Esri News
for Water & Wastewater
Winter 2013/2014

Spatial Analytics Improves Efficiency for Johnson County

By Peter Moody, Johnson County, and Christa Campbell, Esri Industry Solutions

The first Johnson County sewer district was created in 1945. Today, there are more than 1,000 districts and it is the most populous county in Kansas, with approximately 545,000 residents. The responsibility to operate and maintain these districts falls to the Johnson County Wastewater (JCW) Department. JCW is made up of four divisions: Customer Relations, Business Operations and Planning, Operations and Maintenance, and the Water Quality Laboratory. Although each division has unique responsibilities, they work together to protect the environment, enhance the community, and serve their customers.

JCW has grown quickly since 1945. Over the past five years, it has issued 7,725 sewer permits and added 30 districts. The department manages seven treatment plants, 29 pump stations, 54,000 manholes, and 2,200 miles of pipe. This system serves more than 90,000 properties in approximately 1,027 sewer districts. In an effort to promote efficiency and prioritize management of its collection system, JCW has aligned its asset management strategy with industry-standard best practices.

Implementing best practices included an initiative to score the system for business risk exposure (BRE). To assign scores, JCW needed to know the age, size, material, and spatial location of pipes. The spatial location is important for risk analysis because the failure of pipes near a hospital, water supply, or critical facility would have higher consequences.

Using ArcGIS and SQL Server spatial data, JCW developed an automated routine that assigns each pipe a score based on location relative to geographic features such as roads, streams, railroads, and buildings. Spatial analysis links the pipes to a sewer basin, and the basin is assigned a score based on all the

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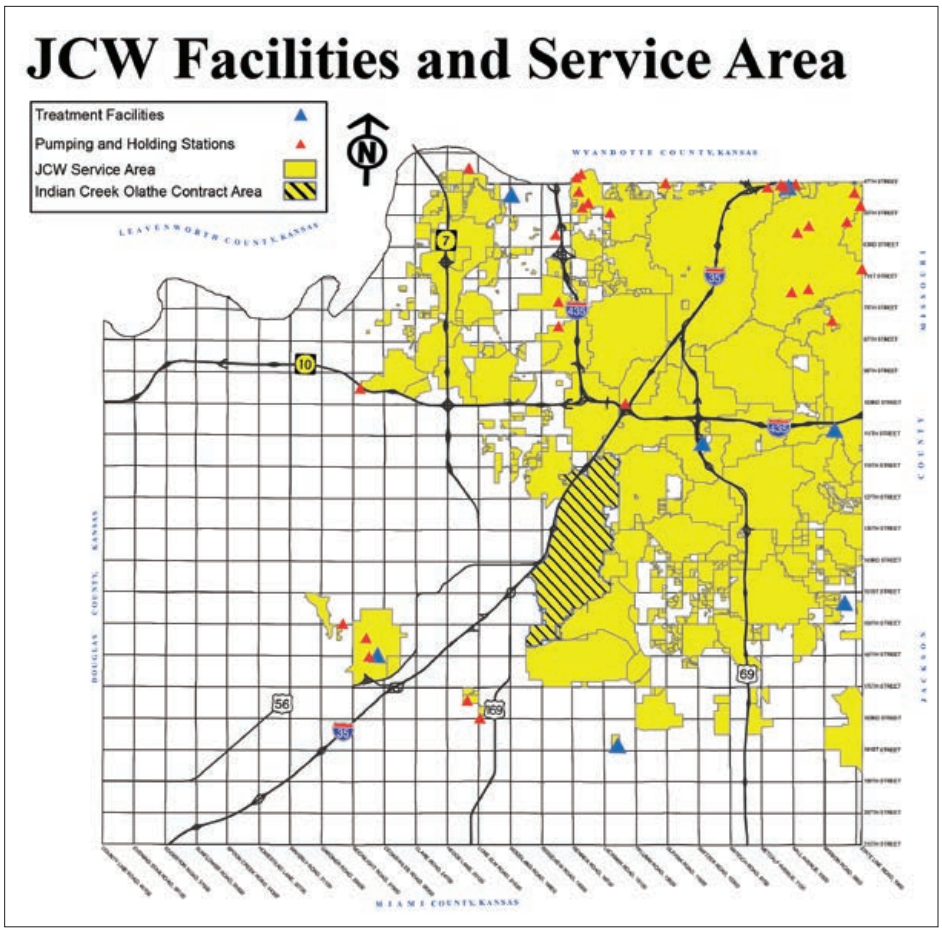

↑ Johnson County Wastewater Department Service Area

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Esri is grateful to the sponsors of the 2013 Water/Wastewater Pool Party held during the Esri International User Conference. The event was a great opportunity for the water, wastewater, and stormwater ArcGIS user community to get together, have a few laughs, and talk shop. We all enjoyed food, refreshments, and live music made possible by our sponsors. Thank you!

City of Sioux Falls Identifies Data Errors

By Lauri B. Sohl, GIS Analyst, Sioux Falls

Sioux Falls is located in southeast South Dakota and has nearly 160,000 residents. GIS has been an integral part of city culture since the early 1990s. The city's GIS Division has one supervisor, one analyst, four specialists, and one intern. In addition, GIS is used throughout the city via ArcGIS for Desktop, ArcReader, and ArcGIS Online for Organizations.

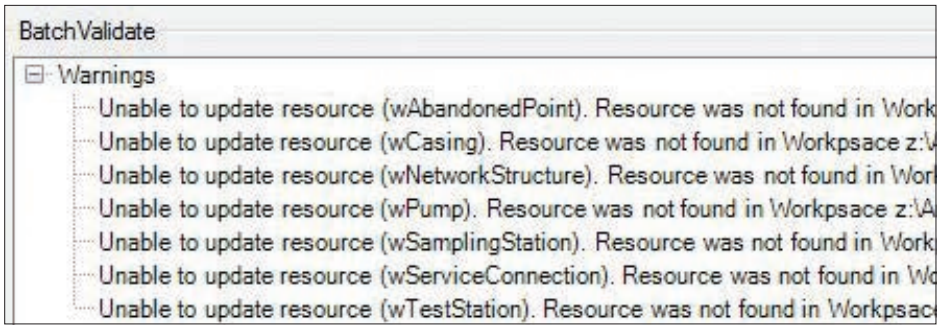
In addition, GIS is used throughout all aspects of government in the mobile environment. The city has field crews performing data collection using ArcGIS applications on mobile devices, project managers viewing data on their smartphones, and everything in between.

The city's GIS has experienced continuous growth, leading to challenges supporting database management and GIS services. To alleviate some of the pressure on local resources, it has taken advantage of an ArcGIS for Local Government organizational account. This has provided another platform for GIS project designers (GIS analysts and specialists) and users and has allowed staff to appreciate the speed and simplicity of the ArcGIS Online platform.

Sioux Falls GIS staff has limited time to dedicate to data editing and integrity. In addition, there are numerous employees outside the GIS Division who are editing the GIS data. Because of this, the GIS Division decided to implement the ArcGIS Data Reviewer extension. The Data Reviewer extension includes a set of tools that simplify automated and visual data quality control. There are more than 40 out-of-the-box data checks that can be used manually or grouped into batch jobs. The checks can also be run as a scheduled service.

Initially, GIS staff utilized Data Reviewer on several datasets, including one for sanitation and streets, using the default data checks. Those have seen an increase in data quality and integrity. This has led to an overall increase in data confidence.

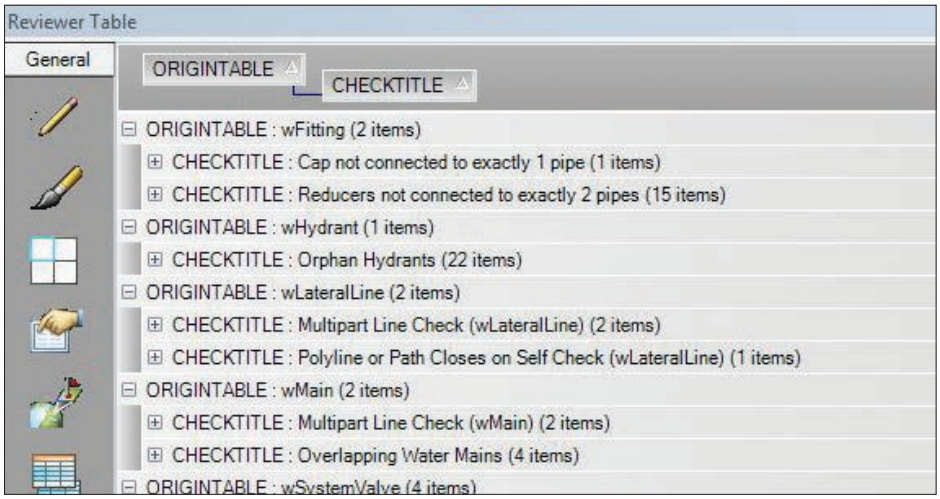
More recently, staff downloaded the Data Reviewer for Infrastructure template. This template provides a series of data quality control checks configured for water, sanitation, and stormwater. However, the template is geared for those datasets that conform to the Local Government Information Model. The timing was ideal—we are currently in the process of updating our data to fit the model where feasible. The city's Darin VanDeBerg worked to extract, transform, and load (ETL) data for interoperability, prioritizing the conversion of the water dataset in the ETL process.



↑ Figure 1. Reviewer Processing Errors

"We were introduced to ArcGIS Data Reviewer, which then allowed us to take a huge project, break it into manageable pieces, and prioritize the most urgent problems."

Lauri B. Sohl, GIS Analyst

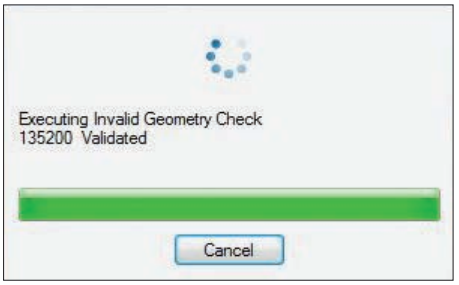


↑ Figure 2. Batch Validate

The Data Reviewer for Infrastructure template is delivered with thorough documentation. Configuring the Data Reviewer for Infrastructure required a few basic steps: updating the Data Reviewer Batch Job workspace, setting the Data Reviewer Batch Job workspace properties, and setting the Reviewer Session Manager properties.

To use the water batch job provided in the template, the city launched BatchValidate. Initially, staff members received an error window identifying which feature classes were not yet available or are not feature classes they maintain (figure 1).

In the BatchValidate window, they chose Add from File, then chose the Water.rbj file included with the template.



↑ Figure 3. Running a Batch Job

Then, data was validated, and staff members determined which checks to run (figure 2).

Batch jobs of interest were selected to run checks on Full Database. The entire process took between two and three hours (figure 3).

The results were as in figure 4.

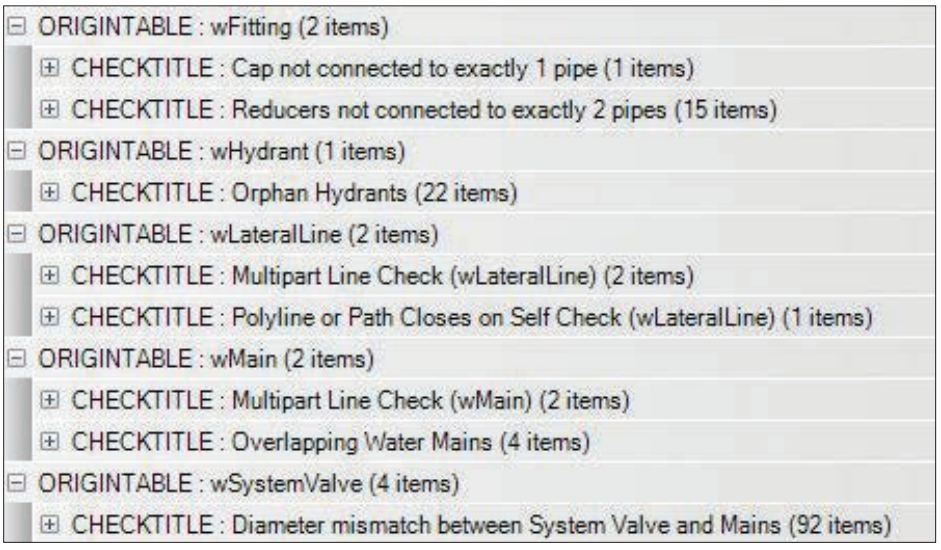
These results indicate the areas in our data reviewing process that are, overall, quite clean and also areas that require further review.

For example, the Multipart Line check identified a couple of multipart water mains (figure 5) and hydrants that were not snapped to a lateral line (figure 6).

Further, diameter mismatches between system valves and mains and system valves and laterals were identified (figure 7).

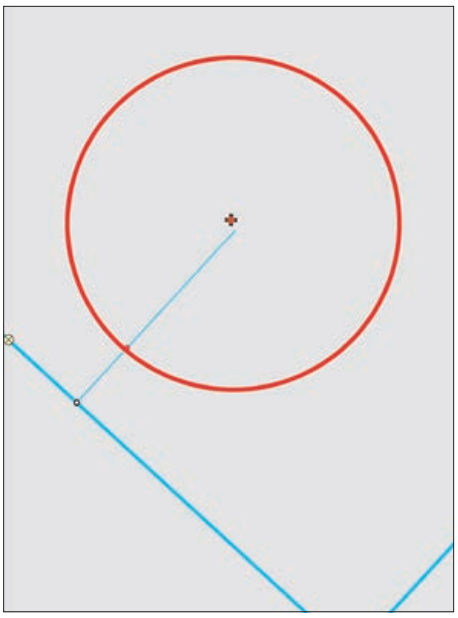
Overall, city staff members are quite pleased with the quality of the water dataset but immensely pleased to fine-tune the water feature classes geometry and tabular data even further.

Future plans are to roll out ArcGIS Data Reviewer to all editable datasets after all data has been converted into the updated data model.

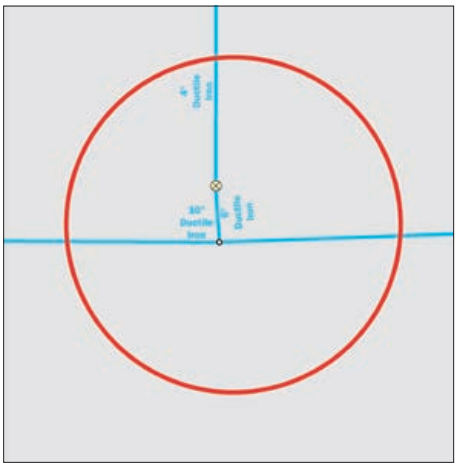


↑ Figure 4. Reviewer Table

↑ Figure 5. Multipart Line



↑ Figure 6. Hydrant Not Snapped to Lateral



↑ Figure 7. Diameter Mismatch between System Valves and Mains

Esri Online Content Streamlines Water Resources Management

By Caitlin Scopel, Hydro Team, Esri

As part of the ArcGIS platform, thematic content is consistently released on ArcGIS Online as ready-to-use curated and authoritative data layers and tools appropriate for GIS analyses. There are hundreds of data layers currently available in the United States, and coverage is expanding to global scales. A number of these content items are specifically designed for water resources management, helping ArcGIS desktop and online users streamline their workflows and produce better results.

World Hydro Basemap

The World Hydro Basemap is a mashup of the World Hydro Reference Overlay on top of the World Terrain Base. The World Hydro Basemap emphasizes surface water features, resulting in a hydrocentric reference map that helps readers understand (1) the relationship between the overland drainage pattern and the landscape elevation surface and (2) relatively how much water is present in each river. Notice the varying stream widths on the map. This is a direct representation of streamflow values present in the attribute table. At world scales, the map displays HydroSHEDS data enriched with streamflow and Geographic Names Information System (GNIS) name attribution. At US scales, the map displays NHDPlus Version 2 data. The World Hydro Basemap is a reference map for scientists, professionals, and researchers in the fields of hydrology, geography, climate, soils, and other natural sciences (figure 1).

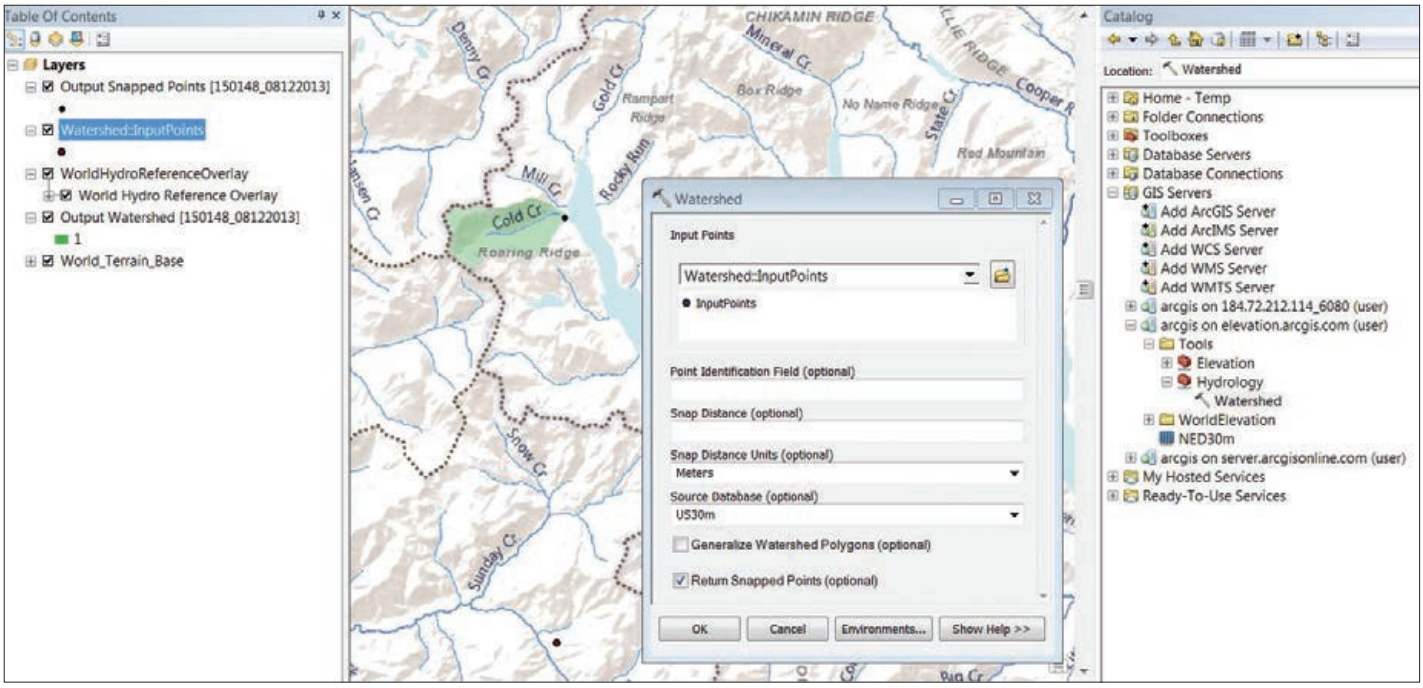
↓ Figure 1. Esri's World Hydro Basemap

Watershed Delineation

The Watershed Delineation tool is a geoprocessing service that delineates a watershed for any point or set of points (50 is the limit) in the continental United States, based on the NHDPlus Version 2 data. Users can connect to the tool through ArcCatalog or an online environment.

Watershed in Desktop: Your input point(s) can be a shapefile or feature class, or you can simply click a location on the map and the watershed is returned. Optionally, adjust your snap distance and snap distance units, generalize the output watershed polygon, or receive a point file containing the snapped point location—which could be different from the original input point (figure 2).

Watershed Online: The Watershed tool works in web applications. For a sample application, see Watershed Explorer (http://184.72.212.114/watershedexplorer/). Click any point in the United States (lower 48 states), and the upstream drainage area is returned. Or load an ArcGIS Online web map with your own set of points into this application and delineate watersheds based on those points. The Watershed Explorer application adds watershed delineation functionality to any ArcGIS Online web map by appending the ArcGIS Online web map ID onto the Watershed Explorer app URL, with "?map=" preceding the ID digits. The Watershed Explorer application



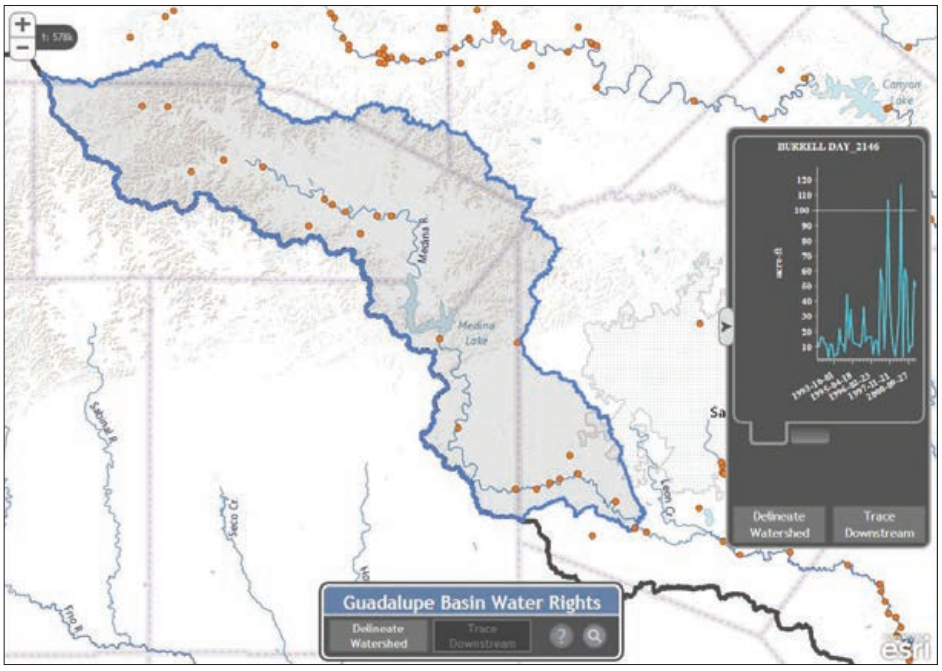
↑ Figure 2. Desktop Watershed Delineation

contains additional functionality that utilizes the WaterML standard. Any data layer published on ArcGIS Online with a WaterML attribute can be viewed in this application with a graphic representation of the WaterML data feed. Simply click the WaterML data point, and a graph of the XML data feed is drawn on the fly in the report window (figure 3).

Hydro Resource Center

These resources and more are on the Hydro resource center, found by following the Hydrology link on resources .arcgis.com. The Hydro resource center is an online community center that promotes hydro information products created with ArcGIS methods to facilitate natural resources management. Navigate through content by choosing a specific area of study, such as surface water, groundwater, or wetlands. Alternatively, go directly to the gallery and peruse the water resources products using the filters on the left side of the page. In addition, the Hydro resource center houses the Education Gallery, where you'll find online courses, presentations from past conferences, tutorials, and white papers by Esri and our partners.

For more information about these products, or if you have any ideas for national or international data layers or geoprocessing tools that you would find useful in your water resources analyses, please contact Caitlin Scopel by e-mailing HydroTeamRC@esri.com.



↑ Figure 3. Online Watershed Delineation

Los Angeles Department of Water and Power Improves Water Incident Management

By Chris Stern, Trimble

It's a familiar problem to water and wastewater utilities across the country. While utilities use sophisticated systems to supply clean water, as well as collect and treat wastewater, the effort to manage incidents and outages leaves room for improvement. Water utilities often rely on manual processes to handle customer reports of leaks, loss of service, or quality issues. But in many cases, the manual approach can hamper the effort to correlate problem reports to specific assets and locations. The result can be slow response and subpar interaction with customers and other agencies. The solution has emerged from a parallel utility: electricity.

The electric utility industry uses automated incident and outage management solutions that combine asset management, using GIS technology from Esri and Esri partner Trimble, with customer relationship management to improve response and cut costs. The automated systems have produced good results, and other utilities have noticed.

Water Incident Management in Los Angeles

In Los Angeles, California, the Department of Water and Power (LADWP) serves more than 4 million residents with water and electricity. As the largest municipal water and power utility in the United States, LADWP services roughly 680,000 water meters. Faced with the challenges of aging infrastructure and limited budgets, LADWP sought to improve management of incidents such as leaks, outages, and quality issues in delivering water to its customers.

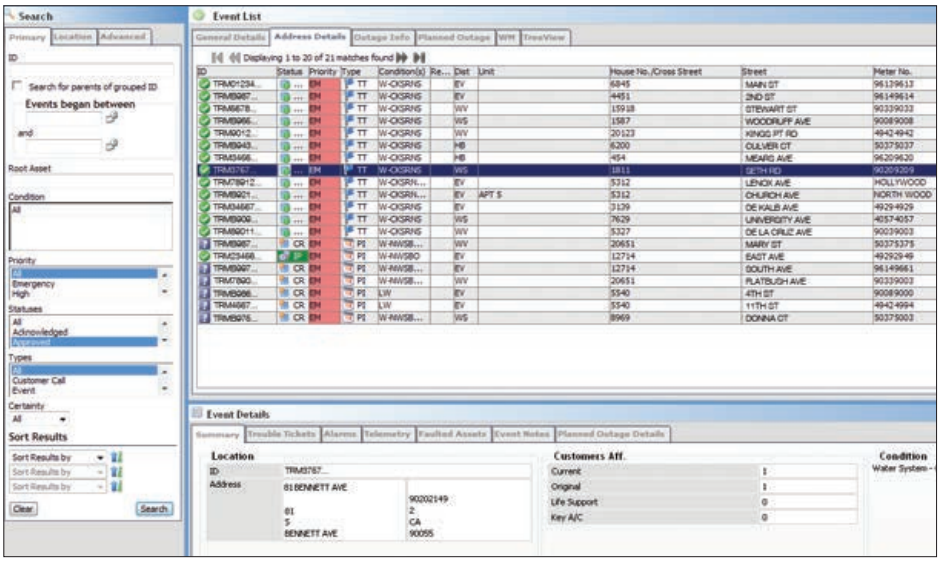
For years, LADWP utilized multiple systems customized into its legacy customer information system (CIS) for water incident management. One system handled incidents such as outages, pressure variations, or leaks, while a second system tracked issues related to water quality. A third system managed daily planned maintenance and repair activities being performed by LADWP field crews. To replace these functions as the CIS was being replaced and to streamline operations, LADWP wanted to find a commercial off-the-shelf (COTS) system that would bring incident management for water service to the same level of performance provided to its electricity customers.

In 2013, LADWP implemented the Trimble eRespond Incident Management solution to merge the three previously separate systems and improve overall incident management and customer relations. LADWP selected Trimble eRespond in part because it was a proven solution for other water and wastewater utilities of similar size; it also gave the company the ability to leverage LADWP's existing Esri GIS technology with its new Oracle Customer Care and Billing (CC&B) solution for customer information and billing. In addition, the Trimble system met LADWP's requirement to use a commercial off-the-shelf product.

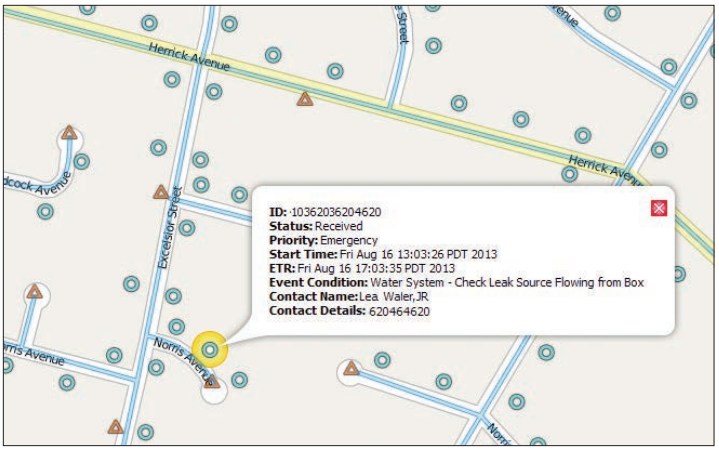
In addition to using customer calls for incident management, LADWP now has the ability to use Trimble eRespond to blend telemetry data from system pumps and facilities. This information often provides important input into the effort to locate and resolve a leak, pressure concern, or water quality incident. Over time, improved asset management will help LADWP achieve longer asset life and improve overall system operations.

Geographic Information for Incident Management

Water and wastewater utilities have miles of underground lines and assets spread over large areas. During incidents or outages, it's important to be able to send crews to the correct location. By connecting its asset database to Esri ArcGIS for Server, Trimble eRespond enables response managers to visualize the location and impact of incidents. The software also utilizes Esri applications to support asset management and planning



↑ Trimble eRespond shows key utility data.



← Trimble eRespond leverages Esri ArcGIS software to provide a proven, commercial off-the-shelf solution for improving water and wastewater network event management and response.

activities. By augmenting schematic depictions of distribution or collection networks with maps and aerial imagery, the system provides information and flexibility for both field and office operations.

During an incident, crews can use the GIS to map the severity and extents of any spills to assist in notification, repairs, and mitigation work. The spatial data also helps to fulfill requirements for reporting water and wastewater incidents to regulatory agencies.

In addition to its geospatial capabilities, the Trimble solution facilitates best-in-class incident management through tight interaction with leading enterprise and asset management systems. The system has received certification by SAP and can operate with the Oracle CC&B system. It's also Solution Architecture Framework for Energy and Utilities (SAFE) certified for use with IBM Maximo software. In its 2013 MarketScope report, the Gartner Group cited eRespond's unique abilities to coordinate with public emergency organizations and to scale to support water and wastewater utilities of all sizes, small and large.

From Data to Information

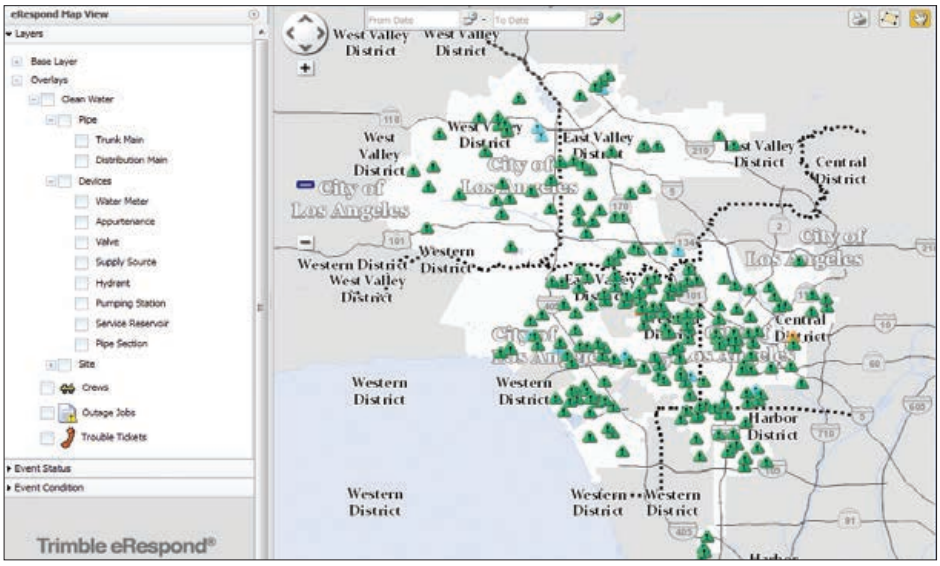
A key aspect of a water incident management system is its ability to utilize incoming calls and messages to produce actionable information. One incident may trigger a large number of reports from customers or municipal agencies. The incident management system can analyze the calls to shrink and isolate the incident until it can determine a cause and location of the trouble.

By collecting and analyzing incoming reports, the automated systems can quickly determine the likely location of trouble sources. Repair crews can be dispatched more efficiently and with the proper tools and parts. With automated systems, customers can receive faster response to reports of water outages as well as estimates on repair times and callbacks when service is restored.

With the 2011 introduction of Trimble eRespond, water and wastewater utilities in North America and the United Kingdom gained access to industry-leading incident management technologies and practices tailored to water and wastewater operations. As it is by LADWP in the United States, Trimble eRespond is used by one of the United Kingdom's largest water and wastewater utilities, where it has demonstrated its performance in three key areas: reduced costs and increased efficiency in managing incidents; improved customer relations; and compliance with the United Kingdom's tight reporting and environmental regulations.

The experience of the electric industry has set the stage for other utilities to benefit from automated systems for incident and operations management. By mirroring the electric utilities' best practices in technology for asset and incident management, the Trimble solution enables water and wastewater utilities to gain efficiency, reduce leakage and nonrevenue water, cut costs, and improve customer service.

For more information, visit trimble.com.



↑ With integrated Esri ArcGIS mapping, Trimble eRespond provides water and wastewater utilities with a single view of all leaks, spills, water quality incidents, and other planned and unplanned events on distribution and collection systems.

Smart Water Management Solutions

Trimble has long been a global leader in positioning technology. Founded in 1978 and a partner with Esri for more than 20 years, Trimble provides advanced, location-based solutions that enable field- and mobile workers to maximize productivity and increase operating efficiencies.

Trimble actively develops field and office solutions for water and wastewater utilities around the world. Solutions include GIS mapping and work management, smart metering, network monitoring and incident management, field data collection, design and inspection, and fleet tracking and management.

Trimble's smart water solutions deliver value by integrating advanced positioning and mapping technologies with software and hardware to automate utility mapping, design, and operations. This integration can increase field-worker safety, efficiency, and productivity; enhance regulatory compliance; and improve customer service and response.

Trimble eRespond

Incident and Leak Management for Water and Wastewater Utilities

Trimble eRespond software is an outage and incident management solution for water and wastewater networks. It has been created specifically to reduce leakage and nonrevenue water (NRW) and to improve field and office productivity by identifying incidents on the network and shortening repair time. Trimble eRespond allows utilities to proactively manage planned and unplanned incident identification and resolution. It also provides timely and relevant information to customers and stakeholders. Built to support industry best practices and processes, Trimble eRespond places the right information in the hands of the user when and where it is needed to ensure better decision making.

↑ Trimble Connect brings your Esri ArcGIS maps and work orders to the field to help locate and map assets, complete work orders, and improve the accuracy and quality of your GIS.

↑ GIS layers for water networks can be carried into the field on rugged mobile devices. The Trimble eRespond system analyzes incoming incident reports to optimize response activities.

Trimble Connect

Cloud and Mobile Software for Smart Water Management

Trimble Connect is a cloud and mobile software designed specifically for automating water and wastewater mapping and field operations. Trimble Connect integrates Trimble and Esri spatial technology, enabling utilities to view and edit GIS maps and dispatch work to mobile employees for inspections, repairs, maintenance, data collection, or any other asset or location-based work.

Trimble Connect works on a variety of mobile devices, including tablets and smartphones, but when combined with rugged, GNSS-enabled Trimble handhelds, the complete Trimble solution gives users the tools they need to work more accurately and productively in the field.

Trimble®

Trimble Rugged Field Computing

Field Computers and Mapping Systems for Your Mobile Work Force

Trimble also offers a fleet of rugged field devices to equip your entire mobile work force. Devices include the Trimble Juno T41, Trimble Ranger 3, and Trimble Nomad 900 rugged handheld computers; Yuma 2 rugged handheld tablets; and the high-accuracy Trimble GeoExplorer 6000 series handheld computers for GIS mapping. Trimble offers operability with both Windows and Android OS, as well as integrated technologies such as GPS/GNSS; radios for smart metering; integrated cameras; voice and data communications; and 1D/2D bar code scanning and radio-frequency identification (RFID) for asset identification on select devices.

For more information on Trimble's developments in the water and wastewater industry, visit www.trimblewater.com.

Spatial Analytics Improves Efficiency for Johnson County

continued from cover

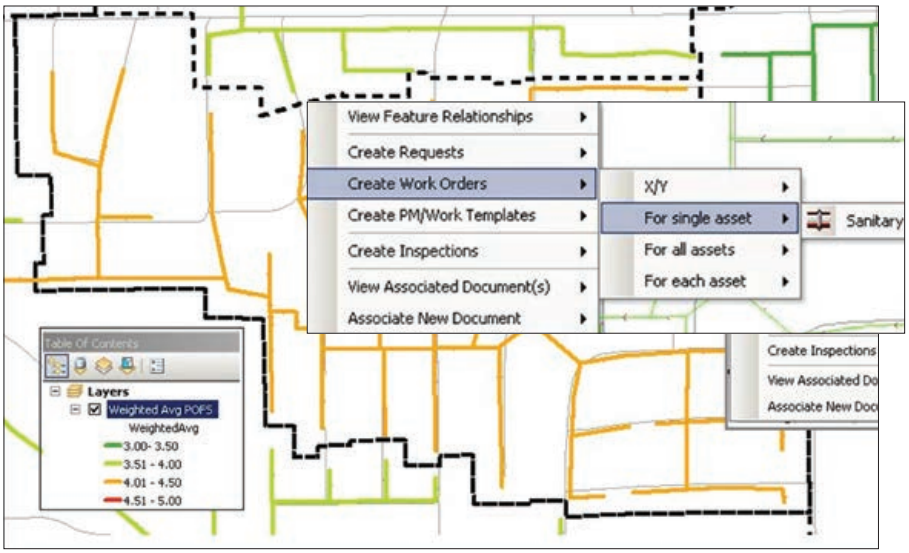
individual pipes. This allows JCW staff to visually inspect the basin and assign a priority for each basin.

By prioritizing the basins, JCW was able to assign a closed-circuit television (CCTV) crew to an entire basin versus locations spread throughout the county. JWC estimated efficiency gains of 20 to 30 percent by assigning CCTV crews by basin, along with other process improvements. In addition, by displaying the data in ArcGIS for Desktop, JCW staff can use the add-in tools to create work orders directly to the maintenance management system.

The results of the pipe and basin analysis need to be shared with all JCW staff. The county's GIS department, AIMS, identified an opportunity to use ArcGIS Online to communicate the final results. By taking advantage of the prebuilt templates and viewers hosted by Esri, JCW is able to host the data on ArcGIS for Server and add it to ArcGIS Online. The map service displays each basin along with its BRE score and highlights the top priority areas.

JCW was able to implement best practices and score its system for business risk exposure by integrating ArcGIS technology with its maintenance management system (Lucity). In addition to performing the system analysis, JCW staff can now visually inspect and identify pipes in need of repair, group pipes together accordingly, and subsequently create work orders. This ensures a more efficient workflow process. Staff members are able to quickly identify critical infrastructure, increase the efficiency of their CCTV crews, and share information within each department. They are able to target critical sewer lines and identify those in need of rehabilitation in a timely manner, which allows them to sustain a high level of service.

"The work we are doing to improve our CMMS [computerized maintenance management system]/IT/GIS systems and tools is critical to our long-term success in meeting our asset management goals and levels of service here at JCW," said Dan Ott, managing engineer, Collection System, Johnson County Wastewater.



↑ JCW staff have increased efficiency by integrating Esri and Lucity technology.

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