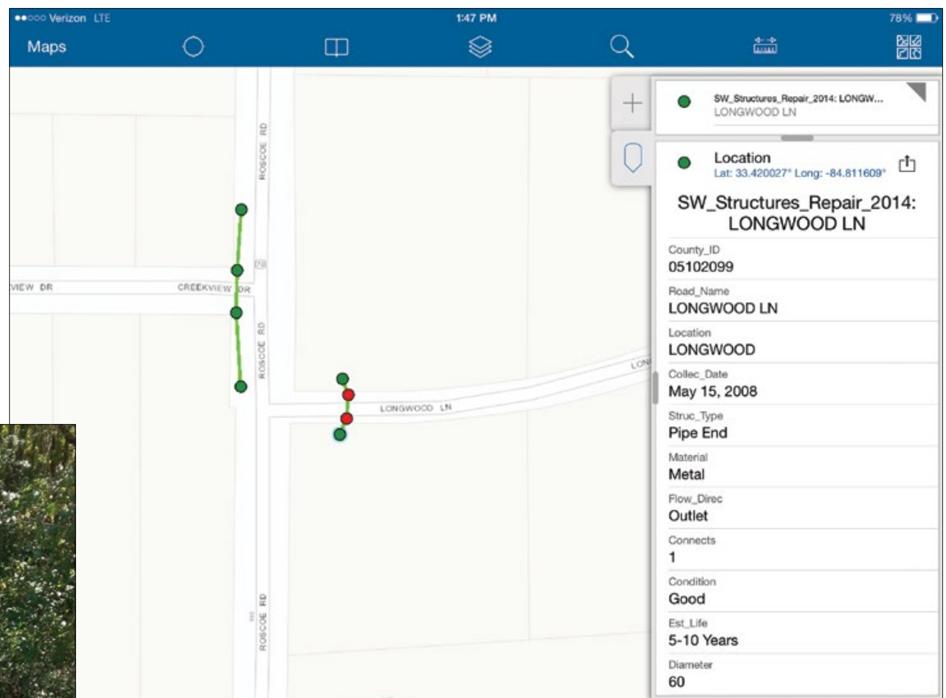
Esri News
for Water & Wastewater
Winter 2014/2015

Double Time in Georgia

Coweta County Public Utility District Moves Twice as Fast with ArcGIS on iPad

Coweta County sits 30 minutes south of Atlanta, Georgia. Its horse farms and gardens sustain a small-town feel; whatever you need is just a short drive away.

"In other words, it's a charming place to live," Coweta County stormwater resources manager Brice Martin said. "A lot of movie filming goes on here; *The Walking Dead* has been filmed here for a number of years. We are a south-metro Hollywood, if you will."



↑ Selecting an attribute on the iPad prompts pop-up information that can be edited and updated.

↑ Coweta County field inspector Scotty Truitt inspects a catch basin in a subdivision. The Collector for ArcGIS app lets him document his findings.

Industrial and commercial growth has exploded Coweta County's infrastructure in the past 20 years. The population more than doubled, to 130,000.

"The growth in all aspects of our community has resulted in us just trying to keep up with infrastructure," Martin said. "The big thing is keeping up with our assets and trying not to outpace ourselves. We don't want to get to the point where we have a lot of infrastructure going in and we are not able to keep up with it."

In just the past two years, something else doubled: daily infrastructure inspections. Coweta County recently became part of Metropolitan North Georgia Water Planning District, resulting in stricter regional mandates. To keep up with a new annual inspection requirement—including inspecting all urbanized infrastructure and at least 10 percent of assets in unincorporated areas—the GIS department got creative.

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Double Time in Georgia

continued from cover

GIS analyst Clint Richmond had an idea. "I had looked into the news articles Esri sends through e-mails," Richmond said. "The articles seemed to indicate that the iPad was going to be real nice for inspections."

The iPad would prove to be twice as nice, in fact.

Keeping Infrastructure Peachy in Georgia

While Richmond explored the iPad as an option, field teams had to be deployed to respond to the new mandates. As resources changed, though, so did the availability of employees to inspect, and soon just one person was responsible for performing all inspections of more than 15,000 assets: Scotty Truitt.

Truitt operated on a clunky mobile device with a small screen. Each morning, he checked out this mobile device from the divisional office and drove across the county to Richmond's office so Richmond could export the day's GIS data to Truitt's device. At the end of the day's inspections, Truitt returned with the device, let Richmond offload the data into the GIS, and then drove back across the county to his own office to deposit the device before heading home.

"There would be a huge time savings if [Truitt] could do it in real time on an iPad," Richmond said of the data transfers. "All I would have to do was get the initial setup."

Going Mobile

Coweta County started using ArcGIS for Desktop in 2007 as a way of centralizing departmental use of GIS in tax assessment, public safety, and planning and engineering. In 2013, the county got an ArcGIS Online organizational account, which Richmond thought would help with inspections and user web applications.

Richmond tested the iPad himself with ArcGIS software. Following the test period, he asked the county to get Truitt an iPad, and he set up the ArcGIS Online organizational account with Esri. The iPad connected with Coweta County's centralized GIS through the common ArcGIS platform and the Collector for ArcGIS app. Now Truitt could do something remarkable. He could perform daily inspections without visiting Richmond. His field data was uploaded instantly to Richmond's GIS through the Internet—no more driving and exporting and importing. "I don't even have to see him," Richmond said. "I haven't seen him in a month now."

In 2012, Truitt completed just over 50 inspections a day. In 2014, Truitt completed just under 100 inspections per day. The iPad, which he got in 2013, has nearly doubled his productivity.

Soft Water Gains

The project has been so successful that Truitt finished all the mandated asset inspections halfway through this year. He even went beyond the mandated 10 percent of rural inspections and completed 40 percent.

"The resulting increase in productivity is above and beyond our mandate," Martin said. "The asset information is invaluable to the county, especially if we have failure of infrastructure, allowing us to be proactive."

Truitt is getting a jump start on a second set of regulatory initiatives—mapping driveway pipelines—that were not yet a priority. But the county is making the most of Truitt's freed time.

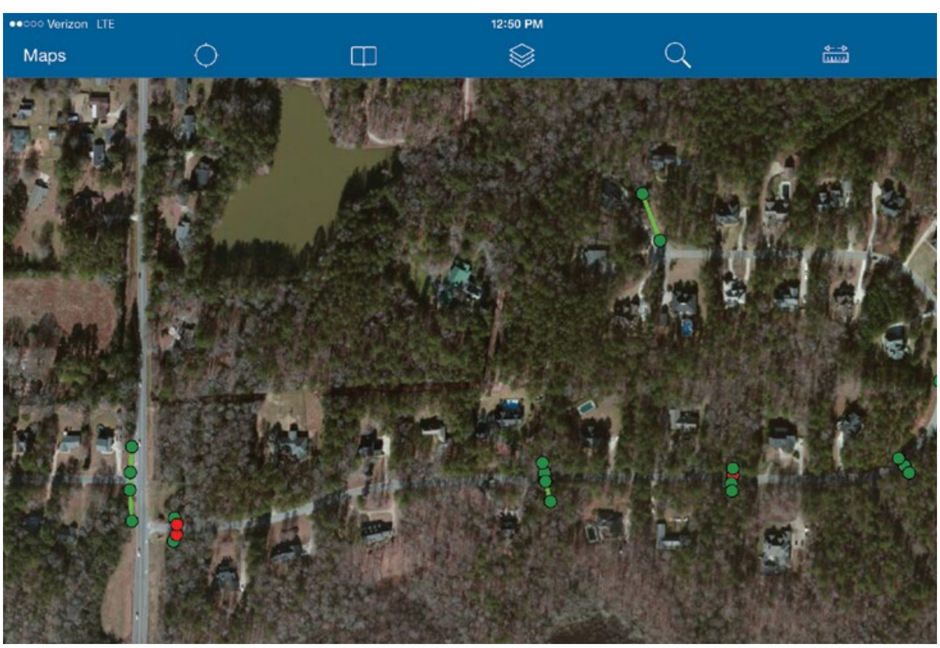
"There's no big rush, just a year or so," Richmond said. "But we were like, Heck, let's just start finding them."

So Truitt uses the Collector for ArcGIS app on the iPad to find the driveway pipes. Richmond added aerial layers to Truitt's basemap so Truitt has an even easier identification tool.

"He can zoom in right where he's at and draw the pipe in," Richmond said.

Not only is work getting done faster, but Coweta County can also proactively see where work needs to be done.

"It's real nice for us not only for reporting to the state," Richmond said, "but also just knowing what's out there and what needs fixing."



↑ Coweta County GIS analyst Clint Richmond configured the Collector for ArcGIS app with multiple basemaps that can be used for field inspection. This aerial basemap provides a look at the neighborhood in which the inspector is working.

For more information, contact contactus @cowetawater.com.

Eliminating the Waste in Wastewater

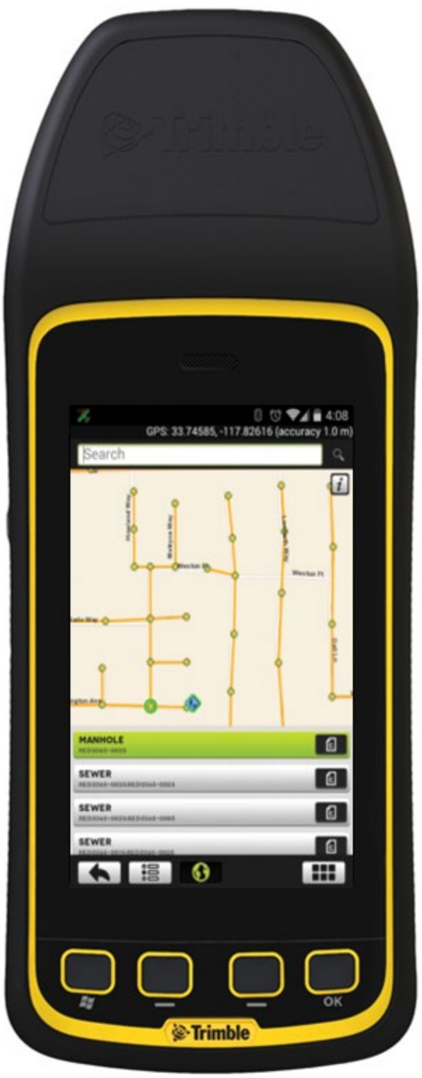
Orange County Sanitation District Mobilizes Manhole Maintenance with Trimble Handhelds

Orange County infrastructure serves a huge population. Orange County is California's second most densely populated county and also the sixth most-populous county in the United States. There, 3 million people reside along 40 miles of coastline. More than 40 million tourists also arrive each year for Orange County's attractions, including Disneyland. The demand this places on infrastructure is enormous.

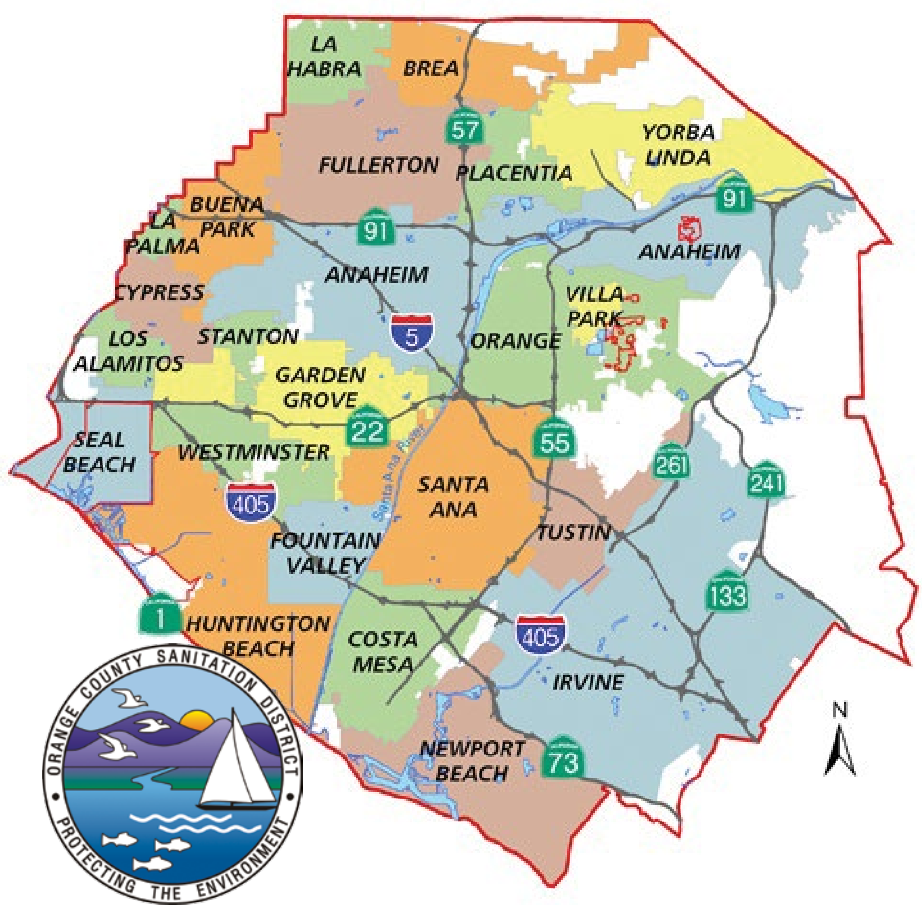
The Orange County Sanitation District (OCSD) serves 2.6 million residents in 21 cities. The utility collects, treats, and disposes of 207 million gallons of wastewater per day—nearly 80 gallons of water per resident.

The infrastructure handling that load includes 579 miles of sewer lines, 15 pump stations, two treatment plants, and five miles of ocean outfall. Field operation crews use more than 8,000 manholes to access the infrastructure. To keep track of all those manholes, pipe networks, and other assets, the OCSD uses ArcGIS.

Knowing where infrastructure is isn't enough, though. Maintaining the vast OCSD network is an ongoing challenge. It demands knowing what, if any, repair or maintenance work has been performed.



↑ The GNSS capabilities of the Trimble Juno help improve the overall quality of OCSD's sewer network GIS during manhole inspection.



↑ Orange County's dense population clusters along the coastline and ebbs and flows with millions of visitors each year.

↑ The gloves can stay on! Electronic data entry on a rugged mobile device is much easier than manual data entry with paper and a pen. The Trimble Juno's bright display and long-life battery allow inspectors to work as long as they need to, all day.

Until recently, the utility tracked and managed this information manually.

Repairing the Manhole Management System

The OCSD inspects its 8,000 manholes every seven years. As with any paper-based system, manual tracking of maintenance and repair generated enormous amounts of documentation.

Not only that, this system also required manual data entry, leaving it prone to human error and inaccuracy. Accessing current and historical records was problematic, not to mention slow. Another challenge was tracking progress. Field inspectors took considerable time just determining which manholes had already been inspected.

But the work was necessary. Manholes are essential to having a smooth-running water collection system. A faulty manhole could be vulnerable to infiltration from groundwater, which in turn could cause corrosion, cave-ins, or other problems.

The OCSD decided that it needed to maintain, map, and inspect its manholes digitally. It also wanted all manhole data to be stored electronically in its central GIS. The solution therefore lay in leveraging the software already being used: ArcGIS. It could communicate with Trimble Connect, which the OCSD implemented to run on Trimble Juno T41 handheld devices.

Nimble with Trimble: Saving Time and Resources

The OCSD needed a system that was accurate, reliable, and easy to deploy. Trimble made it easy for the utility to adopt its technology, beginning with its Manhole Inspector application.

Personnel now plan, manage, and dispatch manhole inspection jobs via the Trimble Connect web interface. Managers can see who is working where and monitor the progress of field activities. Spatial technology lets managers quickly and easily dispatch resources directly to the right locations. Managers can also access data gathered by field personnel as soon as the work is completed and generate reports based on work completed or required. The OCSD's eight manhole inspectors use tools on the Trimble Connect mobile app, including workflows to guide them through processes and forms to complete their work.

The utility's original paper form for manhole inspections was incorporated electronically into Trimble Connect, with additional fields to ensure the right information was captured. Because operators were already familiar with the forms, they easily transitioned to the new system. A three-week field test produced feedback that was used to fine-tune the process to meet OCSD's unique needs and to confirm that there was minimal or no risk involved.

Although Trimble Connect is supported on multiple platforms, including iOS, Android, Windows, and Windows Mobile, the OCSD selected the Trimble Juno handheld, which offers Global Navigation Satellite System (GNSS) capabilities that enable field inspectors to navigate to manholes more quickly and easily—with accuracy of 1 to 2 meters (3 to 6 ft.). Inspectors can also map the location of manholes more accurately for their records. To further enhance data collection, OCSD inspectors photograph manholes to record their appearance and condition—the Trimble Juno, with its built-in 8 MP camera, associates GPS coordinates with photos.

Eliminating Paper, Saving Time and Trees

By automating its manhole management, the OCSD jokes that it has saved a forest's worth of trees. Not only that, but internally, it has also improved its GIS and streamlined communication between colleagues in the office and the field, greatly decreasing the need for trips between the two. The OCSD has certainly improved efficiency and reduced errors to better serve the high demand of Orange County residents and tourists.

For more information, visit www.trimblewater.com.

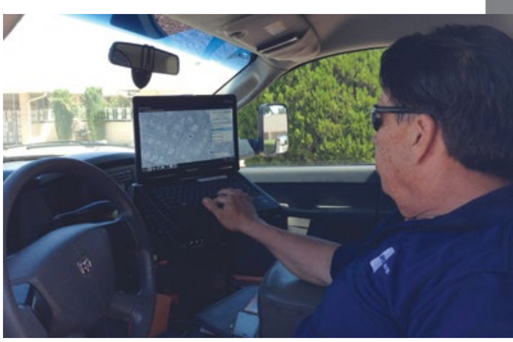
Improving Operational Efficiency at EPCOR Water with Web Maps

Christina Martinez and Jamie Patterson

EPCOR provides water and wastewater service to more than a million Canadians. Its subsidiary EPCOR Water serves more than 300,000 people across Arizona and New Mexico. Until recently, EPCOR Water used three systems to maintain more than 2,400 miles of water main across 13 water districts and another 680 miles across 5 wastewater districts.

The data systems—CADD, GIS, and paper maps—didn't support cross-reference querying. Due to the lack of a standardized data model, it became difficult to manage the main across many districts.

↑ EPCOR is headquartered in Edmonton, Alberta, and serves communities in western Canada and the Southwest United States.



↑ EPCOR Water utility worker Mark Stevens utilizes the EMS Web Map to view the water distribution network while in the field.

"Multiply this across more than a dozen water and wastewater districts," GIS manager Christina Martinez said, "and then it becomes really challenging!"

EPCOR Water's GIS Journey

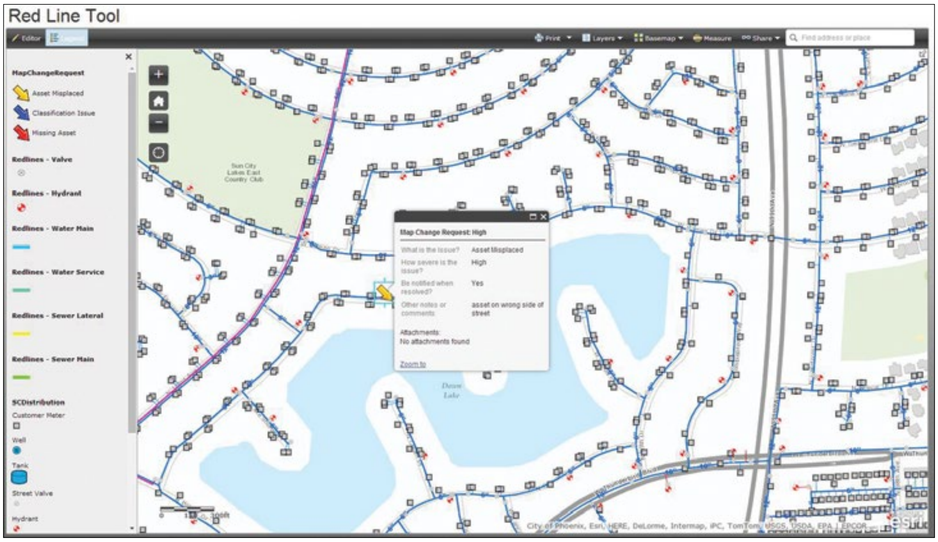
CADD-GIS combinations are common in utilities. But without a common data model, EPCOR Water's workflows slowed. CADD and GIS didn't have the same level of dataset completion. And after the 2009 postconstruction boom, EPCOR Water had less money to undertake a large-scale CADD-to-GIS conversion. The utility needed to access its distribution and collection system maps, and it needed to standardize reports for internal communications and to comply with regulations. In short, EPCOR needed a standard way of producing and analyzing maps and reports.

The GIS team saw a challenge in managing a large number of personal geodatabases—one for each of its 13 water and 5 wastewater districts. While this approach to data management often solved the issue of multiuser editing, it was not always the case. It was difficult to implement changes to the common data model across so many separate geodatabases. Furthermore, the geodatabases were stored on a file server, so performance was not optimal, nor was security ideal. Map display and scales were limited. There was no way to share data quickly. Engagement and feedback were limited. In short, the GIS wasn't operating at its fastest, and trying to implement even a small change across the separate geodatabases proved a huge challenge.

The GIS team emerged with a plan. Senior GIS technician Jamie Patterson, two GIS interns, and local consulting firm Engineering Mapping Solutions (EMS) converted each of EPCOR Water's districts from the various CADD and GIS formats into a common data model.

Through the process, the team was able to produce a variety of updated maps and reports. Initially these fed the need for standardized reporting to EPCOR Water's rate regulator. But the utility's leadership noticed the high-quality reports also supported internal decision making. They wondered whether moving to a web-based GIS would offer even more opportunities internally, for instance, solving the problem of having to request a map or report from the GIS team each time one was wanted. The process was time-consuming anyway. Being in two states meant EPCOR Water leaders sometimes had to wait longer simply because of where the service spanned, and the final product could take several iterations to finalize.

Not only that but "there is only so much data and detail that one can view in a PDF or paper map of a distribution



↑ One of the apps in EPCOR Water's ArcGIS Online platform is a redline tool. Users can give feedback on the map by using the arrow tools, or use the redline layers to provide a field sketch.

or collection system," Martinez said. "Having the ability to do things that GIS professionals take for granted, such as toggling layers and querying data, was seen as a need for staff, especially in Operations and Engineering."

Migrating to Maps and Apps from Desktop

EPCOR Water procured ArcGIS for Server in fall 2012. EPCOR used Esri's three-day jump start program and, with support from the utility's IT resources headquartered in Edmonton, made the move from file-server-based, individual geodatabases to a consolidated single SDE geodatabase housed in a SQL server. Then came testing.

EPCOR Water brought in EMS to support the transition. The team members tested web map functionality. They ultimately deployed three instances of the Silverlight Web Viewer, one each for central Arizona, western Arizona, and New Mexico. Staff throughout the utility could unlock GIS data in the highly accessible viewer and request apps. Staff members themselves could do queries that once fell on the GIS team to perform.

"Staff no longer have to send requests for custom maps or queries," Martinez said.

All EPCOR Water staff, regardless of location, could access the web maps. GIS team members visited each site to demonstrate how to use ArcGIS for Server. Having non-GIS employees using the database created a paradigm shift in the way staff thought about GIS. Employees were used to a several-month lag between GIS updates and newly published hard-copy map books. Now, not only was the data current but also staff anywhere could visualize changes in the system through the web maps, sometimes cutting the lag time to days.

In addition, web maps offered interactivity. Users queried for themselves and toggled layers, spurring employees to think about the benefits additional layers or apps could provide. Realizing there would be no way to combine every great idea into a single viewer, the GIS team looked to take yet another step forward.

EPCOR Water adopted a cloud hybrid of ArcGIS Online, with configurable hosted apps and locally hosted feature and map services, in early 2014. The cloud-based GIS further reduced the utility's need for paper workflows, and it improved security and enabled GIS to go beyond even Operations and Engineering. Customer service representatives, the executive team, and finance and rates staff could access, manipulate, share, and interact with data that had once been locked from all except three GIS specialists.

The GIS team members looked for the best first step to implement cloud-based GIS internally. They started by implementing ArcGIS for Water Utilities, a solution that helped them configure the EPCOR Water ArcGIS Online portal. With help from Esri staff, the GIS team members focused first on solving problems of inefficient and paper-intensive processes. This involved configuring an operations dashboard for maintenance tracking. They created a redline and map-feedback app for field operations and engineering and an information lookup app for customer service staff. Each of these workflows had required copious amounts of paper. Sometimes map labels were so tiny, for instance, customer service representatives had trouble reading them. These are ongoing projects.

For the Future

"In order for GIS programs to continue to mature, it is important to reflect on lessons learned along the way," Patterson said. He recommends starting with high-impact projects.

EPCOR Water focused on an internal and external paradigm shift. The GIS team members gained ideas and insights from their colleagues, who, for the first time, could communicate with EPCOR Water's data. "Understanding the needs of the user community is a key to success," Patterson said.

For more information, contact Christina Martinez, GIS manager, at clmartinez@epcor.com and Jamie Patterson, senior GIS technician, at jbpatterson @epcor.com.

Cleveland Rocks Its Stormwater Inventory

A 40-Year-Old Utility Develops Comprehensive Inventory and Inspection of Regional Stormwater Assets

Jeffrey Duke, P.E. GISP Manager of GIS Services

Since 1972, the Northeast Ohio Regional Sewer District (NEORSD) has been responsible for collection, conveyance, and treatment of wastewater and combined sewer overflow control in the Greater Cleveland area. To support many business activities, a comprehensive stormwater asset inventory was needed. The district had to build a reliable inventory with the ability to grow—fast.

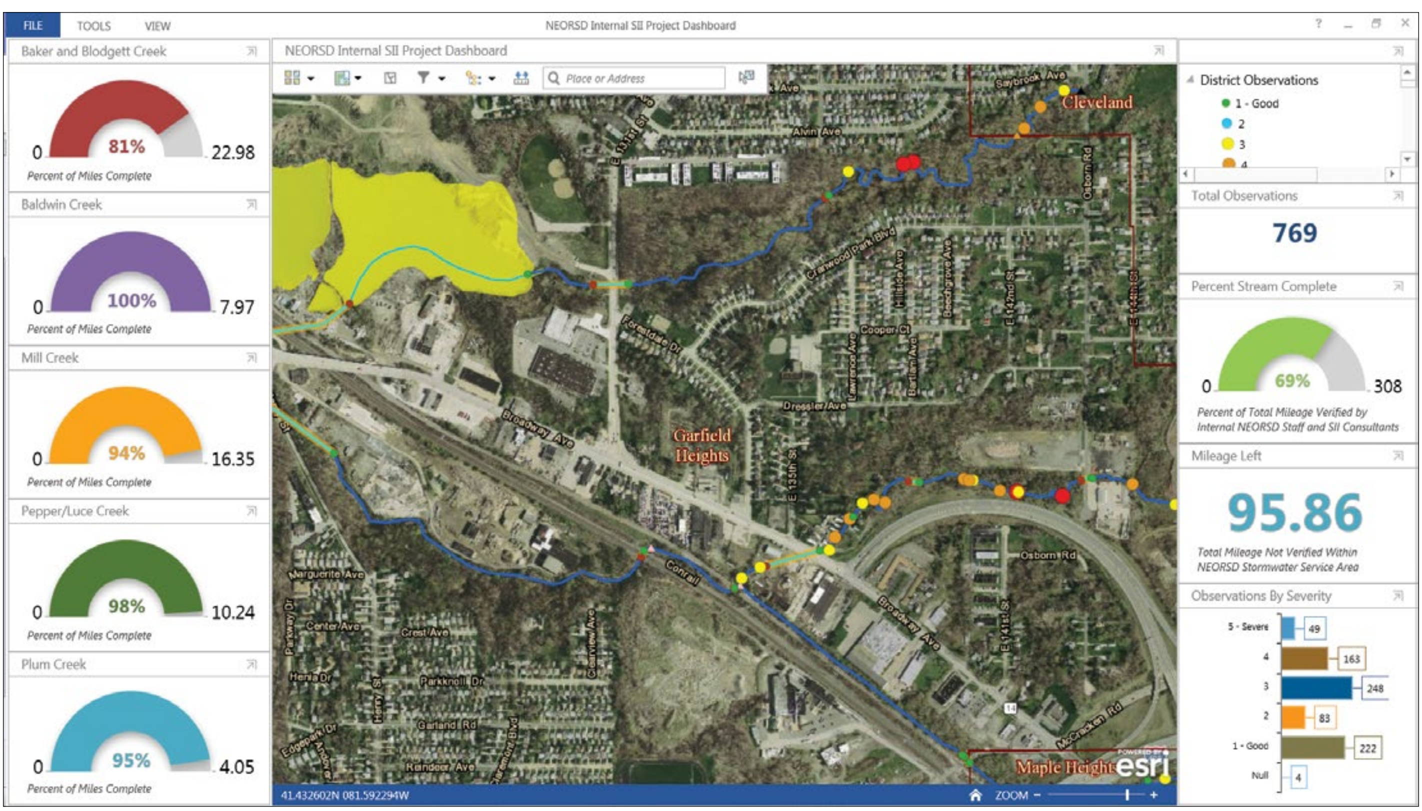
To start development of the inventory, NEORSD relied on a variety of information sources: community maps, local and national datasets, and community images. Combined, these produced a rough picture of the regional and local stormwater system, from streams to outfalls to culverts and sewers.

However, having multiple data sources created a variety of inconsistencies and challenges. Datasets varied in accuracy and the frequency with which each had been updated. Some were more complete than others. District GIS staff, consultants, and external stakeholders had attempted several project-specific inventory and inspection efforts. But each of these had used a separate data model, inspection format, and asset labels. What was called a "culverted stream" in one inventory might be called a "storm sewer" in another.

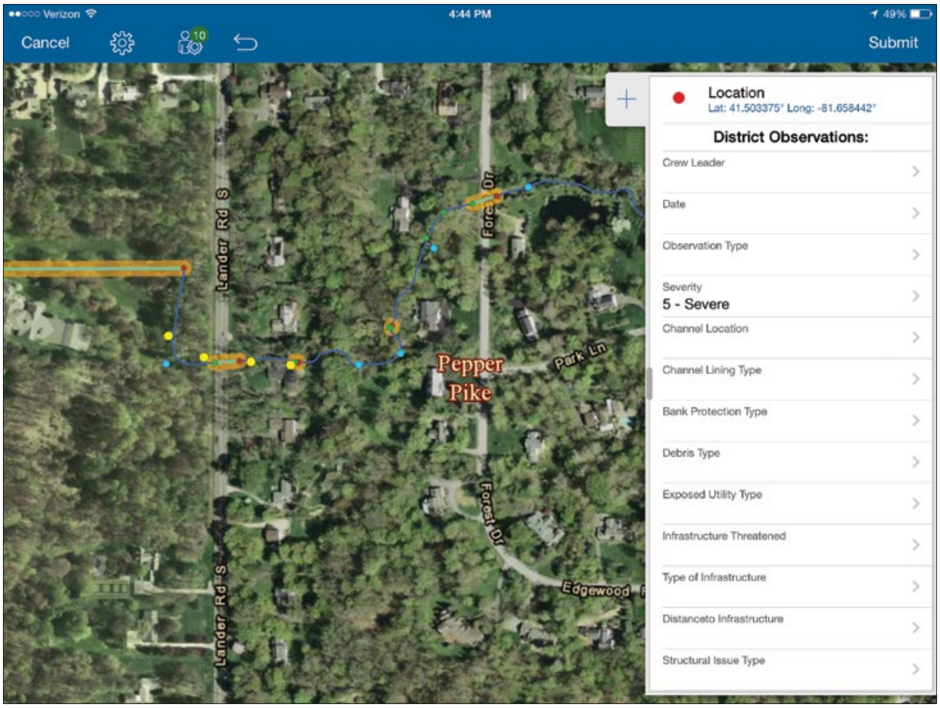
Last year, the district implemented a once-and-for-all program to consolidate its information, capture a clear picture of the wastewater system, and maximize its performance.

Initial Inspection and Inventory

In 2013, NEORSD instituted its regional Stormwater Management Program (SMP). One of the program's goals was to understand the condition of the regional stormwater assets—each one. The SMP assets spanned more than 350 square miles, 56 communities, and four counties. To quickly develop the inventory, multiple third-party field crews were deployed simultaneously to inspect more than 300 miles of streams. They updated asset inventory, performed baseline inspections, and noted observations that may affect stream system operations and management. A crew member might note erosion, debris, or exposed utilities, for instance.



↑ Project managers see at a glance the percentage of miles completed, thanks to a GIS dashboard feeding real-time intelligence to their screens.



↑ NEORSD inspected more than 300 miles of streams across 56 communities by using Collector for ArcGIS.

The data flowed (pun intended) in huge volumes. NEORSD relied heavily on the ArcGIS platform (especially ArcGIS Online) to manage the data flow. The district had issued inexpensive Android tablets to crews, letting them access, analyze, report, and manage information related to stream channels, conduits, inlets, and outlets. NEORSD populated the devices with GIS data, map tile caches of orthophotographic imagery and stream assets, and other tools created using ArcGIS for Server.

Each night, the data was synced to the cloud. From the cloud, Python scripts downloaded the data into ArcGIS feature classes. Each week after quality assurance and quality control checks, staff uploaded the data into an ArcGIS Online app. Then the process was repeated.

NEORSD was building a comprehensive geodatabase on ArcSDE, part of ArcGIS for Server. The geodatabase was integrated with the district's enterprise GIS database (on Oracle). Each week, the field crews added to the geodatabase new information from their inventory inspections.

In September 2013, the SMP was put on hold. Legal rulings had stopped the contract supplying the field crews. Two-thirds of the stream system (~ 200 miles) still needed the inventory and inspection activities completed. In just 100 miles, the crews had made more than 7,000 observations. NEORSD realized the long-term value of continuing the inventory, so it used in-house staff to complete the project. Inventory and inspection activities have continued from October 2013 to today.

A Living Inventory

The comprehensive inventory will not stop after the full 300 miles have been inspected. The district continues uploading new inspection information on a daily basis. In addition, technology updates are modernizing how NEORSD accomplishes its updates. The district invested in iOS tablets (iPad minis with built-in Wi-Fi) for users to access the ArcGIS Online applications. Staff built web maps for accessing the data, so their colleagues can directly edit, share, and manipulate data from their devices. Recently, NEORSD adopted Collector for ArcGIS to facilitate inventory collection and record observations. That data gets loaded instantly to the cloud, giving management staff an eye into the field from anywhere there's Internet access. The district also uses Operations Dashboard for ArcGIS. This gives a full view of the status of field inspections and other project-related efforts. When crews perform stream walks on a watershed-by-watershed basis, for instance, Operations Dashboard lets managers view total observations, severity of conditions, and total mileage of streams with pending and completed inspections.

The district—once without any inventory—now has one that changes with the times. Data collection is efficient and effective, and NEORSD staff in the field and the office access real-time data to manage their projects and make their decisions. Data management, quality assessment and control, and project follow-up have been improved. Staff have clarity and consistency in asset inventory and inspection data, project summaries, and statuses. Efficiencies have been realized through the minimization of staff time spent creating status reports.

This stormwater inventory project is just the start. District GIS staff have received many requests for more tools to support other NEORSD initiatives.

For more information, contact Jeffrey Duke, PE, GISP—GIS Services manager (GIS@neorsd.org); Brian Villers, GIS technician/ArcGIS Online administrator (villersb@neorsd.org); or Monica Day, GIS supervisor (daym@neorsd.org).

Why You Need a Map When You're Just Doing Maintenance

Enterprise asset management (EAM) and GIS can collaborate when integrated the right way. EAM provides rich information about assets over their life cycle, and GIS provides the spatial perspective to understand those assets: Where are they? What surrounds them? What's moving toward them that may put them at risk? When organizations combine EAM and GIS, they typically see these benefits and more.

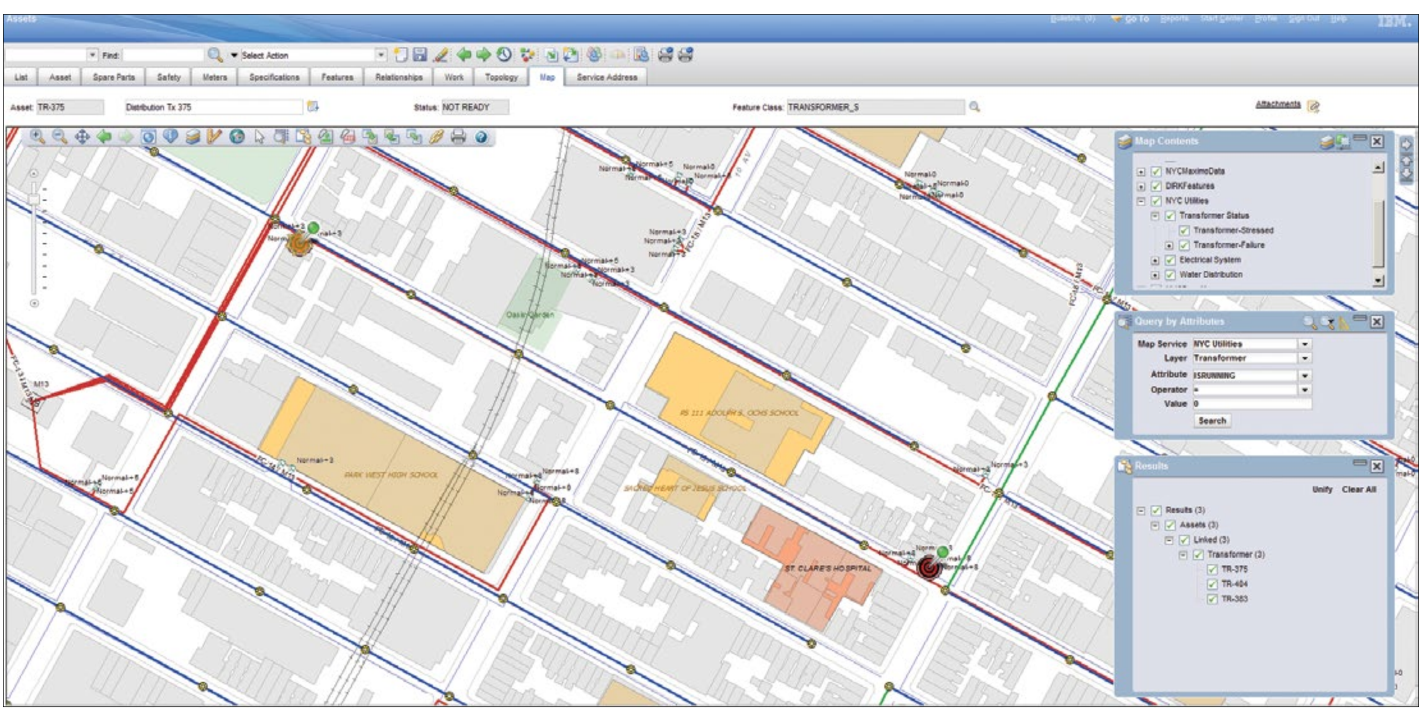
Some say GIS takes EAM to the next level. GIS lets you visualize today's health and status of assets, driven by the maintenance and monitoring of data collected that persists in the EAM system. It moves EAM beyond the limitations of a historical view of assets, to a current, operational one. Companies no longer have to let assets fail silently over time, which occurs when impending failures are not detected early enough for staff to plan a repair or replacement. Monitoring devices have become more affordable, meaning a distressed asset can be identified through condition monitoring in the EAM system. Assets in trouble can be proactively managed and visualized with GIS. Combining EAM with GIS provides insight into managing assets, revealing things that are often overlooked or cannot be detected by visual inspection alone. *Early detection is a cornerstone to improving asset reliability.*

Yes, You Need a Map

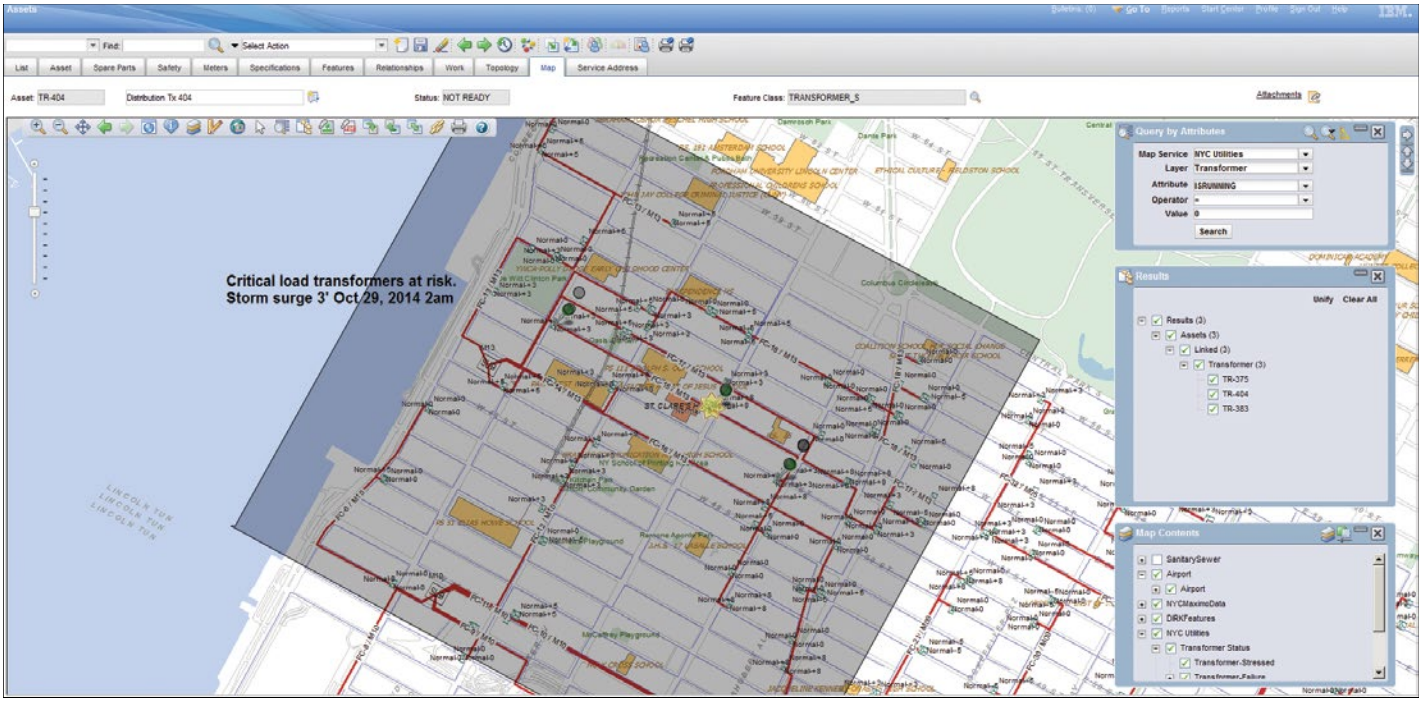
Maps are pervasive in our lives. The next-generation utility employee feels comfortable entering, interpreting, and acting on data using visualization tools, particularly maps. And why not? Today, tools exist to help users understand asset condition in the spatial context of planned and current work in the environment and the community. Maps can minimize crew travel times by optimizing routes and address-related work duties such as responding to a customer call or equipment failure.

Take the case of an EAM system that monitors equipment distress and severity. Time-sensitive repairs should get top priority and response. The GIS can display levels of distress and duration through graduated symbology. Add to that more context—a layer of approaching weather, for instance—and the response plan can improve the outcome to the best possible, given all available information.

So you really do need a map. Spatial analytics are fast becoming integral to managing assets. Spatial queries and clustering techniques help determine whether a problem is isolated or related to the bigger system and, thus, a bigger issue. Real-Time Analytics (RTA) helps even new employees do their work better, faster. GIS and EAM together make us better equipped to tackle the most important work at the right time, in the right way.



↑ Maximo Escalations—Transformer Assets Down



↑ Risk Mitigation—Critical Load Transformers at Risk Due to Storm Surge

Chart Your Course in the Cloud Age

Integrating GIS and EAM is not simple without a plan. Making these systems function in complementary roles is critical to providing the right business value for the investment. IT spending has come under great scrutiny over the past few years. It is the responsibility of us all to invest wisely and record successes. GIS and EAM together can help determine and improve the financial results of the business.

This doesn't have to be hard. Out-of-the-box integration is available for IBM Maximo Spatial Asset Management (EAM) and Esri's ArcGIS for Server (GIS). More than 50 sites globally are deploying this configuration.

We are in a new age—a cloud age. We must leverage cloud storage, spatial analytics, mobile data tools, social responsibility, and information security. We must adapt to our environment, to sustainable management of assets and infrastructure. Bringing EAM and GIS together can yield a productive, responsible, and safe future.

This perspective was written by Gary Cooper, IBM client technical specialist (gacooper@us.ibm.com), and Terry Saunders, IBM worldwide utilities industry leader (terry.saunders@us.ibm.com).

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