

Fiber Management for Infrastructure





Executive Foreword

Fiber as a Strategic Advantage

High-capacity, resilient fiber networks are now foundational to economic growth, digital equity, and enterprise competitiveness for infrastructure organizations. As demand accelerates for broadband, 5G, edge computing, and cloud connectivity, telecommunications leaders face unprecedented challenges regarding how to plan, operate, and scale fiber networks with confidence while controlling risk, cost, and complexity.

Geographic information system (GIS) technology provides a common platform for managing fiber networks, utilizing location as the backbone of modern infrastructure. Across utilities, transportation, energy, and water, fiber is no longer optional—it is the foundational network information management that enables digital operations, automation, and future forecasting and planning. ArcGIS ensures organizations can plan, visualize, and analyze fiber to maximize the value of their most strategic connectivity assets.

ArcGIS gives executives a clear, real-time understanding of their fiber footprint by unifying authoritative fiber network data, location intelligence, and operational workflows on a single geospatial platform. Leaders can see where fiber exists and how it connects across facilities and networks, as well as understand where capacity is constrained, and how it supports operational systems and customer services. This systemwide visibility eliminates fragmented views and empowers alignment across planning, engineering, operations, and customer engagement.

Most importantly, ArcGIS elevates fiber to a board-level conversation about resilience, risk, and competitiveness. Executives gain actionable insight into capital prioritization, service readiness, and expansion opportunities, whether supporting grid modernization, intelligent transportation, resilient water systems, or next-generation digital services. With ArcGIS, fiber becomes a strategic enabler across the entire infrastructure life cycle, connecting physical assets to digital intelligence and ensuring organizations are ready for what comes next. ■

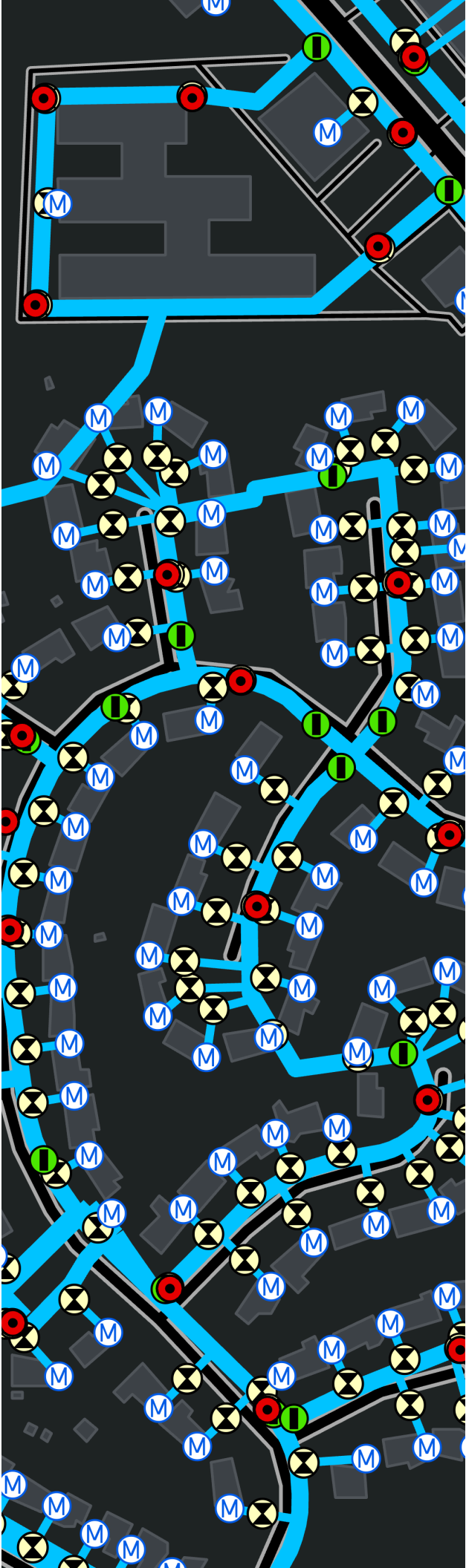


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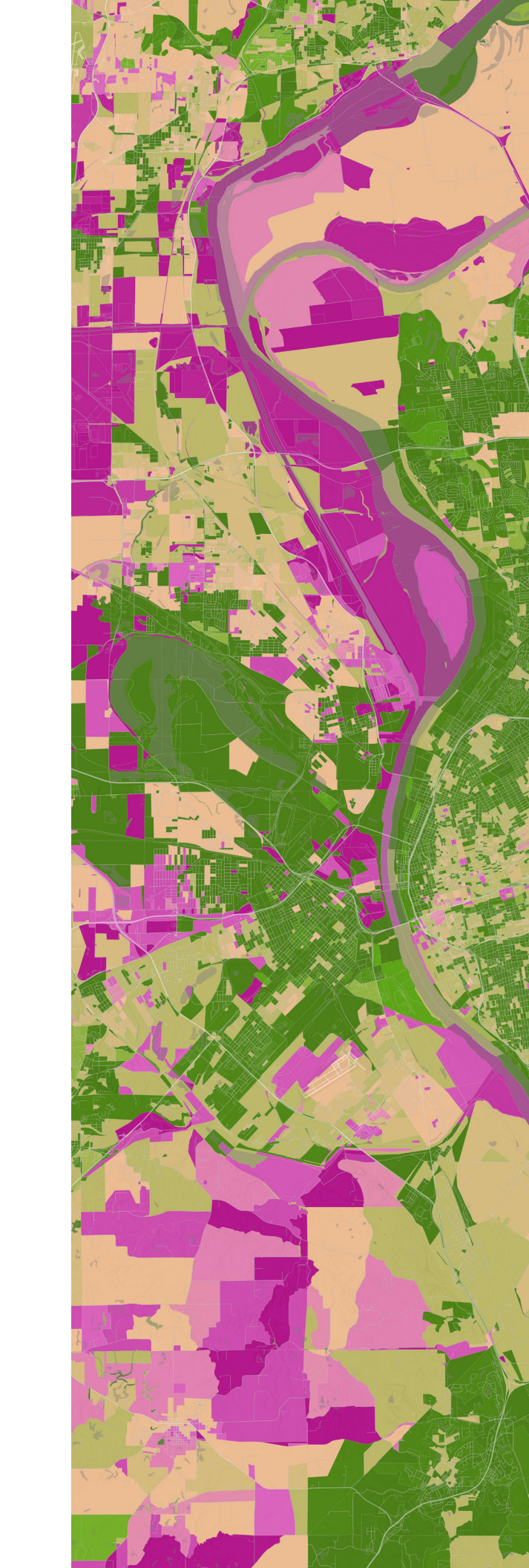


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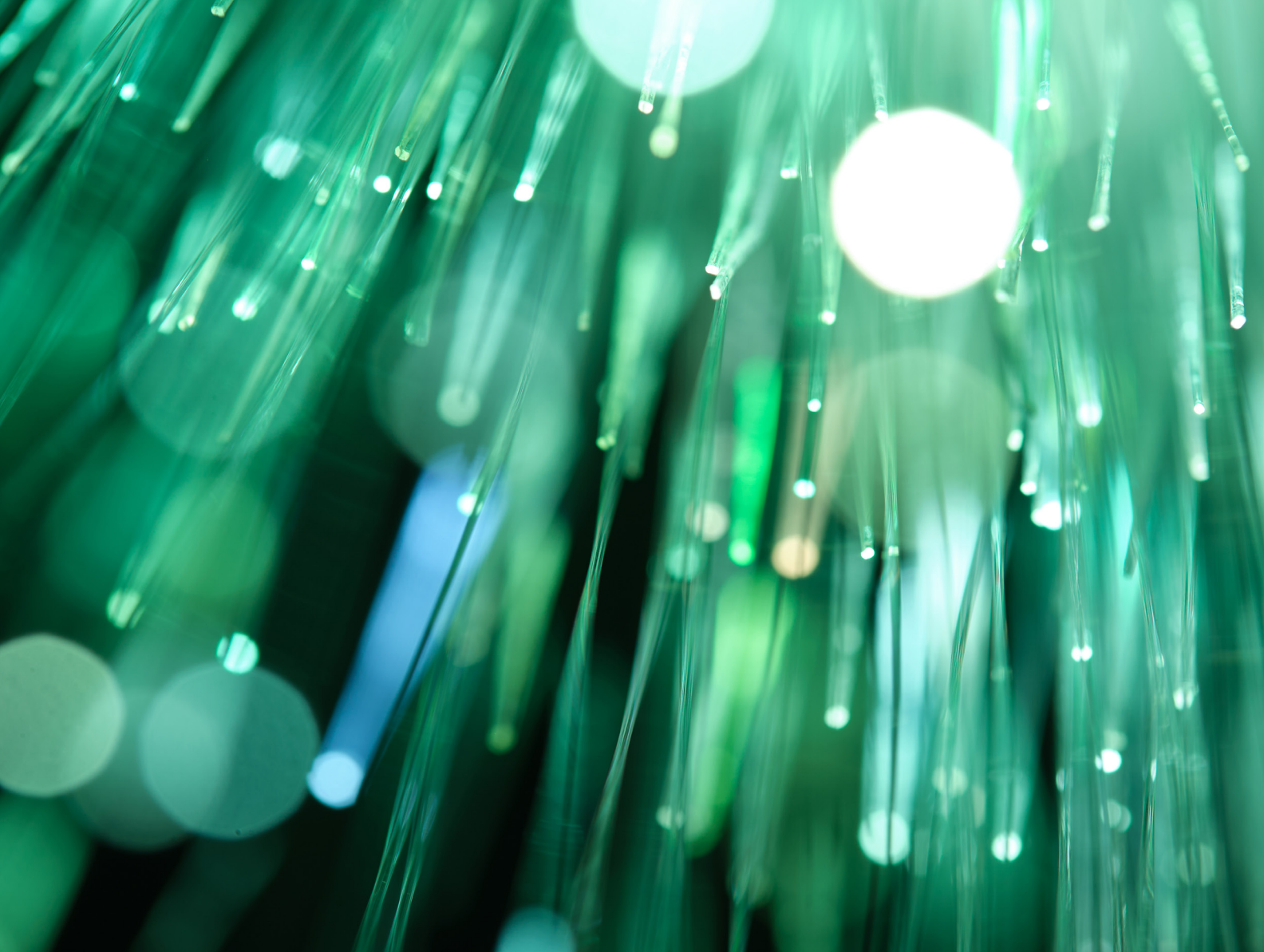
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The Strategic Importance of Fiber Across Infrastructure Industries



Telecommunications

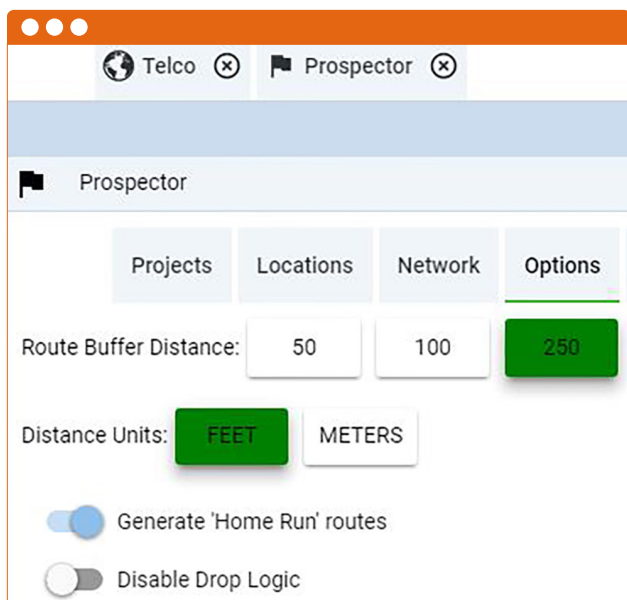
Fiber as the Core Platform for Revenue, Growth, and Differentiation

For telecommunications providers, fiber is the primary driver of growth, competitive differentiation, and long-term enterprise value. It underpins broadband expansion, 5G backhaul, enterprise services, edge computing, and emerging digital ecosystems.

However, the true value of fiber is not realized in construction, but in how effectively it is planned, managed, and monetized. GIS allows telecommunication organizations to manage fiber as a spatially intelligent network, supporting accurate inventory, service qualification, capacity management,

and operational coordination across the full life cycle.

Utilizing ArcGIS as the system of record brings clarity to where fiber exists, how it is utilized, where capacity is available, and where expansion delivers the highest return. By unifying fiber infrastructure with customers, market demand, right-of-way, construction activity, and operational performance, GIS transforms fiber data into actionable intelligence. This enables faster time to market, smarter capital allocation, and differentiated service offerings grounded in location-based insight. ■



FiberLight Puts Network Management into High Gear

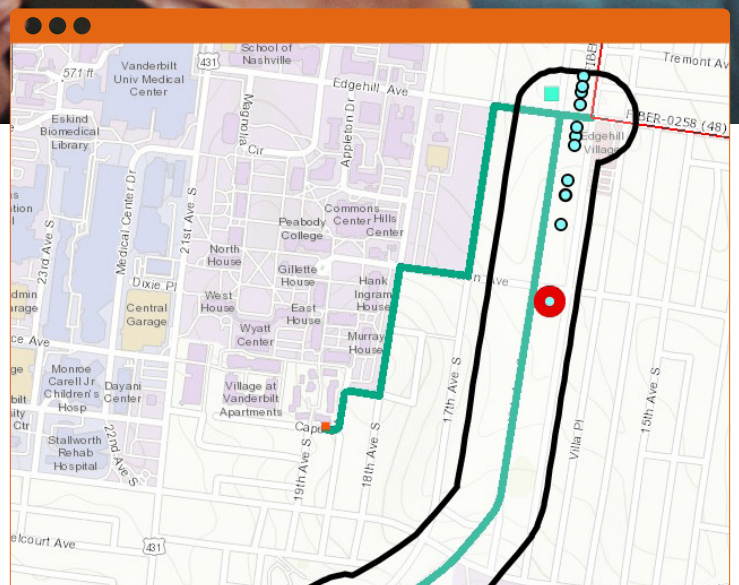
FiberLight has grown from a regional network of just a few hundred route miles into a nationwide fiber infrastructure provider spanning more than 14,000 miles across major US metropolitan markets. This rapid expansion positioned fiber as the foundation for mission-critical connectivity serving data centers, enterprises, and network providers that demand security, scalability, and reliability. As the network scaled across city, county, and state boundaries, FiberLight faced increasing pressure to manage fiber inventory, utilization, and financial reporting with greater speed and precision. Legacy spreadsheet-driven processes could no longer provide real-time insight into available capacity or asset performance, creating friction in network planning, delayed revenue opportunities, and increased operational cost.

7



FiberLight (continued)

The impact has been substantial. FiberLight now reconciles inventory changes in near real time, accelerates route design and permitting, and reduces construction and reporting costs. Clear visibility into fiber utilization enables faster, more targeted commercialization of capacity while improving financial forecasting and regulatory compliance. By using ArcGIS as the system of record for fiber intelligence, FiberLight has elevated fiber from a static physical asset into a strategic growth platform, supporting faster market expansion, smarter investment decisions, and the operational confidence required to deliver highly reliable, high-performance connectivity at national scale. ■



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Electric Utilities

Fiber as the Digital Backbone of a Modern, Smart Grid

Fiber is the digital backbone of the modern, smart grid, quietly carrying the intelligence that keeps power reliable, resilient, and responsive. As grids become more distributed, automated, and data-driven, utilities depend on high-capacity, low-latency fiber networks to connect substations, control centers, field crews, DERs, and mission-critical systems. Without fiber, real time monitoring, advanced protection, automation, and secure operations at grid scale are simply not possible.

Yet fiber's value is only fully realized when utilities can see, understand, and manage it as strategic infrastructure. This is where GIS becomes essential. A GIS-based system of record for fiber provides a single, authoritative view of the network, how it is routed, where it connects to grid assets, how capacity is

allocated, and how outages or construction activities impact operations. By unifying fiber data with electrical network, facility, and environmental context, GIS enables planners, engineers, and operators to move from isolated diagrams to smart grids, enabling a living digital twin of the grid.

Utilities that manage fiber as a strategic digital asset are better positioned to meet regulatory expectations, improve resilience, and support the transition to a more dynamic, data-driven grid. When integrated with ArcGIS, utilities gain a spatial system of record that connects fiber, electrical assets, and operational context, enabling faster fault isolation, better coordination between enterprise systems, and improved visibility from the control room to the field. ■

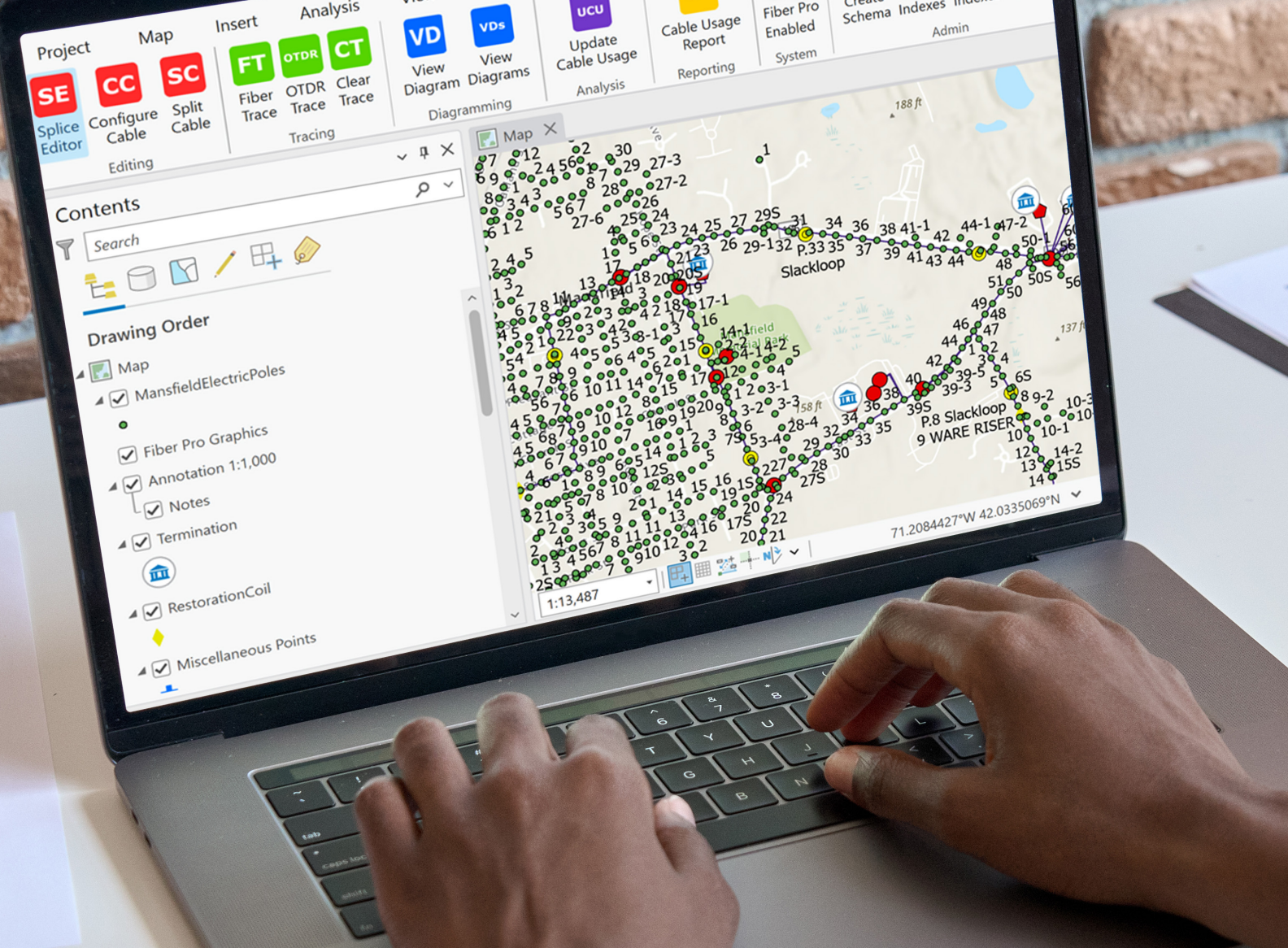


Case Study

Phoenix, Axis, and mPower Modernize Fiber Management for Mansfield Electric

As Mansfield Municipal Electric Department (MMED) expanded its fiber network to support economic development and essential municipal services, fiber quickly became foundational, not optional. The network connects businesses, public facilities, and critical infrastructure, yet legacy documentation methods could not keep pace with growth. With records spread across drawings, spreadsheets, and manual systems, even routine outages became time-consuming events. The lack of authoritative visibility into where fiber existed, how it was connected, and which strands were available created operational risk, limited the ability to monetize spare capacity, and slowed future planning.

To regain control, Mansfield adopted an enterprise GIS approach built on the ArcGIS platform, grounded in rigorous field verification and accurate network modeling. Crews physically validated poles, splice cases, cabinets, and routes, ensuring that every fiber asset reflected real-world conditions. This information was structured into a geospatial system that models fiber connectivity, strand status, and relationships to roads, facilities, and other municipal assets. With fiber mapped as a true network, rather than lines on a map, teams gained precise insight into what was live, what was dark, and how the system could be safely expanded. ►



Mansfield Electric (continued)

Today, fiber is managed as a strategic municipal asset. Outages are resolved faster because crews can instantly trace connections and understand impacts before rolling a truck. Available capacity can be confidently leased, turning underutilized fiber into a new revenue stream. Planning is proactive, coordinated, and data-driven across departments. By leveraging ArcGIS as the system of record for fiber, Mansfield transformed its network from a hidden operational liability into a visible, resilient digital backbone, supporting reliable services, smarter growth, and long-term community connectivity. ■

...Mansfield adopted an enterprise GIS approach built on the ArcGIS platform, grounded in rigorous field verification and accurate network modeling.



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Water and Wastewater Utilities

Fiber as an Enabler of Operational Resilience and the Intelligent Water System

Fiber is the digital backbone of a modern, intelligent water system, enabling the visibility, control, and resilience water utilities need to serve communities with confidence. As water systems become more automated and interconnected, fiber provides the high-capacity, secure communications required to connect treatment plants, pump stations, reservoirs, sensors, and control centers. This always-on connectivity allows utilities to monitor water quality, pressure, flows, and asset performance in near real time, transforming reactive operations into predictive, resilient systems.

Fiber is also a critical enabler of operational resilience and regulatory confidence. With reliable communications in place, utilities can respond faster to disruptions, remotely manage facilities, and maintain continuity of service during emergencies. Just as important, fiber supports the consistent data collection, traceability, and auditability regulators expect. When paired with a GIS-based system of record, fiber networks ensure that operational data, compliance metrics, and asset conditions are spatially

accurate, authoritative, and defensible, reducing risk while strengthening trust with regulators and stakeholders.

Water and wastewater utilities manage geographically distributed, highly regulated systems where service continuity and public trust are paramount. Fiber provides the secure, high-bandwidth connectivity needed to operate these systems in real time, connecting treatment facilities, pump stations, reservoirs, sensors, and control centers into a unified operational network.

When combined with ArcGIS, fiber becomes part of a broader spatial intelligence platform, linking operational technology, asset management, and regulatory reporting within a single authoritative view. ArcGIS is what elevates fiber from a communications asset to strategic water-system intelligence. Together, fiber and GIS form the foundation of an intelligent water system, one that protects public health, ensures regulatory compliance, and delivers reliable service today while preparing for the challenges of tomorrow. ■



Case Study

ArcGIS: Supporting the Deployment of Loveland, Colorado's Startup Broadband Utility

City of Loveland, Colorado

As the city of Loveland, Colorado, continued to grow, leaders recognized that fiber connectivity would be essential to economic development, operational efficiency, and quality of life. Building on decades of experience operating electric and water utilities supported by GIS, the city launched Pulse, its municipal fiber utility, to deliver high-speed, reliable communications to residents, businesses, and city operations. From the outset, fiber was treated as foundational infrastructure, requiring the same precision, coordination, and visibility as power and water. The city needed a system capable of supporting

rapid construction, real-time collaboration, and long-term operational excellence.

Loveland turned to Esri's ArcGIS platform as the system of record for designing, building, and operating its fiber network. ArcGIS enabled near real-time spatial data exchange across engineering, construction, field crews, customer service, and city departments, ensuring everyone worked from a single, authoritative view of the network. Fiber routes, devices, and underground structures were modeled as a connected system, accessible through desktop, web, and mobile ►



“There’s quite a bit of moving parts and pieces and using Esri technology allows all those pieces to stay in sync and stay relatively in tune with each other.”

—Sarah Rose, City of Loveland, Colorado, Senior GIS Specialist

Loveland (continued)

applications. This GIS-driven approach allowed crews to safely build and maintain fiber in the field, engineers to trace connectivity and plan expansion, and managers to coordinate vendors and timelines with confidence.

Within a year, Pulse was operational and serving customers, supported by a scalable, flexible GIS ecosystem purpose-built for a startup broadband provider. Fiber assets are now visible, traceable, and continuously updated as construction and inspections occur. Field crews work more safely and efficiently with mobile access to current data, while customer service, marketing, and city stakeholders all rely on the same trusted information. By managing fiber with ArcGIS, Loveland transformed connectivity into a core municipal capability, delivering faster deployment, stronger coordination, and a resilient digital backbone ready to support smart city services and future growth. ■



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Transportation (Roads, Rail, Transit, Aviation)

Fiber as the Nervous System of Intelligent Transportation Systems

Fiber is the nervous system of connected transportation, carrying the real-time intelligence that keeps people, goods, and services moving safely and efficiently. As transportation systems evolve into fully connected ecosystems, fiber enables continuous communication across roads, rail, transit, ports, and aviation infrastructure. From traffic signals and rail signaling to roadway sensors, cameras, and mobility platforms, fiber delivers the speed, security, and reliability required to support intelligent transportation systems at scale.

Transportation agencies increasingly rely on real-time data to ensure safety, efficiency, and reliability across complex networks. Fiber supports traffic management,

positive train control, intelligent rail operations, connected corridors, and real-time passenger information. When managed through ArcGIS, agencies gain a geospatial platform that integrates fiber infrastructure with operational assets, incidents, and performance metrics, enabling proactive management rather than reactive response.

When combined with ArcGIS, fiber becomes a mission-critical way to reduce congestion costs, improve safety outcomes, and increase system throughput. Just as importantly, fiber creates a future-ready foundation for automation, connected vehicles, and smart mobility initiatives, maximizing long-term ROI on transportation capital investments. ■



Case Study

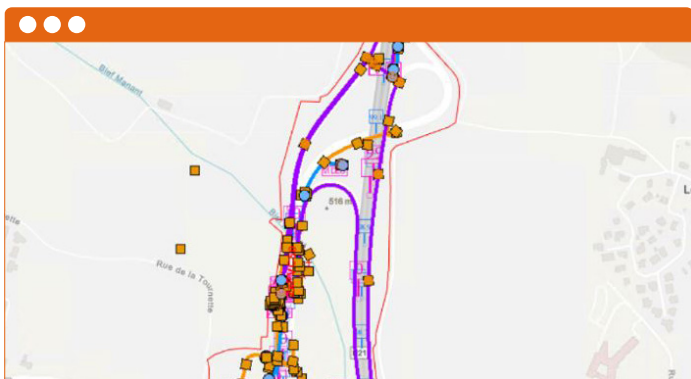
ATMB Optimizes Fiber Network Management with 1Telecomms GIS

Autoroutes et Tunnel du Mont Blanc

Autoroutes et Tunnel du Mont Blanc (ATMB) operates more than a vital transportation corridor; it manages a strategic fiber-optic network that serves as the digital backbone of its operations and the surrounding region. Fiber supports everything from tolling, traffic control, and tunnel safety systems to emergency response and connectivity services for external providers. As demand for reliable, high-capacity communications increased, ATMB recognized that fiber was no longer a secondary asset—it was mission-critical infrastructure. However, asset records were fragmented across drawings, files, and institutional knowledge, creating operational risk at a time when

accuracy, resilience, and regulatory compliance were becoming nonnegotiable.

To regain control and unlock the full value of its fiber network, ATMB implemented an enterprise GIS approach built on Esri's ArcGIS platform to create a unified, authoritative view of its telecom assets. High-precision surveys and structured data management workflows transformed legacy records into a living digital network model with Class A underground accuracy, meeting strict French DI-DICT requirements. Fiber routes, ducts, strands, and capacity are now mapped and managed with precision across highways and tunnels, enabling teams to ►



ATMB (continued)

understand exactly what exists, where it is, and how it is being used, at any moment.

With fiber fully integrated into its infrastructure operations, ATMB now operates with greater confidence, speed, and foresight. When incidents occur, teams can instantly understand impacts, identify alternative routes, and restore service faster. Commercially, clear visibility into available capacity has accelerated fiber leasing, which supports regional broadband expansion while creating new revenue streams. Most importantly, GIS has transformed fiber from a hidden, hard-to-manage asset into a strategic platform, supporting resilient transportation operations, regulatory confidence, and long-term digital growth. Fiber is now firmly positioned as the nervous system of ATMB's infrastructure, powering safe mobility today and intelligent infrastructure for the future. ■



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AEC, Facilities, and Smart Infrastructure Owners

Fiber as the Foundation for Digital Operations and Smart Environments

Fiber is the foundation for digital operations and smart environments in today's architecture, engineering, and construction (AEC) organizations. As buildings, campuses, infrastructure corridors, and jobsites become more connected and data-rich, fiber provides the high-capacity, secure communications that enable intelligent design, construction, and operations. From smart buildings and industrial facilities to large transportation or utility projects, fiber underpins the systems that support automation, real-time monitoring, safety, and long-term asset performance.

Across campuses, airports, ports, industrial facilities, and smart cities, fiber provides the connectivity required to operate complex environments as integrated systems. It enables building management systems, security, IoT sensors, digital twins, and real-time operations across both vertical and horizontal

assets. A GIS-based system brings visibility to where fiber is installed, how it connects across sites and facilities, and how it supports digital systems such as BIM, IoT sensors, security, and building management platforms.

When integrated with ArcGIS, fiber becomes part of a comprehensive spatial digital twin, connecting facilities, utilities, transportation, and communications into a single operational view. This convergence reduces operational overhead, improves safety, and enables data-driven decision-making across large, complex estates. By unifying fiber networks with design models, site conditions, utilities, and construction workflows, GIS creates a shared digital context that improves coordination, reduces rework, and accelerates delivery across the project life cycle. ■



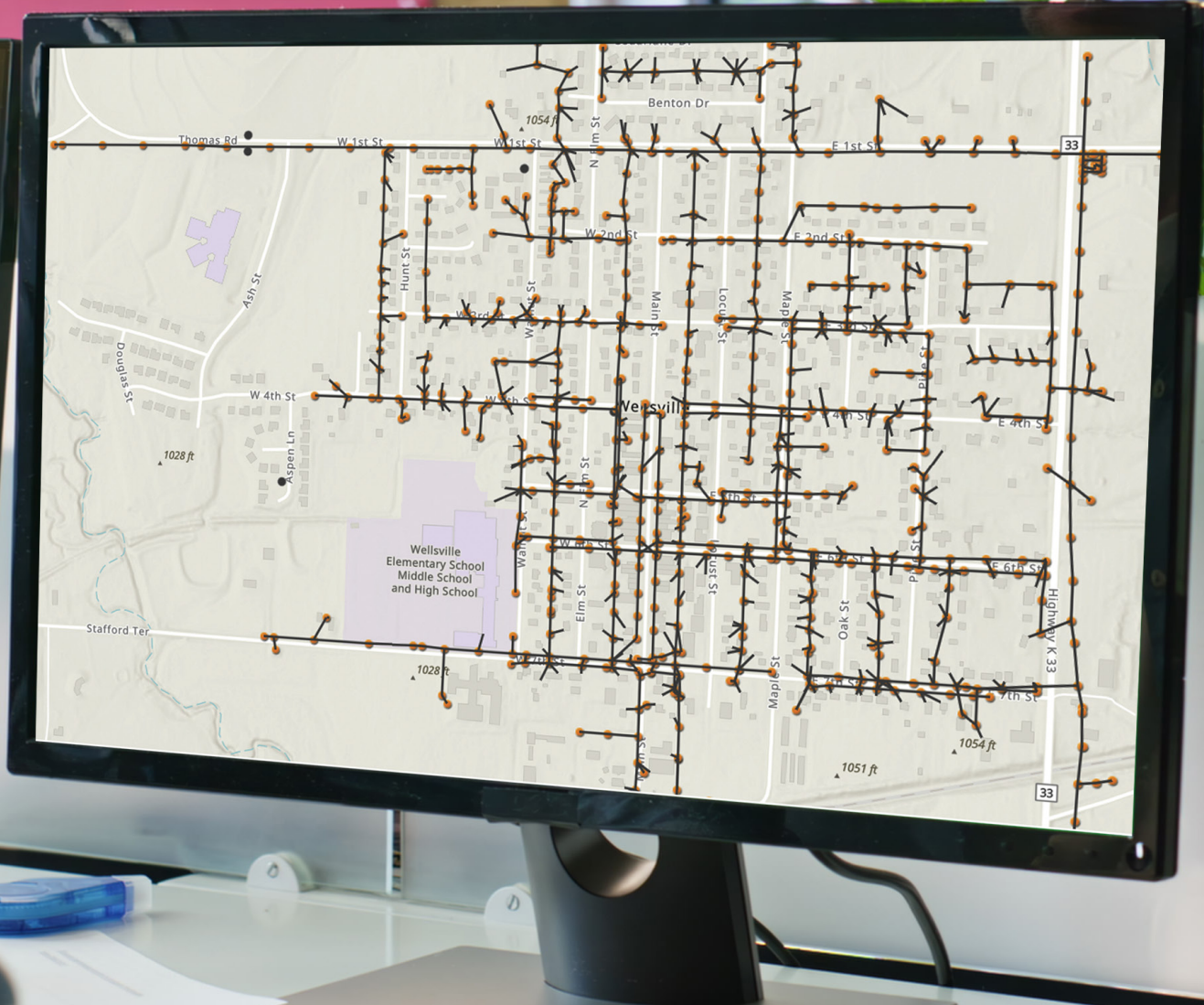
Case Study

Transforming Fiber Network Planning at Geosolv with Reality Capture and ArcGIS

Geosolv

As historic federal funding accelerates broadband deployment across the United States, fiber infrastructure has become central to closing the digital divide on compressed timelines. Telecommunications engineering firm Geosolv supports this surge by designing fiber networks for urban developers and rural broadband providers, where speed, accuracy, and scalability are essential. With limited field resources and growing project volume, traditional survey methods created bottlenecks, slowing design cycles, increasing costs, and introducing risk at a time when communities and providers could not afford delays.

To modernize fiber planning, Geosolv adopted a reality-capture-driven approach built on the ArcGIS platform, transforming how field data is collected and translated into network designs. High-resolution, 360-degree imagery captured from vehicles, drones, and portable systems allows fiber routes, poles, homes, and connection points to be documented rapidly and accurately across urban, rural, and hard-to-access environments. Integrated directly into ArcGIS workflows, this imagery becomes actionable intelligence, enabling automated feature extraction, precise positioning, and continuous quality control from a single geospatial system of record. ►



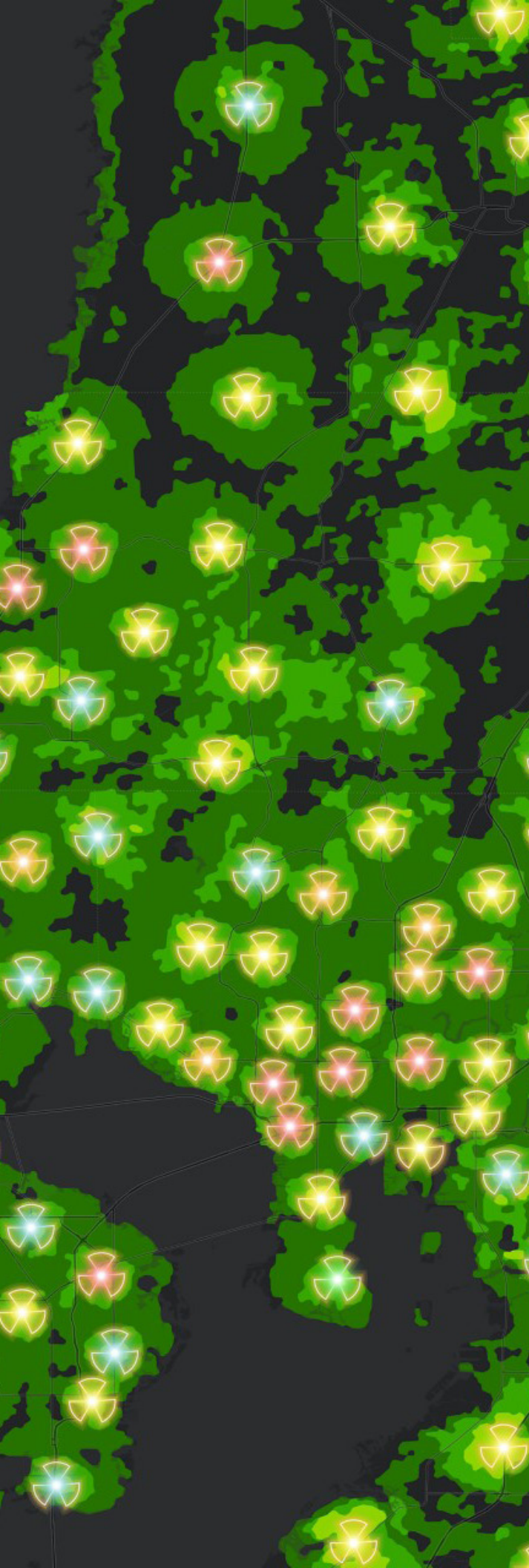
Geosolv (continued)

To modernize fiber planning, Geosolv adopted a reality capture driven approach built on the Esri ArcGIS platform, transforming how field data is collected and translated into network designs.

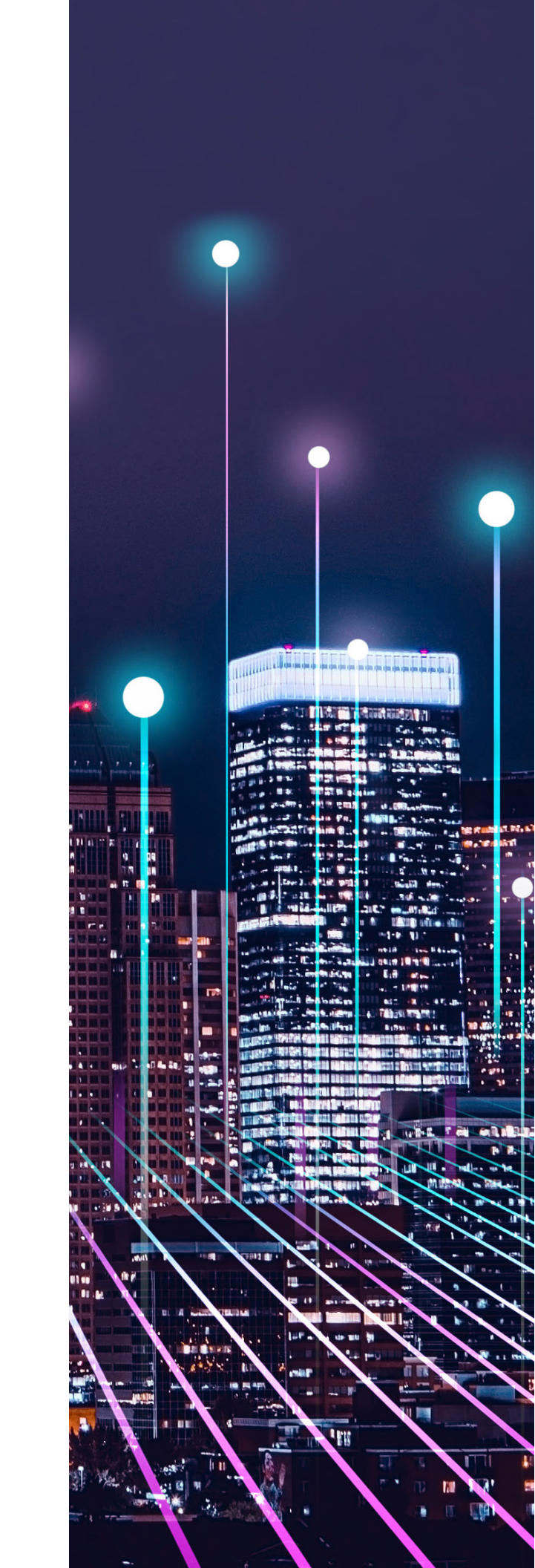
The impact has been immediate and measurable. Geosolv increased field data collection efficiency by more than 60 percent, reduced costly rework, and accelerated fiber network design timelines to meet aggressive funding and construction schedules. With ArcGIS unifying imagery, design, and collaboration, engineers can deliver higher-quality fiber plans with fewer site revisits and greater confidence. By integrating reality capture with enterprise GIS, Geosolv has elevated fiber planning from a labor-intensive process to a scalable, data-driven operation, helping communities deploy resilient broadband faster, smarter, and more cost-effectively. ■



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The Value of ArcGIS for Fiber Management



Turning Fiber Networks into Strategic Digital Infrastructure

Managing Fiber as a Strategic Business Asset

High-capacity, resilient fiber networks have become foundational to economic growth, digital equity, and enterprise competitiveness. As demand accelerates for broadband, 5G, cloud connectivity, and real-time digital services, telecommunications leaders face a defining challenge: how to plan, operate, and scale fiber networks with confidence, while controlling cost, risk, and complexity.

Esri's ArcGIS provides a globally proven platform for managing fiber as both critical infrastructure and a core business investment. By unifying location intelligence, authoritative network data, and operational workflows on a single enterprise platform, ArcGIS gives organizations real-time visibility into network performance, capital efficiency, service readiness, and operational risk.

ArcGIS transforms fiber from fragmented records into a transparent, governable, and optimizable business system, connecting engineering, operations, customer service, and executive leadership across the full network life cycle. ■



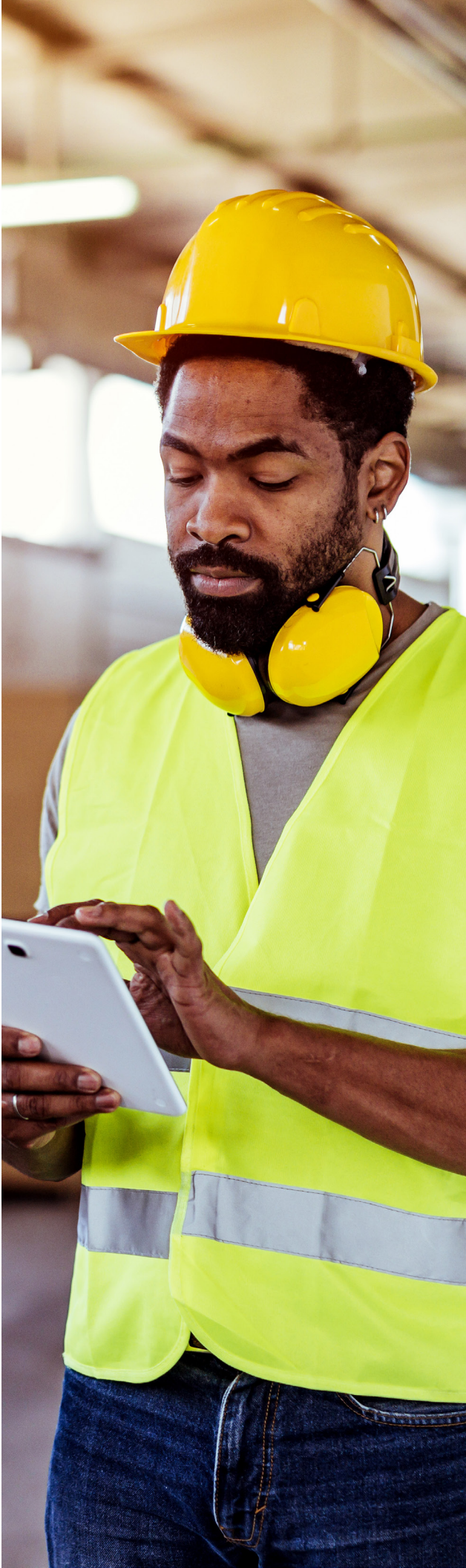
Fiber-Ready, Data-Center-Optimized Development

Powering Data-Intensive Construction and High-Load Growth

Fiber is the essential resource powering new construction and high-load facilities such as data centers, forming the invisible backbone of today's digital economy. As demand surges for cloud computing, AI, advanced manufacturing, and electrification, new projects are defined as much by connectivity as by power and land. Fiber delivers the massive bandwidth, low latency, and reliability required to support hyperscale operations, mission-critical applications, and continuous uptime, making it a first-order siting and design requirement for modern developments.

Fiber readiness determines speed to market, and GIS is what makes that readiness visible and actionable. A GIS-based system provides a clear understanding of where fiber exists, where capacity is available, how networks connect to power, transportation, and utilities, and where gaps must be addressed. By unifying fiber infrastructure with parcels, zoning, rights-of-way, construction activity, and environmental constraints, GIS enables developers, owners, and operators to plan smarter, reduce risk, and accelerate permitting and build-out for data-intensive facilities.

ArcGIS elevates fiber from a technical dependency to a strategic advantage in capital planning and site selection. Leaders gain confidence that new construction is aligned to scalable connectivity, resilient routing, and future growth, while avoiding costly delays and retrofits. Together, fiber and GIS form the foundation for intelligent development, ensuring that data centers and high-load facilities are built where digital, physical, and operational infrastructure converge to support long-term performance and competitive differentiation. ■

A man with a beard, wearing a yellow hard hat and a high-visibility yellow safety vest over a grey shirt, is looking down at a white tablet he is holding. He is also wearing yellow earplugs. The background is a blurred industrial or construction setting.

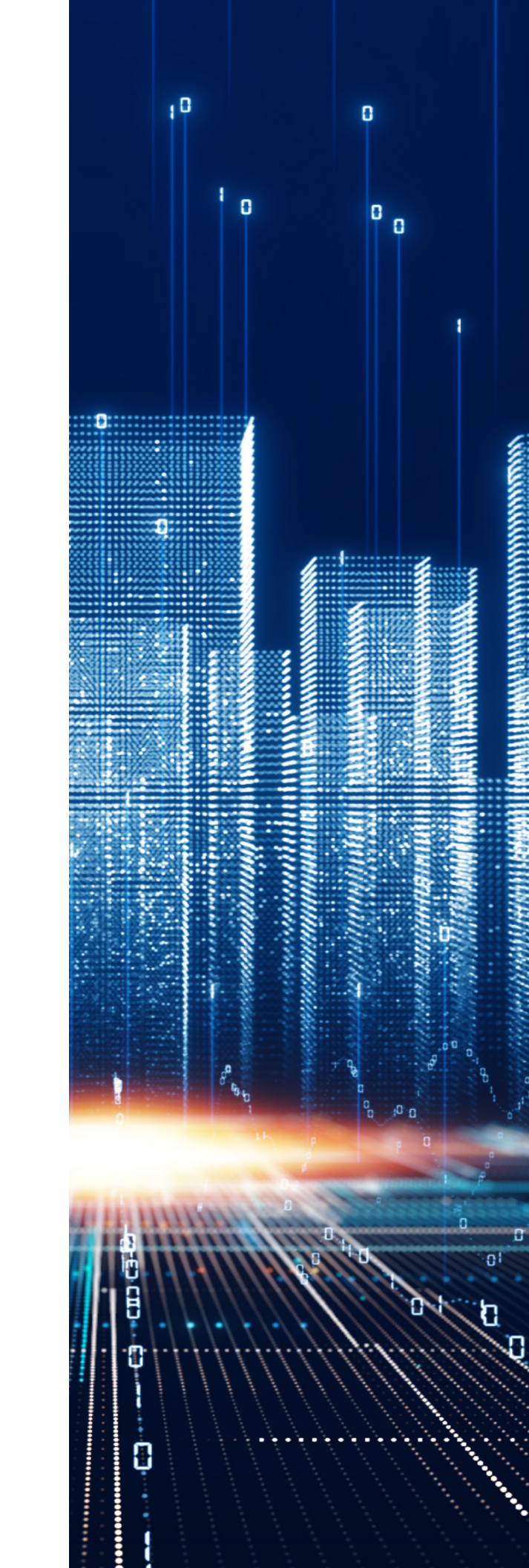
A Digital Foundation That Reduces Risk and Cost

Establishing a Single System of Record for Fiber

Fiber networks are inherently spatial, highly interconnected, and operationally complex, spanning inside plant (ISP), outside plant (OSP), regional, and access environments. ArcGIS establishes a single, authoritative system of record for fiber assets and connectivity, eliminating duplicated data, manual reconciliation, and conflicting sources of truth.

Built on ArcGIS Utility Network and delivered through the Communications Utility Network Foundation, ArcGIS models fiber at true engineering-grade detail, supporting port-to-port connectivity, complex devices, strand-level tracking, and full ISP/OSP representation. This enables advanced workflows such as end-to-end tracing, dependency analysis, and impact assessment that dramatically improve data accuracy and operational confidence.

From an executive standpoint, this digital foundation directly reduces business risk. Capital planning, regulatory reporting, audits, and network expansion decisions are grounded in trusted, current network intelligence, rather than outdated drawings or siloed systems. ■

An abstract digital cityscape with binary code (0s and 1s) and glowing lines, suggesting a network or data environment. The image is predominantly blue and white, with a bright orange and yellow light source at the bottom left, creating a sense of depth and energy.

Driving Faster Growth Through Intelligent Planning

Accelerating Deployment and Time to Revenue

In today's competitive broadband environment, speed and accuracy in planning directly determine revenue outcomes. ArcGIS streamlines fiber planning and design by embedding spatial intelligence, network rules, and analytics directly into day-to-day planning workflows.

Solutions such as Network Path Planner, service qualification, and digital walkout surveys enable teams to evaluate routes, assess constructability, and confirm serviceability before construction begins. Planning, engineering, finance, and external stakeholders collaborate on a shared digital view of the network, aligning capital investment with demand, cost, and regulatory constraints.

These workflows reduce uncertainty early in the life cycle, enabling organizations to deploy fiber faster, minimize redesign, and activate services sooner, without increasing risk. ■



Operational Workflows That Lower Cost to Serve

Operational Excellence and Network Resilience

Once deployed, the long-term value of fiber is determined by how efficiently it is operated and maintained. ArcGIS connects physical network inventory, field operations, and operational awareness into a unified, real-time operational workflow.

Field teams use mobile access to authoritative network data to complete installations, maintenance, and inspections correctly the first time, reducing truck rolls, rework, and service errors. Operational leaders monitor construction progress, asset condition, and service impacts through dashboards that provide enterprise-wide visibility.

In the event of damage or outages, ArcGIS enables rapid damage assessment, network tracing, and impact analysis, supporting faster restoration and clearer communication with customers and regulators. ■



Conclusion

Fiber networks are intrinsically spatial, complex, and interconnected across inside plant (ISP), outside plant (OSP), regional, and access environments. ArcGIS establishes a single, authoritative system of record for fiber assets and connectivity, eliminating duplicated data, manual reconciliation, and conflicting sources of truth.

Built on ArcGIS Utility Network, Esri's fiber management workflows model networks at engineering grade detail, supporting port to port connectivity, complex devices, strand level tracking, and full ISP/OSP representation. This enables advanced workflows such as end to end tracing, impact analysis, and dependency management that were previously time consuming or error prone.

In a competitive broadband environment, the speed and accuracy of planning directly impact revenue. ArcGIS streamlines fiber planning and design by embedding spatial intelligence, network rules, and analytics directly into day to day planning workflows.

Capabilities such as Network Path Planning, service qualification, and digital walkout surveys enable teams to evaluate routes, assess constructability, and confirm serviceability using real time data before construction begins. Planners, engineers, finance teams, and external stakeholders collaborate on the same digital view of the network, aligning investment decisions with demand, cost, and regulatory constraints. ►



ArcGIS streamlines fiber planning and design by embedding spatial intelligence, network rules, and analytics directly into day to day planning workflows.

Conclusion (continued)

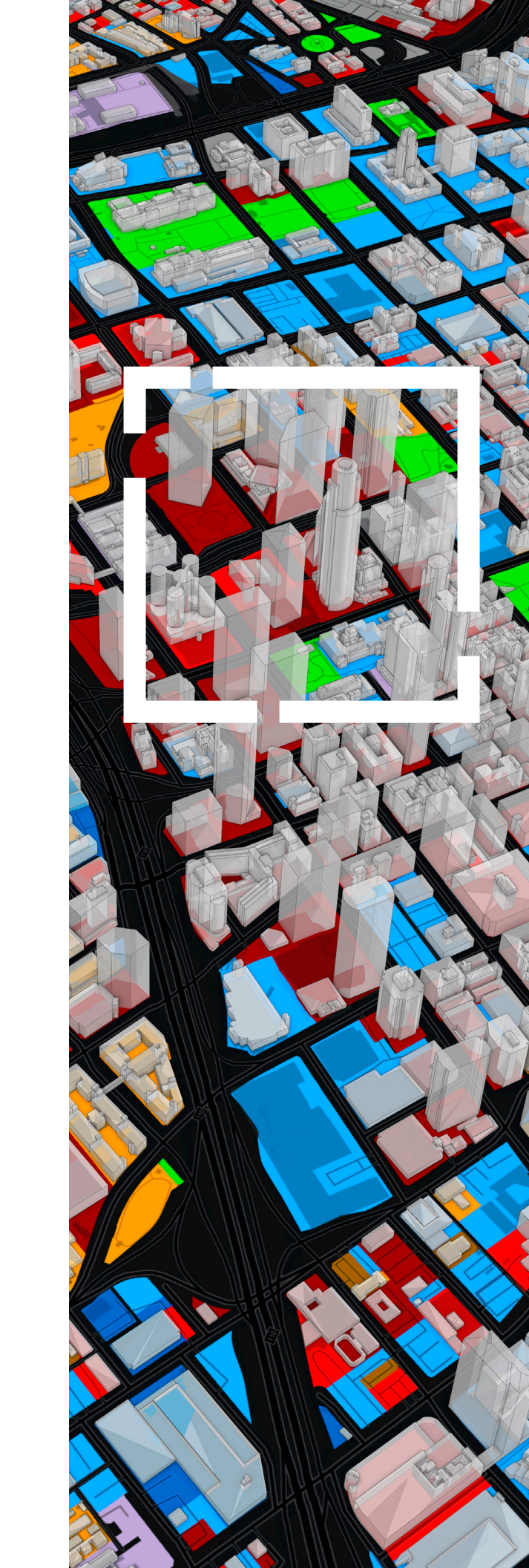
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For outages and damage events, ArcGIS supports rapid damage assessment, impact analysis, and coordinated restoration. These workflows reduce downtime, improve customer satisfaction, and materially lower the cost to serve over the life of the network.

Overall, ArcGIS elevates fiber management from an operational necessity to a strategic business capability. By integrating planning, physical network inventory, operations, and analytics on a single platform, telecommunications leaders gain continuous insight into how infrastructure investments perform over time. ■



[Design Survey Link](#)



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 hundreds of thousands of organizations globally, including Fortune 500 companies, government agencies, nonprofit institutions, and universities. Esri has regional offices, international distributors, and partners providing local support in over 100 countries on six continents. With its pioneering commitment to geospatial technology and analytics, Esri engineers the most innovative solutions that leverage a geographic approach to solving some of the world's most complex problems by placing them in the crucial context of location.

For more information, visit our [**Telecommunications page**](#).



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