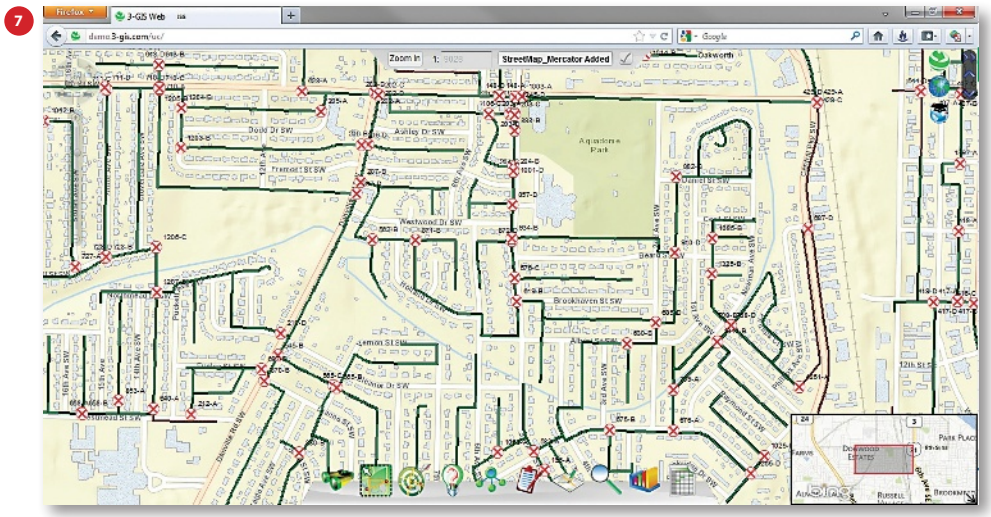
By Jerry Golden

Gas utilities are increasingly being held accountable for their compliance, inspection, and maintenance activities. As federal regulations have increased in both complexity and thoroughness, gas utilities have struggled to comply due to business processes that may be outdated and inefficient and network and asset information that may be inaccurate. However, many gas utilities are embracing both new and old technologies to effectively meet these regulatory requirements—and GIS is helping.

Traditionally, GIS has been considered a backdrop for performing field inspections. Inspections were typically performed against a utility's mapping data and then stored in a separate set of database tables. Referencing a selected asset, the field user would perform the inspection and then store the findings as redlined notes or possibly on a spreadsheet. Upon returning to the office, the user would either re-enter the findings manually or perform a complex synchronization process to upload the data to the ERP system. Although this was an improvement over keeping up with writing notes on a map manually, the newer processes are expensive to maintain, labor intensive, and prone to errors and omissions.

Server-based applications, the latest advancements in GIS technology, were created with these challenges in mind. These server GIS software toolsets provide a base set of functionalities to serve up maps and relate the new data to users through websites or streamlined field applications. Although more traditional





Figures 6 and 7: Checking Assets: The ortho view, which shows actual buildings and imagery, and the street view, which is a simpler map, both show gas utilities assets on top of the maps. The red and white circles are valves; the green lines with black around them are distribution mains; and the solid reddish lines are transmission lines; the service lines are hidden under the transmission lines.

GIS users can continue to access the same data through more complex GIS editing environments, server-based applications provide a utility with multiple benefits. These benefits include software releases that maintain the server without IT resources being burdened with client installations and upgrades; minimized training due to customizable, streamlined Web and field applications; a wealth of free online map data that can be overlaid on the utility's data, including streets, satellite imagery, and weather data; and lastly, simpler interfaces to the GIS data.

In addition to the Web-based GIS interfaces, the new server technologies include mobile components as well. Esri's ArcGIS Server application has integrated the ArcGIS Mobile component, which can be used to quickly take GIS asset data into the field. Mobile technology can also communicate with the server to upload data edits back to the central GIS repository. A product built around ArcGIS Mobile can then be deployed to a number of devices, including tablets, laptops, and handhelds, and the entire installation can be accomplished in under 10 minutes. Using mobile applications, asset data edits are stored in a local map cache. When the user is connected to the utility's network, these data edits are pushed back to the server. These processes enable a simplified communication between the field and the server, reducing data interfaces and synchronization, which was problematic in the past.

Today, GIS companies are taking the lead in developing applications to assist gas utilities in fulfilling these regulatory obligations, leveraging the latest GIS technology in both the office and the field to assist personnel to actively collect, track, and manage both asset-level data and related regulatory information.

Because utilities have a variety of inspections and processes to perform, having a solution to only one of these processes is not an option. Thanks to new GIS technology, HCA surveys, facility inspections, exposed pipe data collection, leak surveys, and inventorying assets do not have to be a dreaded and untimely task. Instead, utilities are able to identify sites inside a potential impact radius and classify the HCA zone; run data collection/correction in the field with high-accuracy GPS; run compliance reports that identify facilities that are due inspections; run queries and reports directly from uploaded data; and view historical inspections on features at any time. With a Web and mobile solution that work in sync, gathering information and performing surveys—which used to require hours of post-processing—can be done in minutes.

The evolution of GIS technology plays a key role in the direction of gas utilities. Today, federal gas regulations can be accommodated in a timely manner using the latest in technology. ◆

Jerry Golden is COO of 3-GIS, maker of the 3-GIS Network Solutions package, an advanced mapping solution based on Esri's ArcGIS Server and ArcGIS Mobile. 3GIS is based in Decatur, Ala.