

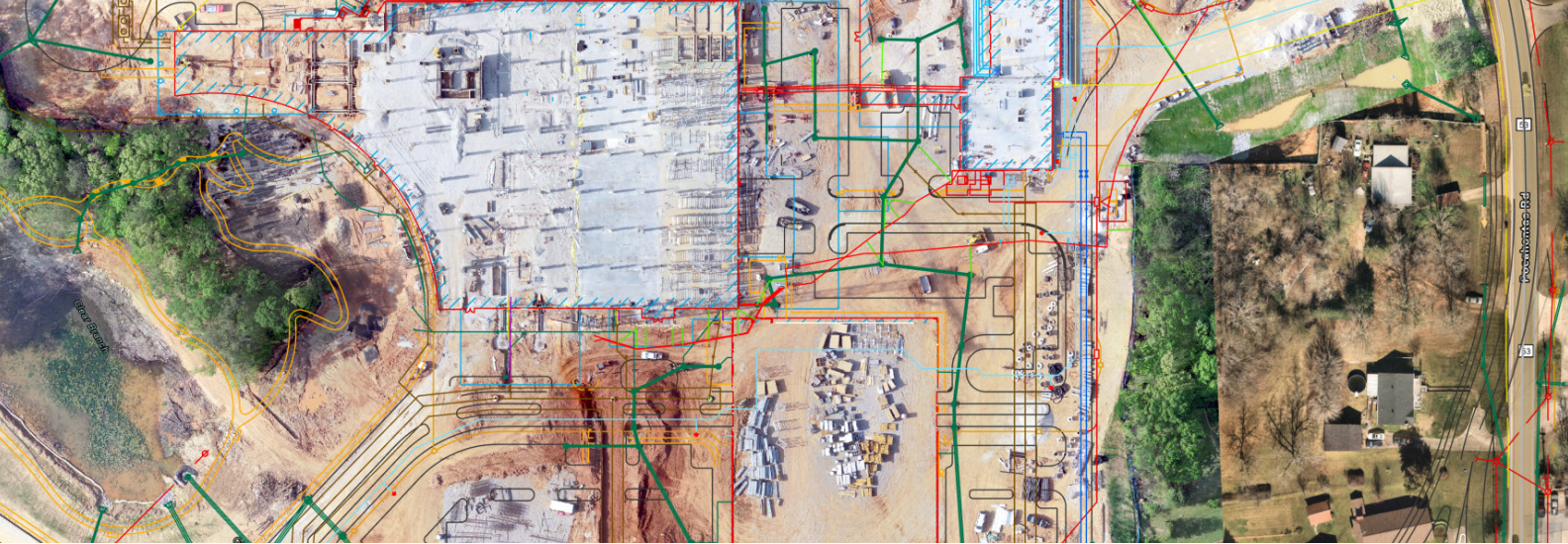


Volume 1 | 2026

Imagery for Infrastructure

Turning Reality into
Intelligence with ArcGIS





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What Is Imagery for Infrastructure?

Imagery for infrastructure is the enterprise capability to capture the real world continuously, manage and process imagery data securely as a system of record, and deploy analytics and solutions into organizational workflows. Imagery for infrastructure relates to any collected data that captures a digital image or point cloud of something related to managing infrastructure across the entire life cycle.

Infrastructure is constantly changing: Assets age, conditions shift, risks emerge, and environments evolve. Yet many organizations still rely on outdated, incomplete, or disconnected views of the real world. Imagery and remote sensing are transforming this reality.

Imagery for infrastructure brings the physical world into focus. By combining satellite, aerial, drone, lidar,

and street-level imagery with geographic information system (GIS) technology, organizations gain a living, up-to-date understanding of their networks, assets, facilities, and operating environments. What was once invisible becomes visible. What was once reactive becomes proactive, and what was challenging now becomes the enabler for automation and innovation.

It is about turning reality into decision intelligence. When imagery is captured systematically, managed as an enterprise asset, and deployed into everyday workflows, it becomes a powerful driver of insight and action. Infrastructure teams can identify change sooner, prioritize work more effectively, reduce risk, and plan with confidence, supported by a digital representation that depicts the real world and evolves alongside the infrastructure itself. ►





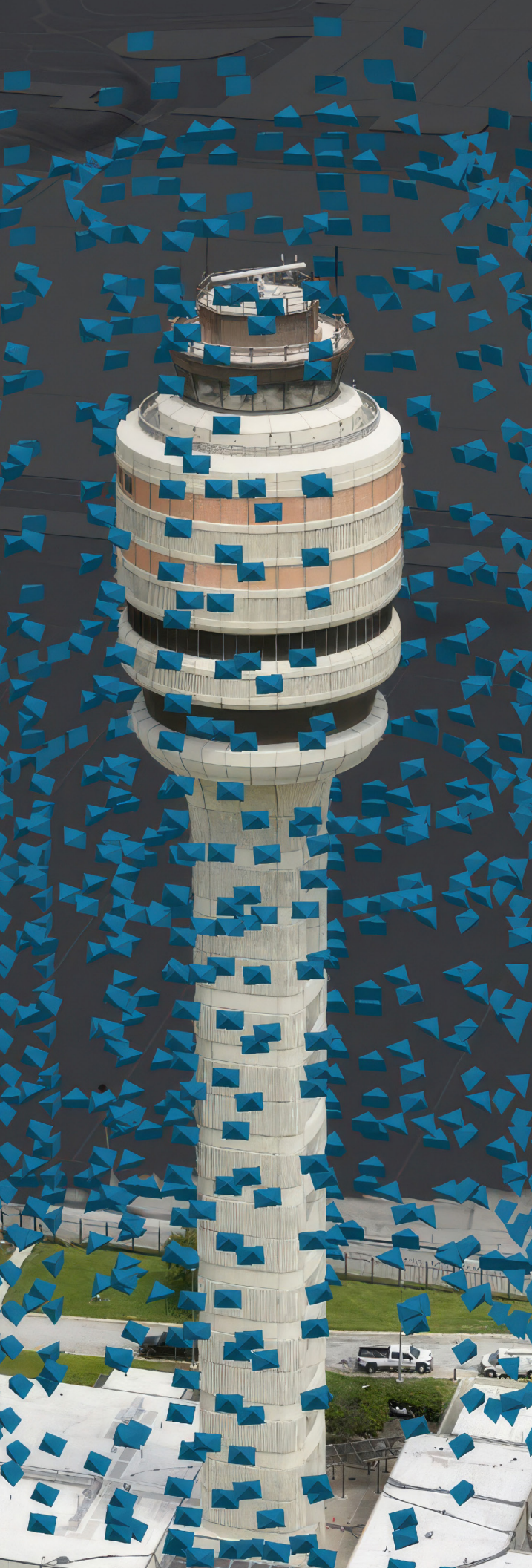
Imagery as the Foundation for Infrastructure Intelligence

Infrastructure organizations rely on oriented imagery at two distinct but complementary levels to understand, manage, and optimize their assets. Oriented imagery is georeferenced, real-world photography, captured with known position and direction, that can be explored within GIS to view assets from a ground-level or angled perspective. This imagery brings context to maps, improving understanding, speeding analysis, and reducing the need for field visits, ultimately enabling faster, more informed decisions across infrastructure operations.

At the most granular level, oriented imagery captures the real world with precision and immediacy. These images include detailed inspection photos of structures and individual assets and components, including the surrounding environment, and post-event imagery collected during storm or disaster recovery. In moments that matter, such as immediately following a major event, these images provide critical, time-sensitive visibility into damage across all infrastructure networks, enabling rapid assessment, safer decision-making, and faster restoration.

At enterprise scale, map-based imagery solutions transform collections of multiple images into contextual intelligence. High-resolution orthorectified imagery becomes a foundational basemap for operations and planning. Digital surface models reveal terrain, vegetation, and built infrastructure, ranging from tree cover and conductors to poles and substations. Advanced 3D representations, including image meshes, point clouds, and next-generation visualization technologies such as Gaussian splats, are powering immersive, living digital twins. These assets enable stakeholders to seamlessly visualize, analyze, and navigate complex infrastructure environments, flying virtually through facilities, tracing high-voltage transmission corridors, and exploring assets in full 3D context.

Together, these imagery products move organizations beyond pictures to insight, connecting the physical world to intelligent systems that drive resilience, operational efficiency, and smarter infrastructure decisions at scale. ■



Accelerating Reality Capture Across Infrastructure

Advances in automation are fundamentally reshaping how infrastructure organizations acquire, manage, and apply reality data, significantly reducing manual intervention and accelerating time to value. Imaging workflows that once required from 10 to 18 months to deliver 2D orthorectified mapping products can now be completed in days or weeks, enabling faster response across planning, operations, resilience, and capital delivery.

With Esri's reality capture approach, organizations can rapidly collect hundreds of unpiloted aerial vehicle (UAV) images across critical infrastructure—such as substations, transportation corridors, treatment facilities, plants, buildings, or construction sites—and apply ground control, terrain models, and proven algorithms to process the data and generate high-fidelity 3D image meshes and advanced visualization outputs in a matter of hours. These GIS-ready capabilities and solutions integrate seamlessly into enterprise systems and can be immediately used by field teams, engineers, planners, designers, and decision-makers to support inspection, condition assessment, coordination, and scenario planning.

Just as importantly, speed and automation do not replace discipline. These outcomes depend on intentional planning, standardized collection methodologies, and rigor in processing workflows. Strong data governance, validated accuracy standards, and repeatable quality controls are essential to ensure that imagery products are trusted, defensible, and suitable for operational, regulatory, and executive decision-making.

The result is an important change in how infrastructure organizations connect the physical world to digital intelligence, enabling faster insight, improved cross-team collaboration, and greater confidence in decisions that shape the resilience, safety, and performance of critical assets. ■



Case Study

Improving Construction Visibility with Drone Imagery and GIS at La Cima

Managing construction across a 2,400-acre planned community requires more than schedules and reports; it requires a shared, real-time understanding of what is happening on the ground. For Natural Development Austin, LLC, developer of the La Cima community near Austin, Texas, achieving that understanding became critical as construction scaled across thousands of lots, amenities, and future commercial and civic spaces.

The combination of high-resolution drone imagery with GIS has established a single point of reference for construction planning, validation, and communication throughout the project life cycle. Weekly UAV flights capture current site conditions, while monthly orthomosaics provide a comprehensive, high-accuracy view of progress across the entire development. Ground-control points collected with Global Navigation Satellite System (GNSS) technology ensure imagery accuracy down to the centimeter level.

All imagery and construction data are integrated into ArcGIS® Online, where GIS serves as the central hub connecting drone imagery, CAD plans, as-built data, parcels, and environmental layers. This geospatial foundation allows project managers, inspectors, and external stakeholders to visualize construction status

remotely, validate work, and make faster and more informed decisions without relying on file-based sharing or site visits.

Purpose-built web apps extend the value of imagery even further. Teams can review current and historical imagery for specific locations, compare construction progress over time, and calculate stockpile volumes directly from drone data to support logistics planning and invoice validation. Mobile GIS apps enable inspectors to collect measurements and updates in the field, keeping the construction picture current and accurate.

The result is greater efficiency, reduced rework, and improved collaboration across all stakeholders. With hundreds of homes already completed and major future projects planned, Natural Development Austin is using imagery and GIS not just to manage construction but also to lay the foundation for long-term digital twins, asset management, and coordination with local municipalities. For the developer, imagery powered by GIS has become a strategic tool for delivering complex projects with confidence. ■



[Read the full story](#)

“By switching to ArcGIS Online, we were able to provide our clients with a highly intuitive, visual, and accurate way of managing, monitoring, and making the most of their investment in the construction of this new community.”

—David Pritchard, Principal at Texian Geospatial



The Importance of Imagery for Infrastructure

Imagery for infrastructure is the foundation for smarter operations, stronger resilience, and more confident decisions, connecting what is happening on the ground to the strategies that shape the future.

Foundation for Digital Twins

The value of a digital twin is directly tied to how well it represents reality. Without an accurate and current picture of the physical world, even the most advanced models fall short. Imagery and reality mapping close this gap by bringing the real-world assets, networks, and environments directly into the digital domain, allowing GIS to connect the social, natural, and built worlds.

Through continuous reality capture, infrastructure organizations gain an authoritative view of what exists, what is changing, and where attention is needed. Reality mapping transforms this imagery into precise spatial products and immersive 3D representations that serve as the visual and analytical backbone of the digital twin.

This connection between reality and digital technology ensures that twins stay relevant, trusted, and actionable.

More importantly, location-powered digital twins built from an imagery and reality mapping foundation shift organizations from reactive oversight to proactive leadership. They enable faster insight, clearer prioritization, and shared understanding across engineering, operations, and executive teams. Grounded in real-world observation and delivered through enterprise GIS, imagery and reality mapping turn the digital twin into a strategic asset, one that continuously mirrors reality and supports smarter decisions at every level of the organization. ■



Case Study

How Concord Wayer Facility Unified BIM, GIS, and 3D Workflows

Municipal water utilities generate vast amounts of data, but without integration, that data often works against efficiency rather than enabling it. The City of Concord water facility manages 780 miles of water infrastructure, treating 15 million gallons per day. The water asset information was fragmented across BIM models, GIS technologies, spreadsheets, work orders, and institutional knowledge. Even routine maintenance required teams to navigate multiple disconnected systems, turning simple inspections into time-consuming, manual workflows.

The utility recognized that assets built 30-40 years ago were entering a critical phase where preventive maintenance could significantly extend service life. The utility partnered with NV5 to unify reality capture, BIM, GIS, and asset management into a single operational framework, shifting from reactive maintenance to proactive, data-driven operations.

The foundation of this transformation began with data capture that included high-accuracy lidar and 3D laser scanning, creating—with subcentimeter precision—detailed digital twins of facilities. These point clouds were converted into intelligent BIM models enriched with standardized asset attributes such as manufacturer, installation date, specifications, and expected service life. Through structured schema alignment and consistent asset naming, data was prepared to move seamlessly between systems.

Using automated BIM-to-GIS workflows, City of Concord connected 3D models directly to GIS and work order systems, preserving geometry and attributes while enabling bidirectional updates. GIS became the system of engagement, providing spatial context, 3D visualization, and enterprise access to facility data. A custom multi-asset selection workflow allows maintenance planners to identify multiple assets across facilities and generate consolidated work orders in a single action.

The impact was immediate. Maintenance planning and site preparation tasks that once took hours now take minutes.

Asset identification is instantaneous; reliance on institutional knowledge is reduced; and onboarding is accelerated through visual, 3D facility context. Most importantly, integrated BIM, GIS, and reality-capture workflows enable proactive maintenance strategies that reduce emergency repairs, improve reliability and water quality, and defer costly capital replacements.

For utilities that manage aging infrastructure, unifying imagery, 3D data, BIM, and GIS is more than an efficiency gain; it is a strategic shift toward predictive, resilient operations with measurable, long-term returns. ■



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Automation at Scale

Infrastructure organizations are under increasing pressure to operate larger, more complex networks with fewer resources, faster response, and greater accountability. Imagery and reality mapping have emerged as critical enablers by providing a scalable foundation for automation across planning, operations, and maintenance.

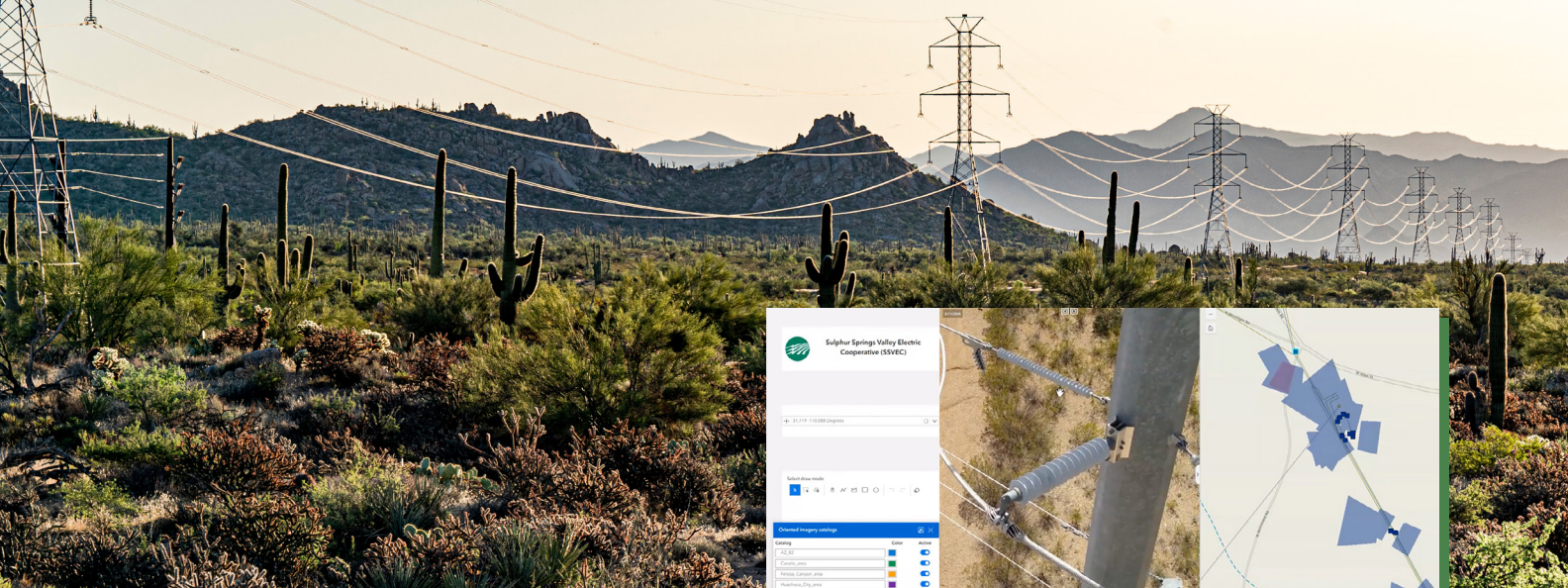
At an executive level, imagery is no longer a supporting visual aid; it is a primary source of operational intelligence. Satellite, aerial, drone, lidar, and street-level imagery enable continuous, real-world data acquisition across entire networks, transforming how information is collected and kept current. Reality mapping converts this imagery into accurate two- and three-dimensional representations that reflect actual conditions on the ground, forming a dependable foundation for analytics and digital twins.

The true power of imagery and reality mapping lies in their ability to automate what was once manual, fragmented, and slow. When imagery is captured on a repeatable cadence and managed as an enterprise asset, organizations can automate asset detection,

condition assessment, change detection, and risk identification at scale. Field inspections become exception based rather than routine. Network monitoring shifts from periodic sampling to continuous observation. Decisions are informed by current conditions rather than outdated records or assumptions.

Equally important, imagery enables automation across departments, organizations, and communities. Centralized imagery platforms allow this data to be reused by engineering, operations, planning, and executive teams, reducing task duplication and accelerating time to insight. When deployed into work management systems, dashboards, and digital twins, imagery derived intelligence triggers alerts, prioritizes work, validates outcomes, and supports defensible decision-making.

For infrastructure leaders, imagery and reality mapping are foundational to operating at scale. They replace labor-intensive processes with automated workflows; extend visibility beyond the limits of field resources; and provide a trusted, real-world baseline for modern, data driven infrastructure operations. ■



Case Study

Turning Inspection Imagery into Enterprise Asset Intelligence at Sulphur Springs Valley Electric Cooperative

Sulphur Springs Valley Electric Cooperative (SSVEC) conducts thousands of utility pole inspections each year using drones and field-based capture tools. While high-resolution imagery is routinely collected, only a fraction of those photos are typically reviewed, leaving tens of thousands of inspection images stored but unused. Instead of providing a long-term record of asset condition, the images lacked spatial context, discoverability, and enterprise access.

By integrating inspection imagery directly into ArcGIS, SSVEC is transforming imagery from passive documentation into a core component of its asset inspection and decision-making workflows. Using XPGEO Studio technology, the cooperative rapidly converted inspection photos into GIS-native oriented imagery, making every image searchable, spatially contextual, and tied to specific assets and locations.

With this automated approach, imagery is processed up to five times faster than with manual methods, allowing a small GIS team to scale imagery management without added complexity. Once in ArcGIS Enterprise, inspection imagery is immediately accessible through intuitive 2D and 3D dashboards, providing engineers, operations, construction, and legal teams with visual confirmation of asset conditions over time.

The result is a living visual history of the network. Teams can review past inspections without returning to the field, compare changes over time, validate work, and preserve defensible evidence for compliance and risk management. Rather than recapturing data, SSVEC now maximizes the value of imagery it already collects.

For SSVEC, the combination of imagery and GIS does more than deliver efficiency—it creates shared situational awareness, strengthens inspection confidence, and unlocks the full value of inspection investments across the organization. ■

“This is a big deal for us. We anticipate a large improvement for a relatively small investment. The ROI [return on investment] will continue to increase over time; it will continue to grow.”

—Kurt Towler, Enterprise Systems Manager,
Sulphur Springs Valley Electric Cooperative



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From Pixels to Insights:

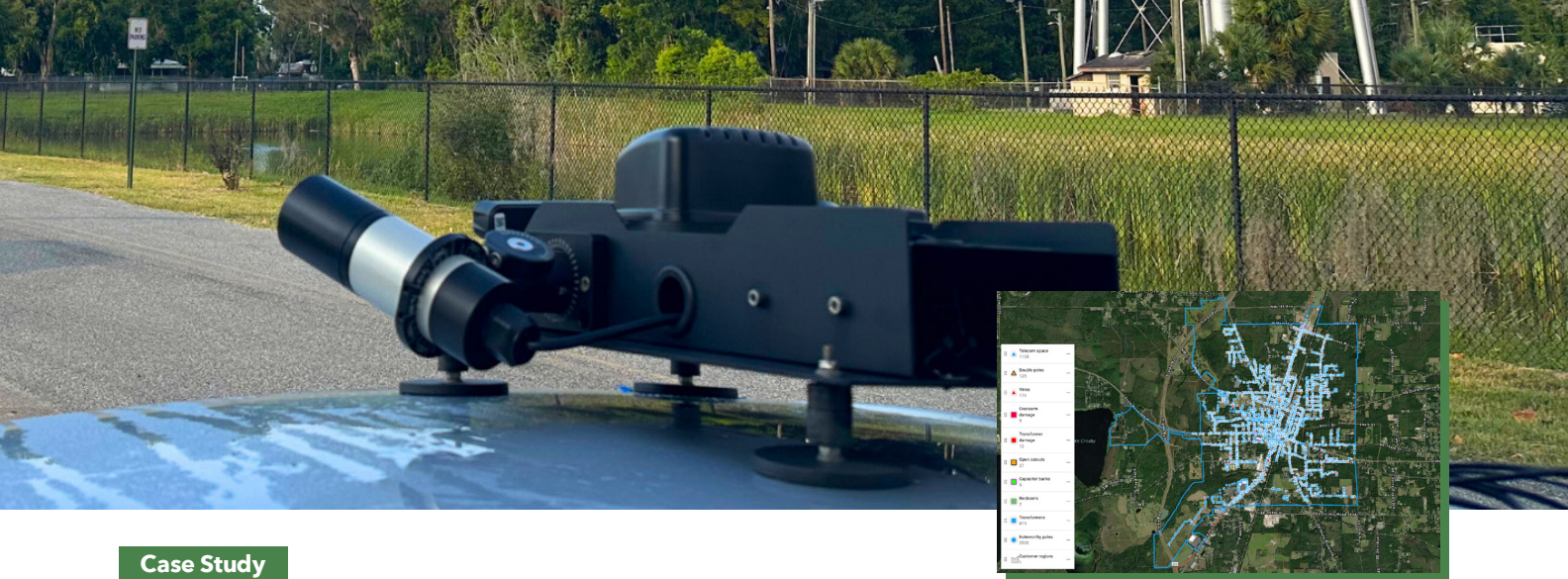
Imagery and Reality Mapping Provide the Engine for Analytics

Modern infrastructure organizations generate vast amounts of imagery, but the true value of that data is realized only when these pixels are transformed into actionable insight. Imagery and reality mapping provide the foundation for this transformation, enabling analytics workflows that convert raw visual data into intelligence that drives decisions at scale.

At its core, imagery analytics begins with high-fidelity observation of the real world. Satellite, aerial, drone, lidar, and street-level imagery captures conditions, patterns, and change across assets and environments that cannot be efficiently measured through traditional methods alone. Reality mapping structures this imagery into accurate two- and three-dimensional representations that provide spatial context and measurable baselines for analysis. Together, they form the bridge between what is visible and what is knowable.

The strategic importance of imagery lies in its ability to support analytics that go beyond visualization. When imagery is managed as an enterprise asset and powered by location, it becomes analytics ready, supporting automated feature extraction, change detection, condition assessment, and time-series analysis. These capabilities allow organizations to identify trends earlier, quantify risk objectively, and prioritize action based on evidence rather than assumption. Analytics shift from descriptive reporting to predictive insight, enabling leaders to understand not only what has changed but also why it matters.

Equally important, imagery-driven analytics scale across the organization. A single captured dataset can support multiple analytical workflows, from asset performance and risk modeling to resilience planning and operational readiness. When deployed into dashboards, digital twins, and decision systems, insights derived from imagery move seamlessly from analysis to action, closing the gap between observation and outcome. Imagery is not just a data source; it is a strategic driver of insight. ■



Case Study

City of Starke, Florida, Achieves Big Impact with Imagery, AI, and GIS

For the City of Starke Utility Services, which serves just over 6,000 residents, maintaining grid reliability with limited resources was becoming increasingly difficult. Decades of reliance on institutional knowledge, paper maps, and undocumented assets left the utility with little visibility into critical infrastructure such as poles, attachments, lighting, and vegetation risks. As experienced staff retired, operational risk grew.

By implementing ArcGIS Online and pairing it with AI-driven imagery capture, Starke rapidly transformed its utility operations from manual and reactive to digital and data driven. Rather than attempting costly, time-intensive manual data collection, the city partnered with Noteworthy AI to capture high-resolution, geolocated imagery across the entire service territory using

vehicle-mounted cameras. In just two days, and less than seven hours of drive time, data on more than 2,300 utility poles was captured and analyzed.

AI models automatically extracted asset inventories, identified defects such as structural issues and stubbed poles, assessed vegetation encroachment, audited streetlights, and documented joint-use attachments. All results were delivered directly into ArcGIS, giving the city an immediately usable system of record without requiring additional field effort from already-stretched crews.

With imagery and analytics anchored in GIS, Starke gained a centralized, searchable view of its grid. Staff can now visualize pole locations and materials, identify maintenance priorities, respond faster to storms, and resolve discrepancies in joint-use billing to recover lost revenue. What once required guesswork and legacy knowledge is now supported by accurate, current, visual data.

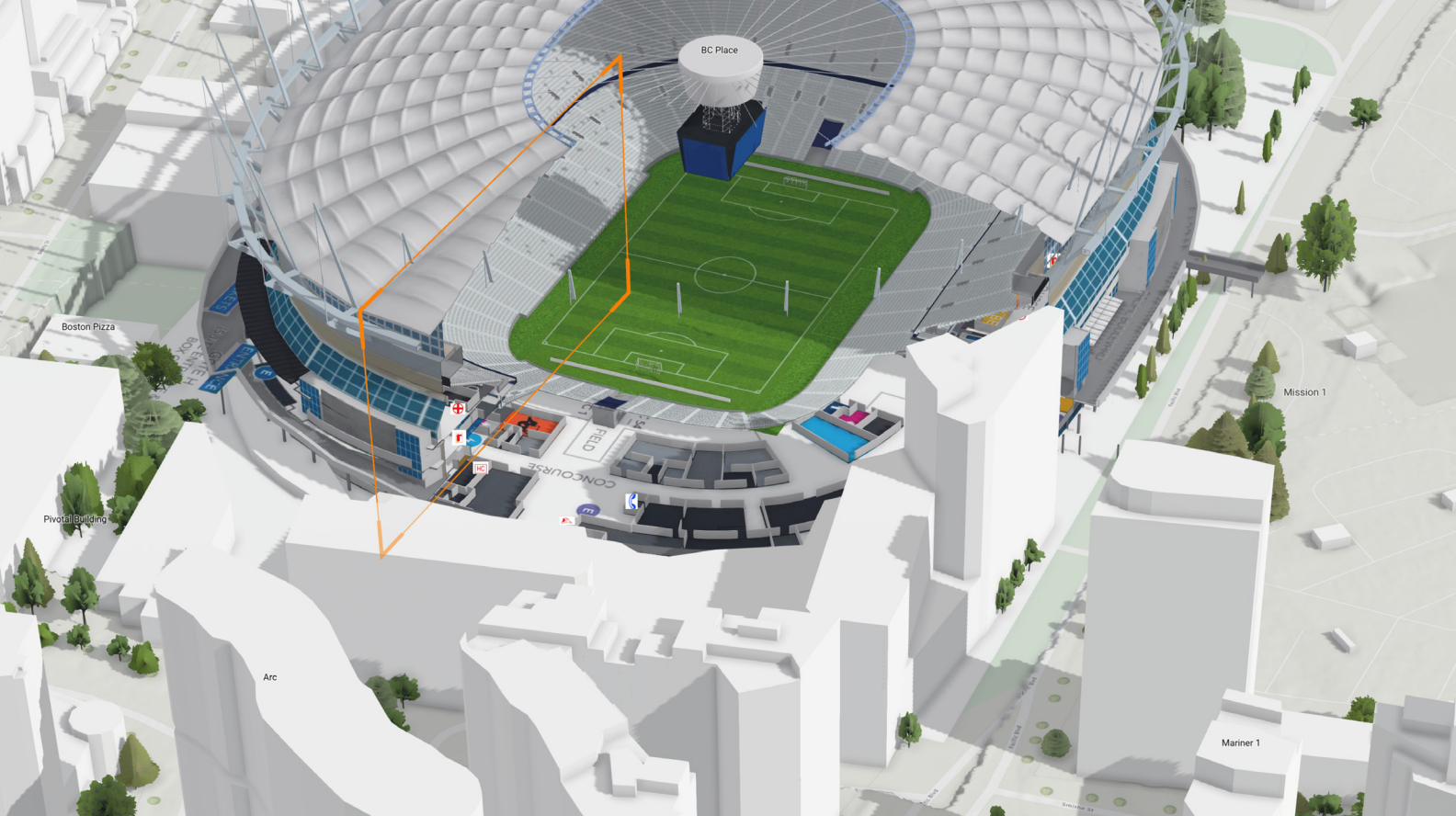
The impact was immediate and measurable. The project cost 80 percent less than traditional inspection approaches, and it delivered far greater insight. For Starke, imagery and GIS are no longer optional tools; they are essential capabilities that level the playing field, allowing a small utility to operate with the confidence, visibility, and intelligence of much larger organizations. ■

“This project was a big leap forward for our utility. Moving from institutional knowledge and paper maps to a fully digital view of our grind in ArcGIS gives us the tools to better serve our community. Noteworthy AI’s data collection made this transition possible in a way that was affordable fast.”

—David Sparks, City of Starke



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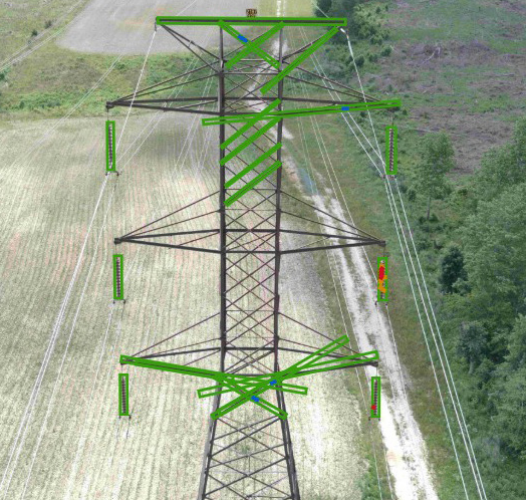
Infrastructure Asset Management, Inspections, and Audits

Organizations that manage complex networks and assets rely on geospatial intelligence in order to understand what assets exist, where they are located, and how they perform over time. For modern infrastructure owners, GIS supports asset management decision-making with asset visibility and analysis, providing essential context about asset location, condition, surrounding risk, and operational impact. GIS plays a critical role by spatially unifying asset data and integrating with enterprise asset management systems to deliver a clear, operational understanding of the network.

For decades, imagery has strengthened this asset intelligence by anchoring physical reality to digital records. Infrastructure organizations have long used photographs to document aboveground assets; validate locations; and create a time-stamped visual history for inspections, maintenance, and compliance. Today, the way imagery is acquired and used has evolved dramatically. Advances in mobile data collection, UAVs, cloud processing, and oriented imagery models now enable organizations to acquire imagery at

unprecedented scale quickly, accurately, and reliably. With ArcGIS, imagery captured through field workflows, automated collection tools, and as-built documentation becomes immediately actionable, supporting both visible and underground assets, and establishing a continuous, reliable record, from installation to the end of the asset life cycle.

The role of imagery continues to expand: automating inspections; advancing AI-driven image analysis; and creating immersive 3D living digital twins that are transforming how infrastructure is monitored, audited, and maintained. As these capabilities accelerate, the importance of a trusted foundation becomes paramount. ArcGIS provides the authoritative system of record, bringing together imagery, spatial data accuracy, governance, and enterprise integration into a single source of truth. This enables infrastructure leaders to move with confidence, ensuring that decisions are grounded in accurate, contextual, and timely intelligence that drives resilience, efficiency, and long-term performance across critical infrastructure systems. ■



Case Study

Dominion Energy Improves Asset Management with Visual AI

As demand from data centers and AI-driven computing accelerates, Dominion Energy is modernizing how it inspects and manages critical grid infrastructure to maintain reliability at scale. As the world's largest utility serving data centers, Dominion Energy supports more than 450 connected data centers, with load projected to grow 17 percent year over year. This rapid expansion places unprecedented pressure on transmission assets and requires faster, more data-driven inspection workflows.

Dominion Energy adopted a modern inspection ecosystem that combines advanced drone and helicopter imagery, visual AI, and GIS to gain deeper asset visibility and to speed decision-making. High-resolution RGB and thermal imagery is captured with precise GIS location and time stamps. The imagery is then stored in a centralized image repository and mapped to structures in ArcGIS, which serves as the system of record. AI-driven analytics automatically extract asset attributes and detect conditions, including insulator types, foundation issues, paint degradation, and bird guards. Inspection results are prioritized and integrated into SAP and work order systems, enabling faster repairs and smarter asset planning.

Early results demonstrate strong impact: over 85 percent detection accuracy for key attributes, 160,000 images processed in 15 hours, and a 70 percent reduction in inspection analysis time. These insights directly informed the addition of 38 new towers to Dominion Energy's 2025 paint program and enabled more frequent

overhead inspections, strengthening reliability as demand continues to grow.

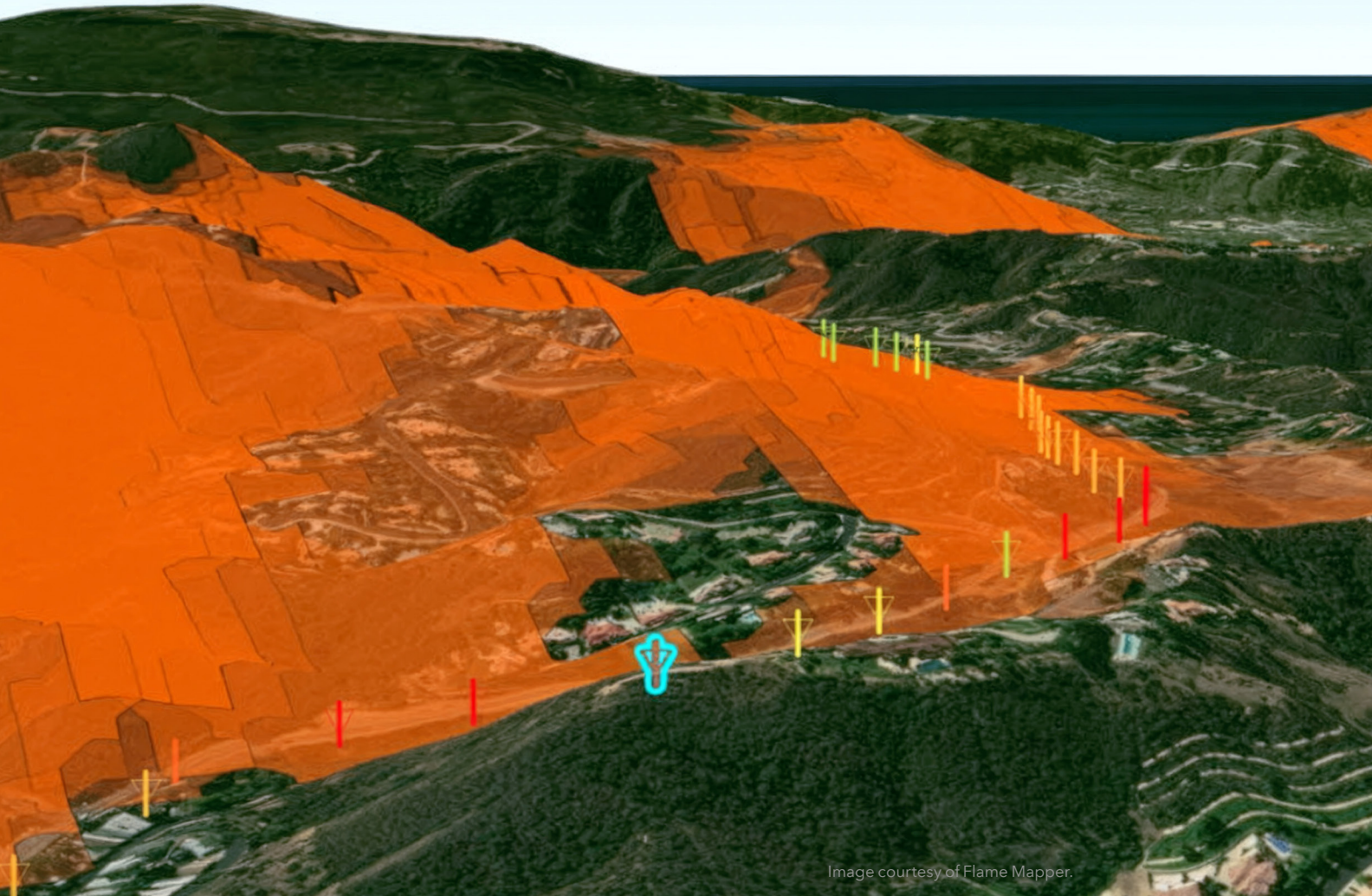
Buzz Solutions is Dominion Energy's visual-intelligence partner, providing the PowerAI platform, which automates inspection analytics across transmission and distribution assets. Buzz Solutions delivers AI models that are purpose built for utility workflows, with standard ArcGIS integrations that ensure that inspection results are spatially accurate and easily consumed by GIS users. By aligning AI analytics, GIS, and asset management systems, Buzz Solutions helps Dominion Energy scale inspections, prioritize risk, and build a resilient foundation for future grid growth. ■

“By investing now in the development of AI models, we are laying the foundation for more efficient use of resources in the future. This approach will introduce an independent analytical capability, create a centralized repository for records, and support enterprise-wide visibility into system condition.”

—Matt Rogers, Manager—Transmission Lines, Dominion Energy



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Resilience and Risk Management

Imagery has become a critical enabler of proactive risk mitigation. For decades, GIS has supported risk reduction by providing spatial intelligence to address natural disaster events including floods, storm surge, fire, and earthquakes as well as their impacts on infrastructure. ArcGIS helps organizations understand where risk exists, how it evolves, and where mitigation investments deliver the greatest return. Imagery and 3D surface data have long served as essential inputs to these practices, and today's reality-capture technologies significantly enhance clarity, accuracy, and situational awareness.

High-resolution imagery and lidar-derived point clouds also provide detailed insight into other programs of work including vegetation encroachment; clearance compliance; and condition assessment along rights-of-way and easements, where reliability and public safety are paramount. Advanced imagery analytics now extend beyond simple clearance measurement to assess vegetation health and growth patterns, enabling earlier intervention and more targeted mitigation. These

capabilities help reduce the risk of asset failure, service interruptions, and catastrophic events such as fires, while improving planning efficiency and workforce safety. Importantly, these same vegetation management practices are applied across gas pipelines, fiber and communications corridors, rail networks, roadways, waterways, and other linear infrastructure.

As infrastructure risk grows in scale and complexity, the role of imagery will only expand. Automated analytics, AI-driven risk detection, and 3D living digital twins are transforming how organizations anticipate threats, prioritize mitigation, and demonstrate compliance. The success of these advanced capabilities depends on a trusted geospatial technology foundation, one that integrates imagery, 3D data, governance, and enterprise workflows into a single source of truth. ArcGIS provides that foundation, enabling leaders to move from reactive response to proactive risk management with greater confidence, resilience, and accountability across the full infrastructure life cycle. ■

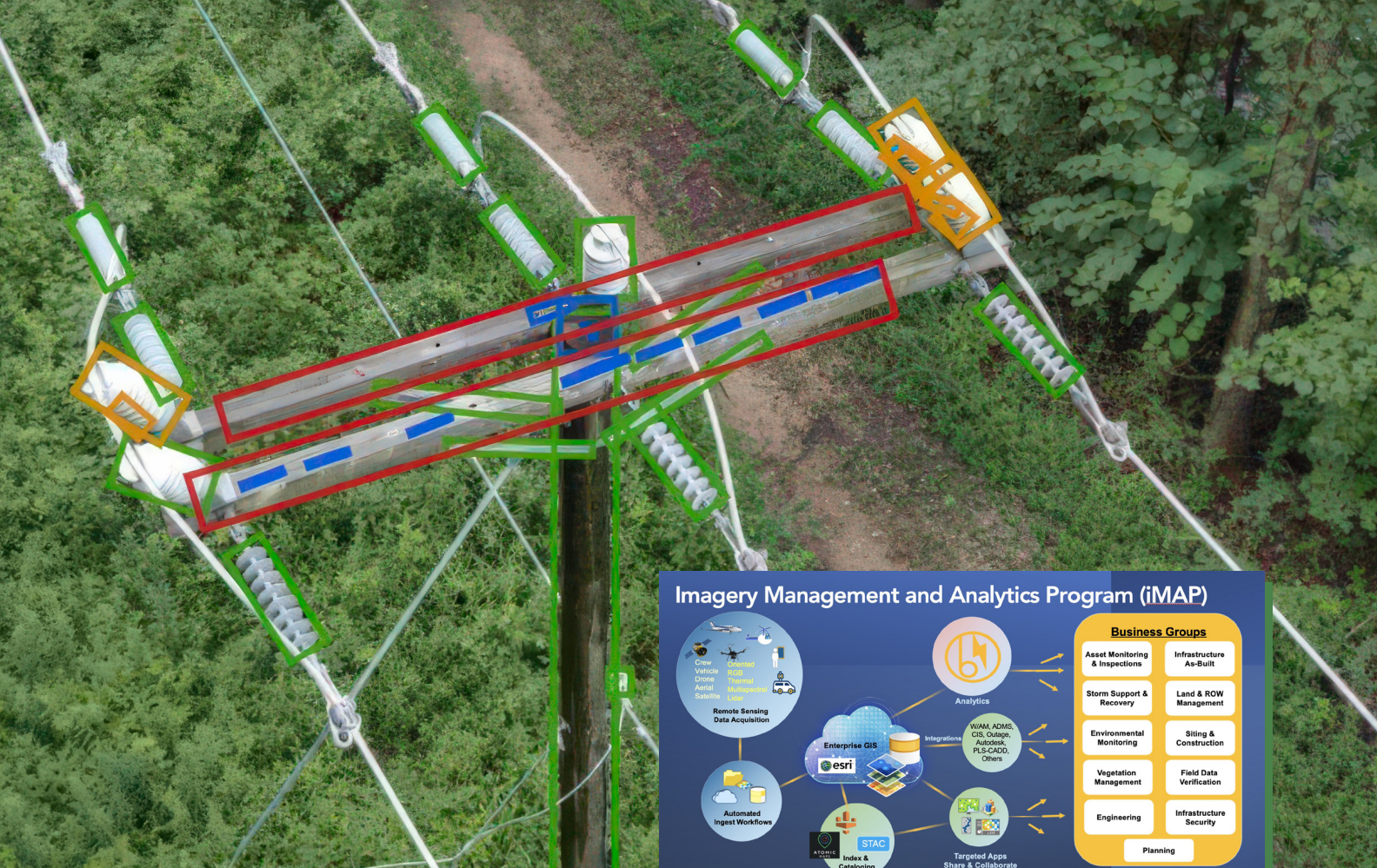


Case Study

Dominion Energy Distribution Team Improves Reliability with Drone Imagery Management, GIS, and Visual Intelligence

Dominion Energy operates one of the largest and fastest-growing electric distribution networks in the US, supporting rising demand from data centers and electrification while dealing with coastal storm exposure. With tens of thousands of miles of distribution lines and a rapidly expanding drone program, Dominion Energy faced a huge problem: Manual inspection of RGB and thermal imagery could not scale fast enough to support proactive reliability and safety goals around the company's distribution assets.

To address these business challenges, Dominion Energy launched the Image Management and Analytics Program (iMAP), an enterprise initiative to modernize distribution inspections using AI and remote sensing. iMAP integrates high-resolution drone imagery, a centralized image repository, and GIS as the system of record to accurately map images to poles and assets. AI-driven visual intelligence analyzes RGB and thermal data and indexes imagery for fast access. These workflows enable inspection results to flow directly into prioritization and work planning, allowing Dominion Energy to act proactively before failures occur. ►



“We are proving that we can rapidly scale our distribution aerial inspections using drone technology and use PowerAI to accelerate the analysis of the increasing volume of imagery. With PowerAI, we can find more issues sooner and preempt more failures to boost system reliability.”

—Will Farmer, Dominion Energy

The results have been transformational. Image analysis that once took months is now completed in hours. Dominion Energy achieved more accurate pole-top inspections, faster field-to-office turnaround, and the ability to inspect overhead circuits more frequently. AI analysis validated 100 percent of known thermal anomalies across nearly 3,000 poles and identified damaged crossarms and equipment issues earlier, enabling better prioritization of work to improve the system average interruption duration index (SAIDI) and system average interruption frequency index (SAIFI). The iMAP strategy has become a scalable foundation for safer, more reliable grid operations.

Buzz Solutions provides the AI engine that powers Dominion Energy's iMAP inspections. Founded in 2017, Buzz Solutions delivers the PowerAI visual intelligence platform, purpose built for utility inspection workflows across distribution, transmission, substations, and solar power. PowerAI uses RGB and thermal imagery to automate detection of defects such as damaged crossarms, insulators, arresters, and transformers. By embedding AI directly into Dominion Energy's inspection and GIS workflows, Buzz Solutions enables faster decisions, consistent analytics at scale, and measurable reliability gains aligned with modern utility asset-management strategies. ■



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The Business Value of Imagery for Infrastructure



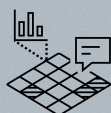
Reduces Cost Through Remote Assessment and Analysis

High-resolution imagery enables infrastructure leaders to assess assets, conditions, and risk remotely, reducing site visits, travel, and manual inspections. This lowers operational costs while improving safety and accelerating informed decision-making.



Eliminates Duplication Through Enterprise Reuse of Imagery

A shared imagery foundation allows departments to reuse trusted data across planning, engineering, operations, and compliance workflows. This eliminates redundant collection efforts, reduces waste, and ensures organizational alignment around a single visual source of truth.



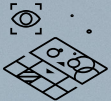
Automates Repeatable Workflows and Scales Analysis

When imagery is integrated with GIS, routine inspections and assessments can be automated and executed at scale. This enables organizations to expand coverage and consistency without increasing workforce or operational overhead. ►



Drives Faster and More Efficient Operations

Timely access to imagery shortens planning cycles and streamlines field and operational workflows. Teams move from insight to action faster, improving productivity and service outcomes across the infrastructure life cycle.



Enables Change Detection, Asset Inspection, and Situational Awareness

Imagery provides continuous ability to observe change, asset condition, and environmental impacts. This empowers organizations to proactively identify issues, validate conditions, and respond with confidence.



Supports Monitoring, Documentation, and Auditability over Time

Time-stamped, spatially accurate imagery creates a defensible record of infrastructure conditions and decisions. This supports regulatory compliance, audit readiness, and long-term performance monitoring.



Accelerates Collaboration and Strategic Alignment

Shared visual intelligence unites technical teams and executive stakeholders around a common understanding of infrastructure reality. Imagery simplifies communication, speeds alignment, and strengthens data-driven decision-making at every level of the organization. ■





Imagery Management Workflow

1: Acquire

Seeing the Real World at Infrastructure Scale

Acquiring is the initial step to collect fit-for-purpose reality data from an array of different sensors, at a defined cadence that is aligned to a business outcome.

For infrastructure organizations, the ability to understand what exists on the ground and how it is changing is foundational to every strategic and operational decision. Imagery enables this understanding at scale. Satellite, aerial, drone, lidar, and street-level data capture provide a continuous, objective view of assets, networks, and environments that cannot be achieved through field inspections alone. Acquiring data is no longer a one-time activity; it is a strategic capability that, with the right frequency and resolution, allows organizations to observe conditions across entire service territories, corridors, and facilities.

Reality mapping and GIS are what transform raw imagery acquisition into enterprise value. GIS provides the spatial context that connects imagery to assets, locations, and business systems, ensuring that captured data is immediately usable across planning, operations, and analytics. Without GIS, imagery remains as disconnected files. With GIS, acquiring data becomes

the first step in building a living, authoritative view of infrastructure, one that supports automation, analytics, and digital twins grounded in reality.

Sources

- **Satellites and synthetic aperture radar (SAR)** provide persistent, wide-area observation for change detection, monitoring, and rapid situational context at scale.
- **Aerial imagery and digital aerial sensors** enable higher-resolution, survey-oriented data capture for corridors, urban areas, and enterprise basemap refresh cycles.
- **Drones** enable on-demand, high-resolution imagery capture for inspections, incidents, construction progress, and targeted verification workflows.
- **Street-level and oblique imagery** provide asset-level context that top-down imagery cannot, and Esri brings this into GIS through oriented imagery capabilities that relate images to mapped locations via camera metadata. ►

2. Manage

Turning Imagery into a Trusted Enterprise System of Record

Managing imagery means treating it as an enterprise information product with governance, metadata, security, and performance standards so that anyone who needs imagery can discover it, trust it, and use it in their workflows.

Captured imagery delivers value only when it is maintained as an enterprise asset and is managed throughout its entire life cycle. Infrastructure organizations generate massive volumes of imagery, and without governance, discoverability, and performance standards, that data quickly becomes fragmented and underutilized. Maintaining imagery means managing it with the same rigor as other critical enterprise systems, ensuring that it is secure, current, trusted, and reusable across the organization. This is what allows imagery to function as a system of record of what exists and what has changed.

GIS is essential to the imagery maintenance life cycle. It provides the framework to catalog images, manage metadata, apply security, and publish imagery as scalable services that can be shared across departments and among partners. GIS enables imagery to be integrated with authoritative asset data, operational systems, and analytics pipelines. In doing so, GIS ensures that imagery is not siloed within teams or projects, but is maintained as a shared foundation that supports consistency, transparency, and confidence at every level of the organization.

Core management capabilities infrastructure organizations need:

- **Centralized catalog and metadata** so that teams can find the right imagery quickly and avoid duplicate acquisition and storage
- **Secure cloud or hybrid services** that support role-based access and scalable delivery to internal teams and partners
- **High-volume image and raster hosting** using distributed compute and storage designed to serve large imagery collections and power raster analytics
- **Enterprise image-management constructs** such as mosaic datasets that can reference millions of images as a virtual collection while storing key metadata and processing rules for fast, scalable access
- **Support for nonnadir imagery** through oriented imagery capabilities so that street-level and inspection images become first-class GIS content with map-linked exploration
- **Support for video data capture**, which provides the ability to leverage video data in GIS applications ►





Imagery Management Workflow (continued)

3. Apply

From Imagery to Action and Measurable Outcomes

To apply imagery for infrastructure means turning imagery into actionable insight that is depicted by business system solutions that deliver outcomes such as dashboards, work and asset management, planning, and stakeholder reporting.

The true value of imagery for infrastructure is realized when it is applied into daily operations. How the content is applied is where imagery moves beyond visualization and becomes intelligence, powering analytics, triggering workflows, and informing action. When imagery is applied effectively, organizations can detect change sooner, prioritize work more accurately, respond faster to incidents, and validate outcomes with confidence. This is where imagery drives measurable improvements in cost, risk, resilience, and performance.

GIS is the critical bridge between imagery and action. It enables imagery-derived insights to be embedded directly into dashboards, work management systems, digital twins, and executive reporting. GIS connects analytics to location, assets, and workflows, ensuring that insights are delivered to the right people at the right time. Through GIS, imagery becomes operational—supporting predictive maintenance, risk management, and strategic decision-making and transforming infrastructure organizations from reactive operators into proactive, insight-driven leaders.

Application Pathways That Matter Most for Infrastructure

- **Apply imagery as services** so that users can stream orthomosaics, satellite scenes, elevation, and categorical layers across web and desktop applications, including constrained bandwidth contexts.
- **Apply analytics outputs** such as classifications, change-detection results, and AI-derived features as layers that can be consumed by apps, dashboards, and reports.
- **Apply reality-mapping products** including True Orthos, DSM, DTM, point clouds, and photorealistic 3D meshes as foundation layers for 3D scenes and digital twin experiences.
- **Apply oriented imagery experiences** so that field and office users can click a map and immediately view the best street-level or inspection image for that location, improving validation and reducing unnecessary visits. ■



Case Study

Dudek Revolutionizes Land Surveying with Drones and GIS Technology

Dudek, an environmental and engineering consulting firm serving clients across North America, is modernizing land surveying and site assessment by combining drone imagery with GIS. Supporting projects in renewable energy, utilities, transportation, and environmental planning, Dudek needed a faster, more integrated way to capture, process, and deliver accurate site intelligence without relying on disconnected tools or costly traditional surveying methods.

By using drones for high-resolution imagery capture and managing that data in ArcGIS, Dudek transformed how site data is collected, analyzed, and shared. Drone flights provide rapid access to current site conditions, while GIS turns raw imagery into actionable insight, integrating

topography, easements, CAD data, and schedules into a single, dynamic view of each project. In many cases, clients can access usable site data the same day it is collected, dramatically accelerating planning, permitting, and design timelines.

Previously, Dudek relied on a fragmented workflow involving multiple tools, file transfers, and manual steps. By adopting ArcGIS Flight and Site Scan for ArcGIS, Dudek streamlined its entire drone-to-GIS workflow. Flight planning, imagery capture, cloud processing, analysis, and secure sharing now occur within a unified GIS environment, eliminating delays and reducing operational costs. ►

“The integration of Site Scan meant we could deliver data to our clients on the same day it was collected, regardless of where the project was located.”

—Steven Hochart, Practice Director at Dudek

An aerial photograph of a city street. On the left, there's a large building with a golden dome and a park area. In the center, a street runs horizontally. To the right of the street, there's a flooded area with some buildings and a bridge. The image is used as a background for the text on the right.

Dudek (continued)

Imagery managed in GIS is delivered to clients through a custom land development portal that combines GIS and CAD data, providing near real-time visibility into project status. Teams can explore 2D maps, 3D models, and historical imagery to better understand site conditions, monitor change, and validate design decisions. This capability has proved especially valuable for time-sensitive work such as renewable energy site selection, rockfall hazards, and emergency response, where speed and accuracy are critical.

The results are measurable. Dudek reduced costs by more than \$80,000 in one year; improved turnaround times on projects of all sizes; and expanded its ability to support clients with immersive, data-rich visualizations. By anchoring drone imagery in GIS, Dudek is laying the groundwork for advanced capabilities such as geospatial AI, digital twins, and integrated BIM workflows.

For Dudek, imagery is not just a deliverable, it is the foundation for smarter surveying, faster decisions, and more resilient infrastructure projects—from planning to construction and beyond. ■



[Read the full story](#)



Case Study

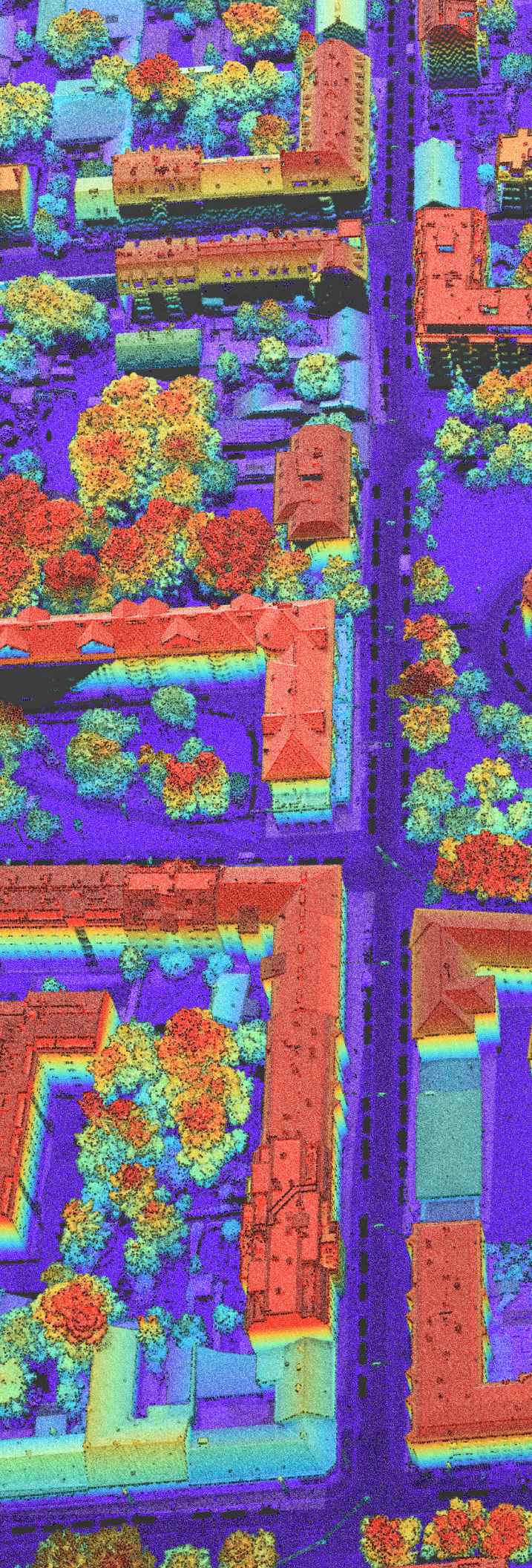
Creating a Business Case for an Imagery Management System at Dominion Energy

With demand rising from data center growth and electrification, and severe storms threatening grid reliability, Dominion Energy needed a better way to manage its distribution network across a large, heavily vegetated service territory. While the utility had collected extensive imagery and inspection data for vegetation management, pole inspections, and circuit patrols, the information was scattered across multiple systems, limiting visibility and operational value.

To modernize asset management and inspections, Dominion Energy launched the Image Management and Analytics Program (iMAP), creating a centralized platform for remotely sensed data and AI-driven analytics. The initiative focused on transforming manual workflows, improving visibility into asset condition, and

enabling a “collect once, use many times” approach to imagery across the organization.

Working with stakeholders across operations, engineering, GIS, IT, and cybersecurity, Dominion Energy established governance, documented workflows, and prioritized high-value use cases. Through a structured evaluation framework, the team selected three pilot programs: right-of-way vegetation encroachment, pole loading and joint use, and overhead circuit patrols. A secure, scalable architecture was designed within Dominion Energy’s Amazon Web Services (AWS) environment, with ArcGIS serving as the central system for imagery management, geospatial analysis, and AI model deployment. ►



“Dominion took an enterprise imagery and analytics platform through a regulatory approval process without a clear precedent to follow, so the use cases and value had to make the case. The pilots [test cases] are proving that value now, and there’s a clear path to scale iMAP across the system.”

—Jaime Crawford, PwC iMAP Program Lead

The business case was approved by the Virginia State Corporation Commission under the utility’s grid transformation plan, authorizing approximately \$28 million to build the platform and execute the test cases. Early test results demonstrated the value of AI-powered inspections, identifying issues such as damaged crossarms, line sag, leaning poles, and missing assets. In one example, AI analyzed more than 41,000 images and accurately identified 120 damaged crossarms in hours, dramatically less than the time required for manual review. The platform is now moving toward production deployment, providing Dominion Energy with a scalable foundation for asset inspections, vegetation risk management, and future AI-enabled workflows.

Esri partner PwC helped Dominion Energy develop the iMAP vision, business case, and implementation strategy. The team facilitated stakeholder alignment; evaluated operating models; prioritized use cases; designed the platform architecture; and assessed collection and analytics vendors against Dominion Energy’s GIS, security, and cloud requirements. PwC also supported regulatory planning, test execution, and change-management efforts, helping validate AI-driven inspection workflows and establish a scalable enterprise approach to remote sensing and asset intelligence. ■



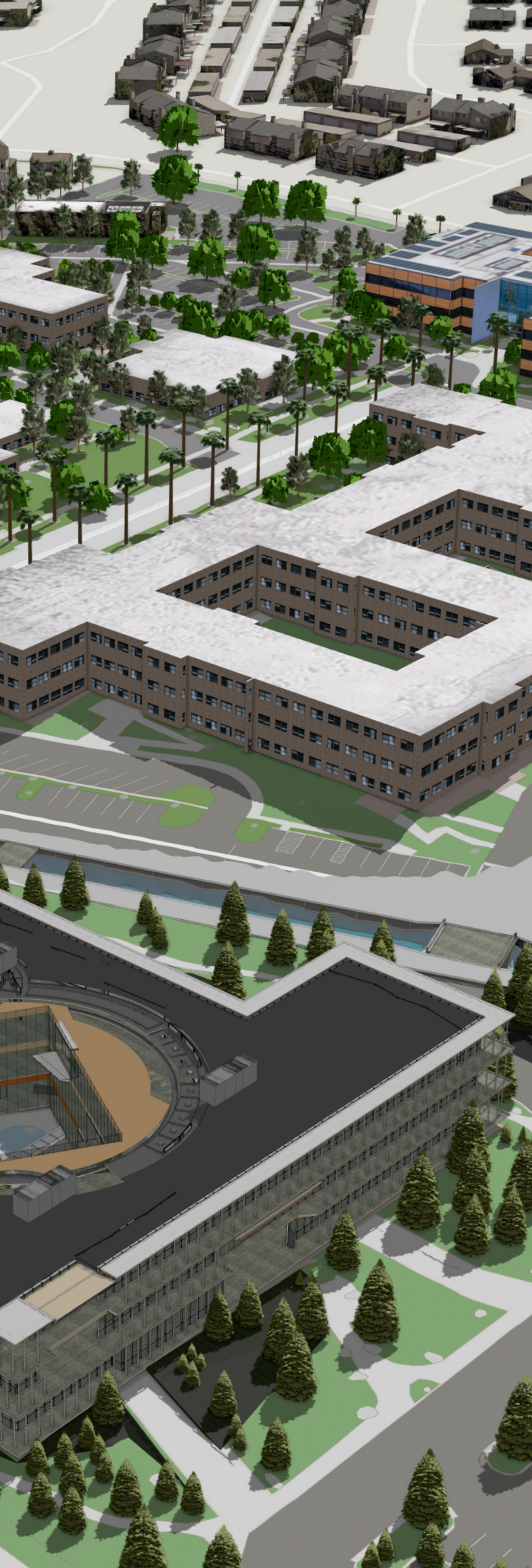
[Read the full story](#)

An aerial photograph of a large cable-stayed bridge spanning a body of water. The bridge has two tall white pylons and numerous white stay cables. Several vehicles, including a white truck and a blue car, are visible on the bridge deck. A green digital overlay is applied to the image, showing a network of lines and points that represent infrastructure data, such as road networks or utility lines, extending from the bridge and across the surrounding landscape. The background shows a lush green hillside and a body of water with some industrial structures in the distance.

Conclusion

Infrastructure is the backbone of modern society, yet it operates in a world that is changing faster than ever. Climate volatility, urban growth, aging assets, and rising public expectations demand a new level of awareness and intelligence. Imagery gives organizations the power to see the real world as it is—continuously, objectively, and at scale. When combined with GIS, imagery becomes more than observation; it becomes understanding. It connects what is happening on the ground to where it matters, revealing patterns, risks, and opportunities that would otherwise remain hidden.

The future of infrastructure leadership belongs to organizations that anchor their decisions in reality. Imagery and GIS together create a shared truth—a living, spatially accurate understanding of assets, networks, and environments that evolves as the world changes. This foundation enables digital twins to be not theoretical models but trusted reflections of the real world, guiding action with confidence. In an era defined by complexity and consequence, imagery and GIS are not just technologies, they are the lens through which infrastructure leaders will anticipate change, act decisively, and build systems that endure. ■



About Esri

Esri, the global market leader in geographic information system (GIS) software, location intelligence, and mapping, helps customers unlock the full potential of data to improve operational and business results. Founded in 1969 in Redlands, California, USA, Esri® software is deployed in more than 350,000 organizations globally and in over 200,000 institutions in the Americas, Asia and the Pacific, Europe, Africa, and the Middle East. Esri has partners and local distributors in over 100 countries on six continents, including Fortune 500 companies, government agencies, nonprofits, and universities. With its pioneering commitment to geospatial information technology, Esri engineers the most innovative solutions for digital transformation, the Internet of Things (IoT), and advanced analytics.

For more information, visit our **Infrastructure Management** link.

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