MODERNIZING ASSET MANAGEMENT WITH LOCATION INTELLIGENCE

A COMPLETE GIS FOR

WATER UTILITIES

Introduction

The objective of asset management is to maximize the performance of assets while minimizing risks, optimizing existing resources, and observing cost constraints.

Utilities have billions of dollars invested in their assets and must gain as much value as possible. A modern asset management methodology must optimize maintenance frameworks, increase asset utilizations, and integrate diverse types of data and systems to create understanding across the entire asset life cycle.

Esri's ArcGIS® platform enables a holistic approach with fresh insights about asset performance, risks, resources, and costs. Assets are spatial—they all have locations, and every location has a story to tell. Using location, utilities discover patterns and trends that simple reporting cannot detect—improving asset management results. ArcGIS uses location-based technology to fine-tune asset management.

ArcGIS brings value to utilities at all stages of asset management practice. It offers strategic capabilities that dramatically improve key performance indicators and business results.

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The Maturity Model of Asset Management

Utility asset management practices vary widely based on an organization's infrastructure and resources and the methods and technology they use. This maturity model shows the span between a tactical methodology and a strategic one.

- Passive (operational): Runs assets to failure, often sacrificing customer impact for maximum asset life

- Planned: Maintains assets on a time scheduled basis; replaces assets based solely on age

- Preventative: Services equipment based on current condition; considers how assets are used and the stresses that they have endured

- Predictive: Repairs and replaces equipment based on current condition and historic failure rates; includes factors for criticality and risk

- Prescriptive (strategic): Optimizes the complete process; balances costs, conditions, failure rates, environmental conditions, reliability, and risk

ArcGIS offers crucial capabilities to dramatically improve asset performance at each level of maturity. This provides value to every utility enterprise seeking to enrich asset management workflows and outcomes.

"One of the biggest challenges in asset management is the injection of long-term thinking (strategic goals and sustainability) while under pressure to deliver short-term results."

—John Woodhouse,
Asset Management Thought Leader
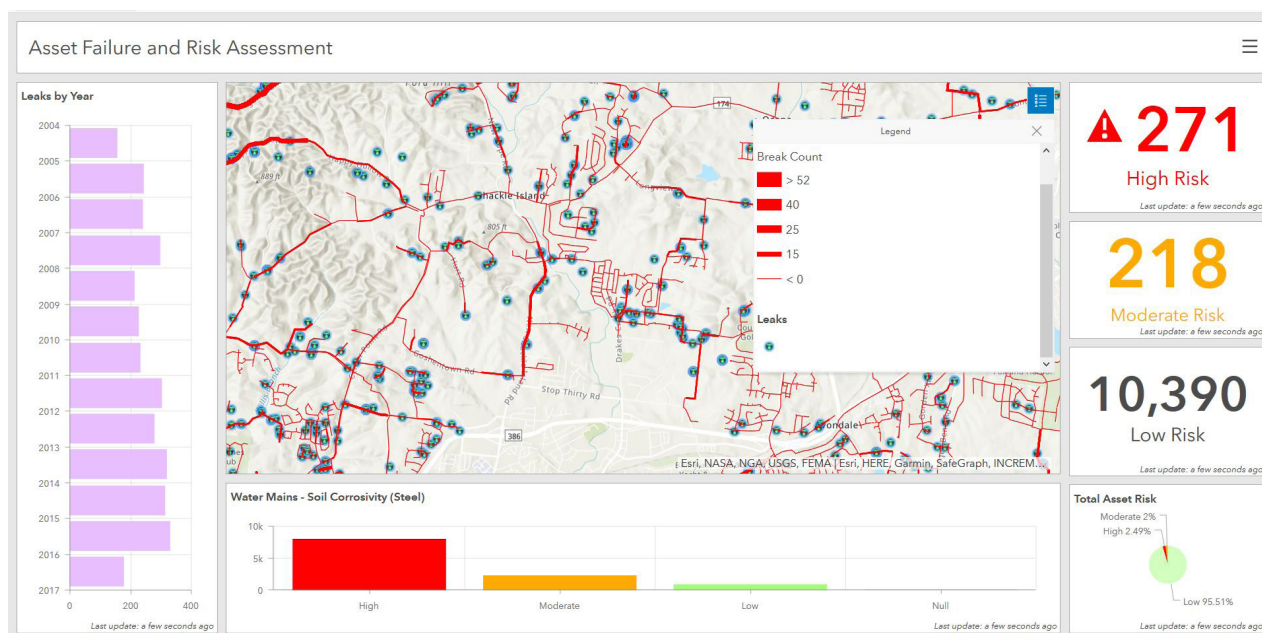
Why Location-Based Technology Matters

Assets are spatial—they all occupy location. Location determines each component's impact on the larger utility system. Assets are also themselves affected by

- Relationships to other assets, customers, and external factors.

- Environment changes such as emergencies, severe weather, and security threats.

- The assets' criticality—if an asset was damaged and out of service, how would it affect the surrounding area?

Mature asset management programs address both short- and long-term interests. ArcGIS effectively handles asset transactions, real-time data, and situational awareness for short-term results. At the same time, ArcGIS provides trends and analytics and enables discovery for strategic decision-making. To climb the maturity ladder from passive practices to prescriptive ones, utilities need better data management, engagement across the organization, and greater insight into the nuances of asset performance.

Modern geographic information system (GIS) technology supports effective asset management by bringing disparate types of information together, modeling the past, present, and future states of the system. Powerful analytics optimize data to reveal the unknown. And information is made available to all stakeholders—on any device, anywhere, day or night.

Location matters. ArcGIS empowers water utilities to effectively manage assets by revealing answers to vital questions:

- Where are assets failing?

- Where are the hazards that threaten infrastructure?

- Where are costs highest? Lowest?

- Where do environmental factors—such as the weather or soil conditions—impact the system?

- Where should investments be made based on risk, cost, and operational needs?

GIS Touches Every Aspect of Central Arkansas Water

From the management of underground assets—like pipes, valves, and meters—to an automatic fire hydrant inspection notification system to efficiencies in the billing system, GIS increases the quality of service Central Arkansas Water provides every day. *Read the utility's story*.

Data Management

Performance Assessment

Life Cycle Optimization

Fine-Tuned Asset Management

ArcGIS uses location-based technology to fine-tune asset management. ArcGIS does this in three ways: managing asset data, assessing performance, and optimizing the entire asset life cycle. Location empowers utilities to discover patterns and trends that simple reporting cannot detect.

Data Management

Utilities tend to piece together information from many sources—real-time data; metering; and systems for enterprise asset management (EAM), work and customer management, and network analysis. ArcGIS provides a new, complete network model that bridges these sources, consuming critical information from many sources to provide a complete picture of the water utility system.

Performance Assessment

ArcGIS delivers insight into the past, present, and future performance of assets and the system as a whole. Holistic data intelligence from the past and present provides deeper understanding that results in an improved ability to predict future performance. Assessing performance reveals vulnerabilities, predicts needs, and provides transparency, ensuring that you manage assets to provide the highest level of service.

Life Cycle Optimization

ArcGIS optimizes the entire asset life cycle by centering it around location—coordinating capital and operational plans, and balancing performance with cost, risk, resources, and regulatory compliance obligations.

Data Management

Outstanding data quality is a fundamental requirement of asset management. New demands for information detail and accuracy place new burdens on long-standing data models. By moving to a complete network model that consumes critical information from data sources with built-in quality controls, water utilities are empowered to meet modern demands. Esri's ArcGIS Utility Network has been developed to provide a system of record based on how assets exist in the real world. Utility Network handles billions of data elements; supports 3D visualization; integrates augmented reality; and is available on any device, anywhere, anytime.

Esri's suite of field applications make data collection and validation easy with simple-to-use interfaces. These location-aware apps modernize outdated paper-based workflows. They capture information once, validate it, and make it immediately available to the enterprise. Information that used to take days, weeks, or sometimes months to be processed now becomes available immediately.

Real-time data from sensors also contribute to complete asset understanding. Different types of data (SCADA, AMI, AVL) provide insight into current conditions affecting assets. ArcGIS organizes these sensors by location. This gives an operational view of asset performance and is the key to identifying risk and anticipating failure.

ArcGIS provides a bridge between business systems—EAM, work management, customer management, and network analysis systems—bringing them together using location and spatial relationships and unifying all asset information. This integration of data provides the insight and understanding that are important for asset management.

Fort Worth Finds a Way to Remove Lead Pipes through AMI Program

Fort Worth's water utility had a goal to replace all lead service lines. One of staff's biggest challenges was creating an accurate risk assessment. Good data was critical to quantify the utility's risk. Staff used GIS to overcome this challenge.
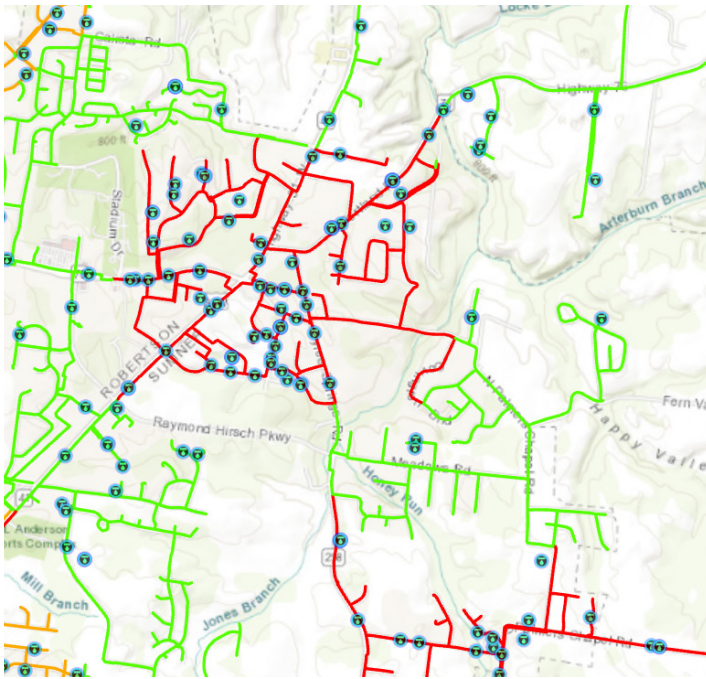Read their story.

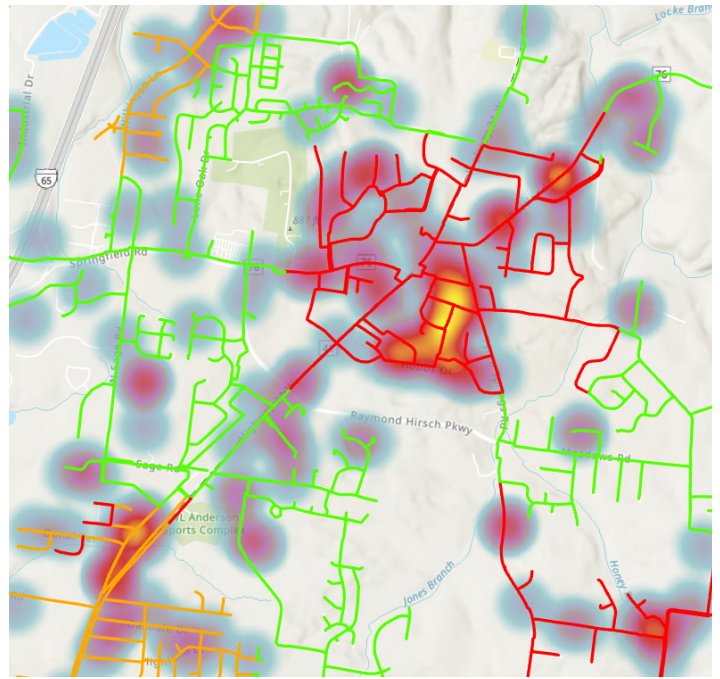Figure 1 - Vulnerable pipes are identified using multiple factors.

Figure 2 – Density of leaks are visualized as hot spots.

Performance Assessment

Asset management doesn't stop at maintaining a system model; understanding asset performance is necessary. ArcGIS provides insight into the past, present, and future, revealing asset vulnerabilities, predicting performance, and providing transparency. ArcGIS provides analytics and machine learning tools to help utilities gain insight that previously had been hidden from them. For example, it can predict which parts of the system will cost more to maintain, based on their location and the physical conditions that impact their total life cycle.

The leak map (Figure 1) identifies vulnerable pipes, depicted in red. Several factors were used to make this determination: age of pipe, type of material, pressure, soil type, and work order history. Cast-iron pipes that were made after 1945, are in corrosive soil, and are in an area with a history of breaks are identified as high risk. The heat map (Figure 2) symbolizes the density of the leaks as a color gradient. It was generated by weighing the factors and overlaying the results on the water system network. Results were then used to create a risk profile.

ArcGIS makes it easy to share this information by using web maps, dashboards, mobile applications, and more. It provides immediate awareness to all utility stakeholders—on any device anytime, day or night.

"'ArcGIS Insights℠' is used to analyze hydrant flushing data and water main data. The results of the analysis help us to prioritize leak investigation, saving labor costs by preventing the authority from mobilizing equipment to areas that are not a priority."

—Mark Bowen,
Manager, GIS & CMMS
Lehigh County Authority

Life Cycle Optimization

ArcGIS is the equalizer between operations, engineering, customer care, corporate management, regulatory affairs, and finance. It breaks down barriers within an organization by creating a collaborative platform. It does this by centering the life cycle around location, enabling easy coordination of capital and operational plans, and providing the data needed to balance cost, risk, performance, and regulatory compliance.

Enterprise asset management systems handle many aspects of the asset life cycle. However, they are blind to assets' spatial relationships to each other, outside influences, or customers. ArcGIS empowers utilities with analytics that help identify which parts of the system will cost more to maintain. Analytics help determine vulnerability and risk by using real-time operational data integrated with predictive and historic failure data. ArcGIS

reveals otherwise hidden impacts. Understanding these connections is essential to optimized asset management.

As utilities move to optimization, they use ArcGIS to get the most value from their assets. They leverage information to facilitate a holistic approach, giving asset managers the ability to fully integrate their data and activities to meet organizational goals and objectives.

Better Business: Operational Insights and Analytics Help St. Johns County Utilities Transform Its Business

St. Johns County Utilities has transformed its business with operational insights and analytics. ArcGIS has provided the utility with a solution for its criticality-inspection-rehabilitation process to extend the lifespan of the organization's aging infrastructure. Tom Tibbitts shares the utility's story in an Esri webinar. Watch the webinar.
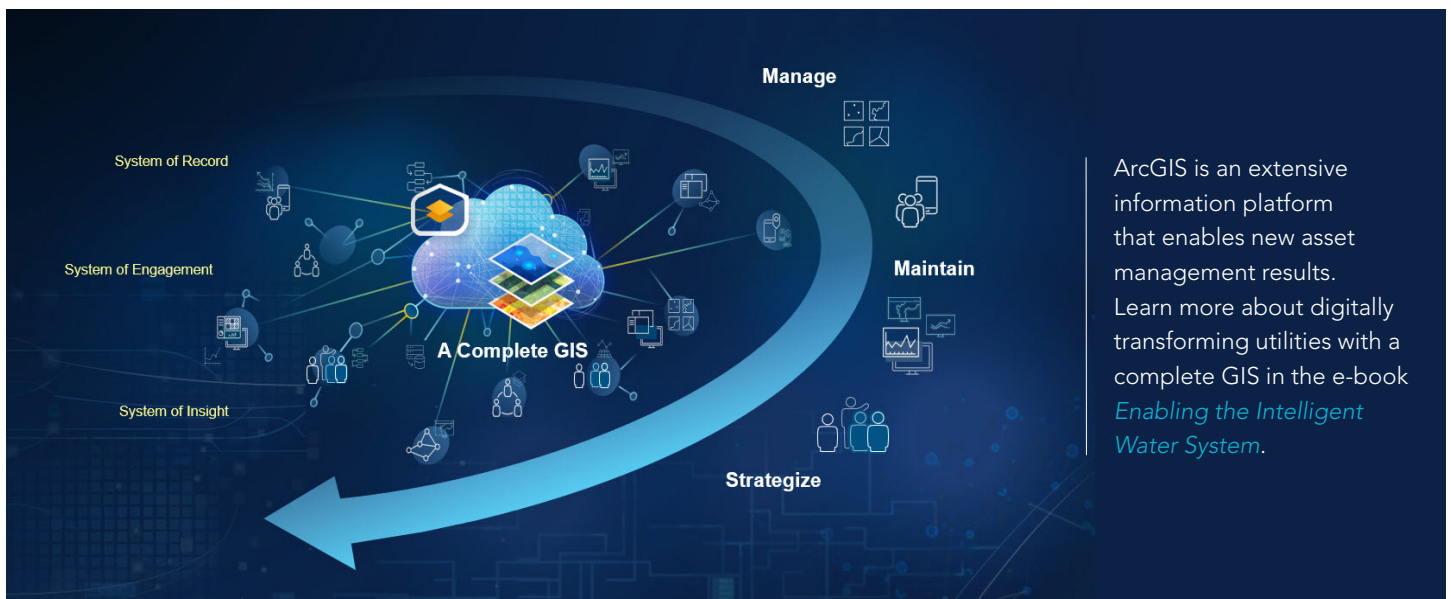
Industry Best Practices and Standards

ArcGIS for asset management supports industry best practices and standards. The ISO 55000 family of international standards is for asset management. Esri's solutions are built to sustain practices that align with the ISO 55000 guidelines.

ISO 55000 provides terms and definitions. ISO 55001 specifies requirements for effective management. And ISO 55002 provides implementation guidance. Data quality, change management, and communication are all focus areas in ISO 55000.

Esri enables real breakthroughs in communication. Asset information is accessed and updated directly—dramatically reducing information latency. ArcGIS solutions break down silos, allowing every stakeholder secure access to the information they need, based on their role.

Esri's ArcGIS Utility Network features built-in quality assurance rules that ensure high-quality data and relationships at all touchpoints. Because of its open services-based architecture, ArcGIS integrates tightly with vital information technology/operational technology (IT/OT) systems, providing a cohesive solution. Using core analytics, ArcGIS moves asset management beyond simple time-based methodologies. ArcGIS helps you align with industry best practices for management and communication.

Manage

System of Record

System of Engagement

A Complete GIS

System of Insight

Maintain

Strategize

ArcGIS is an extensive information platform that enables new asset management results. Learn more about digitally transforming utilities with a complete GIS in the e-book *Enabling the Intelligent Water System*.

The Complete GIS—Supporting Asset Management

Most utilities already use GIS for asset management in some capacity. Yet how they use it is changing. ArcGIS is a complete GIS. "Complete" means it contains all the elements needed to meet asset management challenges, not just make conventional maps.

ArcGIS supports real-world modeling, rich analytics with artificial intelligence (AI), and immediate communication with mobile apps and web browsers. ArcGIS maintains key asset information, discovers its meaning, and distributes it to everyone who needs business intelligence.

These capabilities unite different types of asset information. Combining asset health data and real-time feeds shows how the system is performing. With location as the centerpiece, a total view bonds maintenance, capital, and operational strategies to improve key performance indicators and business results.

Utilities face considerable challenges today and will continue to do so into the future. ArcGIS brings exceptional value to every utility's asset management practice regardless of its history, current state, or future plans.

"GIS is a critical component of our overall Asset Information Management System—a key pillar in our Corporate Asset Management Plan. GIS integrates with our CMMS, ERP, and decision support systems, providing business intelligence for asset renewal and replacement."

—Connie Banegas,
Director of Asset Management and GIS, Charleston Water System

About Esri

Esri, the global market leader in geographic information system (GIS) software, offers the most powerful mapping and spatial analytics technology available. Since 1969, Esri has helped customers unlock the full potential of data to improve operational and business results. Today, Esri software is deployed in more than 350,000 organizations including the world's largest cities, most national governments, 75 percent of Fortune 500 companies, and more than 7,000 colleges and universities. Esri engineers the most advanced solutions for digital transformation, the Internet of Things (IoT), and location analytics to inform the most authoritative maps in the world.

Esri supports utilities in achieving their performance and visibility goals with skills, knowledge, and resources in the following:

• Mapping

• Spatial analytics

• Data-driven insights

• Real-time situational awareness and alerts

• Visualization

For more information,
visit go.esri.com/water.

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