

Building Greater Clarity

Transforming Construction with Connected Data and ArcGIS

esri

THE SCIENCE OF WHERE®



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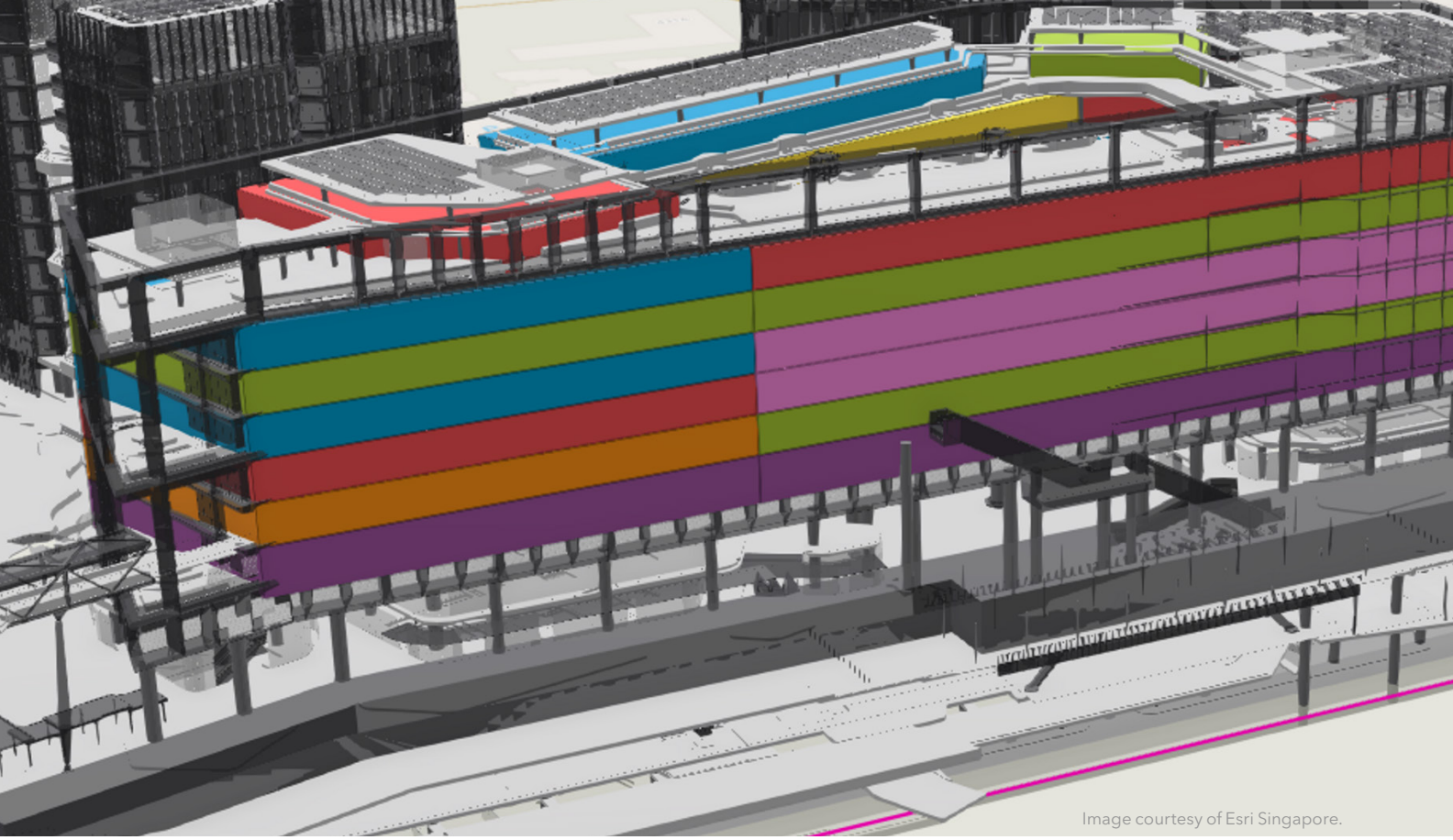


Image courtesy of Esri Singapore.

Executive Summary

Construction has become more complex with tighter margins, larger budget contingencies, and rising expectations from your clients. This is exposing the limitations of disconnected digital systems, information silos, and fragmented workflows.

Across the industry, the challenge is not a lack of data but the inability to connect it in meaningful ways. This is driving a growing recognition that project success depends on connected, location-based data and systems. Successful teams bring together fieldwork, design models, schedules, and operations data into a combined view.

Organizing data by location gives teams a clearer view of what's happening on a project, helping them make quicker decisions, avoid delays, and catch issues earlier.

Real-world examples demonstrate the impact of this transformation. Firms such as Takenaka Corporation and Pomerleau have achieved measurable improvements by integrating ArcGIS® technology with BIM and sensor data, including up to 33 percent faster project delivery. Similarly, companies like ACCIONA are using connected data environments to improve coordination, optimize resources, ensure compliance, and support sustainability goals when owners demand it.

Looking ahead, the future of construction depends on the industry's ability to break down silos and establish a connected system that spans planning, design, construction, and operations. Everything in construction requires a location, whether it's physical or digital. From the request for information (RFI) coming out of the field to the BIM model coming from the office, everything is located in the physical world as a starting point. A location-based approach provides the foundation for these improvements, allowing all project stakeholders to work from the same trusted view of the project.

For over 50 years, Esri has been helping organizations connect data, workflows, and teams through geographic information system (GIS) technology. It's a proven approach that's now being applied more broadly across project delivery. With ArcGIS, information flows more easily, decisions are based on real-world conditions, and projects are delivered with greater confidence and consistency. ■

Introduction: An Industry at a Turning Point

Construction is an industry that cycles through waves of new technology. A new point solution comes in, your teams adopt it to solve a specific problem, but it doesn't work with the other solutions you've tried to standardize on. Before long, that app gets forgotten or replaced altogether. Then the cycle starts again. This boom-and-bust pattern slows progress and leaves teams with disconnected tools that never fully deliver on their promise. What's different now is the scale and complexity of construction, which is exposing the limitations of that approach.

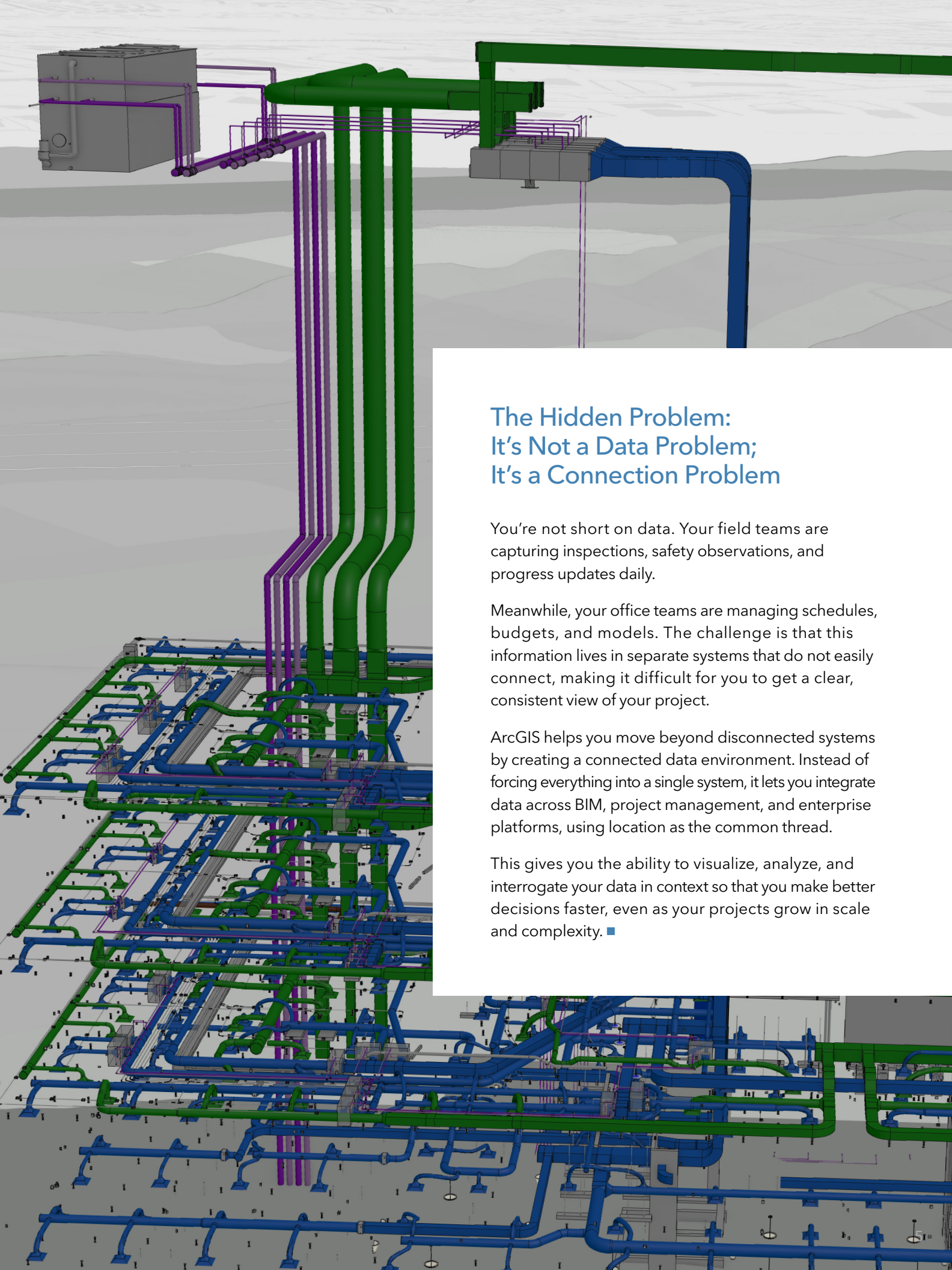
At the same time, you are generating more data than ever across field operations, design systems, and project controls. The reality is that most of that data goes unused. It sits in different systems, in different formats, and lacks the structure needed to support day-to-day operations.

The issue isn't data availability. It's that the data is not connected, not spatially organized, and not ready to inform decisions when and where they matter. That gap between what your teams know and what they can act on continues to widen.

This is where ArcGIS comes into focus. When we talk about context, we are not talking about another layer of data. We are talking about understanding what is happening, where it is happening, and how it connects to everything else on the jobsite and beyond.

ArcGIS brings together data from across systems and ties it to a shared geographic framework, giving you a live operational view of your projects. With ArcGIS, you can break the cycle of disconnected systems and establish a foundation for how construction data is managed and used going forward. ■





The Hidden Problem: It's Not a Data Problem; It's a Connection Problem

You're not short on data. Your field teams are capturing inspections, safety observations, and progress updates daily.

Meanwhile, your office teams are managing schedules, budgets, and models. The challenge is that this information lives in separate systems that do not easily connect, making it difficult for you to get a clear, consistent view of your project.

ArcGIS helps you move beyond disconnected systems by creating a connected data environment. Instead of forcing everything into a single system, it lets you integrate data across BIM, project management, and enterprise platforms, using location as the common thread.

This gives you the ability to visualize, analyze, and interrogate your data in context so that you make better decisions faster, even as your projects grow in scale and complexity. ■

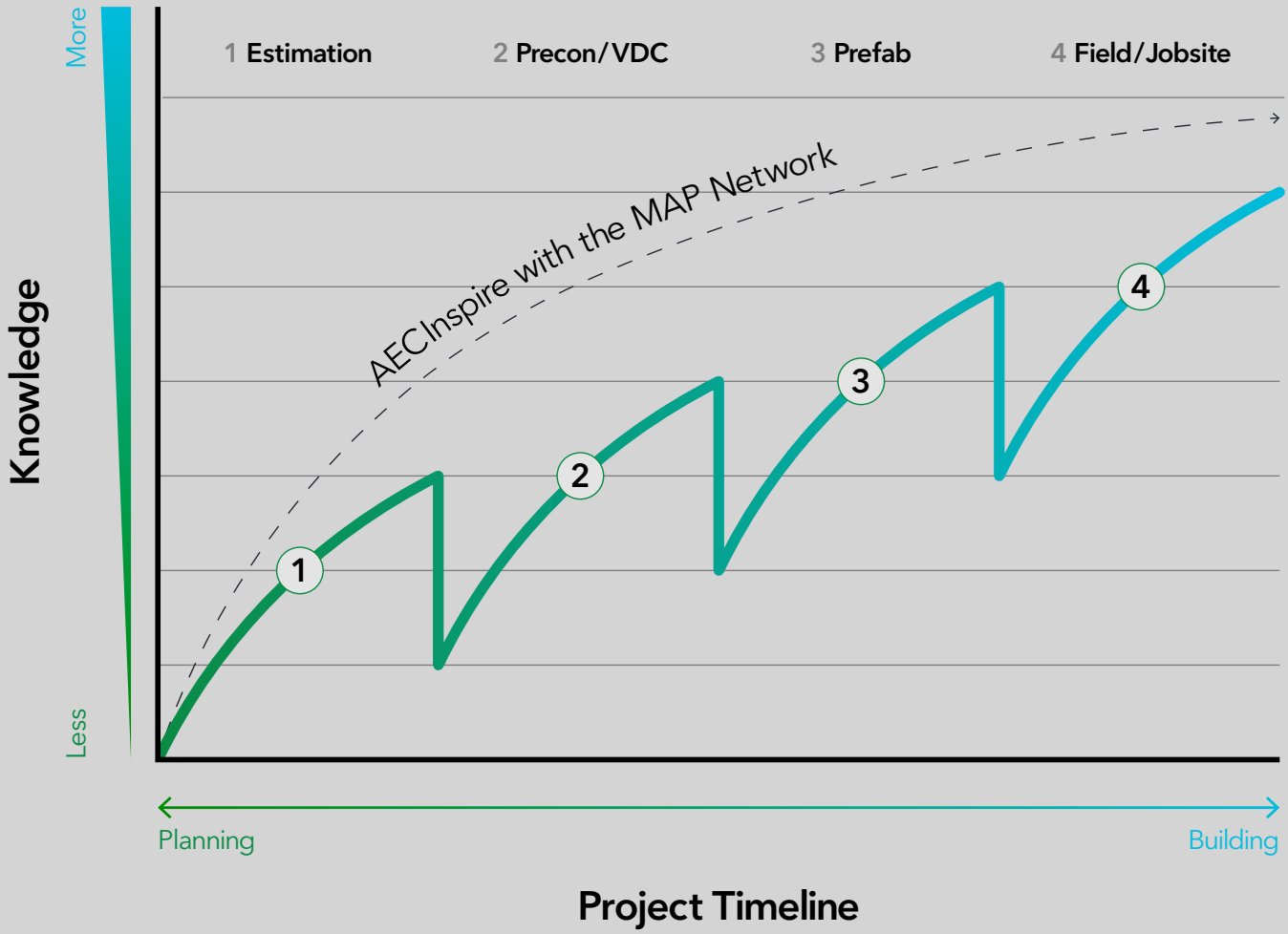


The Business Impact: Where Projects Break Down

You've likely heard that on any construction project, you can only optimize for two out of these three priorities: cost, schedule, and quality. When your data is fragmented, that trade-off becomes unavoidable. Rework driven by outdated information, delays caused by misalignment, and slow decision-making all push projects off track, forcing teams to sacrifice one priority to protect another. That has been accepted as the norm, but it doesn't have to be.

When project data is connected and accessible in real time, you start to change that. With ArcGIS, you can move beyond static reporting and bring live, location-based visibility into your operations through dashboards and digital twins. Instead of reacting to issues after the fact, you can track progress, monitor risks, and understand exactly where problems are emerging across the jobsite.

This shift allows you to act earlier, coordinate teams more effectively, and reduce the conditions that lead to rework and delay. The result is not just incremental improvement but a different level of control over cost, schedule, and quality. The key takeaway is simple: When your data is connected and operational, you are no longer forced to choose between competing priorities. You are equipped to deliver on all three. ■



The Life Cycle Reality: Data Created Everywhere, Connected Nowhere

Across your projects, important data is created at every phase, from planning and design through construction and handover. But as teams transition between stages, that information is often lost or re-created, a pattern commonly illustrated by the "sawtooth" data-loss curve. Each handoff forces teams to rebuild knowledge, leading to inefficiencies, gaps in understanding, and missed opportunities to use the data that was already created.

ArcGIS provides a way to maintain continuity across the life cycle by anchoring data to location. In practical terms, this means tying information to a specific place so that it remains usable, traceable, and connected as the project moves forward. Instead of disconnected files and systems, you maintain a consistent, shared view of what has been designed, built, and verified in the field.

This approach reduces duplication, preserves institutional knowledge, and ensures that construction data is not lost at handover. The result is a smoother transition into operations, where owners receive data that is complete, structured, and ready to support long-term asset management rather than starting from scratch. ■



Why Today's Tools Can't Solve the Problem Alone

You rely on a range of tools to deliver projects, from BIM platforms to scheduling and project management systems. Each of these tools plays a critical role, but most focus on the *who*, *what*, and *when* of construction. What's often missing is the *where*. It's something you were taught early on, but in practice, it's the piece that gets lost across disconnected systems.

ArcGIS fills that gap by bringing location into the equation. It connects your design models, schedules, and field data to the physical jobsite, so you can see exactly where work is happening, how it aligns to plan, and how conditions are changing in real time. Instead of interpreting data in isolation, you understand it in relation to the site, the sequence, and the surrounding environment.

The result is a more complete, shared view of the project, one that ties digital plans to actual progress in the field. When you bring the *where* back into your workflows, you move from managing disconnected tools to managing the jobsite as a coordinated, living system. ■



Why the Industry Has Struggled to Solve This

As you adopt new technologies, you have likely seen how solutions tend to focus on specific phases of a project rather than the full life cycle.

Planning, design, construction, and operations often operate as separate workflows, making it difficult to maintain a consistent flow of information.

ArcGIS helps you break out of that pattern by providing a connecting framework built around location. It connects systems and workflows without requiring you to replace what you already use.

This lets you align teams around a shared location-based understanding of the project, improving coordination and reducing the friction that comes from disconnected processes. ■





Why Location Changes Everything

Every activity, asset, worker, and issue you manage exists somewhere on your project. Location is the one constant that ties everything together, whether you are tracking high-level progress or drilling into detailed inspections.

ArcGIS uses location as the foundation for organizing your data. This lets you visualize complex information in a way that is intuitive and actionable.

You move between levels of detail, understand how work relates to specific areas of the site, and connect design intent to field execution.

This spatial clarity helps you make better decisions and communicate more effectively with your teams. ■



The Role of a Location-Based System

With ArcGIS, you are working within a true location-based system that brings together field, office, and external data into a single environment.

You capture data in the field in real time; connect it to BIM and project systems; and visualize it through maps, apps, and dashboards that are easy for everyone on your teams to use.

This lets you create live project dashboards and digital twins that reflect current conditions on-site. You monitor progress, track safety and quality issues, and respond to risks as they develop.

Because everyone is working from the same, up-to-date information, you improve coordination and reduce the likelihood of miscommunication. ■

From Insight to Execution: A Connected, Scalable Approach

To consistently deliver successful projects, you need workflows that stay connected from preconstruction through execution and handover. ArcGIS helps you maintain that connection by integrating your data and processes across every stage of the project.

You start with a single project and scale across your organization, integrating ArcGIS with your BIM, enterprise resource planning (ERP), and project management systems. This gives you standardized, repeatable workflows that improve efficiency and reduce risk.

By connecting field and office data, enabling real-time dashboards, and supporting proactive decision-making, ArcGIS helps you deliver projects with greater predictability and stronger outcomes. ■





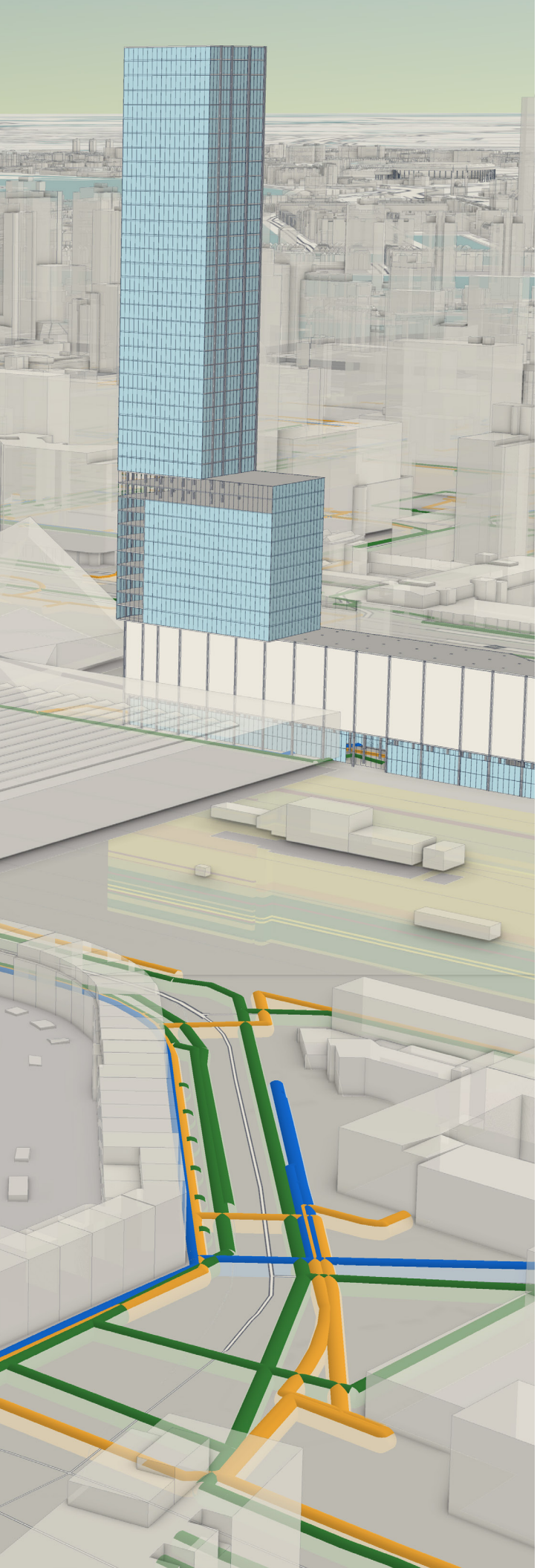
Building the Future of Construction

If you continue operating with disconnected data and fragmented workflows, the cost grows across every project you deliver. You see it in rework, delays, missed opportunities, and the constant need to reconcile information across systems.

Maintaining the status quo makes it harder to meet growing expectations for transparency, speed, and predictability. As project complexity increases, the risks tied to disconnected data only become more significant.

With ArcGIS, you have an opportunity to take a different approach. Forward-looking firms are already using location-based systems to connect field, office, and external data into a unified environment.

By doing this, you create a shared operational view of your projects, improve coordination across teams, and move toward more predictable outcomes. This is how you begin to transform project delivery: by making it more efficient, more connected, and more aligned with the realities of how work gets done in the field. ■



Partnering with Esri

Construction workflows depend on a network of technologies, partners, and systems that need to work together. This is where Esri's partner ecosystem plays a critical role. Rather than replacing the tools your teams rely on, Esri® technology works alongside them, helping you connect data, workflows, and teams across the full project life cycle.

A key example is Esri's strategic relationship with Autodesk, whose platforms are foundational for design, modeling, and construction coordination across the industry. Together, Esri and Autodesk are driving the convergence of BIM and GIS, allowing you to connect detailed design models with real-world conditions in a way that improves decision-making, from planning through construction and into operations. This integration helps bridge the gap between design and field execution, giving teams a more complete and actionable view of the project.

Esri partners include a wide range of construction-focused companies, from reality capture and drone providers to engineering firms, data integrators, and digital twin specialists. These partners bring domain expertise, services, and specialized solutions that extend ArcGIS into real-world construction workflows.

The result is not just better technology but a more connected and scalable approach to project delivery, where every stakeholder contributes to a shared, data-driven understanding of the jobsite and the asset being built. ■

Read the AtkinsRéalis Case Study

Learn more about Autodesk

Watch the Skanska video



Call to Action

You start bringing your projects into focus by using ArcGIS to connect your field data, office systems, and external sources within a single, unified environment. When your data is connected through location, you gain a clearer understanding of what is happening across your project and make better decisions at every stage.

With ArcGIS, you move from a reactive approach to a proactive one. Real-time visibility into site conditions and progress lets you identify issues early and act with confidence. You establish a shared understanding across all stakeholders by anchoring everything to location, creating clarity and context where it matters most.

Break down silos and align your teams around a location-based view of the project.

Ensure that everyone is working from the same reliable information, improving coordination and driving better outcomes. ■



Start with a Foundation

The future of construction is not built on more disconnected software, reports, or spreadsheets. It is built on connection.

From drones capturing site status to dashboards tracking progress to BIM models, digital twins, and field crews working from the same trusted source of information, leading construction companies are proving that a better way is possible.

ArcGIS provides the foundation that brings these workflows together, connecting drawings, models, schedules, costs, materials, inspections, sensors, and workers' activities in the context of the real world.

The opportunity is here to simply manage projects and to connect the people and the information they need. With GIS, better decisions lead to better outcomes for every project you deliver. ■



Case Study

GIS Imagery for Sustainable Construction

La Cima Development

Challenge: Needed real-time data and imagery for construction monitoring and environmental stewardship

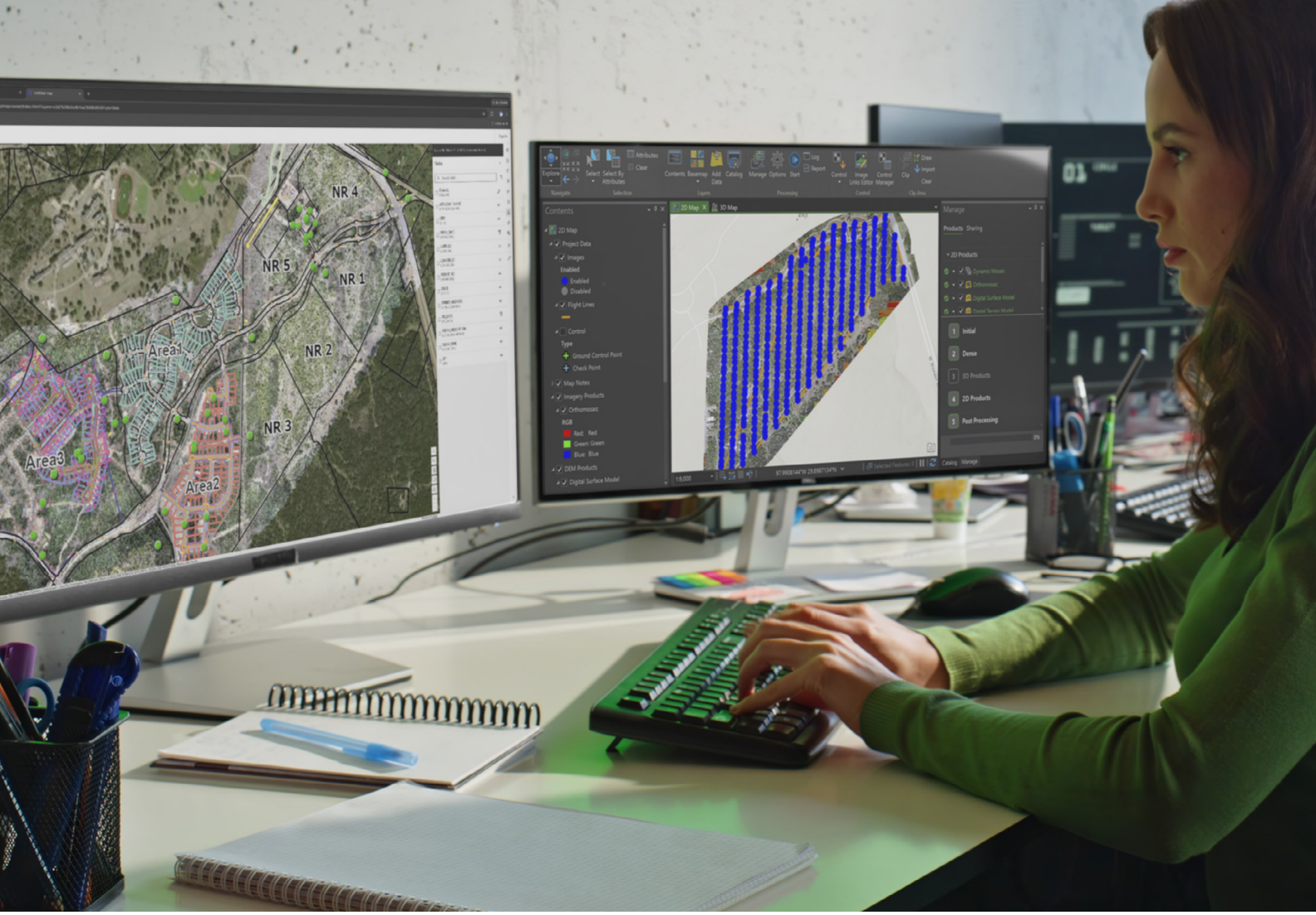
Approach: Used ArcGIS Online, drones, and Global Navigation Satellite System (GNSS) technology for mapping, progress tracking, and communication

Outcome: Enabled real-time site monitoring, improved validation, and supported sustainable development

Key takeaway: GIS and drones help mid-market teams manage projects and environmental oversight efficiently.

Natural Development Austin leverages GIS and drone-based imagery at La Cima to create a real-time, shared view of construction progress, improving coordination, visibility, and execution across a large-scale planned community.

On the La Cima development in Texas, Natural Development Austin, LLC, faced the challenge of managing a 2,400-acre, multiphase construction program while maintaining clear visibility across a distributed team of stakeholders. With ongoing work, large volumes of survey data, and the need to validate construction progress, traditional workflows lacked the ability to provide reliable, near real-time insight into site conditions and performance. ▶



La Cima Development (continued)

> By switching to ArcGIS Online, we were able to provide our client 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

To address this, the project team implemented a GIS-driven construction management system that combined drone imagery, GNSS data, and ArcGIS software-based web mapping. Weekly unpiloted aerial vehicle (UAV) flights and high-resolution orthomosaics were integrated into a centralized platform, allowing teams to monitor progress; verify as-built conditions; and share accurate site information with contractors, engineers, and project stakeholders.

The result was improved transparency, faster coordination, and better-informed decision-making throughout the project life cycle. The key takeaway is that by creating a shared, spatially enabled view of the jobsite, Natural Development Austin demonstrated how integrating GIS and reality capture can streamline construction management, reduce uncertainty, and provide a scalable foundation for delivering large community developments more efficiently. ■

Read the full story



Case Study

Real-Time Project Visibility

Hip Hing Construction

Challenge: Disconnected BIM, field, and stakeholder data with slow, manual reporting

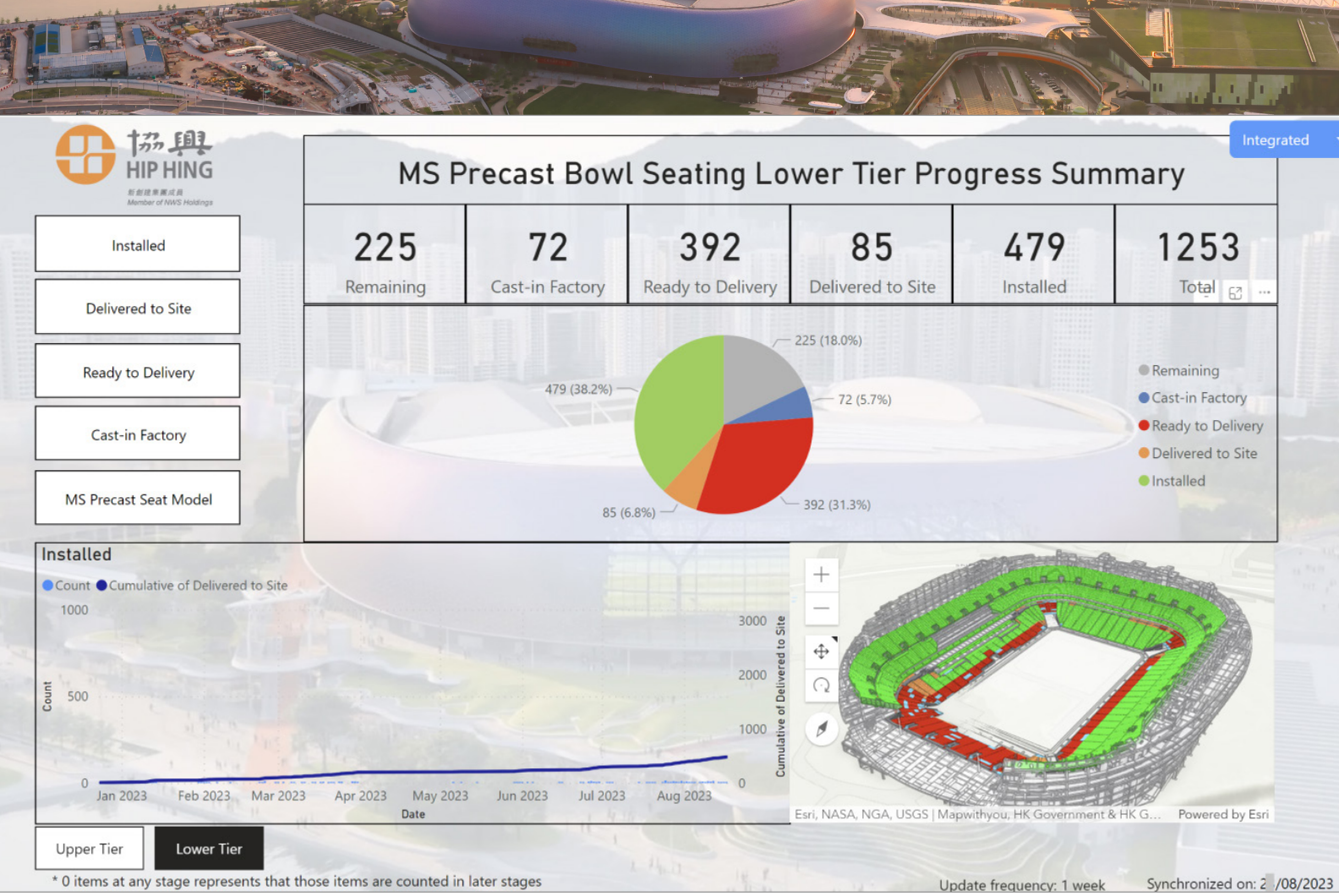
Approach: Centralized platform integrating ArcGIS and BIM with real-time dashboards

Outcome: Reduced reporting time by up to 90 percent

Key takeaway: Real-time visibility becoming the foundation for project-wide alignment.

Hip Hing Construction uses a GIS- and BIM-integrated approach to bring real-time spatial intelligence into complex urban projects, improving coordination; reducing risk; and driving more efficient, resilient construction outcomes.

On various projects across Hong Kong, Hip Hing Construction faced the challenge of coordinating large amounts of project data while maintaining visibility across design, construction, safety, and environmental conditions. In dense urban environments, disconnected systems made it difficult to manage workflows, anticipate risks such as flooding or extreme weather, and keep teams aligned as projects progressed. ▶



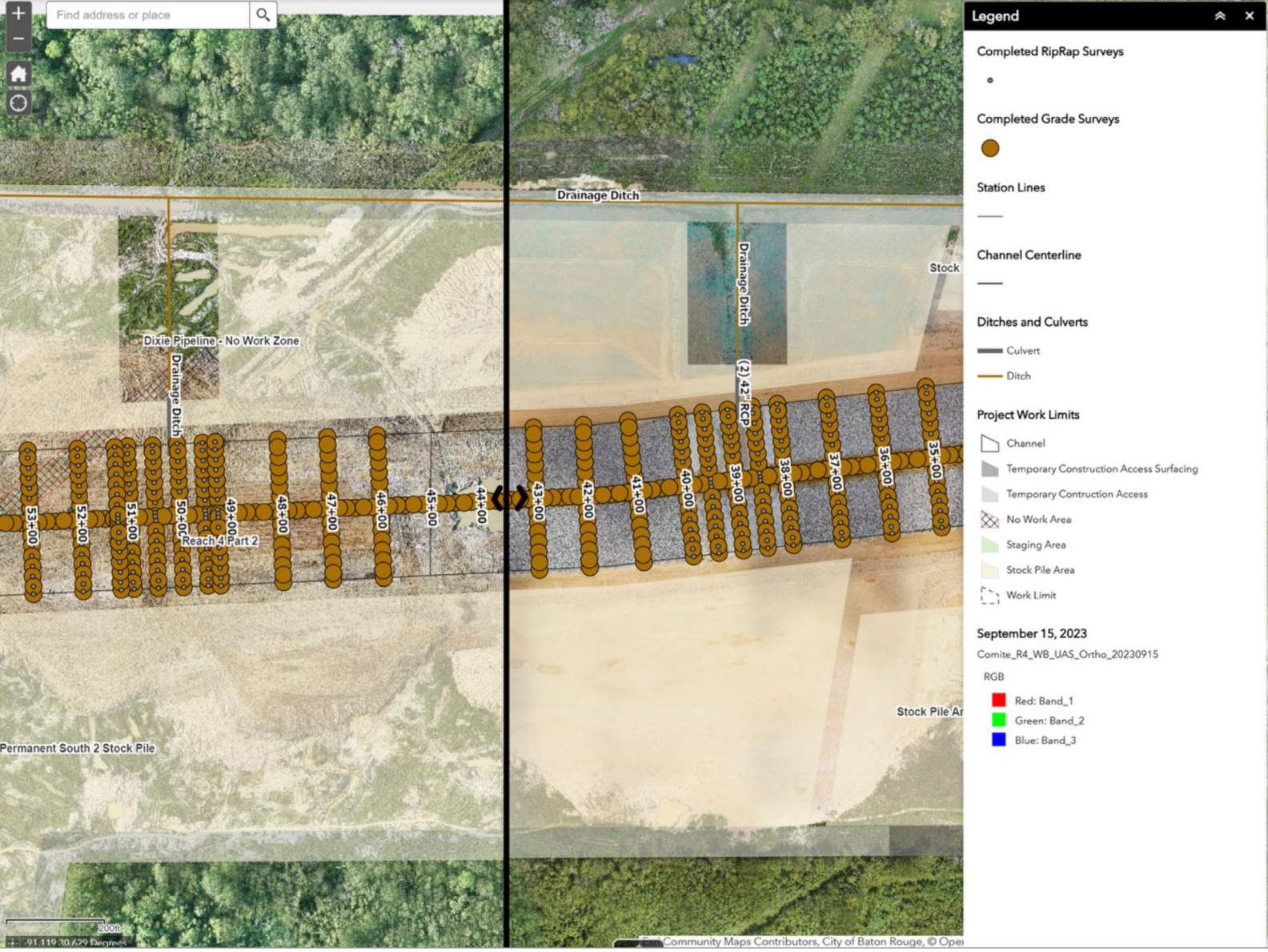
Hip Hing Construction (continued)

To address this, Hip Hing implemented a spatially enabled approach by tightly integrating GIS with BIM to create a connected, data-driven construction environment. Using ArcGIS, the team built centralized platforms and 3D visualizations that combined project data with real-world context, allowing staff to monitor progress, analyze environmental risk, and improve coordination across stakeholders. This approach enabled predictive analysis, including identifying flood-prone areas and simulating site conditions, giving teams better insight during both planning and execution.

The outcome was improved decision-making, streamlined workflows, and measurable gains in efficiency and cost management across projects. With real-time visibility into site conditions and performance, Hip Hing Construction strengthened safety oversight and optimized resource planning. The key takeaway is that Hip Hing Construction demonstrates how combining GIS and BIM into a unified digital environment gives contractors the situational awareness needed to reduce risk; improve collaboration; and deliver more resilient, high-performing projects in complex urban settings. ■

> "This integrated spatial platform ensures comprehensive project oversight, enabling our teams to predict and monitor progress, identify issues, and make informed decisions before physical construction begins."
>
> —**Billy Wong**, General Manager of Construction Digitalization, Hip Hing Construction

Read the full story



Case Study

Streamlined Environmental Projects with Connected GIS

ES2

Challenge: Disconnected environmental, field, and engineering data

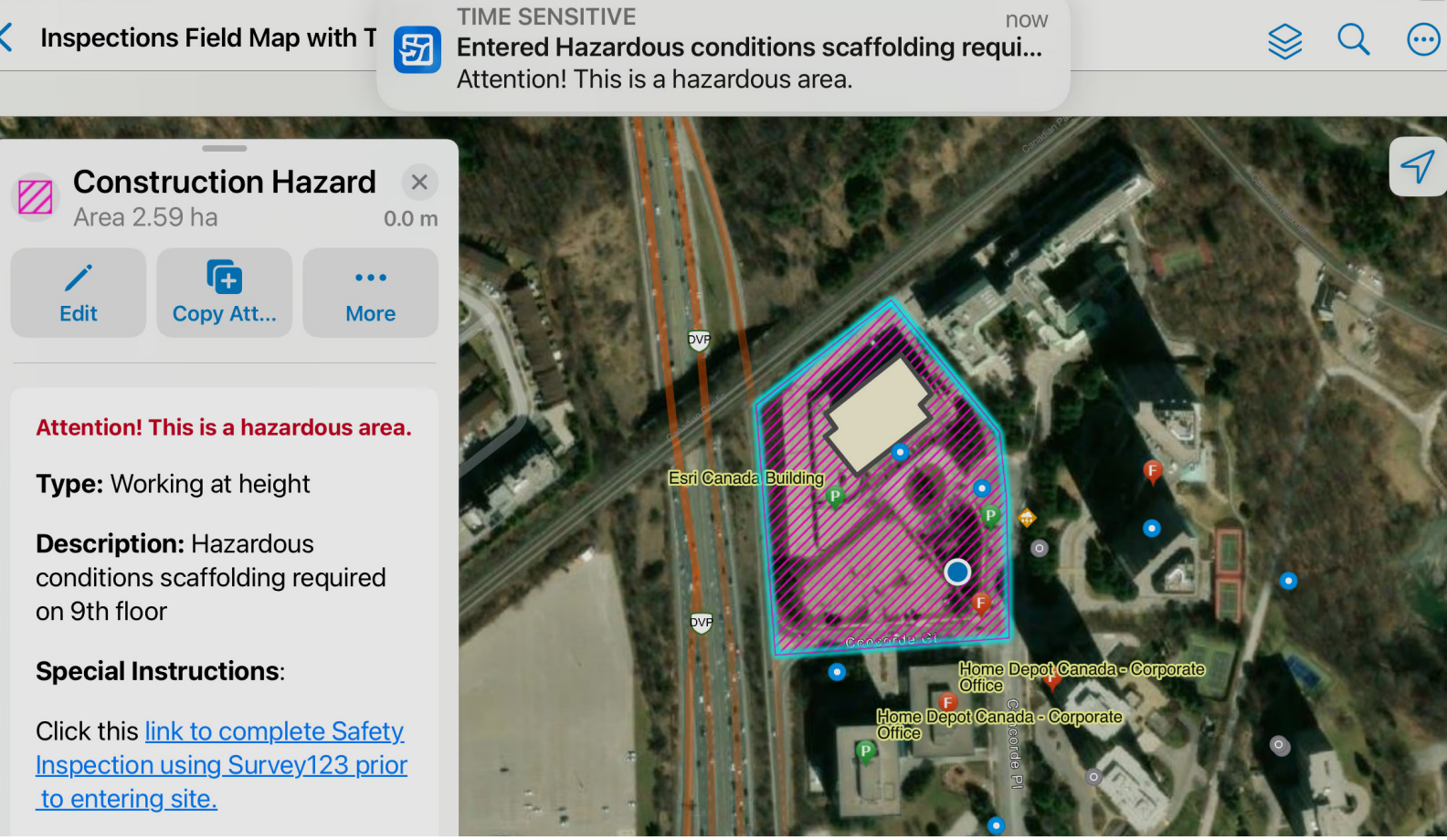
Approach: ArcGIS software-driven, location-based data integration

Outcome: Faster field capture, improved coordination, scalable delivery

Key takeaway: GIS as a foundation for efficient, data-driven environmental projects.

Case Study: ES2 helped the US Army Corps of Engineers (USACE) transform fragmented project data into a single, real-time operational view, giving stakeholders unprecedented visibility across complex infrastructure programs. By combining drone technology, surveying expertise, and ArcGIS, ES2 enabled smarter decisions, stronger coordination, and more efficient project delivery. ■

Read the full story



Case Study

Confidence Through Site Visibility

PCL Construction

Challenge: Keeping pace with changing site conditions

Approach: Combining reality capture with GIS

Outcome: Improved decision-making and project predictability

Key takeaway: Reality capture and GIS-driven confidence.

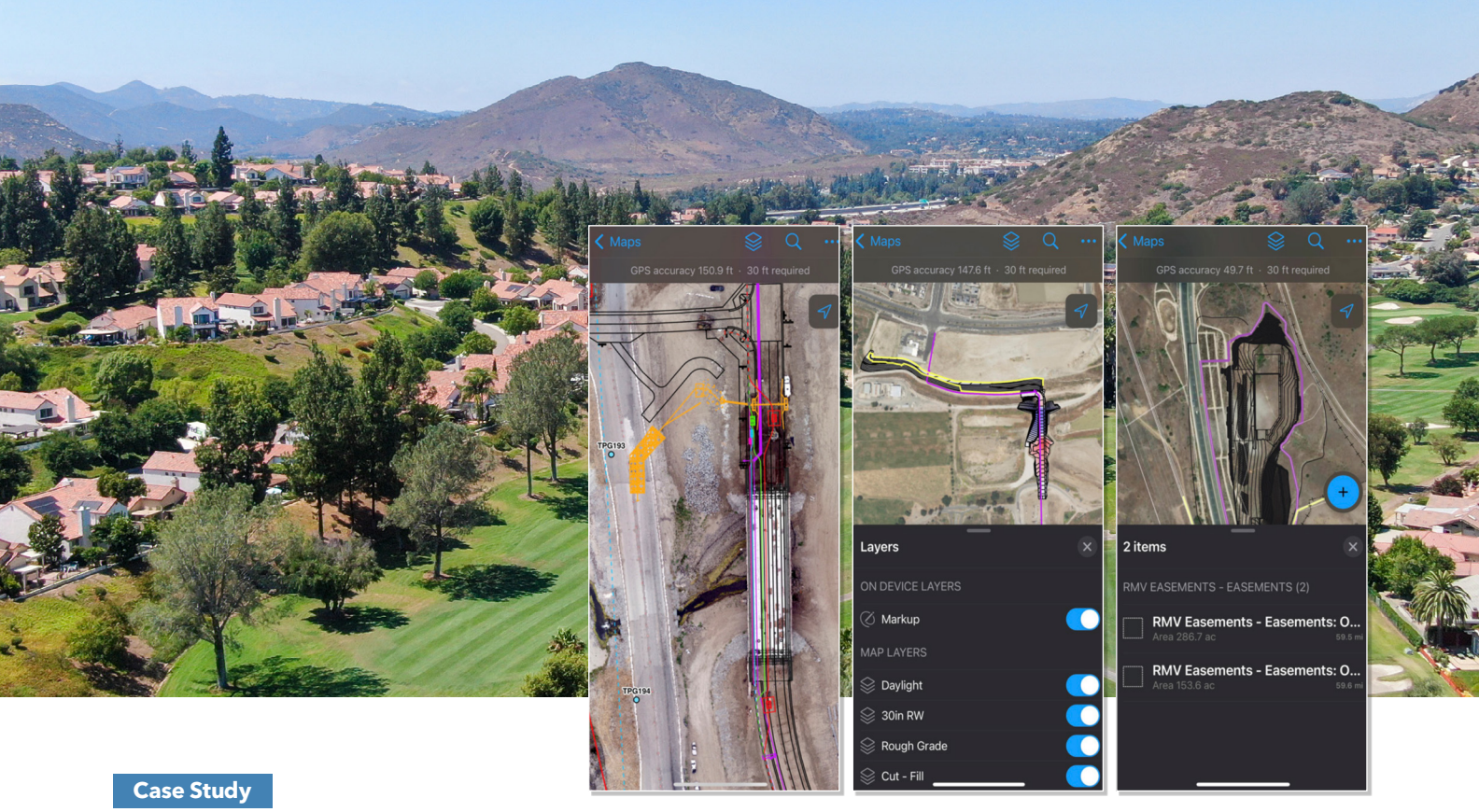
PCL Construction uses drone-based reality capture and GIS to create a real-time, data-driven view of the jobsite, improving coordination, reducing uncertainty, and delivering more predictable outcomes on complex projects.

On the new St. Paul's Hospital project in Vancouver, Canada, PCL Construction faced the challenge of keeping teams aligned as site conditions changed daily. Traditional reporting and static plans made it difficult to track progress; coordinate trades; and respond quickly to issues across a large, complex jobsite.

PCL Construction addressed this by combining drone-based reality capture with a GIS-driven site model that was continuously updated. High-resolution imagery and elevation data provided a shared, near real-time view of the site, enabling teams to monitor excavation, analyze material volumes, and optimize logistics and sequencing with greater confidence.

The result was faster, more informed decision-making and improved control over critical activities like excavation and concrete placement. The key takeaway for contractors is that firms like PCL Construction are demonstrating how integrating reality capture with GIS can reduce uncertainty, improve coordination, and deliver more predictable outcomes on complex projects. ■

Read the full story



Case Study

TurnPoint Geomatics Uses Esri GIS at Rancho Mission Viejo

TurnPoint Geomatics

Challenge: Aligning complex land development activities

Approach: Creating a GIS-based source of truth

Outcome: Improved accuracy and project transparency

Key takeaway: GIS improves coordination and accountability.

TurnPoint Geomatics leverages GIS-driven workflows at Rancho Mission Viejo to create a single source of truth for construction and land development, improving accuracy; coordination; and confidence across complex, large-scale projects.

For Rancho Mission Viejo's Ranch Plan, TurnPoint Geomatics faced the challenge of managing a massive, multiyear land development effort while keeping contractors, survey teams, and stakeholders aligned. Traditional tools made it difficult to coordinate grading, utilities, and environmental constraints while also maintaining the level of accuracy required for construction verification and contractor payments. On a site of this scale, with ongoing changes and strict requirements, having a single, reliable source of truth became critical.

TurnPoint addressed this by embedding GIS into daily construction and survey operations. By combining frequent drone flights, high-resolution imagery, and survey data within a centralized GIS environment, the team created a site-specific system that supported everything from layout and inspection to billing verification and logistics planning. Field crews used GIS to locate and manage control points, while project teams relied on dynamic maps during coordination meetings to visualize utilities, grading, and property boundaries in real time.

The outcome was a more efficient and transparent construction workflow, where work quantities could be verified quickly, site conditions were always up to date, and decisions were grounded in accurate field data. The key takeaway is that TurnPoint Geomatics demonstrated how integrating GIS into construction operations can improve accountability, streamline coordination, and give project teams the confidence to execute complex land development work with greater precision and control. ■

Read the full story



Case Study

Sustainable and Efficient Project Delivery

ACCIONA

Challenge: Increasing demand for sustainability and life cycle efficiency

Approach: Using ArcGIS to optimize construction efficiency and support sustainability goals

Outcome: Enabled greener, more efficient infrastructure delivery at scale

Key takeaway: Location intelligence supports both efficiency and sustainability across the life cycle.

> "If GIS can help avoid utility service strikes or finish a construction project ahead of schedule, then our AEC users make better financial returns."
>
> —**Peter Wilmot**, Senior Account Executive, Esri Australia

ACCIONA embeds GIS at the core of its tunneling operations to unify fragmented data; improve coordination; and deliver more efficient, transparent, and predictable infrastructure outcomes.

Across major infrastructure projects in Sydney, ACCIONA faced the challenge of managing highly complex tunneling operations using fragmented, nonspatial data sources. Critical workflows such as excavation tracking, property condition surveys, and environmental monitoring relied on static reports and spreadsheets, making it difficult to visualize progress, coordinate teams, and respond quickly to risks in dense urban environments.

ACCIONA addressed this by embedding GIS at the core of project delivery, integrating ArcGIS into the company's tunneling and infrastructure workflows. Static reporting was replaced with real-time, map-based dashboards that visualized excavation progress, geotechnology conditions, and machine performance, while property ▶



ACCIONA (continued)

surveys and environmental data were centralized into interactive, spatially enabled systems. This created a shared operational picture across field and office teams, improving coordination, visibility, and decision-making throughout the project life cycle.

The outcomes included faster more informed decision-making; improved coordination across stakeholders; and stronger environmental compliance and risk management. By shifting from disconnected systems to a geospatially integrated approach, ACCIONA improved efficiency, reduced errors, and enhanced transparency across its projects. The key takeaway is that making GIS a core part of the construction workflow enables contractors to better manage complexity, align teams around a single source of truth, and deliver infrastructure projects with greater precision and confidence. ■

> “The ability to share data and the GIS insights across regions, time zones, and countries is invaluable. It means we bring the best people to the project no matter their location, all through the power of location intelligence and integration with other systems such as BIM.”
>
> —**Leon Bowers**, National GIS Manager for ACCIONA

Read the full story



Case Study

Pomerleau Builds Precision into Slipform Construction with BIM, GIS, and IoT

Pomerleau

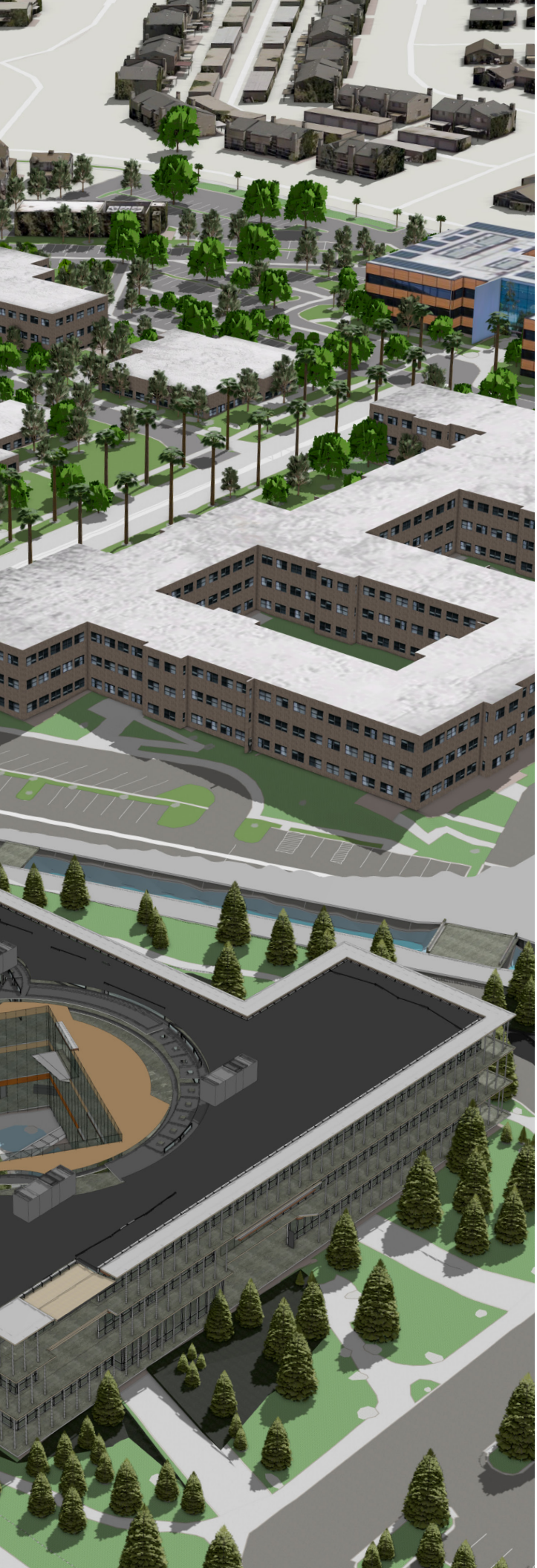
Pomerleau faced a significant coordination challenge during the construction of six 45-meter-tall concrete silos for the Ciment Québec project. Using slipforming, a continuous concrete-pouring method that ran nonstop for nine days, the team needed to accurately place hundreds of embedded steel plates and openings while managing 120 workers across rotating 12-hour shifts. With construction progressing around the clock, maintaining consistent communication and ensuring every team member had up-to-date information was critical to delivering a high-quality finished product.

To address this challenge, Pomerleau developed a detailed 3D BIM model of the silos and integrated it with Internet of Things (IoT)-enabled height sensors attached to the slipform system. Sensor data and construction models were combined within ArcGIS to create a live digital twin of the project, providing real-time visibility into concrete-pour progress down to the centimeter. Automated workflows not only continuously compared actual construction progress against design requirements but also generated notifications whenever the advancing concrete approached a planned opening or embedded component, ensuring field teams could take action at exactly the right time.

The result was a highly coordinated and data-driven construction process that improved communication, reduced uncertainty, and increased confidence across all shifts and stakeholders. By combining BIM, GIS, IoT sensors, and digital twin technology, Pomerleau demonstrated how integrated workflows can enhance quality control, streamline complex construction operations, and establish a new standard for precision and collaboration in large-scale concrete construction projects. ■

Read the full story

Read more about digital twins



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.

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