Esri News
for Federal Government
Spring 2013

"If You Build It, They Will Become Aware"

Web Map Enables Sandy Relief for Federal and Local Collaboration

By Jessica Wyland, Esri

It started as a free, public sewer infrastructure map for Toms River, New Jersey. Len Bundra, IT and GIS director for Toms River Municipal Utilities Authority, built it in 2004. Then, he kept adding layers. He added aerial imagery, parcel data, and information from agencies such as the New Jersey Department of Transportation, the US Department of Agriculture, and the US Census Bureau. Bundra had one belief in mind: "If you build it, they will become aware."
He was right.

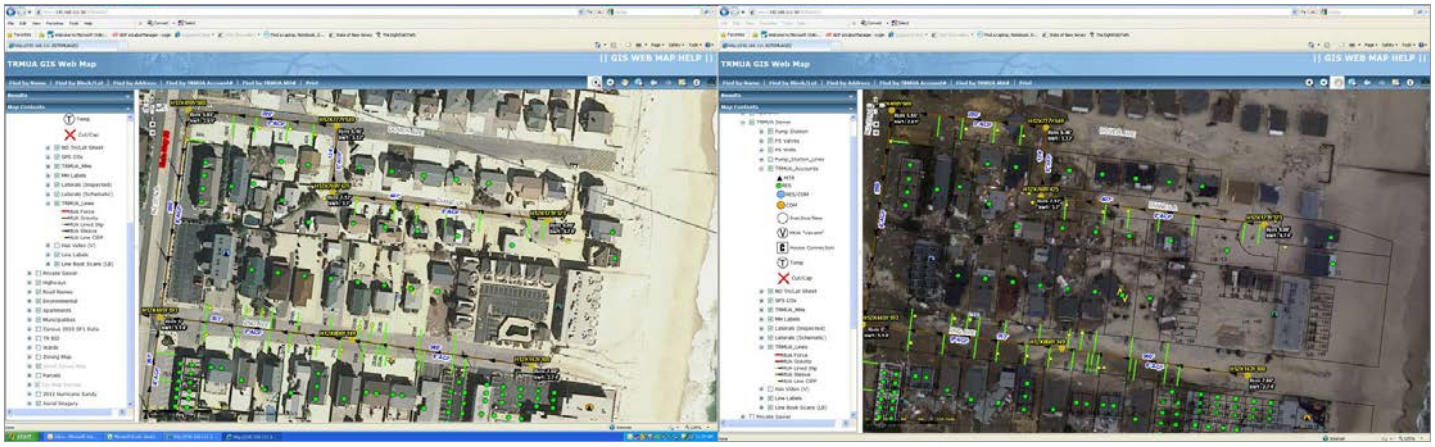
When Hurricane Sandy hit the East Coast of the United States in October 2012, the map was suddenly the go-to information source for emergency responders, utilities, public works, private surveyors, and local assessors. Bundra quickly updated the map—known officially as the Toms River Municipal Utilities Authority (TRMUA) GIS Map. He added poststorm satellite imagery from the National Oceanic and Atmospheric Administration (NOAA) along with current floodplain delineations and Sandy high water mark data from the Federal Emergency Management Agency (FEMA).

Anyone who needed to quickly get an accurate picture of the Sandy situation could click to the TRMUA GIS Map. Bundra built it, and people did come. Police and fire fighters came to determine where to deploy resources. Electric, gas, and water companies came to decide where to start restoring services. Homeowners, evacuated and eager to survey the damage to their property, came to look at before-and-after aerial photos. And, as Bundra predicted, people most definitely did become aware.

"The map served as a valuable resource for the police department after Sandy," said Mike Burke, IT and 911 coordinator for the Toms River Police Department. "We relied on that visual representation—the before-and-after layers—to set up security perimeters and determine where to place cement barriers."

Since the TRMUA GIS Map was built on the Esri ArcGIS platform and hosted by Amazon Web Services, it provides virtually unlimited power for analysis, collaboration, and spatial data processing. For example, following the storm, many outside contractors arrived on the shores of New Jersey to restore the region's infrastructure. One group in particular was engineers who needed to figure out the best plan for repaving roads. The TRMUA GIS Map helped them find their way around unfamiliar areas. They were able to use the map to locate important elements such as parcels, street addresses, hydrants, and underground utilities.

In the weeks and months following Sandy, the map continued to help. Utilities used it to review parcel polygons on the barrier islands to identify houses and neighborhoods that were destroyed so those ratepayers would not be charged for the year 2013. The map's links to FEMA flood advisory maps is helping



↑ NOAA imagery for the Barrier Island areas of Toms River. On the left side are images before Sandy, on the right after Sandy.

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"If You Build It, They Will Become Aware"

continued from cover

affected townships adopt a new flood insurance risk map. Bundra also recently added a layer to show houses that are slated for demolition and/or labeled uninhabitable to advise citizens and utility companies on where to focus rebuilding infrastructure.

For Bundra's own company, the TRMUA GIS Map continued to serve as a hub.

"Simply stated, the TRMUA GIS Map is a comprehensive, one-stop shopping database of all useful pieces of information for everyone within the TRMUA, as well as contractors, plumbers, consultants, and more," said Nicholas Otten, authority engineer for Toms River Municipal Utilities Authority. "All various pieces of data are centralized and accessible by every TRMUA department within the office or in the field."

Before Bundra created the map, Otten said TRMUA engineers had to sift through a room of drawers with thousands of engineering drawings for information or request data from other departments or agencies. Often, they would have to send out crews for field visits. Now everything they need is on the computer screen with an aerial basemap.

Otten says he can now view maps of all 430 miles of pipe, 9,600 manholes, and 18 pump stations, along with all attributes. At a glance, he can see whether a pipe or manhole has been inspected or rehabilitated and then simply click to view an inspection report or video. He can access various aerial maps, including post-Hurricane Sandy and aerial basemaps from as far back as 1930. He can tell when a service lateral has been cut and capped and see the triangulated location sketch of the curb cleanout.

The map shows all billing information, including the recorded number of fixtures within a building. It also shows pump station data and the number of connections flowing to the station and hundreds of pages of data on emergency generators, wiring diagrams, pertinent engineering drawings, and pump curves.

"With a few clicks, I am also able to generate specific reports," Otten said. "With GIS, I can determine the approximate, average flow within any given pipe segment. I can list pipes and manholes by name. I can find the names and mailing addresses of property owners within 200 feet of one of our construction projects."

History of GIS at TRMUA

TRMUA began its GIS work in 2005 in an effort to assemble 40 years of paper plans and files into a centralized mapping interface. The system was built entirely by in-house staff without the use of any outside consultants and was completed within two years.

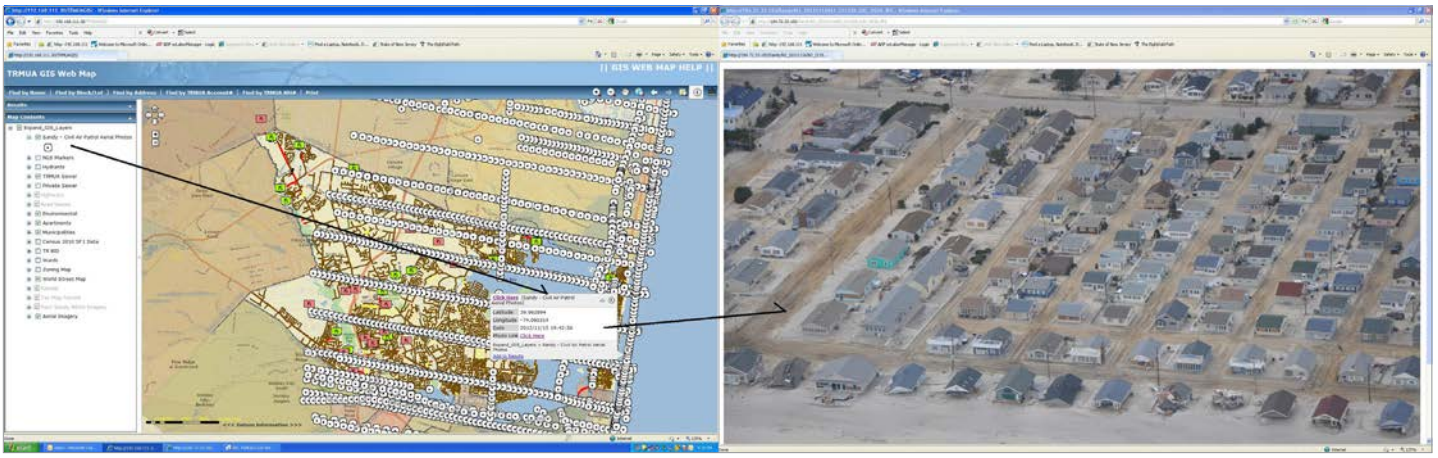
All 9,600 of TRMUA's sewer manholes had exact coordinates verified in the field using submeter GPS units. More than 600,000 line and manhole attributes were entered into an Esri geodatabase from more than 3,000 engineering plans.

In addition, an entire GIS parcel basemap was created from scratch to include additional elements not typically found on the tax maps. For example, 3,000 individual condo units and all major apartment buildings were added to the basemap, which was then aligned to New Jersey State and US Geological Survey (USGS) orthophotography.

The system is now available for all TRMUA office staff across an internal network and to all field staff via ruggedized laptop units.

"The GIS has increased operational efficiencies across all departments by allowing instantaneous access to data that previously had to be searched for among reams of paper files and plans," Bundra said. "The GIS also allows our field crews access to all the information they need to quickly assess and properly address emergency situations."

For more information, visit esri.com/insurance.



↑ There are 2,558 points hyperlinked to post-Sandy aerial oblique photographs from Civil Air Patrol added to the TRMUA GIS Map.

2013 Esri Partner Conference Award Winners

At the 2013 Esri Partner Conference, Esri acknowledged several organizations for innovative use of the ArcGIS platform's latest features. The following award winners are taking geographic visualization to a higher level:

Best New Partner
MindMixer—Mindmixer.com

Public-Facing Web Application
Data Transfer Solutions—WildfireMaps.com

Internal Workflow Web Application
Accela—Accela Automation

Innovation Application
RideAmigos

Mobile Application
NISC—iVUE App Suite

Stand-Alone Desktop Application (Runtime)
Blue Dot Solutions—Cyan Patrol Inspections

ArcGIS for Desktop Application
Dig-Smart—Dig-Smart Enterprise

Location Analytics
Galigeo—GeoDashboard

Organizational Use of ArcGIS Online
GEO-Jobe GIS Consulting

↑ MindMixer Cofounder Nick Bowden accepts Best New Partner Award from Esri president Jack Dangermond.

Learn more about Esri partners at esri.com/partners.

Esri Online

View Highlights from the Esri Federal GIS Conference

If you missed this year's conference, check out videos from the Plenary Session at esri.com/fed2013.

Among the many videos you will find is Todd Park, chief technology officer of the United States, sharing his strategy on harnessing the power of data to improve the health of the nation.

Todd Park, CTO of the USA, at the Esri Federal GIS Conference

See the New Look for Federal and Facilities Industries

Catch up on the latest industry news and conversations on Esri's redesigned federal and facilities web pages. You'll find Twitter updates and success stories you can build from at esri.com/federal and esri.com/facilities.

Discover a New Book

Inside Mapping the Nation: Pioneering a New Platform for Government, you'll find out how 25 government agencies across nine US departments are using GIS to encourage citizen involvement, foster understanding, and facilitate initiatives. This latest Esri map book is your go-to guide for understanding how to make the ArcGIS platform work for your agency and is available now at esripress.esri.com.

Get in the Loop

Learn firsthand from Esri president Jack Dangermond about how industry insiders are leveraging ArcGIS in GovLoop's guide, ArcGIS as a Platform. Gain insight into how ArcGIS is transforming the public sector and what the future holds for GIS. Unleash the knowledge at esri.com/govloopguide.

A Conversation about Capabilities and Collaboration

By Karen Richardson, Esri Writer

Bringing geography to life and then sharing that information using the ArcGIS platform was the talk of this year's 2013 Esri Federal GIS Conference, which drew more than 3,600 people to the Walter E. Washington Convention Center in downtown Washington, DC.

What attendees also learned from Plenary Session talks, Exhibit Hall visits, and the technical and paper sessions was that change is brewing in the world of geospatial technology. Solutions are moving away from client/server architectures to an application and device framework that gives people services they can easily use. Esri's ArcGIS is evolving from a collection of tools to a framework that is open and extendable so it fits into an organization's systems across many platforms.

"As GIS users, we are bringing information sets together using geography as a common framework," said Jack Dangermond, Esri president, during the Plenary Session. "We can create content to be shared, served, and made into apps for others to easily use. Today we are realizing that geography is a fundamental science for understanding our world, and GIS makes it come alive in applications."

New Content Available on ArcGIS Online

Users can begin creating these new applications with an amazing amount of new content, such as imagery and landscape services, coming soon to Esri's cloud-based hosting service ArcGIS Online. Landscape services are a collection of more than 30 physical, hydrologic, and ecological layers for the United States that will be available to ArcGIS Online organizational subscribers. The data will be provided as both feature and image services instead of cached tile services, so users can access the underlying data and use it for analysis as well as viewing. The data layers can also be brought into desktop applications and used just like any other local dataset: they can be mashed up with other data, geoprocessed, and even exported.

Esri also announced that more than 10 million square kilometers of high-resolution aerial views from DigitalGlobe are now available as a free map service via ArcGIS Online. The imagery is available at 30 centimeters at 1:1,000 scale for the continental United States and 60 centimeters for areas in Western Europe down to 1:2,000 scale. This imagery will be continually updated and eventually include more than 100 million square kilometers of high-quality imagery.

The ability to publish and share content as 3D web scenes is being streamlined with Esri CityEngine Web Viewer. This viewer is a browser-based app that lets users capture 3D content and create visualizations. While these visualizations can use industry-standard data imports, new editing tools will allow users to construct their own 3D data as well.

What Does the Needle in the Haystack Tell Us?

During the Plenary Session, Sean Gorman, the founder of GeoIQ and now the chief strategist at Esri's R&D Center, Washington, DC, demonstrated how GIS can be used to synthesize the barrage of data from social media into meaningful, actionable information.

Gorman studied Twitter feeds from New Yorkers as Hurricane Sandy made landfall there in October 2012. He then viewed where thousands of people in New York City were Tweeting using the word *power* by employing ArcGIS GeoEvent Processor for Server, a new extension for ArcGIS for Server that allows people to track real-time data including the time it occurred. One-kilometer grid cells were created across a map of Manhattan that calculated how many Tweets occurred per cell. This gridded data was then normalized so only larger-than-average volumes of Tweets were displayed. By viewing the location of Twitter feeds, the conference audience could see spikes in conversations that happened when the storm hit.

The day after the storm made landfall, the large cluster of Tweets about power outages moved north. Gorman began looking at this cluster and discovered a Tweet with a picture of a substation that had failed, cutting off power in southern New York—hence, no more Tweets from that area. "We can not only find the needle in the haystack, but we can find out what else that needle has to tell us," said Gorman.

Finding Gold in Downtown DC

Other ways to collect, view, and analyze real-time data were also demonstrated at the conference. Esri's Jo Fraley configured Esri's new Operations Dashboard for ArcGIS and Collector for ArcGIS. She then selected a group of audience members to collect data about anything gold they saw on the streets of Washington, DC, using the Collector for ArcGIS app on their Android and iOS devices.

"Gold stands for different things to different people," said John Calkins, Esri's master of ceremonies. "For homeland security, perhaps gold means a gold-painted car holding explosives. For the Environmental Protection Agency [EPA], gold might mean collecting water quality samples of heavy metals. For the Department of Health and Human Services [HHS], this might mean providing the highest level of health care—the gold standard—to those in need."

ttFraley reported back on the field-workers' progress throughout the rest of the day. People could see the number of gold objects, such as gold-colored signs and doors, and where they were dispersed on a map. The map was also configured to display live traffic, weather, and the metro schedule. To end the demonstration, Brett Rose from Esri showed the audience the map and some analysis he ran during the collection process that included the positions, statistical distribution, and orientation of the teams as they moved through downtown DC. "By bringing analysis into a real-time operation, analysts can contribute and improve the mission, helping it be successful," said Rose.

Collaboration and Cooperation

Jerry Johnston, the geospatial information officer at the Department of the Interior (DOI),

gave a Plenary Session talk emphasizing the need for federal government agencies to work closely together when creating and using geographic data. DOI created the Geospatial Platform, a decision support website that Esri's ArcGIS Online powers. The site is meant to help everyone in the federal government and the general public to discover, share, develop, and collaborate using geospatial information. Anyone who needs this data can use it as well as identify and create workflows and methods that help make this information make sense to everyone, including senior leadership.

"ArcGIS Online is helping cross-agency efforts that will benefit from using resources that are spread out all over the country and through many different agencies," said Johnston.

Johnston encouraged the audience members to use the platform and share their ideas about it by contacting the people in their agency who work on the Geospatial Platform initiative. He said more capabilities for the platform will be released throughout the year.

Ever-Escalating Awesomeness

Todd Parks, chief technology officer of the United States, closed the conference by telling the audience, "The best work is ahead of us—this is the golden age of harnessing data. And you in the audience can do it—you are the federal data rock stars."

He went on to talk about how fast technology has moved forward—namely, the ability to take complicated data and make advanced visualizations that are easy to use on browsers without any software in between. This ability is liberating information, such as weather, GPS, public safety, and health data, and making collaborating among the state, federal, and local governments a reality.

"There is an ever-escalating awesomeness," said Parks. "Not only is better data available, but the fact is that thanks to this technology, now people can actually use the data. We are only limited by America's most innovative minds, so we are not limited in any way."

Dangermond reiterated the necessity to continue pushing the envelope with technology. In closing, he reminded the audience of the electronic map that was on display at the National Portrait Gallery, the venue for the Wednesday Night Social. "It was cool—a map as art," said Dangermond. "But it was frozen in time. We can't do that; we must continue moving along."

To learn more, watch conference videos, or ask a question, visit esri.com/fedgis.

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GIS Assists Veteran Health Administration Planners with Better Analysis and Information

The Planning Systems Support Group (PSSG) is a field unit of the Veterans Health Administration (VHA) Office of the Assistant Deputy Under Secretary for Health (ADUSH). Located in Gainesville, Florida, its mission is to assist the US Department of Veterans Affairs (VA) planners in improving veterans' access to health care. This goal is accomplished through the use of GIS and geospatial analysis.

Using GIS Strategically

GIS allows PSSG to optimize VA resources and provide the right services to the greatest number of veterans. PSSG is the primary source for the geographic data and analysis needed to evaluate patient access and plan new sites of care.

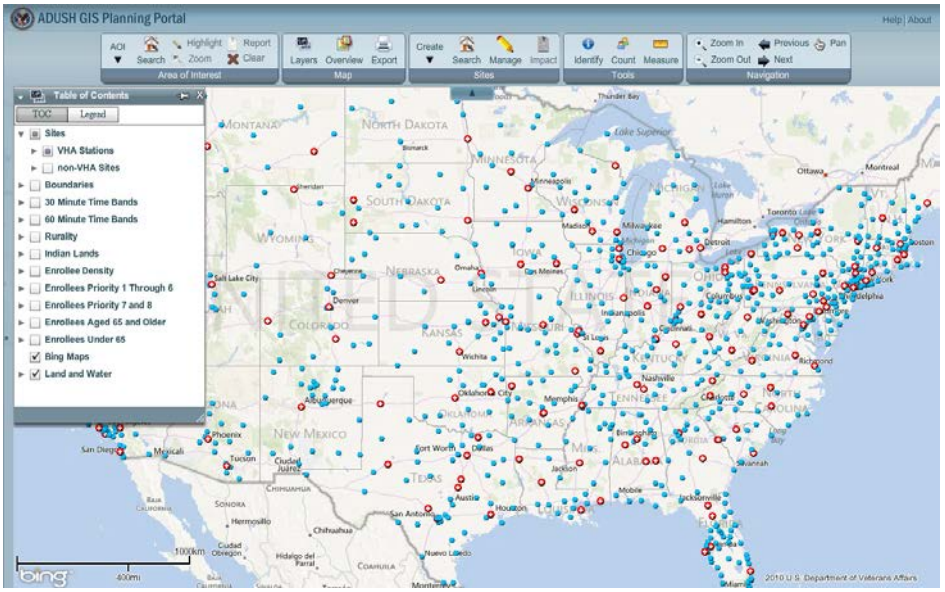
Using data from the VA Site Tracking System (VAST) and the enrollee travel time file, PSSG computes drive times to the nearest VA primary, secondary, and tertiary sites of care for over 8 million enrollees. The geocoded VAST and enrollee travel time files are the basis for many products and analyses, including the following:

- VA Enrollee Health Care Projection Model
- Market access performance statistics
- Geographic Access Report
- ADUSH GIS Planning Portal

Visualizing Ways to Serve Veterans

PSSG's geospatial mapping and analyses directly support the VA Enrollee Health Care Projection Model, which is used to develop estimates for approximately 95 percent of the VHA medical care budget. This model is required for all new VA site planning. PSSG staff serve as the geospatial experts for health services within VHA and provide technical support to the internal GIS community.

ArcGIS Online assists PSSG in geospatial collaboration and sharing. Numerous VHA staff use the cloud-based geospatial tools to ensure that more veterans have access to care given finite resources. The GIS Planning Portal helps accomplish this by allowing planners to visualize how decisions regarding their facility locations spatially relate to the residential locations of veteran beneficiaries. The ADUSH GIS Planning Portal is key for VA planners to identify access gaps in geographic coverage and how to best allocate existing and future resources most efficiently for our veterans.



↑ The ADUSH GIS Planning Portal interactive map enables VISN planners and others to evaluate geographic access to VA health care services. This powerful tool is "a planner's best friend."

PSSG's GIS expertise was able to contribute to these important veteran initiatives. In addition to VHA strategic planners, past PSSG clients have included the White House Health IT Task Force, the Indian Health Service, the Presidential Advisory Council on HIV/AIDS, and numerous VHA program offices and Veterans Integrated Service Network (VISN) offices. PSSG supports these groups by providing both geospatial mapping and analyses deliverables.

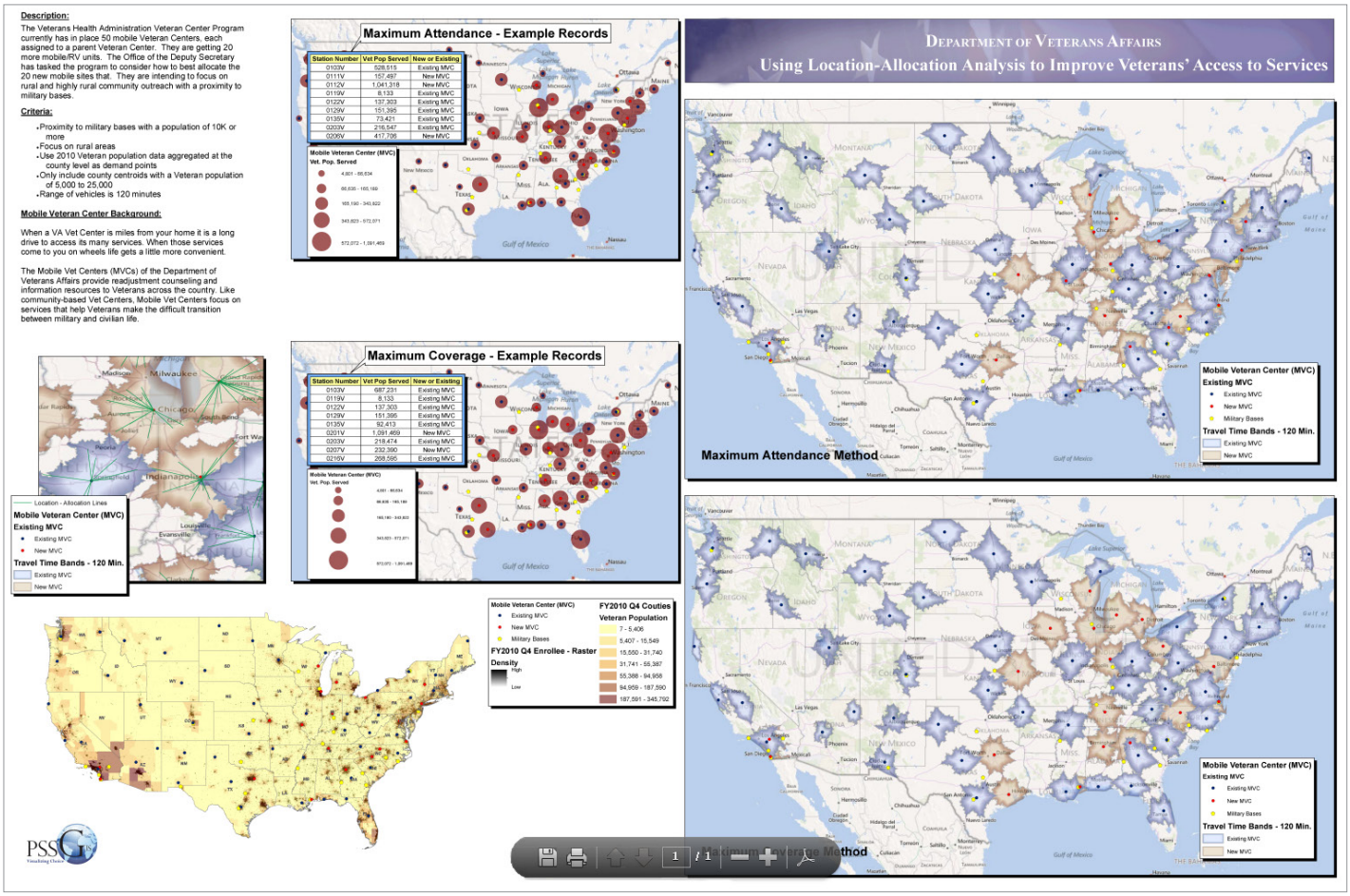
Maximizing the Number of Veterans Served

Since 2011, PSSG has been using ArcGIS for location-allocation analysis, which determines the optimal location for facilities to service demand from a given set of points, in this case, VA patients. This assists planners who are contemplating where to best locate new facilities to maximize the number of patients served.

Furthermore, while there are half a dozen location-allocation problem types to work with, PSSG has been using maximum coverage and maximum attendance methodologies to derive unique hybrid outputs. These assist decision makers in identifying the spatial gaps that should be considered for new candidate sites. The maximum coverage method locates facilities so that as many patients as possible are allocated to facilities given a particular cutoff distance. The maximum attendance method locates facilities assuming that the farther people have to travel to a facility, the less likely they are to use it. This is reflected in the amount of demand allocated to facilities as the distance from demand points increases. Analyses conducted by PSSG have assisted numerous planners and high-level stakeholders in estimating the future impact of site openings and closings given certain criteria and projected data.

Supporting Efforts across the Organization

PSSG was honored to be able to provide preliminary location-allocation analysis to the Readjustment Counseling Services (RCS)



↑ Geographer Chris Richmond of PSSG created this map showing location-allocation analysis in action to assist RCS with new Mobile Vet Center assignments. Geographer Chase Gatlin; supervisory geographer Kevin Willis; program analyst Mark Guagliardo, PhD; Health Systems Data and Analyses director DeAnn Farr, PhD; and Policy Analysis & Forecasting director Duane Flemming have been actively advocating for more extensive use of location-allocation in the VA facility planning process where applicable.

within the VHA to assist with the placement of 20 new Mobile Vet Center vehicles nationwide. This analysis complemented other information available to RCS to optimally place these new mobile vehicles.

PSSG supplies VA offices with regional and national VISN boundary maps and market boundary-level Health Care Planning Model maps. In addition, PSSG oversees the development of a Geographic Access Report that provides county- and market-level summary data for primary care, acute care, and tertiary care. The information shows totals by travel time intervals; number and percent within travel time intervals; as well as the number of urban, rural, and highly rural veterans. Regardless of the task, project, or initiative, PSSG strives to help veterans and those who serve our veterans to better "visualize choice" using GIS.

For more information, contact Kevin Willis, supervisory geographer, Veterans Health Administration Planning Systems Support Group, at kevin.willis10@va.gov.

Gathering Location-Based Intelligence from Social Media

By Barry Dauber, Topsy

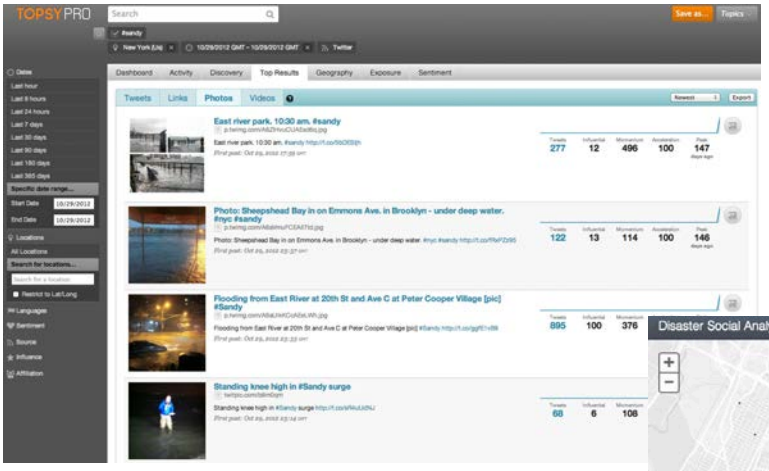
Responding to a natural disaster will never be easy and requires intense preparation, training, and the ability to quickly deploy personnel and resources to the hardest hit areas. But some tasks can be particularly difficult, like finding out whether or not a specific hospital is open.

As the use of social media grows, it's becoming a valuable tool to turn to when disaster strikes. Easy access to communication provides first responders, FEMA, DHS, HHS, and other state and federal agencies with real-time insight into the conversation taking place among individuals on the ground. Analysts no longer have to rely on news reports or wait for deployed personnel to gather intelligence. Instead, they can use tools like Topsy Pro Public Sector to get up-to-the-minute information on what is transpiring before, during, and in the aftermath of a disaster.

Yet, today on Twitter, less than 1 percent of Tweets contain the latitude and longitude coordinates needed to identify where a Tweet is coming from (as individuals may or may not have their GPS location services enabled). This can be problematic when trying to gather information about boots on the ground. To help solve this problem, Topsy invented a machine learning algorithm that looks at hundreds of billions of Tweets, then, using a statistical inference model, identifies a Tweet's origin. This vastly increases "conversation coverage" and helps disaster relief responders find trends in the conversations.

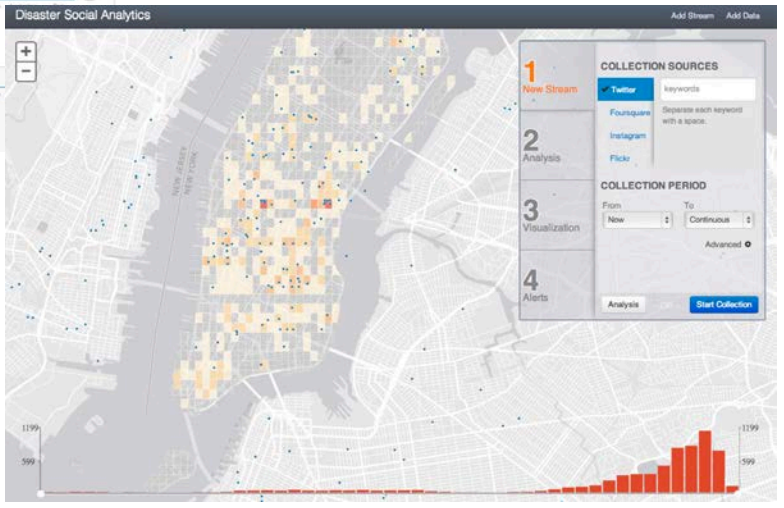
With the power of social media and technologies like Topsy's geoinference, government agencies are now better able to respond to natural disasters quickly and effectively. Topsy Pro Public Sector has been used in several cases for this purpose. How would you like your government to better use social media? Let us know by Tweeting to @topsy.

For more information, contact Barry Dauber, product manager, Topsy, at barry@topsy.com.



↑ A search for #sandy isolated Tweets from the state of New York including images of flooding and destruction during Hurricane Sandy.

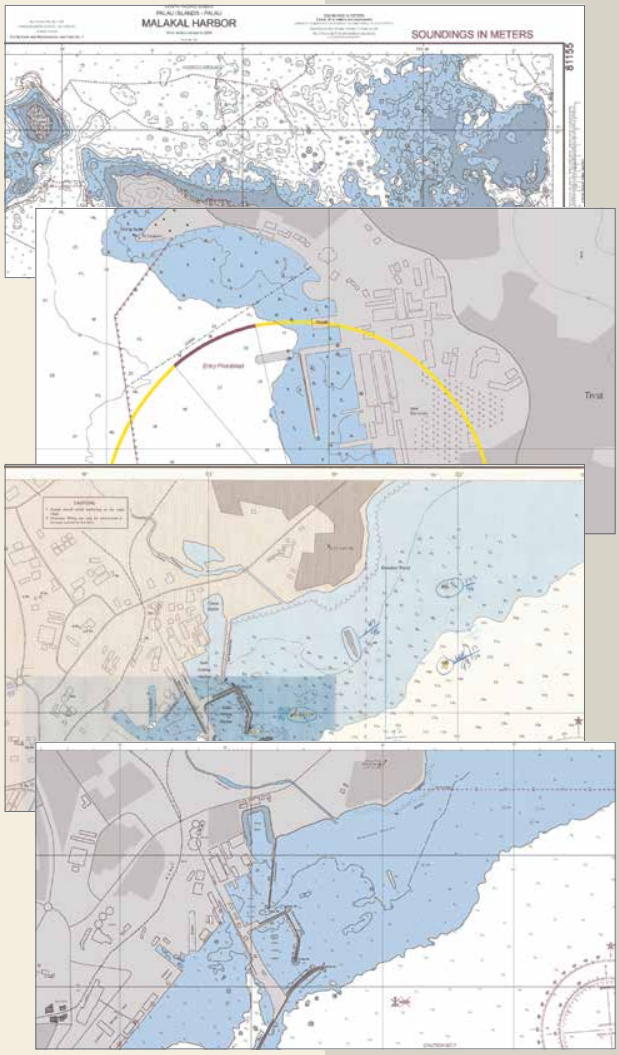
↓ The integration between Esri and Topsy allows users to map social media and begin filtering based on unique streams, trending phrases, or topics.

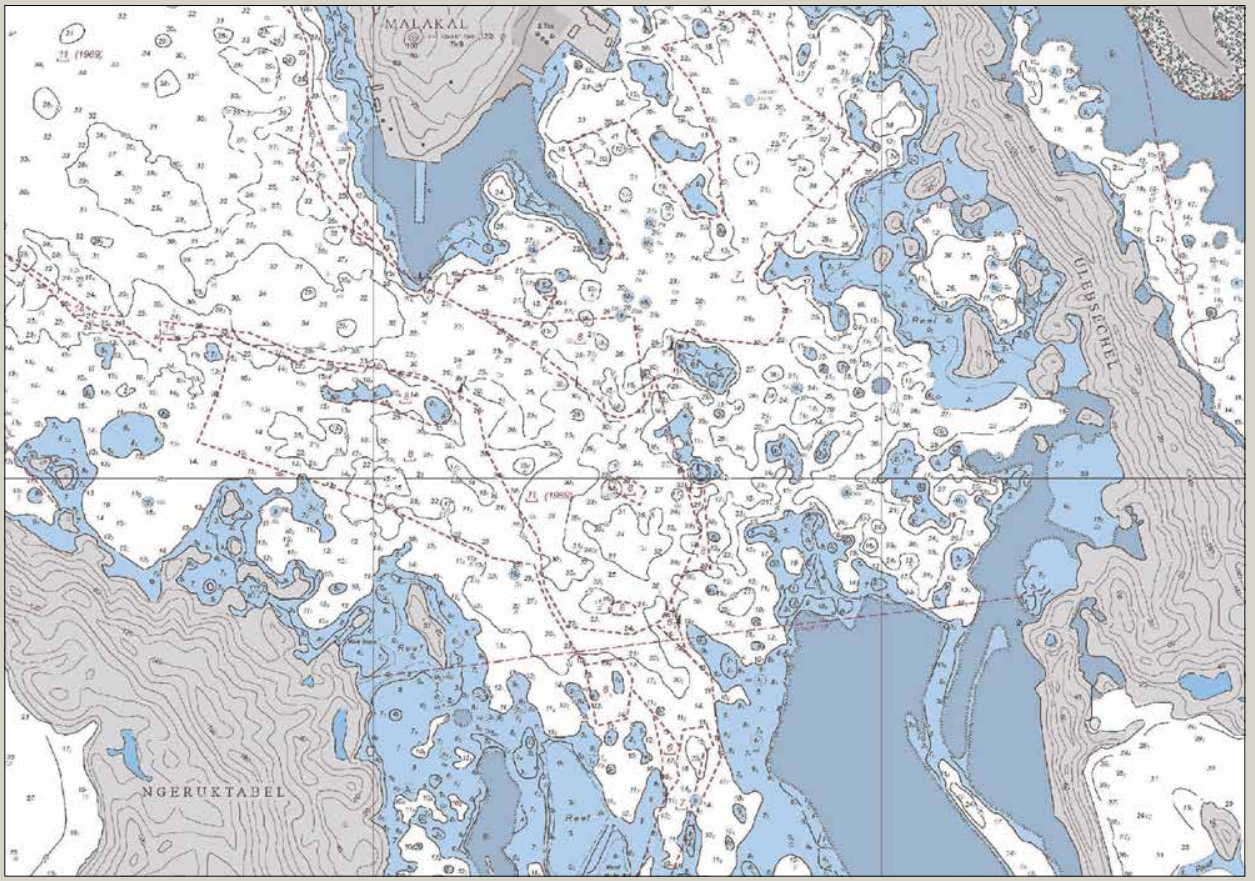


Maritime Domain's Enterprise Product on Demand Services (ePODS)

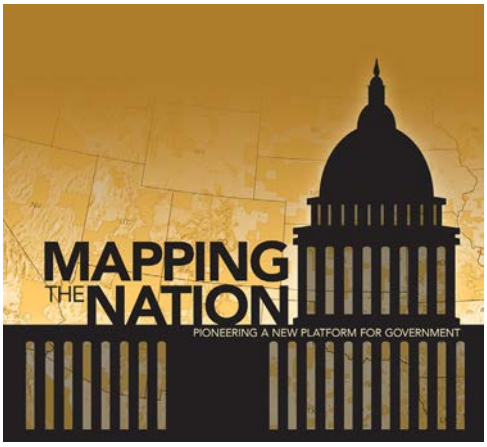
Over the past several years, the National Geospatial-Intelligence Agency (NGA) and Esri have worked together developing the Enterprise Product on Demand Service (ePODS) concept. The goal of ePODS for the Maritime Domain group within the Office of Global Navigation is to develop software that produces "fast-and-safe" or print ready nautical charts directly from Digital Nautical Charts (DNC) and Vector Product Format (VPF) data. The collaboration between government and contractor has been a key part of this successful effort. The initial stage involved beta testing of the new software by a select group of NGA analysts, which was ultimately a process of trial and error. Close coordination and feedback were essential between NGA analysts and Esri to ensure that the ePODS toolset was functioning properly. This has made ePODS a more efficient process today. The overall purpose of ePODS is to expedite and modernize the creation of legacy chart formats. This is done using GIS techniques, which automate the generation of the base chart and regenerate, reprint, and replace outdated charts with current, near real-time charts. This will improve and expand functional capabilities in chart creation and dissemination. The premise of ePODS was simple: develop a tool to build hard-copy charts directly from DNC/VPF data with little human interaction. The process has become more automated, requiring less manual effort by users. This will inevitably save on the time and costs needed to produce traditional cartographic products, including nautical hard-copy charts. The Maritime Domain group aims to address and solve the issue of an aging DNC inventory that is increasingly difficult and expensive to maintain. This on-demand service has become an extension within Esri's Production Line Tool Set (PLTS) for ArcGIS—Nautical Solution (now called ArcGIS for Maritime: Charting).

In summary, ePODS has become an essential tool in the NGA's efforts to support the US Navy's hard-copy requirements for the near future. The ePODS process has the potential to shorten production times, thus enabling real-time distribution and customer access to the data. Rapid hard-copy production via ePODS will also allow the NGA to resolve many issues, including mitigating the current hard-copy crisis, synchronizing the hard-copy portfolio with DNC, and providing an advanced quality control/quality assurance tool for DNC production and maintenance.





↑ This is an excerpt from the new Esri Press book *Mapping the Nation: Pioneering a New Platform for Government*. The book is a collection of maps developed by US federal agencies using both desktop and web-based GIS tools and applications. More than 25 agencies across nine US departments have contributed maps on subjects such as ecoregions, disaster planning, census distributions, hydrography, and pollution remediation. To learn more about the book, visit esripress.esri.com.



Advice from a Rocket Scientist—How NASA LaRC Uses GIS to Manage Facilities

Langley Research Center (LaRC) is one of about a dozen National Aeronautics and Space Administration (NASA) facilities located in Hampton, Virginia, at the mouth of the Chesapeake Bay. LaRC is the oldest facility, and its roots are firmly entrenched in aeronautical research. LaRC scientists strive to improve the earth by studying the atmosphere. This provides a better understanding of the conditions planes and spacecraft fly through, making it safer for both civilian and military planes, as well as quieter and more efficient. LaRC staff also work above the atmosphere, analyzing materials and structures to help spacecraft withstand the unforgiving environments they will meet in space.

From Space to Speedos—Facilities Are Important

When swimsuit manufacturer Speedo wanted to develop a new, faster swimsuit, it called on LaRC researchers. With their expertise in drag reduction, gained through years of studying aircraft aerodynamics, the researchers were able to develop better fabric—tested in a Langley wind tunnel. This fabric now comprises suits worn by champion swimmers the world over.

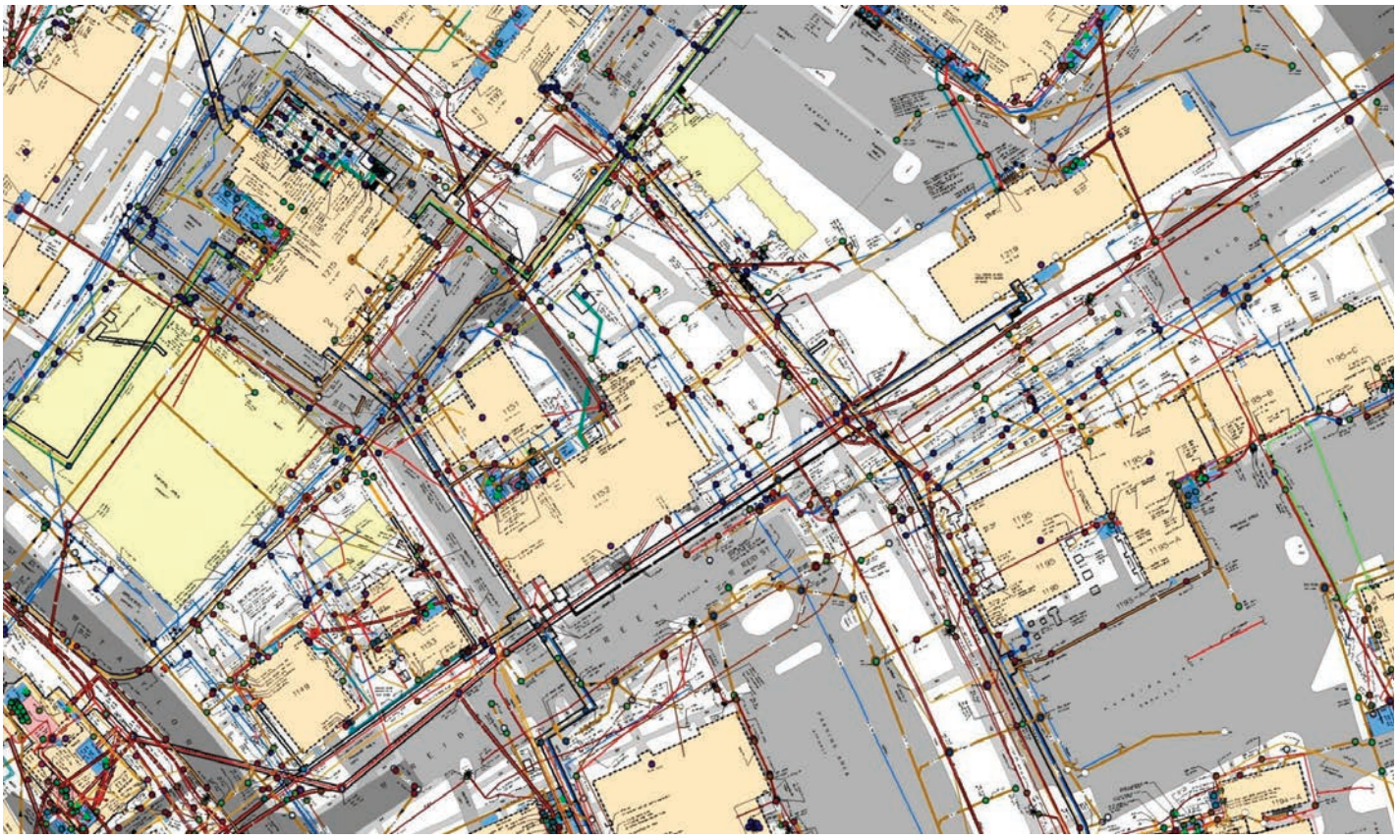
The wind tunnels are an obvious asset to the LaRC facility. These unique structures require special care due to their extensive horizontal infrastructure, including power, cooling, and high-pressure air and other gases, to stay operational. Understanding and maintaining this unique environment led LaRC to find a better way to manage its data and provide decision support tools to use at the facility. The facility team looked at GIS and was drawn to the technology's ability to manage, view, and analyze data in a holistic manner.

Today, the LaRC facility contains 800 acres of housing and 280 facilities with an estimated replacement value of approximately $3.5 billion. Facilities management at LaRC includes managing approximately 6,000 rooms that contain close to four million square feet of building data. All the information needed to run this massive organization is managed by the LaRC operations directorate's GIS team. The team utilizes a vast information technology structure, and ArcGIS is an important part of that solution.

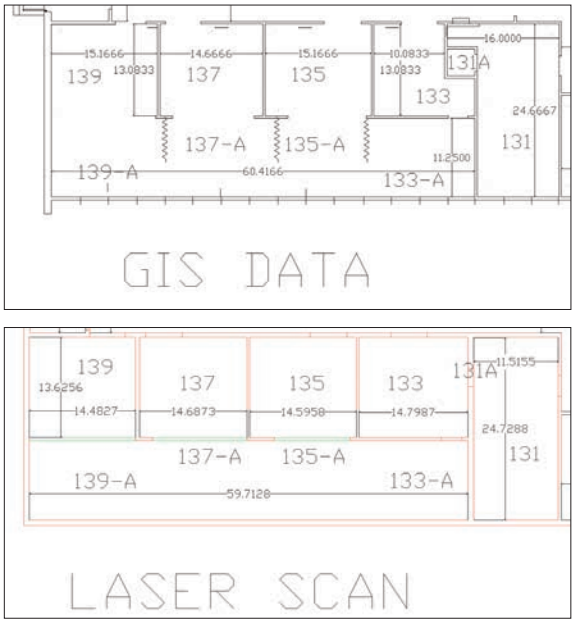
Simple Concepts Manage Complex Infrastructure

"LaRC GIS staff members try to apply two simple concepts anytime we engage in an effort," explained William "Brad" Ball, GIS team leader at LaRC.

The first concept is to pursue the most stringent requirements. For example, when addressing geodetic control, measurements



↑ The unique structures at the LaRC facility require special care in managing the infrastructure for power, cooling, and high-pressure air and other gases.



↑ Building data, such as as-built data and laser scans, can be aligned with georeferenced building data to solve inaccuracies in collected data.

should be to a few millimeters. Utility and facility locations are to be measured to a few centimeters, and aerial imagery should provide two-inch resolution and comparable accuracy. A similar attention to detail is also adhered to when interior building measurements are taken.

The second concept Ball expects his staff to engage in is data integration. "I want all possible data uses brought together," said Ball. "Then, I want to publicize the data as widely as possible, where security concerns allow, of course."

These approaches allow the LaRC facility team to use and reuse data. The data is made even more available by providing access to it on the web. Using an integrated process like this allows team members to view all the data and flag any potential problems quickly.

"Sharing data gives us the benefit of many eyes with different perspectives looking at it and quality checking," said Ball. "This means we are using our limited resources as efficiently as possible."

The result: the LaRC GIS website supports approximately five million hits a year.

From As-built Comes Better Building Management

More than a decade ago, the LaRC team realized that there was tremendous value associated with integrating building interior data and GIS. At that time, the team was supporting the organization with spatial data management and decision support tools. As the team began pursuing using facilities data, the owner of the data would not allow the GIS process to do anything but publish the data exactly as it existed in as-built drawings.

To address the challenges, Ball's team developed a process that consumes the building spatial data directly from the drawings, then translates, scales, and rotates the data to align with the georeferenced building outline. Using this process, Ball's team could use the data. To date, approximately 20 layers of information have been consumed, including fire system components, automated external defibrillators, handicap accessible features, and electrical panels.

Again using Ball's integration concept, data is tied into LaRC's space utilization, real property, and master plan processes. Database tools are used to address day-to-day processes such as figuring out statistics describing the use of buildings, move management, demolition coordination, and organization change projection tools.

Space Optimization and Beyond

"The most recent and possibly revolutionary twist to our implementation approach has been our Space Utilization Optimization tool," Ball said.

This tool not only automates optimization of any available space in a facility but also allows users to manually drag and drop and fine-tune data including which organizations or personnel should inhabit a space. The automated optimization operates under a series of constraints and metrics that Ball's team set up. Metrics can include any commodity that can be modeled such as energy efficiency, carbon footprint, safety, or security concerns. The constraints include rules such as minimum and maximum areas for various types of employees. In the system, managers require their own offices.

Current metrics in the LaRC administrative model deal with synergy within and between organizations, move costs, and lighting costs. Optimization can be applied to address both tactical, or short-term, needs and strategic, or long-term, goals. The LaRC team has found that an optimization run can generally improve the modeled cost of metrics by a factor of two, meaning the new configuration will be twice as efficient as the original.

Seeing the Buildings through the Spatial Trees

LaRC staff employs a unique user interface to support presenting and interacting with the optimization tools. The interface consists of spatial tree diagramming, which was developed so the user can see all bases, facilities, buildings, rooms, or personnel across a wide geographic area. Since there are millions and millions of square feet, the interface uses an abstract representation of any space in question.

Because ArcGIS is used as the underlying functionality, the visualization or symbolization can be based on any data available. For example, instead of square footage, a user can easily change the information displayed to represent operational cost, or perhaps the commodity rendered. Any rooms larger than 1,000 square feet can be shaded in red, or heating costs per space can be thematically displayed to find outliers that may require attention.

This abstraction makes it easier for staff members to process quickly. For detailed information, including realistic renderings, the interface also links to maps and building layouts. The user simply clicks on the feature in the image in question, and the actual floor plan is opened.

NASA is patenting this technology to be used outside its walls. "We developed a process to automatically consume any building-level vector data that exists and link it with any attribute data that is available," said Ball. Currently, LaRC is using this technology to prototype more efficient use of facilities for partners, including the US Navy.

Creating Alliances

"Much can be accomplished in the area of facilities management with meager resources; LaRC GIS is living proof," said Ball. "All it takes is a few technologically savvy and motivated individuals to start the effort."

Ball also pointed out that much can be addressed by partnering, especially within and between government entities. LaRC GIS has kicked off and partnered on numerous

initiatives across many government entities over the years.

"It is much easier if top-down management support exists, even if there is nothing else other than a prototype," said Ball. However, in some instances, the LaRC GIS team has resorted to the "build it and they will come" philosophy in an effort to overcome legacy processes.

"In our instance, alignment with principal users, such as Space Utilization, Real Property, and Master Plan, contributed to our success," said Ball. "Now integration with other functions, such as maintenance, communications, safety, and security, are starting to be better understood."

Use It or Lose It

Where GIS is first placed can also be critical. "My experience has been that linking the GIS to organizations that routinely use the data versus organizations that perform oversight or process functions, such as IT groups, has generally produced superior results," said Ball.

Additionally, use of interns is a very affordable approach to facilitate initial development as well as major changes to any program, including GIS.

"Finally, I suggest building FM [facilities management] on top of core technologies like GIS and a robust RDBMS as opposed to pursuit of third-party products," said Ball. "This simplifies customization to align with your organization's workflow."

For more information on how GIS can help facilities managers, visit esri.com/fm.

↓ The NASA LaRC facility contains 800 acres of housing and 280 facilities with an estimated replacement value of approximately $3.5 billion.

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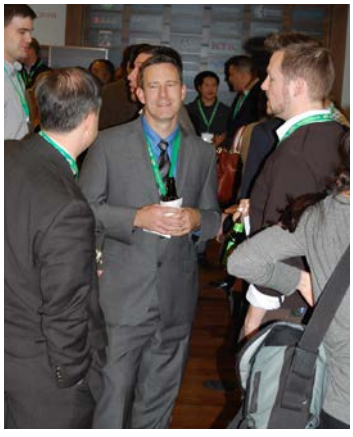

↑ Esri solution engineer Bonnie Stayer discusses the latest features of ArcGIS.

← Esri DC R&D Center CTO Andrew Turner explains about using Open Source.

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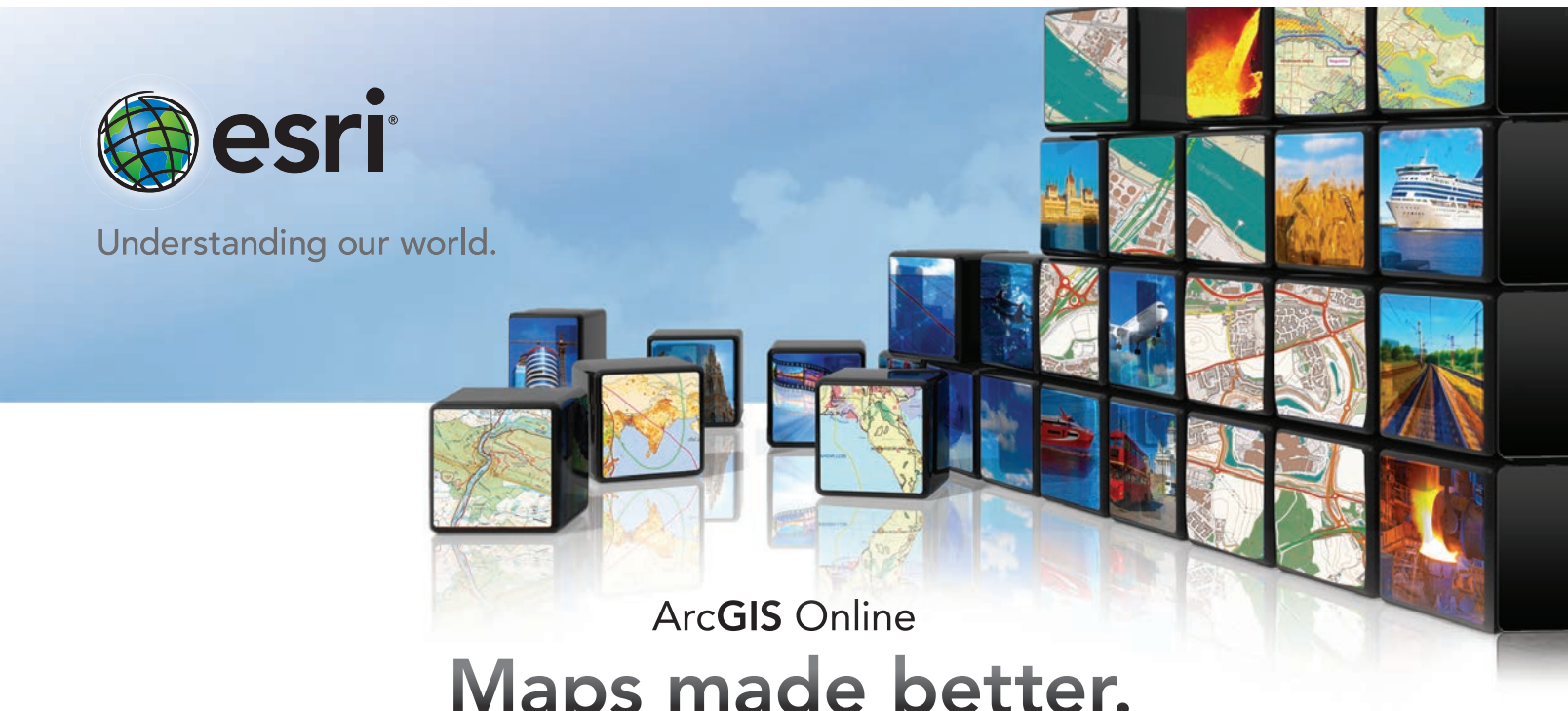

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