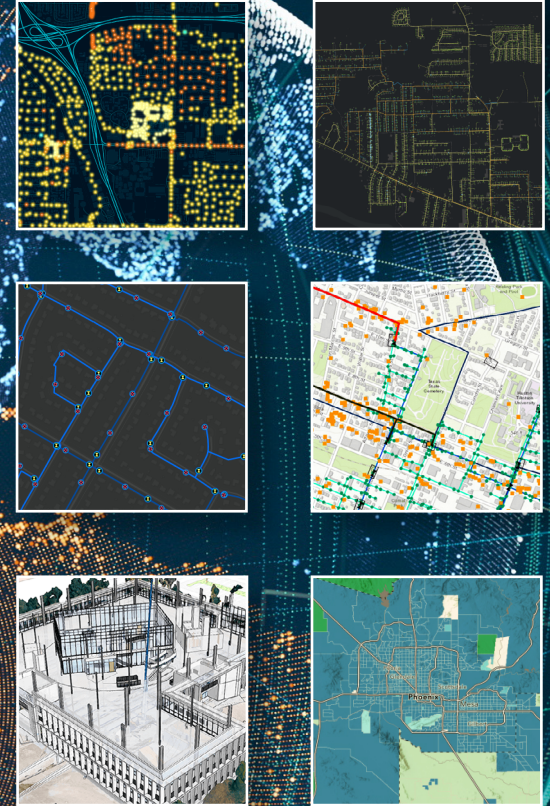


MAKING INFRASTRUCTURE CUSTOMERS SUCCESSFUL

Volume 3 | 2023



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A stylized globe with a network overlay, held by two hands. The globe is dark blue with yellow and orange highlights representing landmasses and data points. A network of white lines and dots connects various points across the globe's surface. The globe is held by two hands, one on the left and one on the right, with fingers spread. The background is a dark, textured gradient.

PROVIDING SOLUTIONS FOR A CHANGING WORLD

Throughout the world, companies of every size and in every industry are actively pursuing and deploying more resilient and sustainable practices to implement throughout their organization. As a result, these efforts can impact every level of the company, the businesses it works with, and its customers alike. By leveraging the power of location, organizations are best prepared in understanding these effects. A geospatial approach to infrastructure management dramatically improves business results and safeguards customer experience and satisfaction. Location-based technology aligns infrastructure with human needs and the environment.

When organizations have the capability of seeing the whole picture, they gain understanding and the ability to anticipate problems and proactively establish strategies. They understand relationships and predict outcomes based on science.

Organizations that support infrastructure are challenged to deliver safe, reliable, and sustainable services. To be effective in the world today, companies must share information and collaborate with members of the community. Likewise, Esri and its partners deliver services and proven solutions and technologies promoting efficiency, situational awareness, and excellent customer care.

This ebook demonstrates how organizations can deliver and leverage comprehensive infrastructure management by using Esri's geospatial software and solutions. You will see many examples from your peer agencies and learn how they applied location-based technology across their organizations. Explore the improvements to asset management, operations, planning and engineering, customer care, and network management. Business intelligence from Esri's ArcGIS software leads to smart decisions in the moment and predictive abilities for the future.

ASSET MANAGEMENT

Today, utilities and infrastructure organizations are modernizing their asset management systems to meet the needs of the future. Esri helps you get the most value from your assets, leveraging the power of location and ArcGIS. Esri technology provides fresh insights into performance, risks, resources, and costs. Using location intelligence, utility staff can discover patterns and trends that simple reporting cannot detect—improving asset management results. Throughout the organization, employees have full operational awareness via desktop or mobile methods for fast response and collaborative problem-solving. A complete geographic information system (GIS) fine-tunes asset management.





FROM PAPER SURVEYS TO DIGITAL DIG PERMITS

Mortenson Construction, a global leader in construction, was using a paper survey to handle its dig permits for a project site. The team at Mortenson Construction decided to move from this paper survey to GIS and contacted Equinox Geospatial, LLC, to develop a custom digital dig permit application.

Equinox Geospatial developed the Mortenson Dig Permit, Review Dig Permits, End of Day, and Random Check surveys using ArcGIS Survey123 Connect. Automation routines were built to handle various tasks to streamline the permit authorization process, allowing Mortenson to develop routines for users to receive email notifications with a copy of the Dig Permit in PDF.

The digital permit approval process takes less than 20 minutes. The necessary documentation is present in the corporate system architecture, and the review is efficient due to the ease of Survey123. All active dig permits are available on the utility map and may be filtered by company, area, etc., for easy tracking.

[Learn more about Equinox Geospatial, LLC.](#)

“Digital permit approval process takes less than 20 minutes.”

—Nate Lewis,
Mortenson Construction Superintendent



DIGITAL ASSET MANAGEMENT UNITES STAFF IN CUSTOMER CARE

City of Sheboygan Falls Utilities (SFU) faced challenges with old infrastructure data and maps. Information about the city's network was managed with CAD drawings and printed annually in map books.

SFU contacted Esri partner OpenPoint and determined that ArcGIS Online could help improve operations with streamlined information sharing in both the field and the office. Furthermore, mobile line workers could collect data and also use it with ArcGIS Field Maps.

To support SFU's goal of submeter accuracy, OpenPoint recommended the Arrow 100 Global Navigation Satellite System (GNSS) receiver from Eos Positioning Systems. Using Bluetooth® technology, the Arrow 100 receiver streams accurate locations to ArcGIS Field Maps in real time. Using this solution, SFU staff mapped its network details with high accuracy in just over one year.

Now, SFU staff access accurate and timely maps from the office or the field. As new equipment is added to the system, it is updated promptly and available on smartphones and iPads. During an outage, staff quickly retrieve

equipment details, photographs, and phasing information to help speed restoration and improve customer care.

In addition, SFU has begun to securely share read-only data with external entities such as telecommunications providers to determine pole attachment points to support broadband expansion.

[Learn more about Eos.](#)

[Learn more about OpenPoint.](#)

"It's hard to put a value on what we are doing. There's the annual outsourcing cost we're saving, of course, but the bigger value is in the knowledge of where things are. It's been a relief knowing that our system is now accurate."

—Joel Schoneman,
Sheboygan Falls Utilities, Field Supervisor

GEOENABLING A LAND MANAGEMENT WORKFLOW

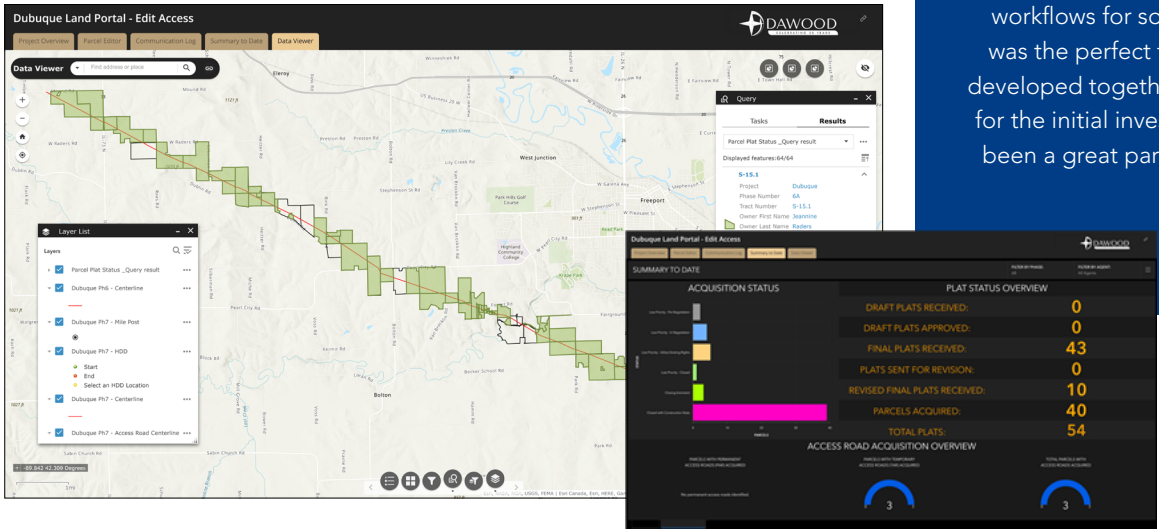
The land development team at Southern Company Gas struggled for years managing multiphased pipeline construction projects with a spreadsheet. The spreadsheet contained 53 columns and 100 rows or more. This made detecting patterns, errors, and areas of concern difficult. Working from a flat spreadsheet also meant that only one person at a time could make spreadsheet changes. All this made it difficult for the pipeline construction project team to stay current on each parcel's status, effectively provide management with a snapshot view of acquisition metrics, and demonstrate progress during meetings.

Working with Dawood Engineering, Southern Company Gas developed the Land Management GIS portal to geoenable the spreadsheet-based workflow. The portal was developed through several phases to ensure that the data schemes, design functions, and reporting aligned with project

requirements. The portal encompasses Esri products such as ArcGIS Dashboards, ArcGIS Survey123, and ArcGIS StoryMaps. Together, these technologies empower users to quickly access pertinent information via web-based data input and updates.

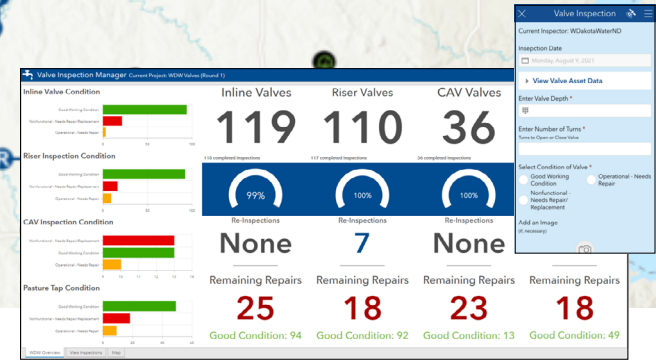
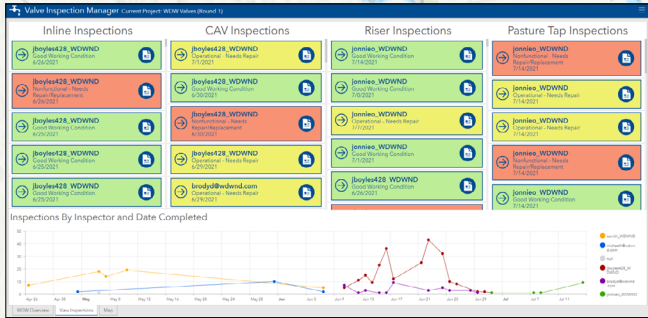
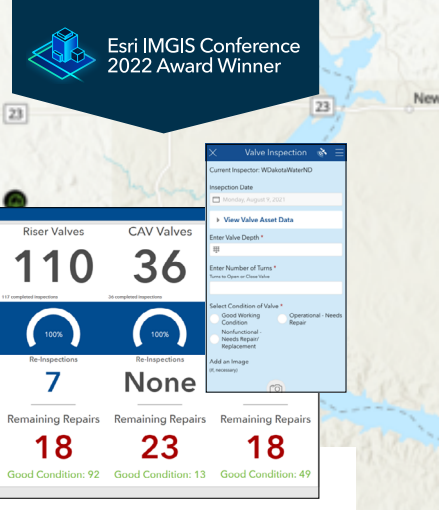
The portal now enables the entire project team to access, analyze, and visualize easement acquisition information in real time and make informed decisions. This central repository and data hub significantly increases the team's efficiency and communication and elevates collaboration.

[Learn more about Dawood.](#)



“Our land management team has been looking for an optimized solution for our workflows for some time. Our new 100-plus-mile-long Illinois pipeline project was the perfect time to implement a geoenabled workflow. With this solution developed together with Dawood Engineering, we expect it will more than pay for the initial investment, saving us time and helping avoid errors. Dawood has been a great partner, listening and responding to our needs. We look forward to future collaboration.”

—David Behrens,
Manager of Land Development, Southern Company Gas



WEST DAKOTA WATER: OPTIMIZING ASSET MANAGEMENT WITH GIS

West Dakota Water (WDW) faced several challenges when it decided to build a robust GIS foundation for each of its four departments. First was the lack of in-house GIS expertise. This prevented WDW from knowing how to achieve its goals or whether doing so was even possible. Also, WDW's data was not in a format that was sustainable for growth of the GIS or the expansion of operations. Paper maps were the status quo. Additionally, valves along WDW's pipe route weren't routinely inspected, and when they were, many more were found to be in need of repair or replacement than anticipated.

Implementation of a modern, robust GIS would make the data more user-friendly, enable a streamlined inspection solution, and increase operational efficiency. To help achieve these goals, WDW partnered with Pro-West, which functioned as WDW's GIS department.

A set of three applications was configured and deployed. The applications included a swipe tool that allowed users to explore imagery, as well as a valve inspection tool and an asset manager tool. These enabled staff to use modern GIS technology, increasing efficiency, improving data

management in the field, and increasing understanding of the work being assigned and completed.

WDW is getting greater value from its data by making it more user-friendly and focused on addressing the organization's needs.

[Read the full story.](#)

[Learn more about Pro-West.](#)

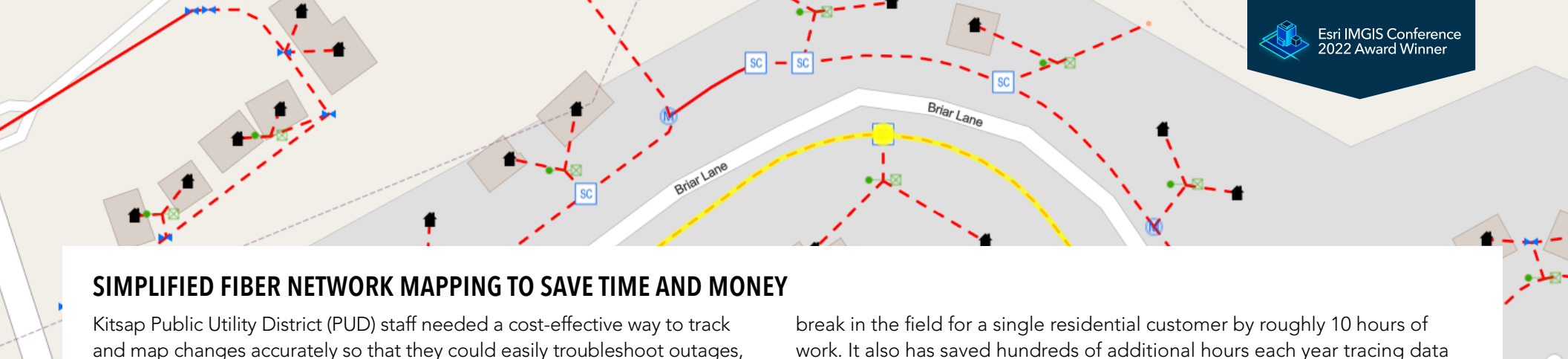
"West Dakota Water utilizes ArcGIS Online daily for planning, operations, and management of company fixed assets. ArcGIS has become an essential tool for all of our company divisions to carry out our day-to-day operations."

—Ryan Waters,
Director of Water Systems and Sourcing, West Dakota Water



OPERATIONS

Situational awareness drives effective operational performance. Esri's ArcGIS technology helps organizations optimize their resources using location intelligence and GIS. System operators use GIS to model their networks and visualize data that shows the immediate state of the network. Moreover, they can see operations in a geospatial context, so they can locate resources, monitor status, and evaluate factors affecting performance. Operations dashboards reveal performance shifts and enable staff to quickly locate assets, monitor field task status, track workforce locations, trace faults, and much more. ArcGIS delivers situational awareness for real-time network and field operations.



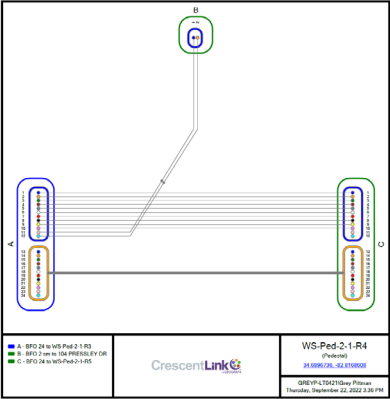
SIMPLIFIED FIBER NETWORK MAPPING TO SAVE TIME AND MONEY

Kitsap Public Utility District (PUD) staff needed a cost-effective way to track and map changes accurately so that they could easily troubleshoot outages, communicate between teams, and serve customers. After wading through manual and time-consuming solutions that didn’t work, staff knew they needed affordable and reliable fiber management software and GIS data that worked.

break in the field for a single residential customer by roughly 10 hours of work. It also has saved hundreds of additional hours each year tracing data circuits, and saved up to \$10,000 on costs for troubleshooting and fixing fiber breaks for each commercial customer.

[Read the full story.](#)

[Learn more about GEOGRAPH.](#)



The organization sought a solution that was easy to use; created an accurate network map; and was connected to an excellent data structure that could be customized to reflect all aspects of the map, down to each splice and connection. The solution would also need to provide seamless collaboration between in-office and field teams, help simplify troubleshooting for faster outage response time, and could manage new expansion buildouts.

Kitsap PUD staff found what they were looking for in GEOGRAPH’s CrescentLink, a powerful fiber mapping and management product and an extension of Esri ArcGIS. As a result, Kitsap PUD now has accurate and detailed fiber maps. This has cut down the time it takes to identify a line

“We have saved hundreds of hours per year that would have been spent trying to figure out where fiber breaks are in the field.”
—Paul Avis, Kitsap PUD

“GEOGRAPH has made many advancements to the platform, and moving into a mobile environment with CrescentLink Web Experience has been a big benefit.”
—Greg Berghoff, Kitsap PUD

“The GEOGRAPH team is very responsive. Problem-solving happens quickly, minimizing interruptions to our workflow.”
—Katrina Harris, Kitsap PUD

INTEGRATED TECHNOLOGY HELPS IDENTIFY FOG BUILDUP BEFORE IT'S A PROBLEM

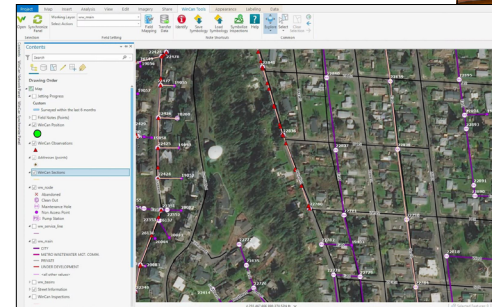
In Oregon, the City of Springfield's Trash It, Don't Flush It initiative makes it clear that fats, oils, and grease (FOG) have no place in the sewers. This is one of many efforts the city has in place to keep its wastewater system clean and operating smoothly. With the help of WinCan VX technology and an integration with Esri's ArcGIS Online, the city is enhancing efforts to ensure that main lines are healthy and wastewater is flowing properly.

From marked-up paper maps and overloaded hard drives to slow, manual transfer of inspection data, Springfield has relied on a variety of data management solutions over the years. For a long time, an engineer was tasked with creating and transferring work orders to and from WinCan. But for some inspection teams, these outdated workflows created disorganization and complicated efforts to find and clean FOG buildup before it became problematic. Integration of WinCan VX and Esri's ArcGIS Online provided a direct and less manual transfer method, and it offered the analysis tools Springfield's inspection team needed. This allowed the team to create a multipronged approach to preventing FOG accumulation, enabling a more efficient maintenance process while improving on the established database.

With updated pipe data in ArcGIS Online, Springfield has been able to modernize flow modeling and sewer condition monitoring and has significantly improved its ability to address FOG buildup as soon as it happens.

[Read the full story.](#)

[Learn more about WinCan.](#)



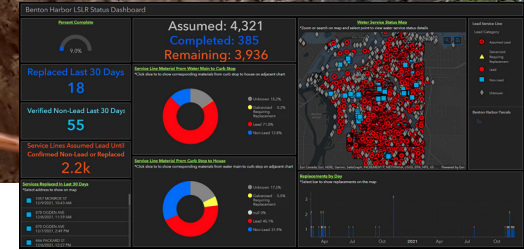


LEAD SERVICE LINES: DATA TRANSPARENCY FOR A COMMUNITY IN ACTION

The City of Benton Harbor’s water distribution system is more than 100 years old. Water leaving the city’s water plant doesn’t have lead in it; however, many of the water service lines from the property line to the homes are made of lead or have lead components in them, as do some public-side water service lines.

With new funding in place, Benton Harbor plans to replace all lead service lines within an 18-month time span. As the city engineering firm for Benton Harbor, Abonmarche was tasked with coordinating lead service line replacement efforts for the quick-moving project.

Abonmarche used Esri’s Lead Service Line Inventory solution as a foundation for the project. This industry-specific solution helped easily set up the necessary data layers, maps, and applications—enabling Benton Harbor to better communicate with its community.

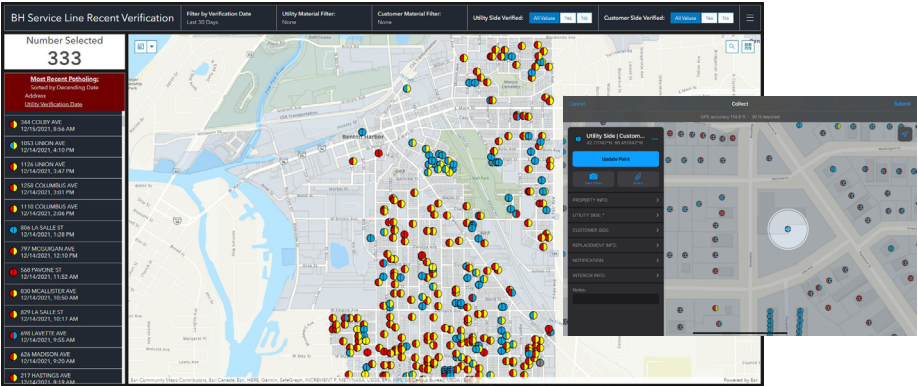


Esri’s Lead Service Line Inventory solution includes a number of built-in maps and apps that were configured and extended, enabling Benton Harbor to efficiently organize and track right-of-entry permission, log work by mobile staff into the GIS, enter and edit data in the office or the field, monitor work being completed, and quickly quantify results.

Benton Harbor has eliminated paper update records, information that has been transposed, and redundant data entry. Using the new solution, information is shared in real time, updates on work completed are shown instantly, and GIS data can be used to autogenerate any needed documentation.


[Read the full story.](#)

[Learn more about Abonmarche.](#)



“The Lead Service Line Inventory solution has saved our team and Benton Harbor hundreds of valuable hours that can now be spent in other ways.”

—Garrick Garcia, GIS Technician, Abonmarche



NEW JERSEY CITY DITCHES PAPER MAPS FOR ARCGIS FIELD MAPS

The City of Rahway’s Code Enforcement Department and Engineering & Land Use Department are responsible for the engineering, design, and inspection of everything from properties to rights-of-way. Department staff regularly respond to internal and external information requests. Recently, the city created an initiative that would digitize and streamline such requests.

With approval to implement an enterprise GIS, city staff identified upcoming municipal separate storm sewer system inspections as the ideal project to implement the new digital workflow. Partnering with Colliers Engineering & Design, the city prepared to not only perform inspections but also map the entire stormwater and sanitary sewer system.

Technicians paired Eos Arrow Gold Global Navigation Satellite System (GNSS) receivers to iPads running ArcGIS Field Maps to collect high-accuracy location of assets. Ninety-five percent of the data was captured within six-inch accuracy—two-thirds had accuracy within one inch. In just a few days, one

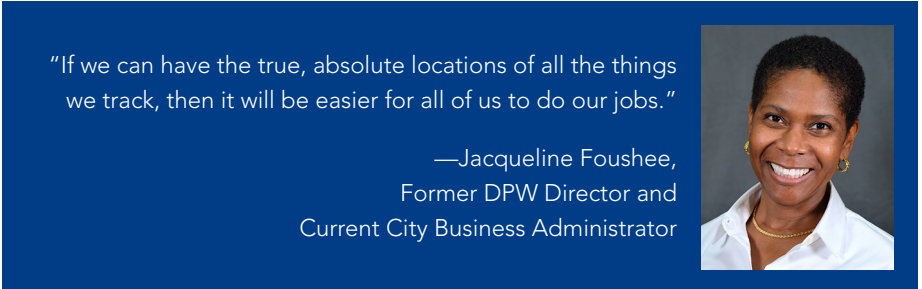
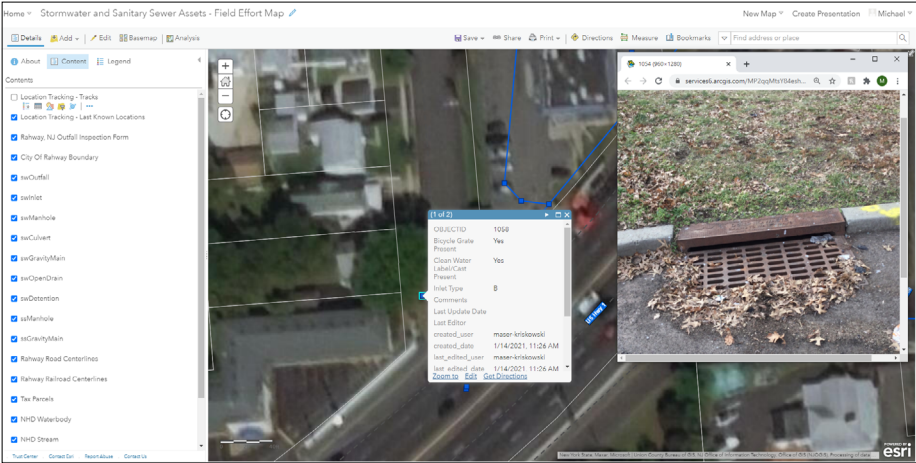
GIS technician was able to capture the majority of data on the 4,750 assets. ArcGIS Dashboards was used to communicate data-collection progress in real time.

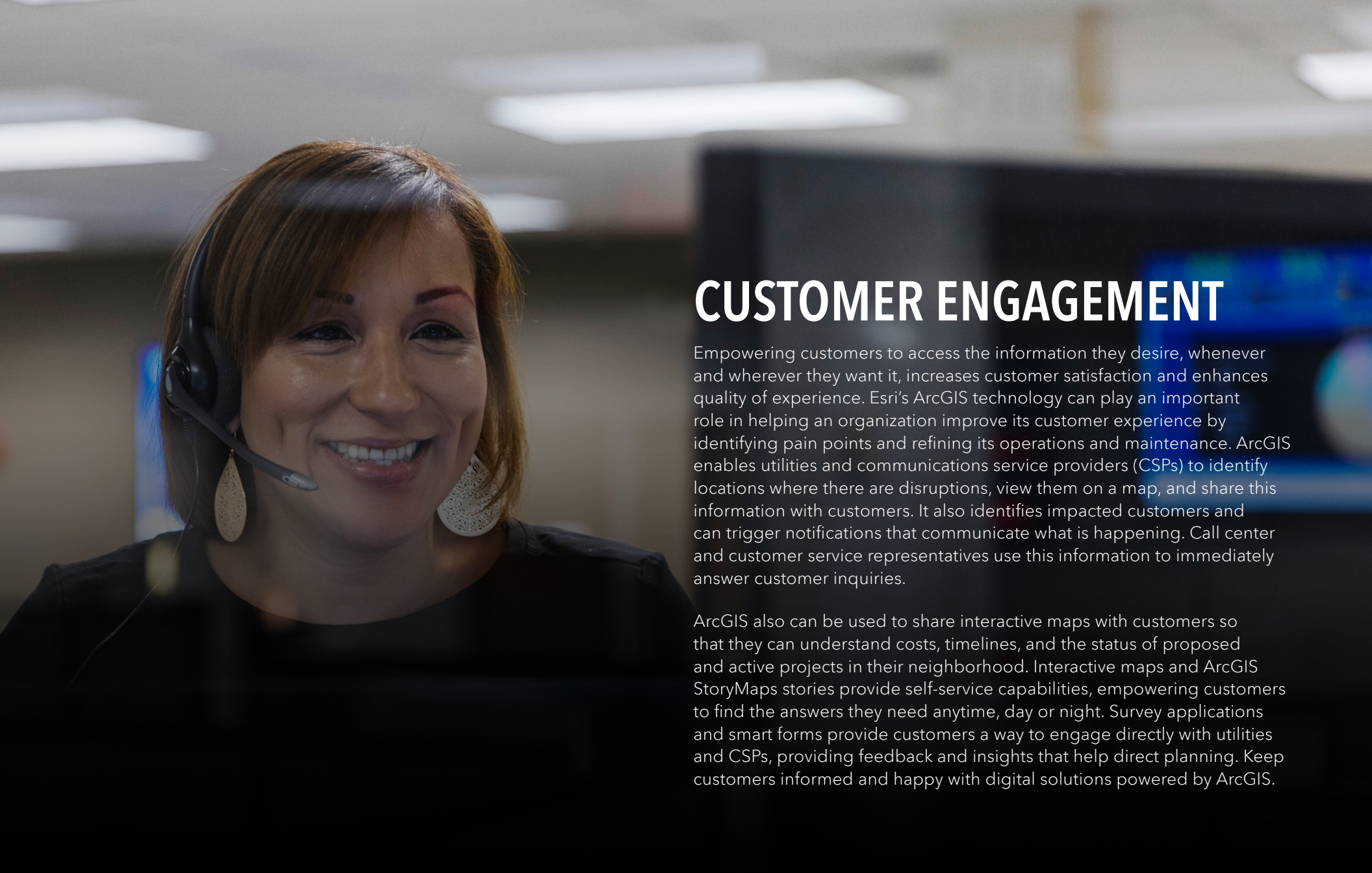
Using the digital workflow, the city was able to more efficiently and accurately collect and share asset information. The city has also gained efficiencies from other departments’ accessing information via web maps, rather than using paper file scans or manual updates. The long-term vision is to be able to expand the enterprise GIS beyond the city’s Engineering Division and Department of Public Works (DPW).

[Read the full story.](#)

[Learn more about Colliers Engineering & Design.](#)

[Learn more about Eos Positioning Systems.](#)





CUSTOMER ENGAGEMENT

Empowering customers to access the information they desire, whenever and wherever they want it, increases customer satisfaction and enhances quality of experience. Esri's ArcGIS technology can play an important role in helping an organization improve its customer experience by identifying pain points and refining its operations and maintenance. ArcGIS enables utilities and communications service providers (CSPs) to identify locations where there are disruptions, view them on a map, and share this information with customers. It also identifies impacted customers and can trigger notifications that communicate what is happening. Call center and customer service representatives use this information to immediately answer customer inquiries.

ArcGIS also can be used to share interactive maps with customers so that they can understand costs, timelines, and the status of proposed and active projects in their neighborhood. Interactive maps and ArcGIS StoryMaps stories provide self-service capabilities, empowering customers to find the answers they need anytime, day or night. Survey applications and smart forms provide customers a way to engage directly with utilities and CSPs, providing feedback and insights that help direct planning. Keep customers informed and happy with digital solutions powered by ArcGIS.

GEOSPATIAL INTELLIGENCE AS A COMMUNITY COMPANION

US transportation agencies are responding to the US Department of Transportation's (USDOT) new guidelines and expectations for meaningful public involvement to be conducted on all infrastructure projects.

Bay Area Rapid Transit's (BART) Link21 Program was seeking to transform the Northern California passenger rail system through equitable approaches to safe, efficient, and affordable travel for everyone.

Leveraging the Esri platform and automation using Python and web APIs, one company, HNTB, has developed a series of postprocessing routines that harvest and index the vast wealth of demographic data from the US Census Bureau, the National Housing Preservation Database (NHPD), environmental justice datasets, and more. This information is processed nationwide to populate what HNTB has branded as a Community Intelligence Toolkit (CIT). The CIT provides rich data tapestries and Esri web apps, dashboards, and map templates that leverage ArcGIS Online as an authoritative source of truth.



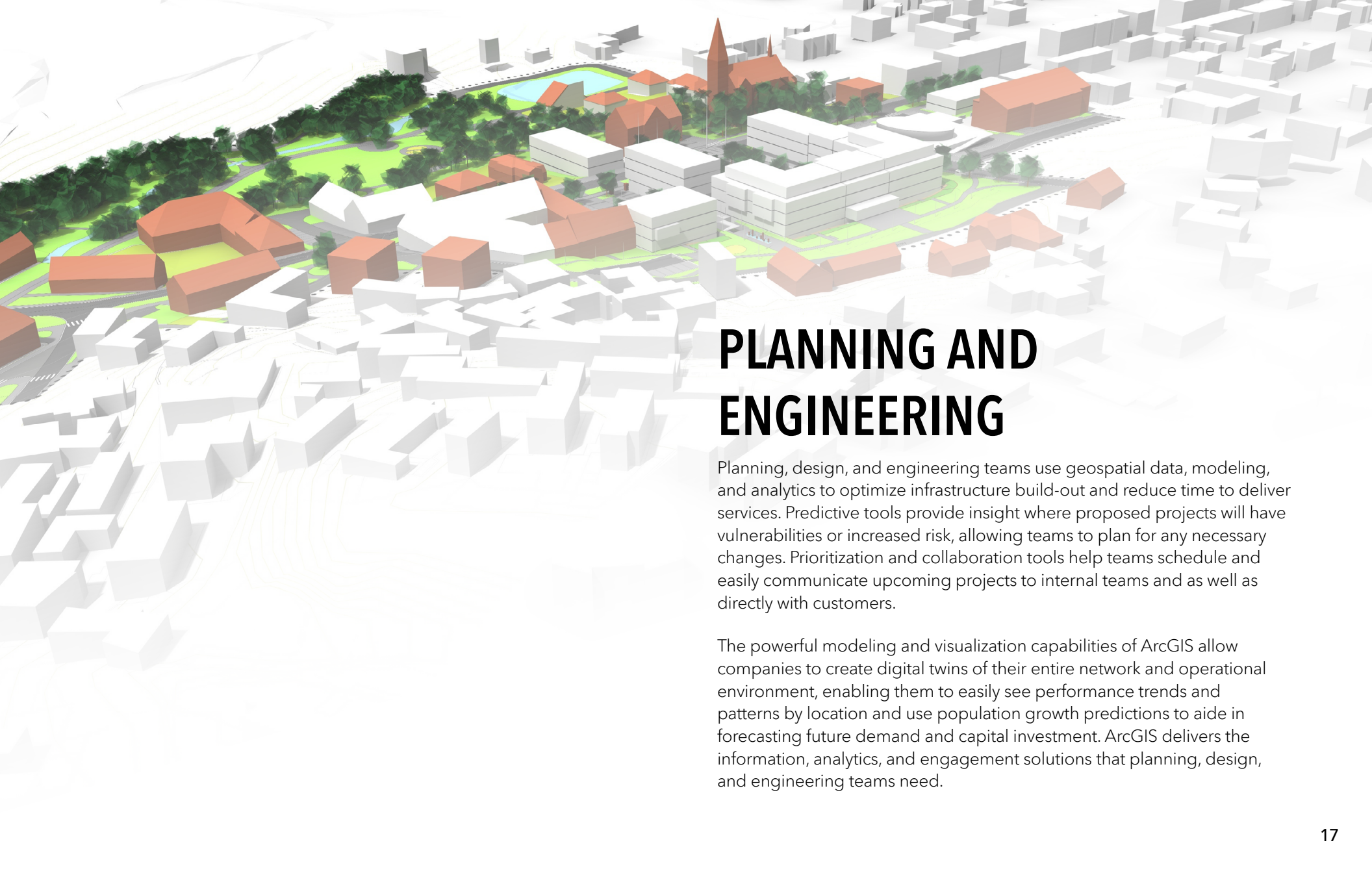
Using the CIT, Link21 Program teams can visualize which groups and communities are being engaged, determine whether those groups are priority populations, and refine strategies to increase their engagement. Using ArcGIS Dashboards, engagement data can also be filtered by in-person versus online participation, and staff can even evaluate whether participants were using desktop or mobile devices.

BART Planning + Development

[Learn more about HNTB.](#)

"Link21 is a transformational program, focusing on active participation by the communities that make up our 21-county Northern California Megaregion. As we work together to shape equitable transit options for the next generation, HNTB's approach to virtual public engagement and the incorporation of [its] PIMA platform, overlaid with priority equity statistics using ArcGIS, [have] been an important aspect in the strategy and assessment of our engagement and outreach efforts. Matching this tool with [HNTB's] equitable outreach solutions is providing our program with the confidence in knowing that we're hearing from and responding to our megaregional communities in real time."

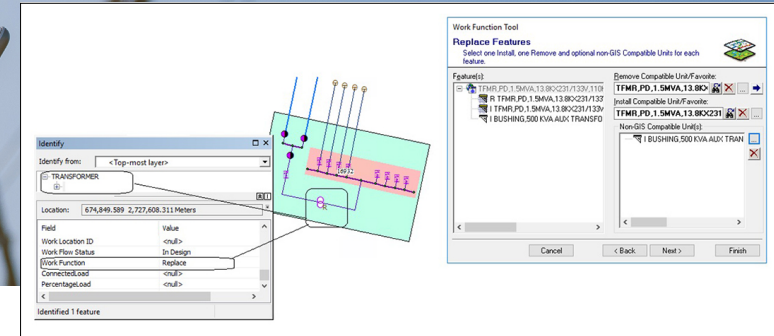
—Sadie Graham,
Director, Link21



PLANNING AND ENGINEERING

Planning, design, and engineering teams use geospatial data, modeling, and analytics to optimize infrastructure build-out and reduce time to deliver services. Predictive tools provide insight where proposed projects will have vulnerabilities or increased risk, allowing teams to plan for any necessary changes. Prioritization and collaboration tools help teams schedule and easily communicate upcoming projects to internal teams and as well as directly with customers.

The powerful modeling and visualization capabilities of ArcGIS allow companies to create digital twins of their entire network and operational environment, enabling them to easily see performance trends and patterns by location and use population growth predictions to aide in forecasting future demand and capital investment. ArcGIS delivers the information, analytics, and engagement solutions that planning, design, and engineering teams need.



SEC'S SMART DIGITAL UTILITY PLATFORM

Cumbersome paper-based design and construction processes with months' worth of backlog have burdened Saudi Electricity Company (SEC). Hard-copy drawings and documents caused significant inefficiencies and redundant design work. Esri Platinum partner Khatib & Alami (K&A) and Schneider Electric implemented, operated, and maintained SEC's ArcFM-based GIS platform in Riyadh and later in the remaining parts of the Kingdom of Saudi Arabia (KSA). The system will also significantly impact the agility and availability of resources, allowing SEC engineers and technicians to keep up with the pace of new development in KSA.

The new geospatial digital utility platform supports the daily business of all company sectors. It modernized the entire design life cycle and accelerated the design and planning tasks by more than 50 percent by using an intuitive

and user-friendly interface instead of a manual, paper-based design. In addition, it provided a built-in commissioning workflow that converts design sketches to enterprise GIS data with few clicks, reducing backlog data conversion by 60 percent. As a result, SEC leveraged Esri's ArcGIS and Schneider Electric's ArcFM to establish an intelligent, digital engineering platform that is highly adaptable to SEC's business processes.

[Read the full story.](#)

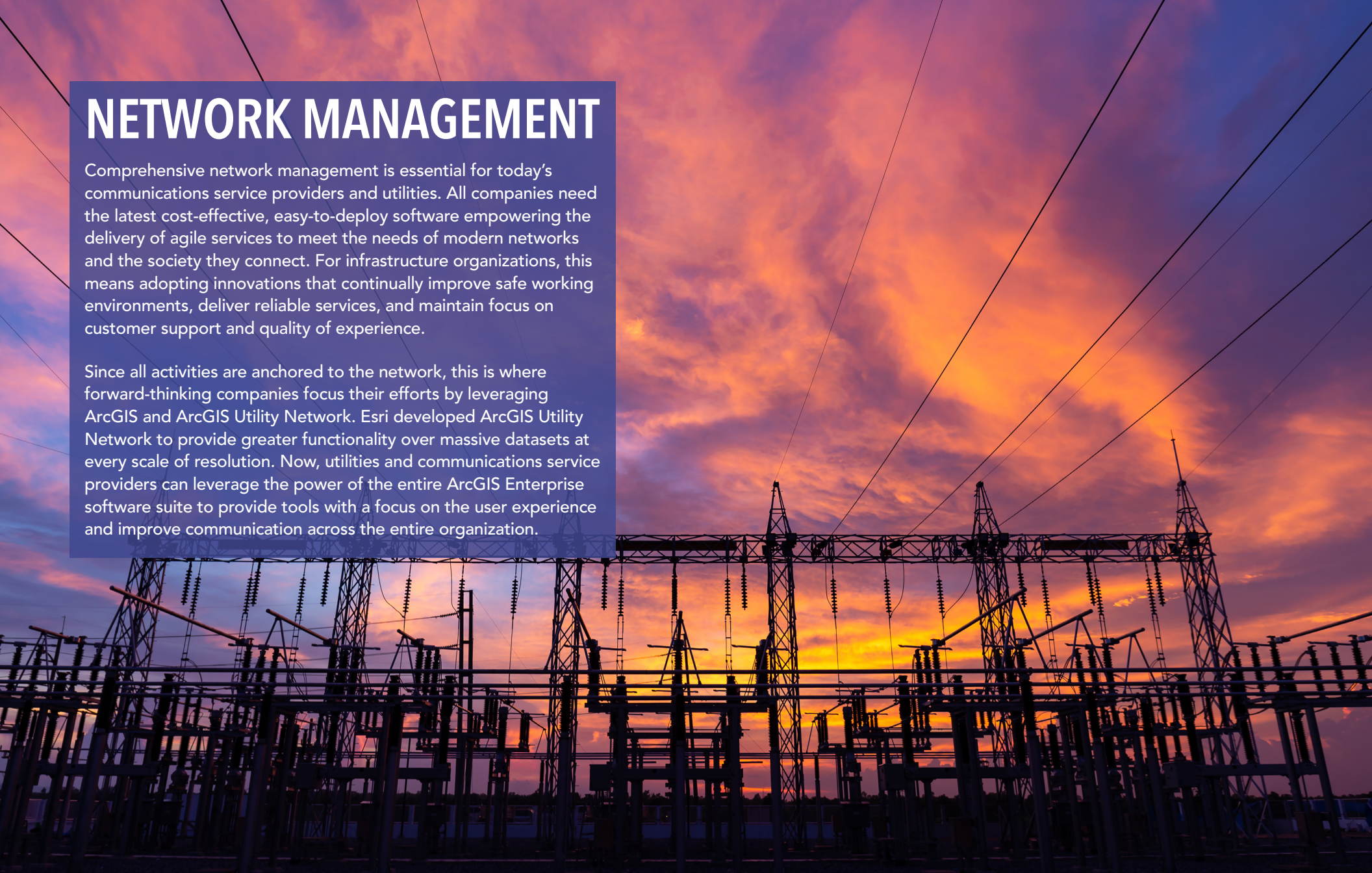
[Learn more about Khatib & Alami.](#)

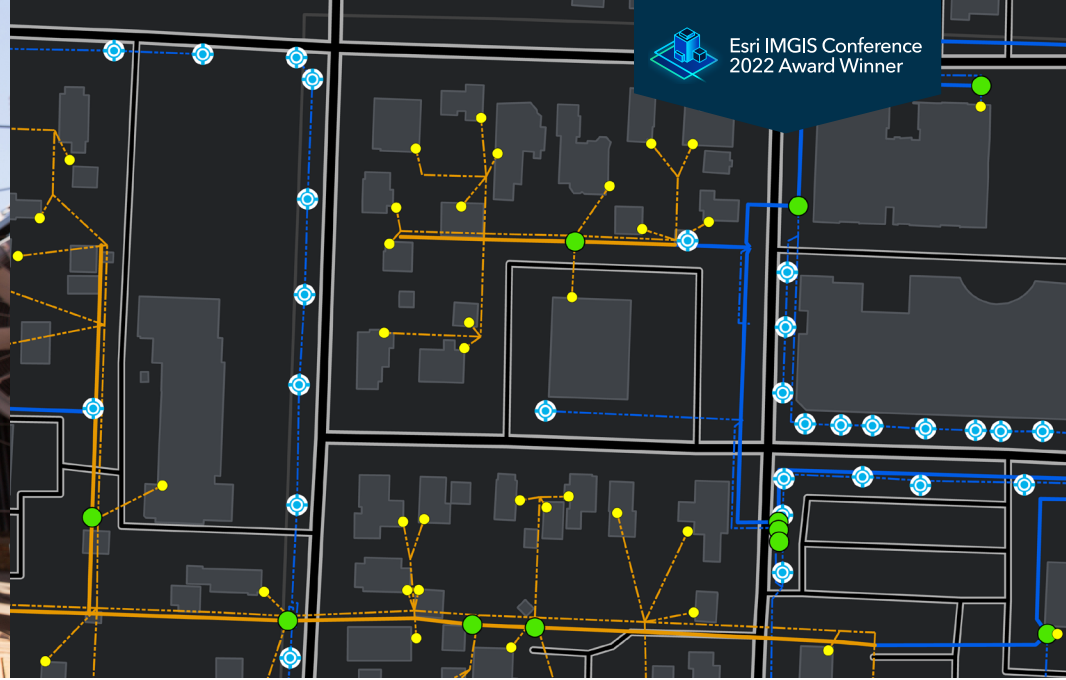
[Learn more about Schneider Electric.](#)

NETWORK MANAGEMENT

Comprehensive network management is essential for today's communications service providers and utilities. All companies need the latest cost-effective, easy-to-deploy software empowering the delivery of agile services to meet the needs of modern networks and the society they connect. For infrastructure organizations, this means adopting innovations that continually improve safe working environments, deliver reliable services, and maintain focus on customer support and quality of experience.

Since all activities are anchored to the network, this is where forward-thinking companies focus their efforts by leveraging ArcGIS and ArcGIS Utility Network. Esri developed ArcGIS Utility Network to provide greater functionality over massive datasets at every scale of resolution. Now, utilities and communications service providers can leverage the power of the entire ArcGIS Enterprise software suite to provide tools with a focus on the user experience and improve communication across the entire organization.





DATA ANALYSIS PAVES THE WAY FOR MIGRATING TO ARCGIS UTILITY NETWORK

Denton Municipal Electric (DME) needed a plan for moving its existing ArcGIS geodatabase to ArcGIS Utility Network. The geodatabase was on a legacy version of ArcGIS and was largely maintained using third-party editing tools. DME wanted to understand the quality, condition, and structure of its existing data and its readiness for Utility Network. DME also needed a plan for implementing any necessary data improvements for future migration.

SSP Innovations performed a rigorous assessment of DME's data, identified the severity of errors, and provided recommendations for performing corrections. Automated validation tests were run to identify data errors or conditions that needed to be addressed. SSP also visually inspected applicable data and features across 20 percent of the geodatabase to identify potential errors, issues, or gaps.

DME is carrying out the data corrections needed for a smooth migration to Utility Network, with a well-structured and aesthetically pleasing result. The work is being carried out and balanced with DME's normal day-to-day workflow. With over 27 Utility Network projects under its belt, SSP brings a wealth of technical knowledge, practical experience, and tools to Utility Network software-related data improvement and migration projects. SSP worked closely with DME to develop a plan that met DME's requirements and staffing level.

[Learn more about SSP Innovations.](#)

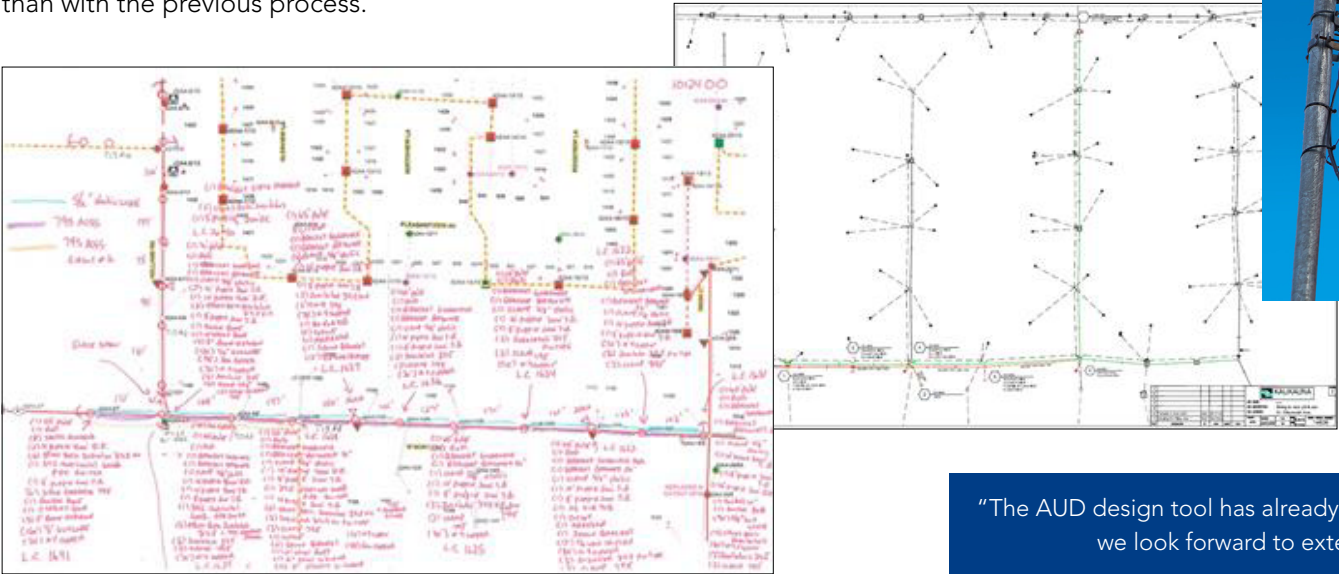
ELECTRIC UTILITY DESIGN WITH AUD AND ARCGIS UTILITY NETWORK

Before implementing a digital transformation project, Kaukauna Utilities (KU) utilized a paper-based design process. The designers would often start a design by printing out the area of interest and then proceed to manually add their design using colored pens and highlighters.

KU decided to implement Automated Utility Design (AUD) and Utility Data Hub (UDH) products from Spatial Business Systems. AUD was selected in part because KU was already an AutoCAD user. AUD was also selected for its overhead design capabilities and its ability to integrate with ArcGIS Utility Network. The new design software has greatly improved Kaukauna Utilities efficiency and overall design quality. AUD rules are helping ensure proper pole framing and line tensioning. Creating a material list for the design is accomplished literally at the push of a button—faster and more accurately than with the previous process.

POWER Engineers, Incorporated, provides a full suite of geospatial and asset management solutions for electric and gas utilities. POWER specializes in implementing Esri's ArcGIS Utility Network and has developed numerous tools to support utilities in this process. POWER is a partner with Spatial Business Systems and can implement and support its AUD and UDH solutions.

[Learn more about Power Engineers.](#)



“The AUD design tool has already made a big impact on our design process, and we look forward to extending the tool to further improve efficiencies.”

ELSINORE VALLEY MUNICIPAL WATER DISTRICT PERFORMS A PILOT STUDY OF ARCGIS UTILITY NETWORK FOR THE DISTRICT'S SEWER SYSTEM

Elsinore Valley Municipal Water District (EVMWD) wanted to modernize its sewer system management to increase collaboration and alignment between field and office staff. EVMWD had a comprehensive dataset that was well-connected topologically and to other business systems with industry-standard feature classes and fields. Sewer data included most invert elevations, with accurate geometry and attribute information. The geometry was in 2D format; however, the invert elevations from as-built drawings were present as attributes for most of the data. EVMWD's goal was to transition to using ArcGIS Pro and implement ArcGIS Utility Network.

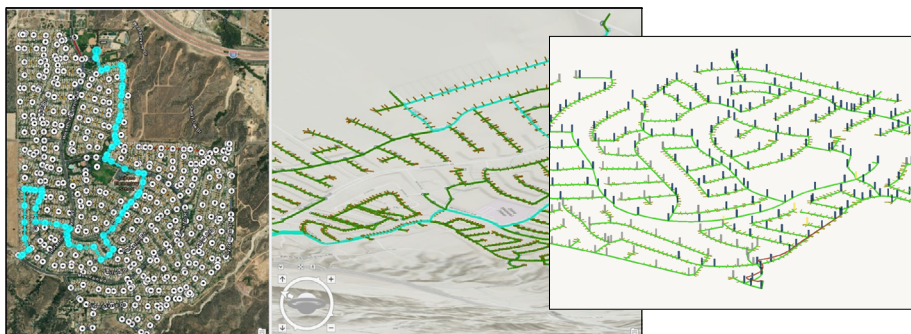
EVMWD decided to partner with DCSE Inc. to perform a pilot study that included data from a treatment plant, a couple of lift stations, and four subareas in the Horsethief Canyon area. The project was planned and managed in an agile project tracking environment.

The pilot study resulted in an understanding of how to implement ArcGIS Utility Network. Challenges and exciting functionality were identified. EVMWD staff learned that implementation of Utility Network requires data preparation ahead of time. The Utility Network framework was stable and provided a complete asset package and the tools needed for the migration.

Data visualized in a 3D format; advanced tracing capabilities; network diagrams of the sewer sheds; and, most importantly, improved data quality demonstrated to EVMWD that the migration effort was most worthwhile. The enhanced capabilities and data accuracy will benefit staff in all aspects of system management.

[Read the full story.](#)

[Learn more about DCSE.](#)



"What's really important is that modernizing our GIS will enable us to create applications that make it easy for EVMWD staff to perform geospatial analysis and understand the wastewater system without the necessity of being an expert in GIS."

—Anthony M. Vazquez,
GIS Technician II, EVMWD





CONCLUSION

Over the years, Esri has worked alongside our infrastructure customers to build and evolve software that meets the industry's dynamic needs. Despite the changing environments during these uncertain times, our mission remains the same: to help you unlock the potential of your data so that you can better

serve your customers. We share your vision for sustainability, so we focus on developing systems that accommodate your present needs and will prove foundational to your sustainable operations. Our staff and partners have hands-on industry expertise to help you along this journey.

THANKS TO OUR PARTNERS

Consider Esri partners when you want to accelerate ArcGIS implementations, customize solutions, or fine-tune your systems.



ABOUT ESRI

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