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Getting to Zero: Designing Safer Streets with GIS

District of Columbia mayor Muriel Bowser launched Vision Zero in 2015 to inspire and transform DC's roadway safety efforts and to set the city's sights on a goal of zero fatalities or serious injuries on district streets through more effective use of data, education, enforcement, and engineering. This strategy is supplemented by prioritizing policies and projects that provide the greatest benefits to neighborhoods with streets that have seen historic disinvestment and high numbers of vulnerable populations. As part of the Vision Zero program, the District Department of Transportation (DDOT) has shifted to designing streets that are safe for everyone, working closely with community members to identify problems and build solutions.

"We know our efforts must ever evolve by applying lessons learned and data-driven solutions, especially to our most vulnerable street users and populations," said DDOT director Everett Lott. "We also know the burden of traffic violence falls

disproportionately across DC, with Wards 7 and 8 hit hardest, and that's why we remain so keenly focused on equity."

Mayor Bowser's Vision Zero initiative started as an all-hands-on-deck approach to traffic safety. Through the mayor's FY 23 investments, more than a dozen of DC's most dangerous corridors have been made safer by reducing conflicts at 15 high-crash intersections, and school safety has also significantly improved through a major expansion to the district's school crossing guard program.

DDOT's Vision Zero 2022 Update involves collaboration among 30 district agencies, with 5 key agencies deeply involved and the Metropolitan Police Department serving an integral role.

A recently released Vision Zero 2022 Update focuses on centering equity in traffic safety

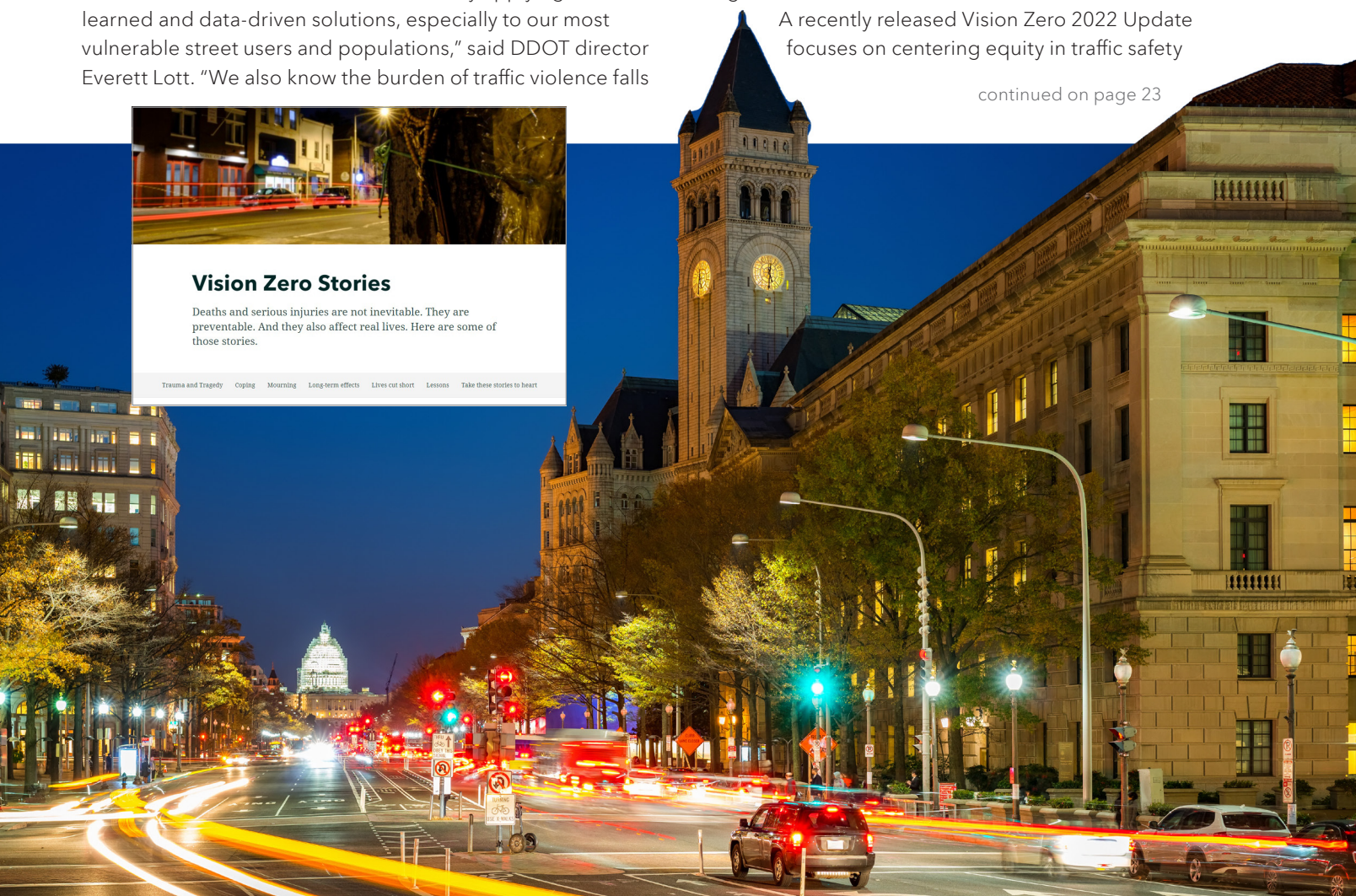
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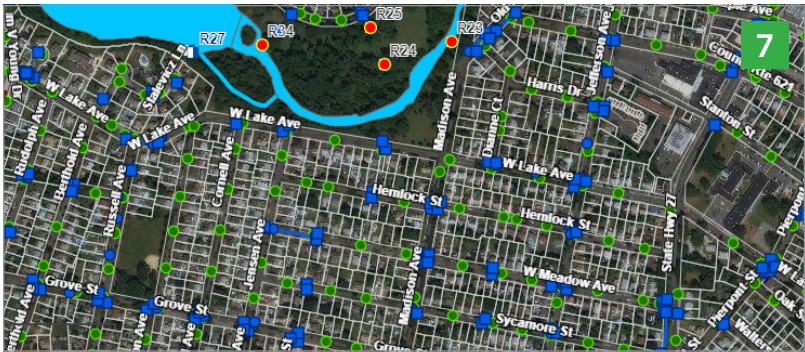


Vision Zero Stories

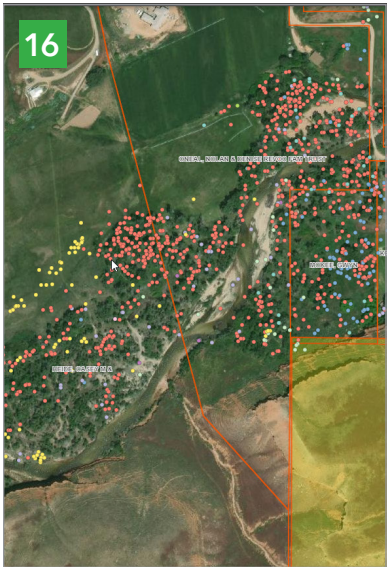
Deaths and serious injuries are not inevitable. They are preventable. And they also affect real lives. Here are some of those stories.

[Trauma and Tragedy](#) [Coping](#) [Mourning](#) [Long-term effects](#) [Lives cut short](#) [Lessons](#) [Take these stories to heart](#)

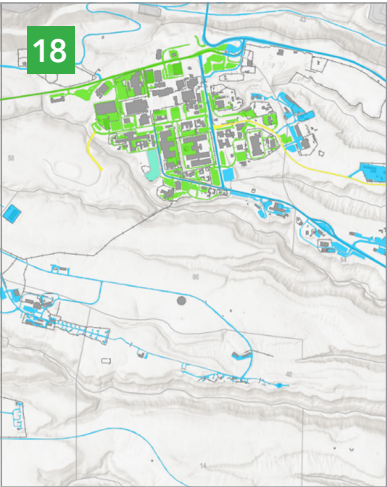




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Round Rock, Texas, Resolves Critical System Outages with Enterprise Monitoring Solution

A donut shop that sells a two-pound donut; Dell Diamond, which showcases the talents of future baseball stars; and America's largest indoor water park are all features of the vibrant city of Round Rock, Texas. This municipality, located 15 miles north of Austin, is one of the fastest-growing towns in America and one of the safest cities with a population of at least 100,000. The city also has an award-winning park system and school district.

The local government of Round Rock is responsible for providing the essential services that make the city run efficiently and keep residents and businesses moving, including wastewater, transportation, public works, and public safety. There are 15 departments of the city offices, and the geospatial services team in the information technology (IT) department provides geographic information system (GIS) services to internal personnel. This includes data management and quality checks, web application development, cartographic services, and maintenance of the geospatial infrastructure that supports these services.

After experiencing frequent system outages in their ArcGIS Enterprise deployment, the geospatial services team members wanted a solution that would enable them to proactively resolve technical issues. The team members deployed ArcGIS Monitor, a tool designed to monitor the health of an enterprise GIS. This has enabled them to not only resolve outages before help desk tickets are even received, but also provide city employees the reliable data they need to successfully do their job.

Challenge

The enterprise GIS for the City of Round Rock includes one production and one test environment, each with 12 servers. According to Nathan Smith, IT manager of geospatial services for the City of Round Rock, frequent outages and other technical issues were continually occurring within the system. The help desk system the group had in place received tickets from staff to resolve issues—for example, not being able to access web applications. The geospatial services team would have to conduct some root cause analysis to troubleshoot the issue and determine if it was something at the server or database level. As such, the small team of four wouldn't know if part of the enterprise GIS was down until after the problem occurred, which led the organization to be more reactive than proactive. Smith says, "We weren't thrilled with the downtime because we have high standards here."

In addition, Smith says the team members wanted to quantify their success with resolving issues through key performance indicators (KPIs), so they wanted a solution that would give them metrics on system performance. He says that senior leaders at the City of Round Rock may not be able to dig into the finer details of the department's work, so showing them KPIs that indicate the team's successes is crucial.

"We weren't really able to quantify any system downtime. It's difficult to portray success when you aren't able to quantify or have metrics," says Smith. "Whether it was human error or an automated task that just broke something, we wanted to get a better handle on that."

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Solution

Smith wanted a new solution to help the geospatial services team better manage and address system outages, and he knew exactly what product could help: ArcGIS Monitor. ArcGIS Monitor is designed to collect, analyze, and optimize the health of enterprise GIS implementations throughout its life cycle. Smith, a former Esri employee in support services, was familiar with Monitor and its capabilities and felt its ability to measure availability and uptime could be valuable.

Staff at Round Rock try to be up-to-date technologically. “When I recognized the problem, I didn’t have to consider other options,” says Smith. “And because of all those frequent run-ins that we had with servers being down, I wanted to be able to quantify those outages.”

Smith says deploying the solution was quick and easy and referenced available documentation to do a lot of the setup himself while also utilizing the Esri Advantage Program for assistance. Smith worked with the assigned Esri consultant to complete the setup. He recommends the program for anyone who may need technical help or doesn’t have the time or resources to deploy software.

Smith and the team now receive reports weekly with different system metrics, like peak-hour transactions, using the Excel Report Task add-in. Smith explains that the reports provide a high-level overview of the metrics as well as the option to get more detail.

“This is our number one reporting tool right now for Monitor: the Excel report add-in. My system administrator will review [reports], and she will notify me of anything that really stands out to her,” says Smith.

The geospatial services team members receive alerts from Monitor via an email or a ticket in the help desk system, which allows them to immediately investigate the issue. Smith also checks Monitor throughout the day to ensure that the test and production environments are functioning.

“Availability is important. If I see that we’re healthy but like maybe there’s one little exclamation point [on the Monitor dashboard], I want to know about that and see why something happened. And then, if we do have any active alerts, I’m checking those consistently,” says Smith.

Results

The deployment of ArcGIS Monitor has helped the geospatial services team reduce the number of tickets related to outages and better monitor the health of the entire enterprise GIS, which includes around 280 web services. According to Smith, the process of troubleshooting has been streamlined because Monitor does the root-cause analysis and tells the team immediately what’s wrong, eliminating the guesswork. Previously, Smith says he’d have to check multiple things, like every tier of the GIS, to determine the cause of a problem.

“I don’t have to investigate and troubleshoot for 15 or 30 minutes anymore, looking at logs, trying to decipher all of those. We are definitely more efficient because of it,” says Smith. “It’s saved a significant amount of time and money when it comes to troubleshooting.”

Monitor also enables the team members to quantify their success through KPIs. Smith says the solution shows their average uptime as far as availability and provides data for many areas such as how busy the web services are. The team can also set up counters for performance.

In addition to details on RAM, CPU, and data storage, Monitor offers geospatial context to the team’s data by giving metrics like how many transactions have occurred on a specific web service or the average response time when a call is made. Smith says the previous system was not able to tell him the “nitty-gritty details at the geospatial level.”

“So getting metrics on things that are important to us as providers of geospatial services was definitely taking it to the next level for us,” says Smith.

The use of Monitor has increased transparency within the City of Round Rock and enables the geospatial services team to better communicate with upper management. Smith says the metrics displayed in an easy-to-read Monitor dashboard have helped make complex geospatial data easily understandable for managers as well as for other IT staff members.

“If you are in a division of IT as a GIS professional or geospatial [services] professional and you need to be able to communicate on their terms, this tool is essential in helping you do so,” says Smith. “You don’t have to be a geospatial



↑ Nathan Smith and team meet to discuss this week’s alerts reported by ArcGIS Monitor.

[services] professional to understand the Monitor dashboard and take a look at those numbers.”

Smith and the geospatial services team created a smart parking application—a mobile app with real-time data feeds—incorporating ArcGIS GeoEvent Server. The app integrates the team’s smart parking system with GIS, enabling residents to check parking availability in downtown Round Rock. The app is accessible on mobile devices or a desktop computer. The team members monitor the number and rate of transactions and have built an alert to become immediately aware if they’re not receiving enough input and output in GeoEvent Server, because that may mean the solution is down.

“This one’s been essential for us in understanding whether or not some of the real-time GIS offerings that we have out there are up and running. I don’t think we would be able to be as successful with our availability if we didn’t have [Monitor] configured,” says Smith.

Another useful Monitor add-on the team has taken advantage of is ArcSoc Optimizer. Smith explains that there are some services that the city hits regularly, and the team leverages the ArcSoc Optimizer add-on to ensure that those services are performant.

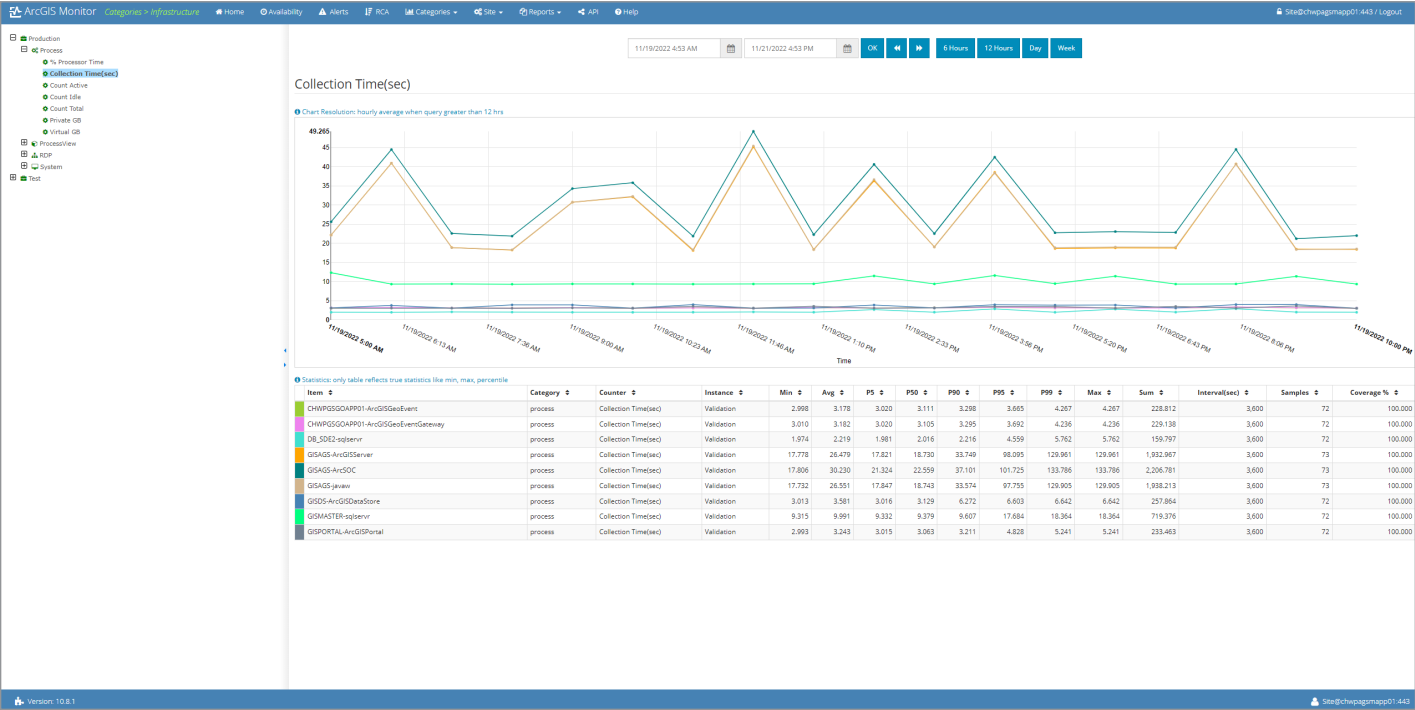
Finally, Monitor has helped deliver an improved user experience for city personnel and residents. For example, if the fire hydrant web service is down when public safety officials are trying to locate a hydrant, a person’s life could be at risk. This makes the work the team does more meaningful because supporting these services is crucial to running a city and keeping its residents safe.

“I love ArcGIS Monitor because it allows me to help my end users be more successful. We want to make sure that both the city staff and the citizens have access to those solutions that we provide through the ArcGIS system,” says Smith. “Monitor provides us a way of measuring that availability, that uptime, and that success.”

"Because we've been able to be more proactive than reactive, we've been able to address like 99.9 percent of all outages before we even get a help desk ticket. Monitor has helped us be more successful and more proactive since we deployed it."



—Nathan Smith, City of Round Rock



↑ The City of Round Rock monitors the activity of processes necessary to keep ArcGIS Enterprise components operational.



New Jersey City Ditches Paper Maps for ArcGIS Field Maps

Getting to Know Rahway, New Jersey

About 22 miles southwest of New York City, 30,000 residents call Rahway, New Jersey, home. Of Rahway’s 10 departments, the Code Enforcement Department and Engineering & Land Use Department are collectively responsible for the engineering, design, and inspection of everything from properties to rights-of-way. Within the Engineering & Land Use Department, the Engineering Division, in particular, regularly responds to internal and external information requests. Recently, the city created an initiative that would digitize and streamline such requests.

Adopting GIS to Modernize Response to Records Requests

Decades ago, Rahway’s engineers captured high-quality information while mapping the city’s sanitary sewer and stormwater systems, but there were challenges because the engineers did so on paper forms called “flat files.” Over time, these files became difficult to update, such as after routine work was completed by Rahway Department of Public Works (DPW). The flat files were also difficult to maintain and share. “The original engineering flat files contained terrific information,” said Jacqueline Foushee, former DPW director and current city business administrator. “But over time, they became difficult to interpret, share, and update. Each time they were fed in a scanner, for instance, their quality

deteriorated. Our goal was to get away from that, and we had always envisioned having an enterprise GIS.” Foushee received approval from Rahway mayor Raymond Giacobbe to implement an enterprise GIS throughout the city. Foushee identified the city’s upcoming municipal separate storm sewer system (MS4) inspections as the ideal project to start capturing information with the city’s GIS. **Ditching Paper for Mobile Maps** The city is required to inspect its stormwater outfalls every five years as part of the MS4 Tier A permit. The New Jersey Department of Environmental Protection (NJDEP) required all MS4 Tier A municipalities to map and submit their stormwater outfall locations in a digital GIS format by December 2020. Realizing the opportunity to populate Rahway’s new GIS, Foushee sought the help of Esri partner Colliers Engineering & Design (formerly Maser Consulting). With vast experience in municipal and utility GIS, Colliers was prepared not only to perform the inspections, but also to map the entire stormwater and sanitary sewer system in the process. “Prior to this, the information lived either on paper files or in a CAD system that wasn’t geospatially tied to reality,” Colliers project manager Michael Kolody said. In the past, Colliers had used ArcGIS Collector to map utility systems within enterprise geodatabases. But for this

project, Colliers staff saw an opportunity to migrate to the new ArcGIS Field Maps mobile application. In addition to the data-collection capabilities of Collector, Field Maps offered a mobile-worker tracking capability. Colliers staff members activated two supplemental tracking licenses, which allowed them to track their GIS technicians’ real-time locations. This added efficiency and safety to their process. “In the past, we might not have known if we had mapped the assets on a street or if there were simply no assets there,” Kolody said. “With Field Maps, we now have that tracking record to say that, yes, someone had surveyed that street and there was nothing there. We can also see where each technician ended their day, which provides an extra layer of safety and monitoring.” Training the two GIS technicians, who had already used Collector, took just a few minutes. A third, new employee was trained in under an hour. “There were more similarities between Collector and Field Maps than I expected,” Kolody said. The Colliers GIS team installed the Field Maps app on Apple iPads. Colliers chose iPad as its standard GIS data-collection tablet because of its familiar user interface as well as its stability in the field. To ensure that assets were collected with six-inch accuracy or better, the technicians used Bluetooth to pair Eos Arrow Gold Global Navigation Satellite System (GNSS) receivers to the iPads running Field Maps. Because the data collection took place in the northern part of New Jersey, the technicians could easily log in to the New York Department of Transportation (NYDOT)

public real-time kinematic (RTK) network to receive the survey-grade, satellite-based location corrections for the Arrow Gold receivers. Ninety-five percent of the data was captured within six-inch accuracy, while an impressive two-thirds of the collections had accuracy within one inch. “The combination of accuracy from the Arrow Gold, the seamless integration into ArcGIS Field Maps, and the iPad’s user-friendliness just made this an easy-to-adopt mapping solution,” Kolody said. “It’s a solution our mobile teams actually like to use.” About 130 storm drains located on the busy eight-lane Route 9 right-of-way were collected using the Eos Laser Mapping solution for ArcGIS. The solution included the Field Maps app, iPads, the Arrow Gold GNSS receiver, and a TruPulse 200X Laser Rangefinder from Laser Technology, Inc. This allowed a GIS technician to capture the storm drain locations from a safe distance off the highway while retaining accuracy. After mapping the locations of the stormwater outfalls in Field Maps, Kolody’s team performed the inspections required for the MS4 Tier A permit, using a form the team created in ArcGIS Survey123.

Providing a Flood of High-Quality Data to the City’s GIS In just a few days, one GIS technician was able to capture the majority of the 4,750 municipal surface assets (2,867 storm drains, 1,718 stormwater catch-basin inlets, and 160 outfalls). On a few occasions, two other GIS technicians assisted part-time.

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↑ As storm and sewer assets were captured with ArcGIS Field Maps and Eos Arrow Gold in the field, a dashboard created with ArcGIS Dashboards updated office personnel on what data had been collected in real time.

New Jersey City Ditches Paper Maps for ArcGIS Field Maps continued from page 7

Colliers also set up a dashboard, created with ArcGIS Dashboards. The dashboard enabled Foushee’s team to see the data-collection progress in real time.

“The dashboard was such a great addition,” Kolody said. “It allowed Jackie [Foushee] and her team to be able to review and visualize our progress in real time.”

After mapping all surface assets, Colliers used the data from the original paper surveys to digitize the subsurface assets (e.g., gravity mains) in the GIS.

“The information was good enough that we didn’t have to open [storm drains] to collect the data,” Kolody said. “This was the most cost-effective approach.”

Meanwhile, Foushee’s team digitized the legacy flat files and made them searchable by keyword (e.g., street name) so that the team can always retain a copy of the historical surveys within the new GIS.

The next phase will be to create web maps that expose the data for internal and external use.

“Now that we have a complete, geospatially accurate inventory of the stormwater and sanitary sewer system, our next step is to explore the best practices for sharing this information,” Kolody said.

Foushee is excited to see the efficiencies gained from other departments’ accessing information via web maps, rather than having to call and request paper file scans or manual updates.

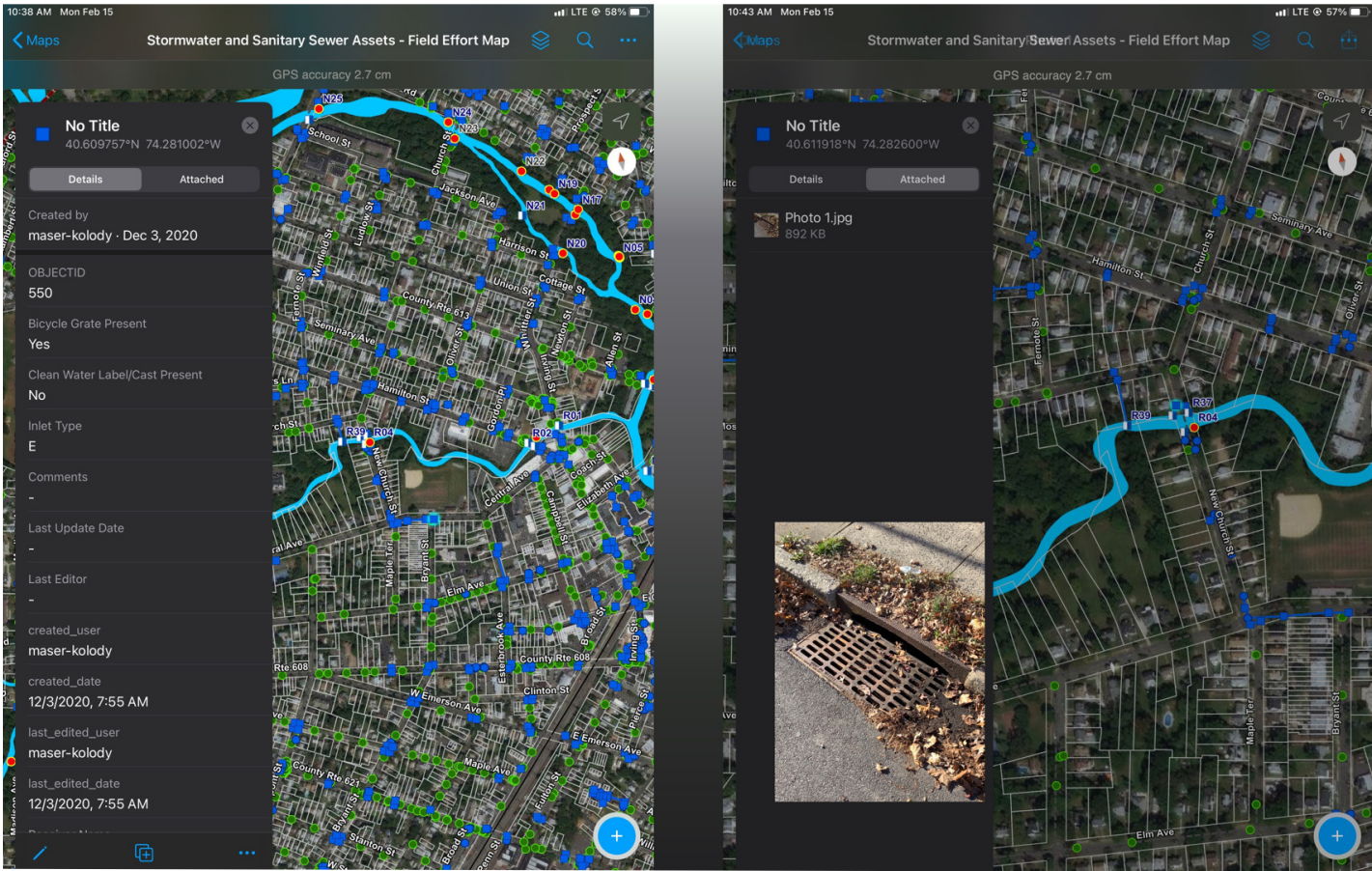
“This will let our public works department [staff] access and update data themselves, without having to call Engineering,” she said. “We can do the entire information exchange through web maps, which is one less step in our manual interactions. That’s going to speed things up, which is great, especially when you’re facing an urgent public works event, such as a sinkhole repair.”

Foushee expects Field Maps to replace all paper-based mobile workflows. Also, Colliers is exploring how the new smart form capability in Field Maps might be used for routine DPW maintenance.

Moving forward, Rahway will require all plans associated with awarded contracts to be submitted in GIS format. The long-term vision is to be able to expand the enterprise GIS beyond the Engineering Division and DPW. There are talks, for instance, of informing the public of scheduled road work, and sharing water data with the Department of Police, Fire, and Municipal Court.



↑ Before deploying the city’s new field data-collection kit, Kolody tested the software and hardware—the ArcGIS Field Maps app and the Eos Arrow Gold receivers—on Apple iPads for proof of concept. Using the NYDOT public RTK network, he was able to capture storm and sewer assets with centimeter-level accuracy and record them directly in ArcGIS.



↑ Mobile workers captured storm and sewer assets in ArcGIS Field Maps (shown here) with centimeter-level accuracy from an Eos Arrow Gold GNSS receiver. Supporting media such as photos helped create a complete digital twin of the city’s storm and sewer systems.

“We want to migrate completely off our legacy software systems and onto GIS. If we can have the true, absolute locations of all the things we track, then it will be easier for all of us to do our jobs. That’s going to make a real difference.”

Jacqueline Foushee,
Former DPW Director and Current City Business Administrator

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Oklahoma County's Assessor's Office Modernizes Workflows with GIS

Oklahoma County, Oklahoma, is blazing a trail for other counties to follow. The Oklahoma County Assessor's Office, which holds the greatest amount of county-level responsibility in the state, has successfully streamlined its workflows with mapping technology. The Assessor's Office manages and maintains more than 325,000 parcels, worth more than \$90 billion and representing more than 22 percent of the entire state of Oklahoma's ad valorem tax base.

Using GIS technology, the Assessor's Office created a comprehensive system of records, mapping more than 325,000 parcels in the county and providing the public with each property's historical data and valuations. By making this valuable information available for residents and other taxpayers to easily access, the Assessor's Office is helping property owners understand their property information. The updated GIS is being used by all other departments for work ranging from road construction and maintenance and storm response to property resale and law enforcement in the county. All county departments can make well-informed, accurate decisions based on the data the map and GIS provide.

Advancing Technology Sooner rather than Later

To successfully transform and digitize the Assessor's Office workflows, staff needed a technology that could effortlessly mesh with their existing records system. For the Assessor's Office to streamline its workflows, integrating multiple systems was necessary.

An additional challenge was finding an efficient way for appraisers to access data in the field to support them in their valuations. A map showing field appraisers historical changes of properties was a critical aspect to utilizing a single platform in their workflows.

It was also clear that the Assessor's Office needed an easy, accessible site where residents, property owners, real estate agents, and investors could view all historical, value, tax, and other detailed property information. Delivering transparency and strengthening public trust was important to the Assessor's Office because staff wanted people to see that the data collected and posted is accurate and represents a fair valuation of their property.

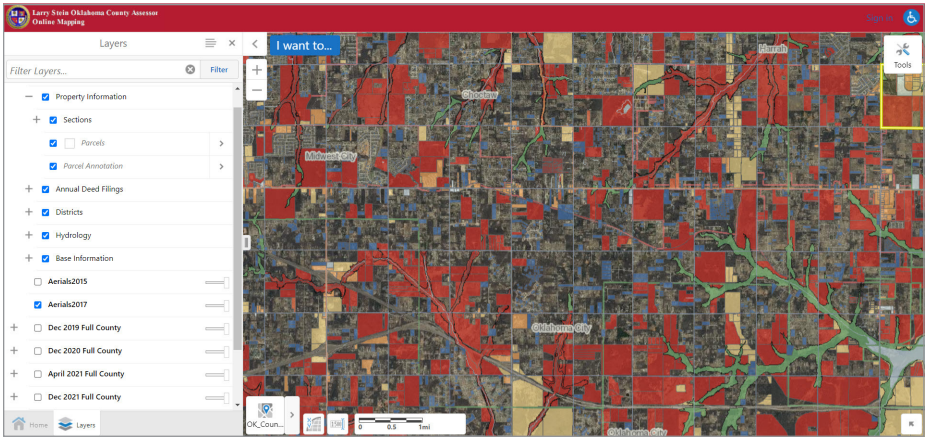
"Transparency is key in public agencies, particularly the Assessor's Office. In order to ensure the delivery of fair,

uniform, and equitable valuations, the public wants to see and use the data," said Larry Stein, Oklahoma County assessor. This means not just delivering data in PDFs, tables, and spreadsheets, but also providing data in usable formats and applications that answer residents' questions.

County One-Stop Shop for Land Information

With ArcGIS technology and Esri partner Patriot Properties, which delivers GIS-integrated computer-assisted mass appraisal (CAMA) solutions, the Assessor's Office created the Oklahoma County Assessor Online Mapping site. Now the public can search property information that links each parcel to the property record card detailing the property's value history, tax information, and characteristics as well as comparable sales. Deeds and historic ownership, permit history, and tax account information are also accessible from the same map interface.

The Assessor's Office implemented ArcGIS Parcel Fabric, an integral part of mapping and maintaining highly accurate tax parcel boundaries. To enhance the public's digital



experience, the Assessor's Office also added other important layers to its mapping solution—school district boundaries, city boundaries, hydrology elements, aerial imagery, and other key basemap information. Since migrating ArcGIS Parcel Fabric into its workflows, the Assessor's Office has seen a significant reduction in the time it takes to update property data and information.

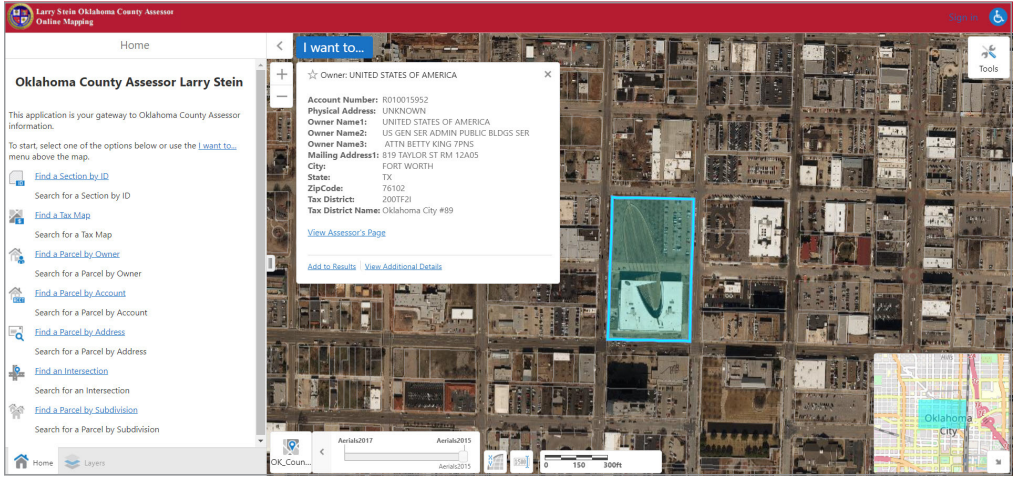
"Before we switched to Parcel Fabric, it would take a week just to convert the entire county and upload the updates. Now, it only takes an hour, saving us substantial time," said Tim Conner, Parcel Fabric manager and mapping site admin for the Oklahoma County Assessor's Office.

Change detection was another beneficial GIS component that the Assessor's Office was able to empower field appraisers with, making their jobs easier. Appraisers now have a desktop tool to assess property changes, helping prioritize which properties require a site visit and saving substantial field time. This tool also enables property owners to use a slider to view the current and past aerial imagery and see physical changes to their property over time. "GIS gives us the ability to deliver county data from many departments in a single system. Residents like the map interface and a single app to answer the most common questions. This saves everyone time," said Conner.

GIS Expedites Workflows

The Oklahoma County Assessor's Office is benefiting from GIS technology. Staff can update data in multiple systems from a single point, print maps to scale, and update property information instantly in real time.

Since incorporating ArcGIS Parcel Fabric into its workflows, the Assessor's Office has seen a substantial reduction



in the time it takes to update property data. Many staff members within the Assessor's Office are seeing the results of the effort, which took a couple of years to complete. The time staff are saving from the GIS integration is allowing them to focus on more day-to-day assignments and larger strategic projects.

Leading Other Counties to Succeed

With all the success and progress GIS is providing, Oklahoma County

is enabling the Assessor's Office to prioritize digital mapping with additional resources and funding so that staff can continue modernizing workflows and public engagement. In return, the Assessor's Office is reaping the benefits of the latest software, delivering the most value to the public. As technology is rapidly changing, Oklahoma County and the Assessor's Office are seeing the widespread benefits of leveraging GIS. Several other departments within the county are feeling empowered by integrating GIS in their workflows too.

"I know whatever comes along in the future, now that we are immersed into Esri technology, we know [Esri is] going to be there for us. If the formats or systems change, we won't have to go to an outsourced vendor with our data because we have Esri's GIS technology to secure our data and provide us with

the latest updates," said Mike Morrison, chief deputy for the Oklahoma County Assessor's Office.

"GIS is the key that unlocks the doors to making incredible amounts of data available to anyone in the world. For Oklahoma County, it means the ability of more than 25 million visitors to our website every year [to see] information about more than 325,000 parcels online anytime, instead of having to travel to the courthouse to get the information they want," Stein said.

Law Enforcement in Manassas Park, Virginia, Tracks Vehicles and Calls for Service with Real-Time Data Solution

From law enforcement to public works and parks and recreation, the local government of Manassas Park, Virginia, is an independent agency that offers a full range of services to meet the needs of residents and businesses. Recognized as the seventh-safest city in the state, the local government and law enforcement strive to make Manassas Park a secure place for anyone to call home.

Chris Himes, the assistant city manager of Manassas Park, began an initiative to grant citywide departments access to GIS data. The city had to scale back administrative services during the 2008 recession. So the city not only had to transition from its legacy system to help better integrate its siloed data systems, but it also needed the help of technology firm Blue Raster to provide GIS services for the initial migration and ongoing support. Blue Raster, a member of the Esri Partner Network, is helping companies tell their story through interactive mapping technology.

Himes says the immediate need was to get the Manassas Park police division's new fleet an automatic vehicle

location (AVL) tracking component and attach a computer-aided dispatch (CAD) system for calls-for-service data. The legacy CAD system previously in use did not have an integrated GIS component. Himes began the search for a GIS product to give departments across the city access to GIS data.

Blue Raster tested and deployed ArcGIS Velocity, giving the city near real-time data and a map-based view of police vehicles as well as recording and plotting calls for service. The fully integrated component now gives emergency personnel a comprehensive picture of the city.

Esri Integration

According to Himes, when he began his role with the city, the goal was to develop and implement a comprehensive IT plan to dictate how the city would centralize all services and leverage GIS to enhance reporting, transparency, and performance management. After examining different

options, Himes selected ArcGIS Online, Esri's web-based mapping software, because it offered multiple access points for GIS novices as well as city personnel with more familiarity.

"I needed to find a better common denominator, and that's where Esri was top of mind. It's just what scale of Esri did we need and what type of Esri product did we need," explains Himes.

The initial part of this project was the migration to ArcGIS Online from the previous software provider. All the stored data was still in a readable format in the third-party web application, and Blue Raster needed to convert it into a cloud-based GIS. Andrew Patterson, a GIS analyst with Blue Raster, says team members began by taking an inventory of all the data that had been delivered to them. Then, they went through the process of publishing the data and organizing it by department in ArcGIS Online. Overall, close to 100 GIS layers were migrated.

Blue Raster then began doing a one-for-one implementation for each city department in need of a geospatial



↑ Law Enforcement Vehicles outside Police Headquarters

viewer of Manassas Park data. The team had planning meetings with the departments that already had a GIS viewer to get an idea of what their needs were during the transition, such as determining what layers have been available to them and what layers were not in use.

"We then worked through implementing those needs into different ready-made applications using ArcGIS Experience Builder, so that from the [users'] standpoint, they have a named user, and they sign on to the same link every single time. It never changes, no matter how much we update it," says Patterson.

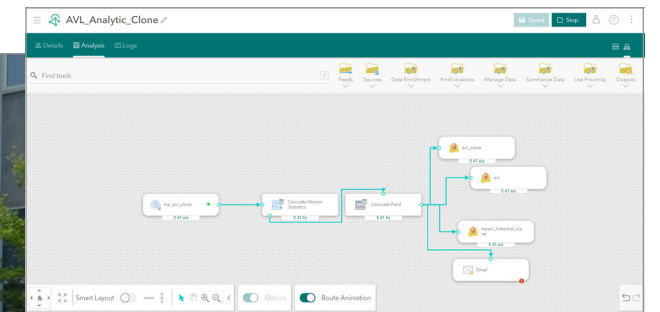
A Move to Velocity

The next phase in this process was shifting the focus to the needs of Manassas Park law enforcement. Patterson explains they wanted to ensure that police had full usability with an AVL and CAD integration and a real-time solution, which is what led the group to ArcGIS Velocity. ArcGIS Velocity is a cloud-native add-on capability for ArcGIS Online designed to help users process and analyze real-time data feeds.

As the city had already invested in ArcGIS Online, the Blue Raster team believed this Esri solution would be the best option to provide the infrastructure to do near real-time data delivery, says Patterson. Also, with no dedicated GIS support, Himes liked that it would work in the background with no heavy oversight needed because it was a cloud-native solution and was scalable to fit the needs of the city.

"Because of the city's implementation of ArcGIS Online, if we were to use [another] near real-time solution instead of Velocity, we would have to have implemented an entirely separate infrastructure to use it," Patterson says. "I think the decision really came down to the cost of it. It made the most sense in every single way."

In addition, the City of Manassas Park already had a Microsoft Azure account, which would help with the Velocity deployment. Patterson explains that because Velocity is based on Azure infrastructure, it meant the city could use a cloud-hosted solution it was more familiar with as opposed to other services. As such, the costs of Velocity could be wrapped up in the city's annual spending for Azure. Blue Raster also had its own



↑The AVL Analytic feed receives information from in-vehicle routers as the information source.

environments to test with Azure, so Patterson says everything fell into place.

The Blue Raster team wanted to test Velocity before deploying and putting it into production for the city. Patterson explains that Blue Raster team members were able to use their own cloud environments in Azure, acquire a test license for Velocity, and test all the development—from receiving the AVL to using Azure Event Hubs (a real-time data streaming platform).

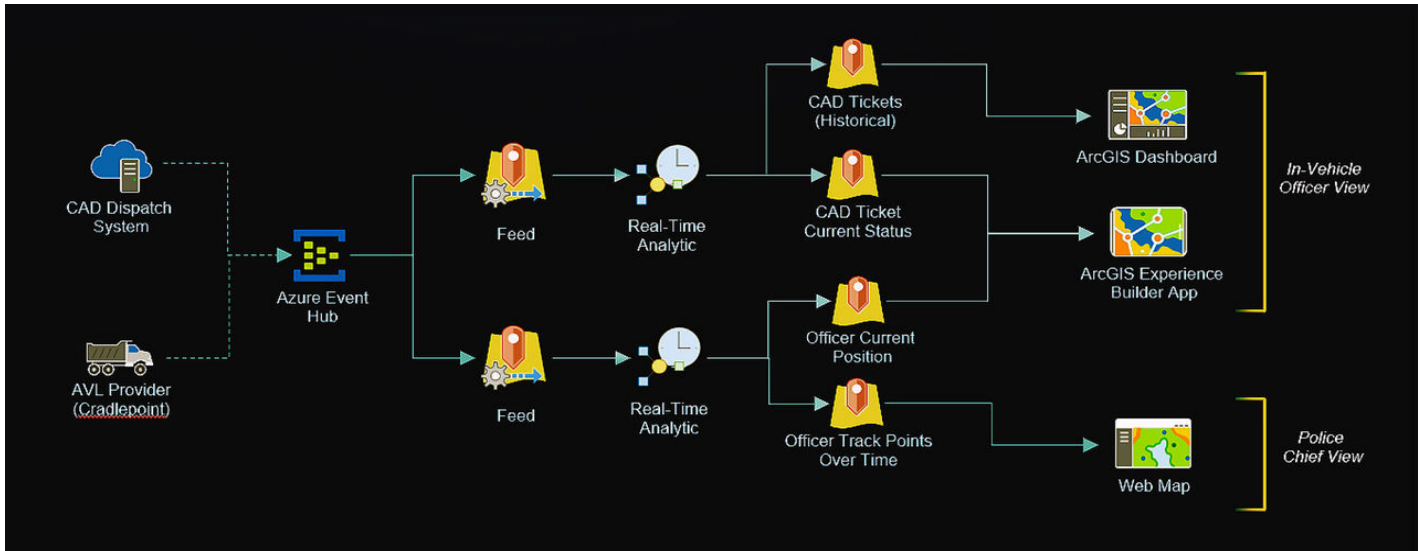
"The immediate benefit of Velocity was made evident by enabling the consolidation of the city's legacy public safety systems to provide real-time data and situational awareness to our officers. However, the long-term benefit is Velocity's ability to scale and integrate, offering limitless potential as the city onboards modern technologies, which seemed improbable prior to starting this project."

—Chris Himes,
Assistant City Manager of Manassas Park

continued on page 14

Law Enforcement in Manassas Park, Virginia, Tracks Vehicles and Calls for Service

continued from page 13



↑ High-level functional architecture integrates ArcGIS and real-time data from public safety information systems.

A Public Safety Use Case

The primary use for Velocity for public safety in Manassas Park is to have a geospatial viewer of the city map with all linked public facility schematics in PDF files and response mechanisms housed on one page. An integral part of this solution is live layer feeds with locational data from the AVL component that can be toggled on and off and is updated every few seconds. This is for officers who are logged on to their Cradlepoint routers, which provide network connectivity in the field and are responsible for the AVL feed, and have their mobile data terminal (MDT) activated.

One live layer feed provides near real-time data on active police cars. If a car is turned on, the location is plotted on a map and remains there for up to 30 minutes after the vehicle is turned off. The second feed is for the CAD dispatch system, which is designed for recording and prioritizing incident calls and identifying locations of field personnel, to show when a ticket is logged in to the system. When tickets are logged, the data is processed by Velocity and made

available on a map to officers in less than a minute. Active events from the past 24 hours are also displayed.

“We are using Velocity so that whenever we log a CAD ticket, we only log it once. One of the concerns was, with the CAD, when a service ticket is opened, it sends a message once. When it’s closed and no longer an active event, it sends a second message. So we wanted to make sure that we aren’t getting two points for every one ticket,” explains Patterson.

A dashboard was set up to log calls for service, which uses the live feed of CAD data and enables users to search and filter data; for example, viewing only calls for service for parking violations over a two-month period. The live feed lets users see active events, calls for service, and the locations of other active units.

Results with Velocity

The AVL component was rolled out to the police staff and police chief, law enforcement deputies, and E-911 employees, among others. The solution combines a dashboard and mapping interface to easily view data,

and Velocity gives the ability to have data consumable in a GIS.

Patterson explains that because the police department data comes from different sources such as the Cradlepoint routers, the data does not easily integrate into a GIS. However, for both data feeds, there are solutions in Azure to receive the data and transform it into a GIS-type format. For example, AVL comes in as a coded message, and Blue Raster parses out the information needed to translate it into a more readable format. Then, it is pushed into Event Hubs, a standard connector from which Velocity can receive.

An additional example is the police department is now able to gather data on when officers exceed a certain speed in their vehicle. Velocity gives Blue Raster team members the ability to enrich track data with movement metrics using real-time analytics. Patterson explains that they can trigger events and other information through Velocity, so not only is it receiving data, but it is also enriching it with more details.

“Now with Velocity, I can say . . . if it’s accelerating or decelerating . . . with real-time analytics to make it useful and not just points dancing around the map,” says Patterson.

Benefits of Real-Time Data

Himes believes Velocity has shown the power of GIS-driven solutions in the city and what solutions are possible with Esri technology.

“From what it is right now, it is capable of giving [police staff] exactly what they need from an operational standpoint, and that’s perfect for them,” says Himes. “But I think if you show that utility just through [continual] enhancement and

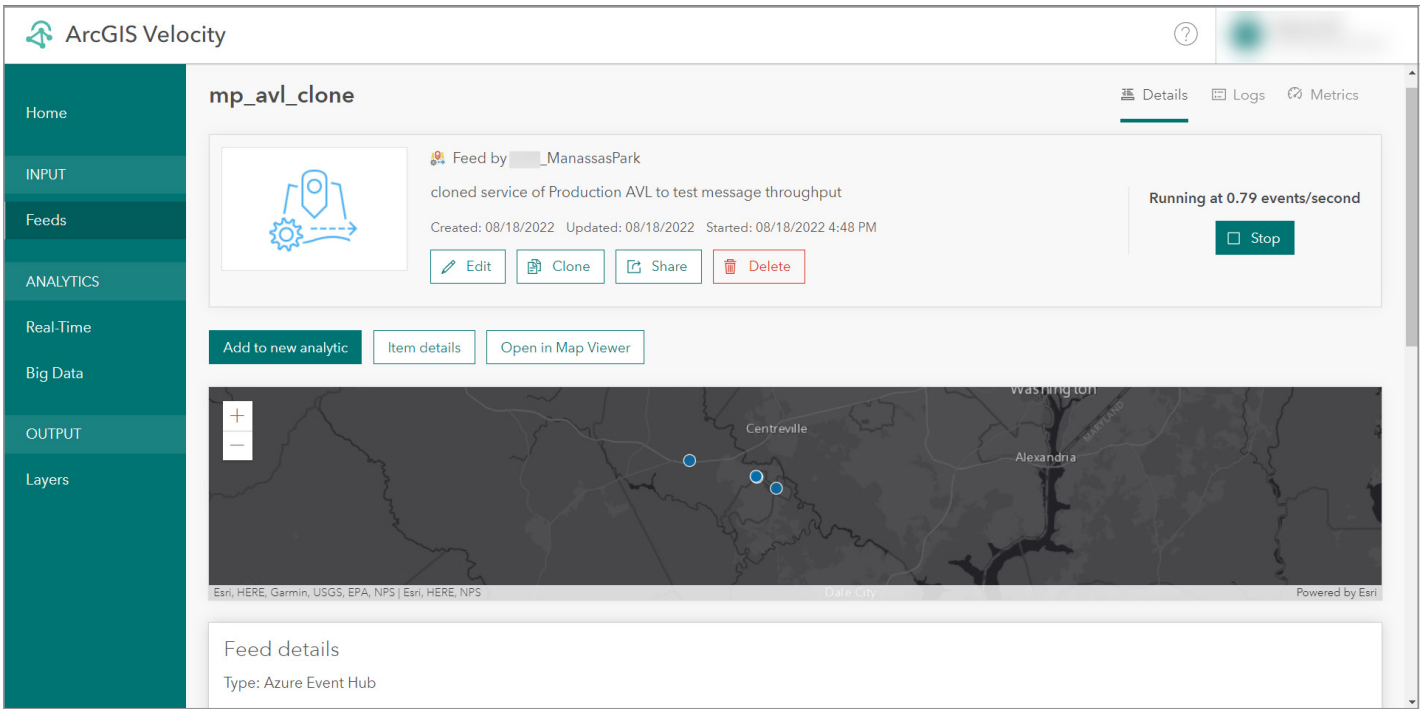
build-out, it’s only going to get more buy-in and use of the service in and of itself.”

Patterson adds, “In terms of goals for providing what was required from the city and what [it] desired with the initial rollout, we wanted to make it one-for-one and then improve on it. And having Velocity be a cloud-native solution that can provide both near real-time data delivery as well as enrichment, Velocity was [necessary] to be able to say, ‘Hey, Esri can do all of this and more.’”

Moving forward, Himes has several ideas in mind for Manassas Park to enhance the use of Velocity and other Esri technology, including an elevated

performance dashboard for managers across the city that allows them to incorporate their data with a mapping view. He would also like to proactively design more customized views for resident services and performance initiatives like offering the improved ability to report on maintenance issues in the city.

“Having Velocity really made everything else for this possible. It [lets] us possibly implement other Esri solutions for the city,” says Himes. “It really is just your imagination mixed with . . . technology . . . and then . . . what the city needs in the moment.”



↑ The Velocity feed interface allows a service’s throughput to be tested without having to toggle between Velocity and a web map in ArcGIS Online. The service can be controlled and checked from the item details page on Velocity.



Ecological Landscape Management in the Heart of the West

By Chad Minter

Doing things the hard way isn't really Cliff Winter's style. Managing noxious weeds and pests in a large Wyoming county is already hard enough. Expansive geography; small populations; limited budgets; and the overlapping interests of federal, state, and local landowners and stakeholders make for plenty of challenges. Add to that the recent phenomena of seasonal positions that can't be filled, the rising costs for fuel and supplies, and the difficulties in getting equipment and parts, and the need to be more efficient—to do more with less—becomes ever more apparent.

Winter supervises the Big Horn County Weed and Pest Control District in Wyoming, in a county of more than 3,000 square miles and with a population of around 11,000. He and his assistant supervisor, Porter Jones, are experienced in using technology to help with their management decisions and operations. In the past, GPS trackers, home-grown databases, Google Earth, and lots of spreadsheets complemented their use of ArcGIS Desktop. Winter and Jones are both handy with ArcMap and ArcGIS Pro, but all the separate data silos—and the manual steps needed to incorporate

all of them into a comprehensive operational picture—typically had to wait until after the season.

A few years ago, they set a goal to implement a GIS solution using ArcGIS Online. They wanted to have a real-time operational picture that would be visible to all stakeholders, internal and external, in a variety of contexts. It seemed obvious that ArcGIS Online could help them accomplish that.

In 2020, Jones implemented some ArcGIS Survey123 forms for certifying weed-free forage and providing compliance documentation that allows growers to sell and transport forage across county lines. In the past, taking and responding to requests from hundreds of growers covering thousands of acres was very inefficient and time-consuming. Collecting and processing the data needed for the documentation and providing the necessary reports added time and inefficiency. With Survey123, it was easy to record exactly what was needed in the field and generate the required documentation. A Survey123 report could immediately be emailed to the grower or printed while in the field. With a few hours of work, Jones

was able to set up a survey and a report that could be tweaked anytime. After a couple of iterations, he and Winter were saving many hours every week. What else could they accomplish?

In the fall of 2020, Winter came across FieldSeeker GIS for Invasive Plant Control, a software package created by Esri partner Frontier Precision that's purpose built for data collection and reporting for noxious weed management. After checking out the functionality and workflows, he and Jones agreed to be beta testers and early adopters. Frontier Precision provided the data model and helped deploy and configure the hosted feature service and web maps used by the solution. The company also helped set up a Survey123 web form for taking requests from growers for weed-free forage certification, and the district shared the form on its website.

During the 2021 season, the district saw immediate efficiency gains in scheduling and prioritizing jobs, viewing progress in real time, managing contracts, performing simple billing, and creating reports and sharing data. Service requests and scheduled control activities could be viewed alongside historical plant

locations and past control efforts by using the FieldSeeker GIS mobile app. Field technicians operating in areas without reliable cellular coverage could collect data offline and sync it at the end of the day. And at the end of the season, running reports was "like a dream," Jones said. The investment in FieldSeeker GIS and ArcGIS Online more than paid for itself in that first season.

Before the 2022 season, the district and Frontier Precision worked together to add support for county contracts staff—much of the work they do is on federal land managed by the Bureau of Land Management and the US Forest Service—and provide automatic email notifications to growers and contractors for service request status and scheduling. The district again saw immediate gains in efficiency for managing contractors and sharing data and reports with stakeholders. In the past, staff might have shared a paper report at the conclusion of a job or the season, but now they could do that more efficiently and also share maps and data with internal groups or the public in real time by using ArcGIS Online.

Winter estimates that the district saved more than \$54,000 just on time spent on scheduling and reporting during

the 2022 season. More importantly, those same resources could be put to use elsewhere supporting the district's mission to control weeds.

As they contemplate the next season, Winter and Jones are busy using GIS to build relationships with their federal

partners. For example, they've worked out a way to share GIS data with the Forest Service that makes it easy for the federal agency to incorporate the data into its enterprise GIS. ArcGIS Online and FieldSeeker GIS make it easy to filter, query, and export the required data in a variety of formats. Using ArcGIS Online and an Esri partner solution built for it, closer collaboration has been facilitated not only between local, state, and federal government agencies but also with the landowners and growers the district serves. There's been a learning curve for making effective use of ArcGIS Online, but it's been worth it. The time and money that have been saved are only part of the benefit. Stepping into the world of Web GIS has facilitated the communication, collaboration, and feedback that help Winter and Jones accomplish their mission. They're looking forward to where they can go from here.

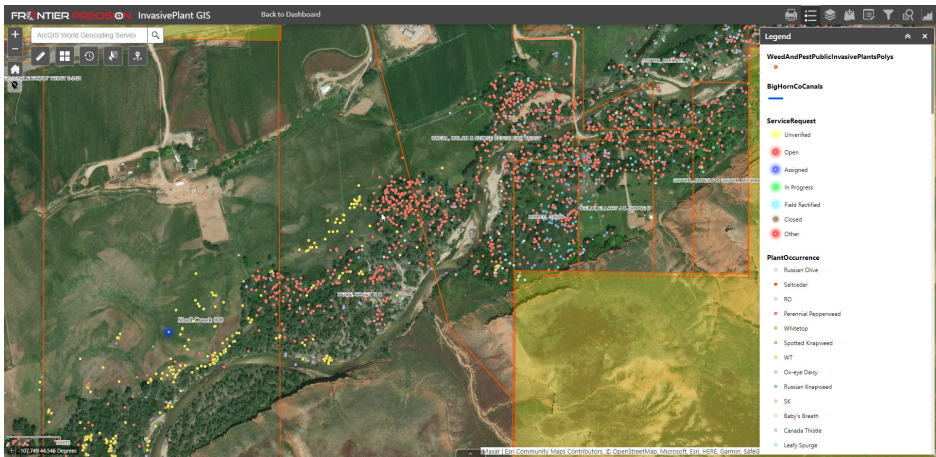
For more information, contact Chad Minter at chad@frontierprecision.com.

About the Author

Chad Minter is the mobile GIS software solutions manager at Frontier Precision. He is also the product manager for FieldSeeker GIS for Invasive Plant Control and FieldSeeker GIS for Mosquito Control software. He is a GIS professional and has a remote pilot license for flying drones. Minter has 25 years of experience in GIS and geospatial technologies and has worked in sales; support; training; development; and program, project, and product management.



Supervisor Cliff Winters, assistant supervisor Porter Jones, and FieldSeeker product manager Chad Minter stand near the Big Horn County Weed and Pest Control District office in Greybull, Wyoming.



Big Horn County Weed and Pest Control District staff are now employing Web GIS to get a real-time view of their operations that they can share with internal and external stakeholders.

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The Secret behind Keeping Los Alamos National Laboratory Open in the Winter

Most visitors to Los Alamos, New Mexico, are attracted by Los Alamos National Laboratory's (LANL) history as the headquarters of the Manhattan Project—specifically, the development of the world's first atomic weapons program. What most are unaware of is that LANL spans approximately 40 square miles, with 165 lane miles of road to maintain, and employs more people than reside in the main townsite of Los Alamos. Basically, it is a city within a town.

Sitting 7,500 feet above sea level and averaging around 41 inches of snowfall annually, LANL is prone to snow-covered and iced roads during winter. Campus operations are responsible for clearing roadways, sidewalks, and parking lots before Mother Nature disrupts the lab's contribution to the country's nuclear deterrence and other scientific research. Using GIS technology, campus operations enhance roadway safety and minimize the need to close the campus due to winter weather—a matter of national security at LANL.

Prior to using GIS for their snow removal operations, superintendents would rely on calling the teamsters driving the snowplows to inquire about which roads were cleared. After calling snow teamsters, snow removal duty officers (SRDO) would check off a list of which roads and arterial highways had been cleared to understand each snow event better. Often, the decision to keep the campus open was based on nonvisual information and a hunch.

SRDOs dreamed of being at multiple places across the campus during a snow event to make a more informed decision. GIS technology helped bring that dream to reality.

After collecting all of the data points of interest for snow operations, Christina Chavez, program manager at LANL, convened with SRDOs, forepersons, general forepersons, and mobile workers.

"Meeting with the individuals who conduct snow removal helped me understand their concerns and what data they needed to see before making a decision that would impact 15,000 people," said Chavez.

Chavez and team reached out to the LANL GIS program to see what options were possible for better workflows and to support making high-level decisions regarding weather-related lab delays and closures.

Working with the GIS program resulted in a suite of GIS applications, including a request GeoForm and management app, a data editor app, and a dashboard.

Now, the snow removal team members use GIS to streamline their workflow, making their jobs easier and more transparent across the organization.

The new workflow is as follows:

The teamsters, operators, and laborers call their forepersons/general forepersons located at Roads and Grounds, the base of operations, when they complete an area. Using the Snow Removal Operations Editor, the snow app operator updates the completed section/zone in the application.

The plowing completion status is then reflected in the Snow Removal Operations Status dashboard, which refreshes every 30 seconds. As more

areas of the campus are cleared, the percentages displayed for roads, sidewalks, and parking lots reflect how much more of the campus remains to be plowed.

The dashboard pulls real-time GPS location information of the snowplows, so the superintendent can track snowplow movements as drivers go about their plow assignments. The dashboard also integrates weather tower information and live camera feeds from priority one roads and intersections. The cameras allow the SRDOs to browse the campus from the map, click an intersection, zoom in, and pan the cameras within the dashboard. This way, before someone needs to inspect the road in person, they can do so from the comfort of the operations base.

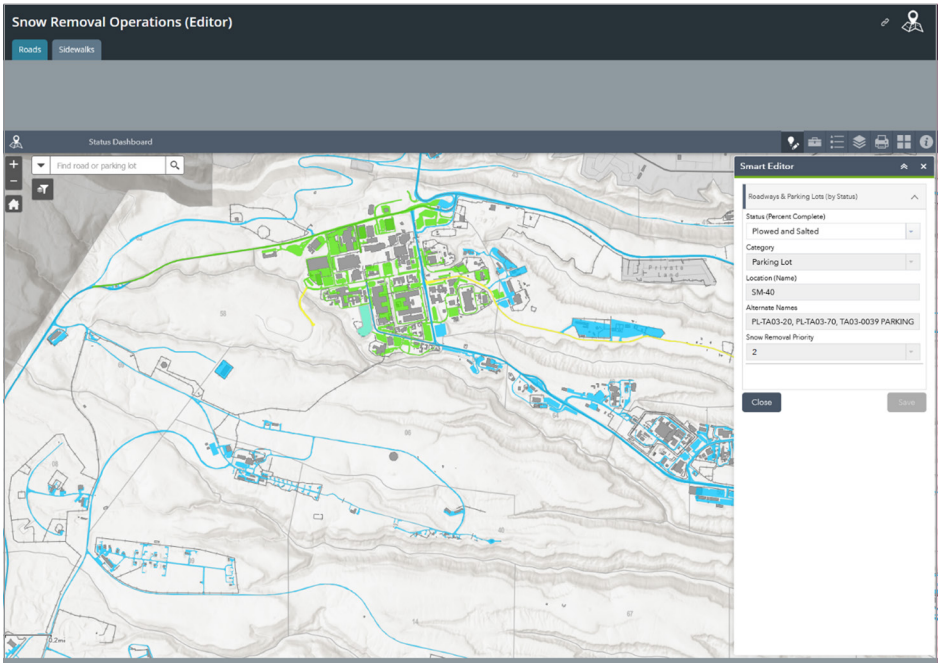
On top of the several advantages that the dashboard quickly provides to leadership, the GIS program team later added a histogram serial chart to the dashboard that tells how long it took to clear and plow all areas of the campus. From the time a spike appears in the histogram to the time it falls flat, leadership can determine the amount of time it took to clear the roads. Again, this provides more insight and detailed information that the previous workflow lacked.

Additionally, the snow team will capture site-wide post-snowstorm requests to address icy and snow-packed areas via the Snow Calls Manager. The Snow Calls Manager creates a cluster map of impacted areas and organizes data per snow event. Knowing that certain areas need additional attention helps with future snow events.

"There is so much going on at LANL regarding the type of work happening that's critical to national security," explained Chavez. "A lot is on the line if we shut down the lab for a single day. GIS gives our leadership insight they never had before to make those tough calls and keeps our folks safe."



↑ Snow Removal Operations Status Dashboard



↑ Snow Removal Operations Editor

Seeing Data in Context Enables Better Decisions

The Kansas Water Office (KWO) adopted ArcGIS, which enabled the analysis and display of complex information about the state's water plan as well as the clear communication about it to its many stakeholders.

In devising strategic plans that sustainably and equitably manage and develop water resources, state water agencies must deal with the challenges of climate change, the increasing demands of human populations, and the depletion and degradation of groundwater and surface water stores.

KWO is a state-run agency that communicates, coordinates, and provides marketing resources to support the statewide water plan. The *Kansas Water Plan*, is the primary source document developed by Kansas officials to address the availability of water supplies and plan for a sustainable future.

"We're able to provide a visual, interactive display that allows users to see a more complete picture to make more informed decisions."

Katie Goff
GIS Coordinator
Kansas Water Office

The plan's objectives include conserving and extending aquifer water levels, protecting reservoirs, improving overall water quality, reducing vulnerabilities to extreme weather events, and increasing awareness of water resource needs through public education. The plan is also used by residents, advocacy groups, and local governments to enhance awareness of water needs in the state.

Meeting the Needs of Many Stakeholders

KWO has multiple stakeholder groups that need access to information at various levels of detail. The agency needed an efficient solution that would explain and easily display the State Water Plan Fund (SWPF), which is created to implement the state water plan.

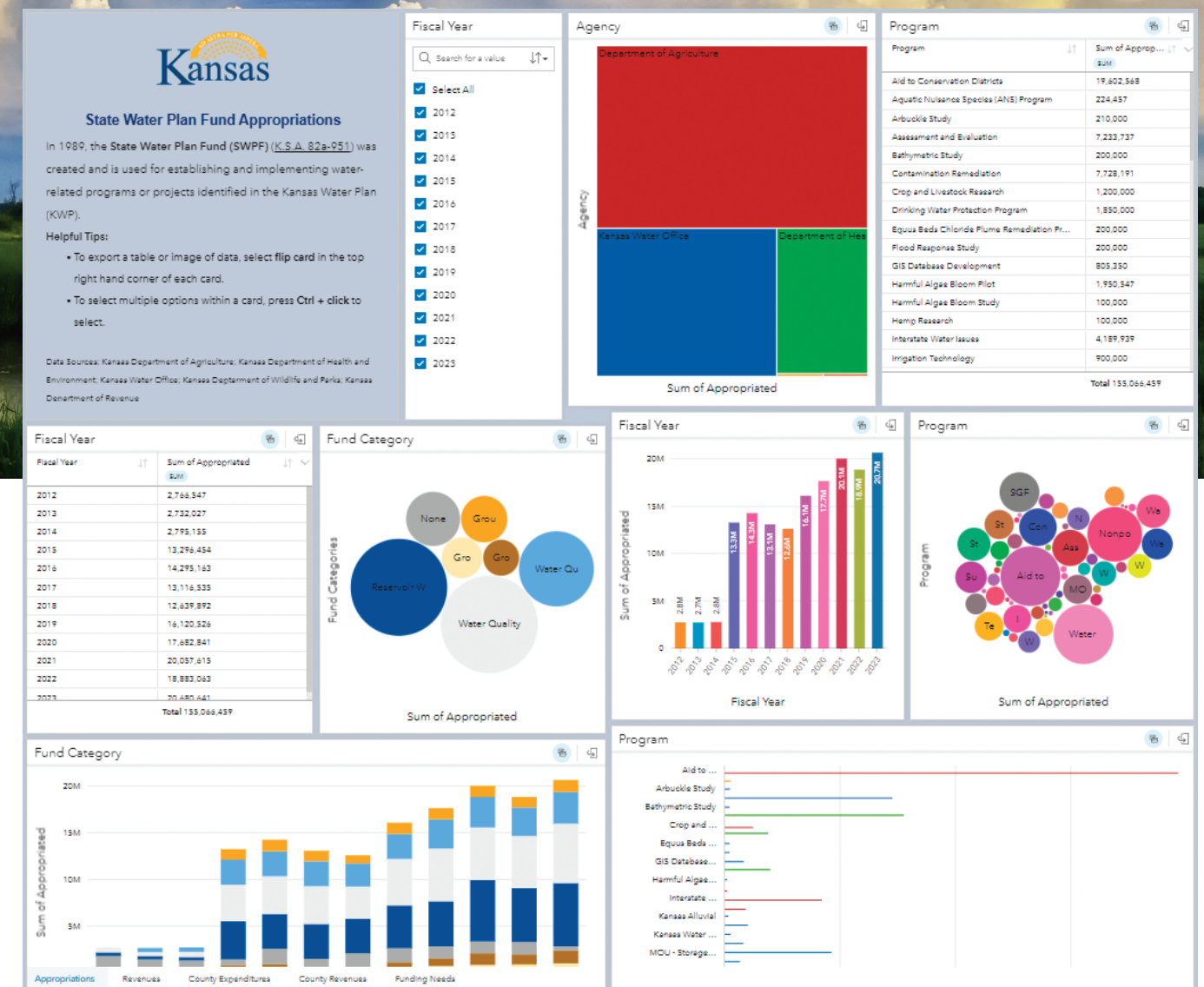
Projects are funded by water user fees and general tax contributions to the state. Annually, funds are distributed to multiple state government agencies for projects including watershed dam construction, irrigation technology, basin management practices, water use

studies, crop and livestock water research, water education, public water supply support, and flood response.

The distribution of funding is guided by considerations relating to conservation, sustainability, and education. Programs being considered for funding are reviewed by KWO and other state agencies involved in creating the annual budget. Then recommendations are made to the governor and state legislature to ensure that water policies and programs equitably address the unique needs of residents and supports the state's water resource goals.

Previously, KWO used spreadsheets and narrative reports to share this data, but this did not share the SWPF information in a meaningful and impactful way. For example, fully appreciating the current year's appropriations required seeing data for funded categories in the context of funding for those categories over recent fiscal years. That was difficult or impossible using those methods.

With the need for effective communication with stakeholder



↑ The State Water Plan Fund Appropriations page, created using ArcGIS Insights, enables queries about allocations for multiple fiscal years.

groups and the requirement to implement the state water plan in conjunction with the SWPF, leaders at KWO saw an opportunity to be innovative and efficient in their data sharing approach.

Interactively Providing Information

KWO realized a GIS solution could create efficiencies in its data sharing processes. The agency chose ArcGIS Insights, a self-service location analytics application that allows users to explore data and cross-filter

results. With ArcGIS Insights, it was also easier for KWO staff members to provide stakeholders with more detailed information to answer specific questions.

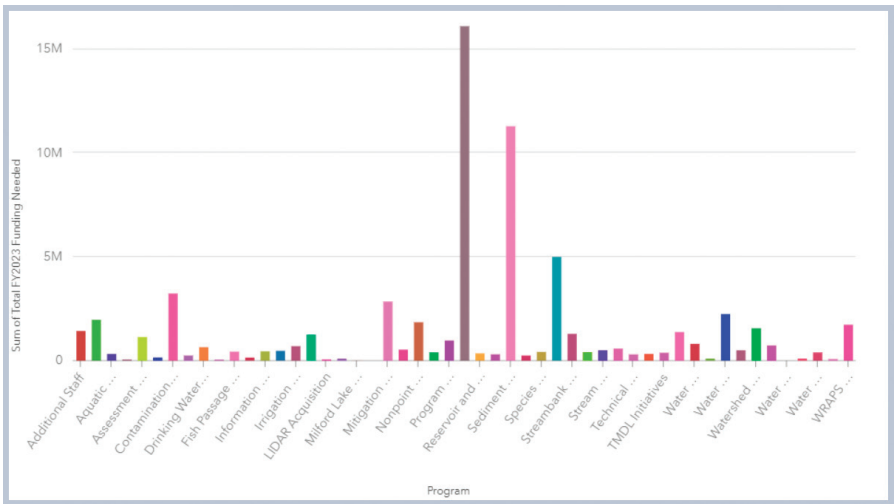
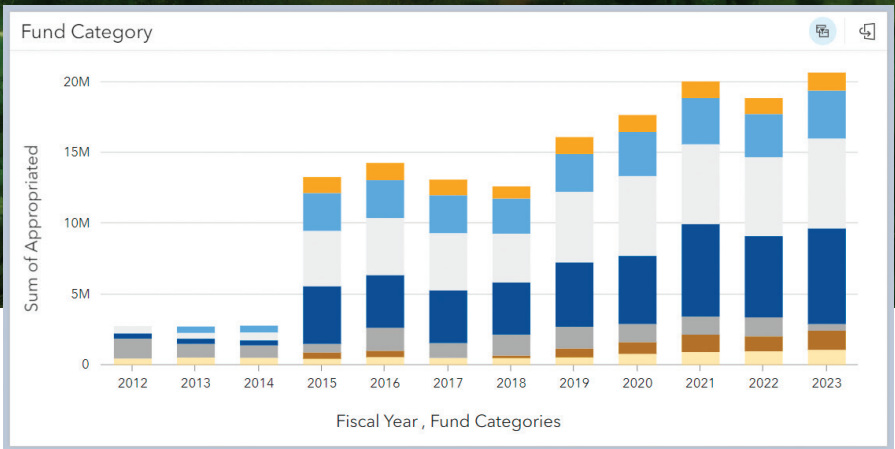
KWO also uses GIS to show past areas of focus and identify the need for future funding requests. This leads to faster, better-informed budgetary decisions. Kansas residents can access the interactive charts, graphs, and tables to better understand and advocate for their needs. The data in those charts can be exported in a comma-separated value (CSV) file for further analysis. Using the data and tools in ArcGIS Knowledge,

past public budget data can be analyzed, and project funding reviewed. The detail provided helps residents understand how specific water needs fit into budgetary decisions made by elected officials.

Making Water Data More Accessible

KWO has a lot of information to share, and it now has a simple way to do that using a single access point. A hub site (<https://bit.ly/3DvIvTN>), created using ArcGIS Hub, shares information about appropriations that are based on priorities in the

continued on page 22



Kansas Water Plan and revenue generated from fees, fines, and fund transfers. This site also lets users interact with data using interactive graphs and charts and contains links to background information and relevant statutes before diving into the information. “[Using the ArcGIS Insights and the hub site], regional planners have been conducting informational sessions to ask questions of stakeholders, and this information loop helps us to understand what is important to regional users through facilitated discussions. We are also more efficient by not replicating multiple regional static maps. With an easy upload of data, next year’s fiscal data can be easily viewed,” said Katie Goff, GIS coordinator at KWO.

Building in time-saving measures for KWO staff has also streamlined communications with stakeholders. “Internal staff [have] found the solution incredibly helpful. When they are asked questions by residents or regional members, they now have a better understanding of the data. This helps facilitate better conversations and decision-making processes,” Goff said.

- ArcGIS Insights displays allocations to each funding category for each fiscal year.
- Using the interactive display, residents can isolate specific categories to view more detailed information.
- Data charts also show funding needs for programs.

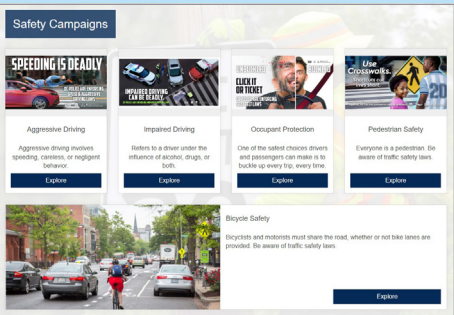
and taking a holistic approach to making DC’s transportation system safer. The Vision Zero 2022 Update also outlines the adoption of the national Safe System model, which is based on how an entire interconnected transportation system can become safer for everyone with the understanding that humans make mistakes, and human bodies are vulnerable to crash forces. The Safe System approach focuses on five key elements: Safe People, Safe Streets, Safe Vehicles, Safe Speeds, and Postcrash Care.

The district’s renewed approach at achieving Vision Zero comes with a newly launched Vision Zero website, built using ArcGIS Hub technology, in collaboration with Esri partner SymGEO, a Maryland-based GIS company specializing in ArcGIS Hub, ArcGIS Online, and state and local government solutions. The new site, found at <https://visionzero.dc.gov/>, provides a consolidated home for information on current and upcoming traffic safety projects, as well as dashboards and map features for interactive user experiences. The website also serves as a robust educational tool in promoting safe traveling behaviors. “The new Vision Zero DC website will help us work closely with community members to identify problems and build solutions,” said DDOT Vision Zero

director Linda Bailey. “SymGEO iterated quickly and efficiently on design ideas and built a very engaging platform solution for DDOT.”

The Vision Zero DC site is organized into easily navigable sections based on audience interest and is designed to be mobile responsive and broadly accessible. The Education section features educational campaigns that help to promote safe driving and pedestrian habits throughout the district, while a poignant look at the human costs of dangerous driving and unsafe behaviors is presented in Vision Zero Stories, developed using ArcGIS StoryMaps technology.

The Safety Campaigns section targets the biggest threats to the most vulnerable travelers on DC’s roadways. These include aggressive driving, impaired driving, occupant protection, pedestrian safety, and bicycle safety. A look at the Engineering section demonstrates the significant progress made in designing solutions to benefit vehicular and pedestrian traffic, conveniently organized into a Safety Treatment Toolbox. Expanding a section of the toolbox gives a wealth of information about each treatment “tool.” A Safety Intervention dashboard gives insight into all the implementations



➤ The Vision Zero hub site is organized by area of interest.

of the safety toolbox tools that have occurred to date, while an Annual Safety Improvement Program dashboard provides awareness into all the roadway and intersection improvements made throughout the city. Exploring the Crash Analysis page gives a deep dive into the data that’s fueling the push for zero fatalities on DC’s roadways, including a Fatality and Injury dashboard with authoritative data provided by the Metropolitan Police Department.

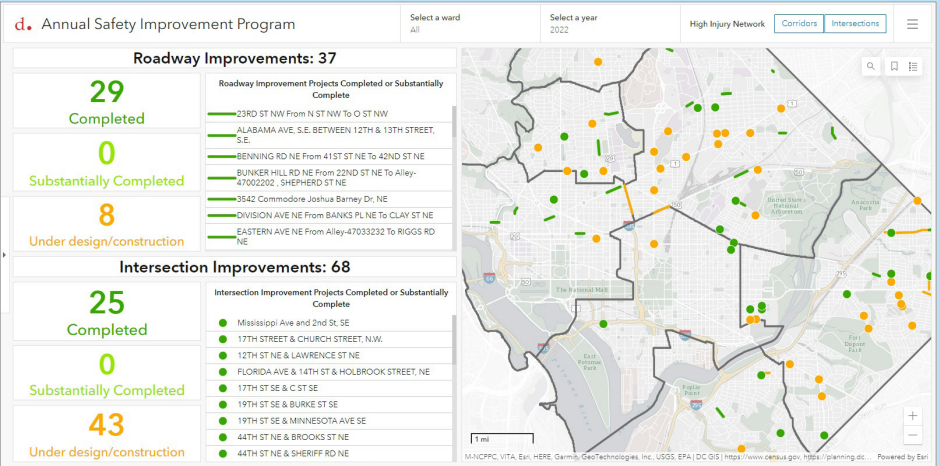
Finally, DDOT’s Highway Safety Office section features information on and many links to safety programs, grants, procedure manuals, and helpful publications. Learn more about this important program and the significant progress made to date at <https://visionzero.dc.gov/>.

For more information, contact the following:

District Department of Transportation
Linda Bailey, Vision Zero Director
linda.bailey@dc.gov

SymGEO
Kevin McMaster, Principal
kevin.mcmaster@symgeo.com

➤ The Annual Safety Improvement Program dashboard shows roadway and intersection improvements.





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