Esri News
for Federal Government
Summer 2013

# Working beyond Retirement Age

## Esri Data and Analysis Tell the Story

By Brent Roderick, Esri Writer

As they age, today's baby boomers—those born between 1946 and 1964—are doing something very unusual. They are not retiring.

Just how many seniors are currently of traditional retirement age? A lot. Census 2010 figures note that the number of people aged 65 and older jumped 15.1 percent between 2000 and 2010 and now comprise 13 percent of the total US population. By 2020, the Bureau of Labor Statistics projects people aged 55 and older will make up 28.4 percent of the resident population. This growth will translate into the work force. Seniors will soon make up 38 percent of the American work force.

Why are so many seniors still working? What are the causes of this phenomenon?

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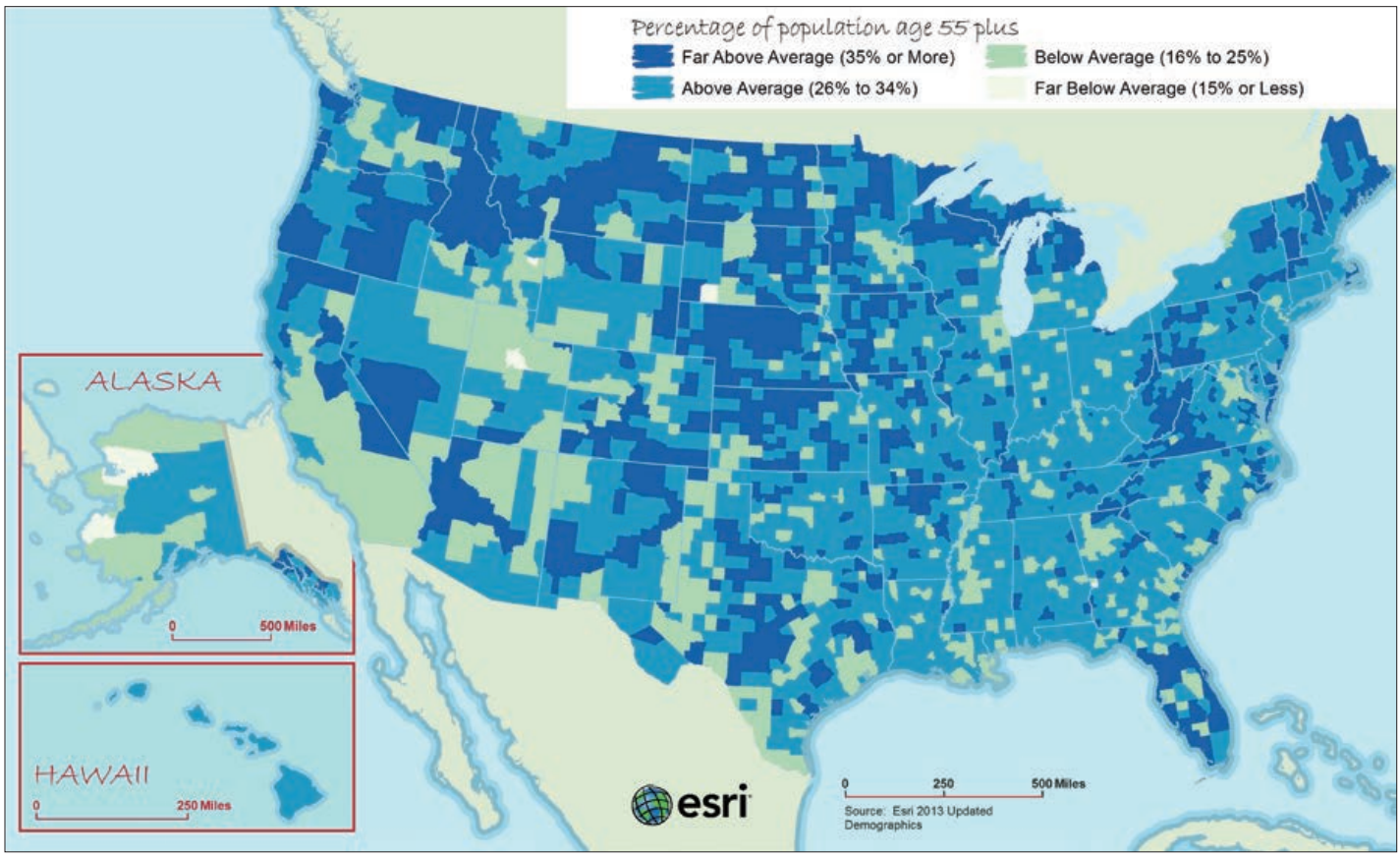


↑ Other than in Florida and Arizona as expected, significant numbers of seniors are also found across America's Breadbasket, in the upper Midwest, and Northwest. This map of the United States by county was created with Esri's 2013 Updated Demographics data.

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Summer 2013




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## Working beyond Retirement Age

continued from cover

### Retirement Postponed

Reduced home values and decimated 401(k) assets have postponed or changed retirement plans for many seniors. Even more alarming is the lack of savings among some of retirement age. Most workers questioned in a survey conducted by the Employee Benefit Research Institute (EBRI) say they have virtually no savings or investments. Also, 37 percent of those surveyed think they will have to wait until after age 65 to retire.

When they can least afford it, many seniors are also carrying mortgages and credit card debt. Others made loans to adult children that have not been repaid. The American Association of Retired Persons (AARP) notes that 34 percent of older Americans used credit cards for basic expenses such as mortgage payments, health care, groceries, and utilities. The average amount of credit card debt is $8,248.

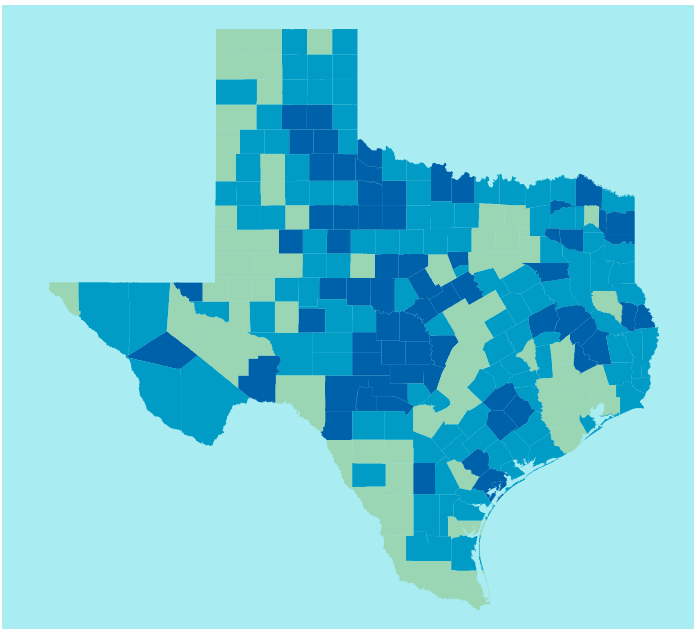
### Still Working

Face the Facts USA notes that 4 in 10 Americans aged 55 and older are still working. This is the highest percentage of people of this age in the work force in more than half a century. Longer life expectancy, better health, and more women in the work force are contributing factors for this change. Other reasons for postponing retirement include concerns about assets lost during the Great Recession, access to health care before becoming eligible for Medicare, a desire to contribute, enjoying one's job, staying busy, and earning extra money.

Over the years, the economy has shifted from heavy industrial manufacturing jobs to less physically taxing service occupations, enabling more seniors to work longer. Dr. William Hall, professor of Medicine at the University of Rochester and director of the Center for Healthy Aging at Highland Hospital, Rochester, New York, notes, "Among aging boomers, there is a desire to stay active in their professions or work. This can be a positive phenomenon. If you feel productive and valued, don't think about retirement."

These changes in the work force present formidable tasks for government. Agencies will have to provide more services for retirees, working seniors, and employed seniors who are also caring for elderly relatives. With more people remaining in the work force longer, government agencies must plan ahead to determine the types of services these seniors will need.

Government may have to extend health services to unemployed, uninsured seniors who are not yet eligible for Medicare. Many working seniors may want or need access to senior health care programs, legal assistance, and recreational opportunities outside regular business hours. Some seniors also may be caring for elderly parents at home and need daytime services such as senior day care, home health aides, medical supply delivery, and consultants to help with medical bills and insurance claims. Some seniors have given up their homes and moved in with their adult children. Different types of housing are needed to accommodate this increase in multigenerational households.



↑ Above-average concentrations of seniors can be found in areas of central Texas; for example, 30.7 percent of the population in Llano County is aged 65 years or older. More youthful populations live in many of the border counties.

How can agencies learn more about seniors in the United States? Demographic and segmentation data from Esri provides detailed demographic profiles; lifestyle and lifestage information; and product, service, and media preferences.

Current-year estimates and five-year projections for demographic data categories, such as age, race/ethnicity, income, net worth, and home value, are included in Esri's Updated Demographics database. Ranked number one for accuracy and updated annually with Esri's proven methodology, Updated Demographics data is available at multiple geography levels. Access includes reports and maps from Esri Business Analyst Online, map services from ArcGIS Online, in-depth analyses via Business Analyst for Desktop and Business Analyst for Server, and for purchase by table.

The Tapestry Segmentation system classifies all US residential neighborhoods into 65 unique segments based on demographic and socioeconomic characteristics. For a broader view of markets, segments are divided into 11 LifeMode (lifestyle/lifestage) and 12 Urbanization (population density/affluence) summary groups. Tapestry classifies seniors into 9 distinct segments that range from affluent, active seniors to older, sedentary folks with limited resources.

Government agencies can use this information to learn more about retirees, working seniors, and their elders in order to understand them, locate them, and provide the best services for them.

# Open Data for Agriculture

By Susana Crespo, Esri Agricultural Specialist

The agriculture industry is on the verge of massive transformation as it rises to overcome the challenge of feeding 9 billion people by 2050.

With the increased risk posed by a changing climate, pests, volatile prices, and land degradation, compounded over time with growing demand, the industry's challenge/opportunity lies in developing integrated solutions that bridge traditional divisions between sectors, companies, platforms, and stakeholders.

The agriculture industry is refining its use and application of information technologies to respond more precisely to risk. New and innovative strategies are emerging that optimize production by leveraging *the right information in the right place at the right time*. For example, farmers in Kenya obtain better prices for their crops with real-time access to market prices thanks to M-Farm.

On the domestic front, the industry is increasingly leveraging spatial data to minimize uncertainty and increase productivity. Thanks to the government's open Global Positioning System (GPS), the precision agriculture industry is empowered to measure, analyze, and respond to subfield variability in production.

Using GIS to create management zones based on variable rates of soil moisture and nutrients, farmers are able to optimize production by varying the application of inputs. As a result, over time, yields have increased substantially, while the use of fertilizer has remained the same.

But more data does not necessarily lead to more understanding. Unless this increasingly sophisticated, diversifying, and complex approach to agriculture is accompanied by an equally strong force of **convergence** characterized by interoperability, open data, and open access, we risk charging ahead to overcome our greatest challenges while bearing the burden of needless inefficiency.

↑ Susana Crespo, Esri Agricultural Specialist

## The Opportunity

As with most industries, the emergence of information technologies in agriculture has led to industry-specific solutions where unique data formats have challenged growers to integrate data from proprietary machinery with imagery; public data; proprietary data; and, most importantly, with what growers observe in their fields and ranches.

In response, the domestic agribusiness community has organized in Collaboration for e-Connectivity as AgGateway, a consortium of businesses serving the agriculture industry to promote, among others, Standardized Precision Ag Data Exchange, also known as the SPADE project. The idea behind SPADE is that by promoting standards, the industry will achieve better communication and faster, real-time transactions while optimizing production at less cost.

While information technology for agriculture is becoming increasingly complex, there is growing awareness of the need to converge toward standards and platforms that facilitate flow of information between data systems.

Once the industry optimizes the flow of data describing what is happening *within* a field, the next frontier is to better understand what is happening *between* fields, allowing people to answer questions like, I want to know where *else* matches x,y,z conditions I observe in my region, and what are they growing there? What management practices are successful under what soil types? Under what conditions do x,y,z seeds perform the best? How do x,y,z variables aggregate to different geographies? How does my yield compare with that of land with characteristics similar to here?

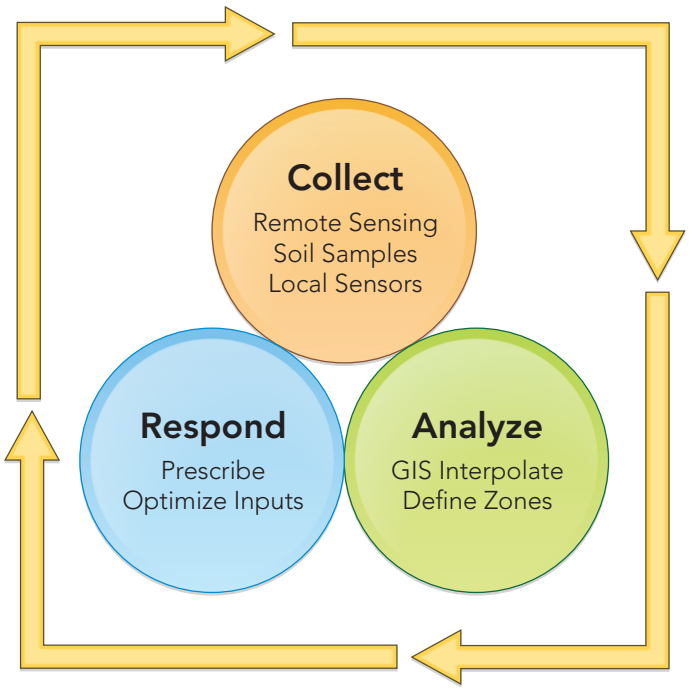
While answering these questions would depend on people sharing information traditionally held privately, many of these questions can be answered thanks to open data made available by the US Department of Agriculture (USDA) and US Geological

Survey (USGS), some of which is now hosted as live web services on ArcGIS Online.

Esri hosts USDA/Natural Resources Conservation Service's (NRCS) Soil Survey Geodatabase (SSURGO) general soil map coverage as a live web service and web map on ArcGIS Online, ready for analysis to reference in desktop and for developers to hit with Esri's API.

Open data is now an official part of federal policy. In May, President Barack Obama signed an executive order and open data policy committing to new services on Data.gov, where users can now browse 370 ag-related datasets to inspire analysis and innovation. Many of these datasets have geographic dimensions and power useful applications such as the USDA's Supplemental Nutrition Assistance Program (SNAP) Retail Locator and Know Your Farmer, Know Your Food Compass Map connecting producers, consumers, and service providers to one another.

Liberating data and exposing it to users, analysts, and developers unlocks creativity and innovation to address shared challenges. Just in June 2013, in Silicon Valley, California, Food and Tech Connect, with sponsorship by organic meat company Applegate, challenged a community of ranchers and hackers to design solutions to equip the next generation of farmers to meet the growing demand for organic meat.




Three teams built hacks using ArcGIS API for JavaScript. By calling on routing services in ArcGIS Online, the USDA/NRCS general soils map coverage, and other live feature services such as location and distance to slaughterhouses and farmers' markets, the hacks creatSed mobile applications to help connect aspiring farmers with suitable land for lease.

The Esri platform was key to making the solutions geoaware. The live web services provided authoritative content that enabled a convergence of information that resulted in increased knowledge and understanding of the US agricultural landscape.

The trends toward interoperability and open data are just as apparent on the international front. In 2012, when G8 leaders met in Camp David, they made a commitment to a New Alliance for Food Security and Nutrition, which led to the G8 Open Data for Agriculture Conference held in Washington, DC, in April 2013. This conference highlighted the power and potential of open data to transform the agriculture industry worldwide, as well as its vital role in achieving forward security.

The International Aid Transparency Initiative (IATI) is also indicative of this trend. IATI is a voluntary initiative that takes the pragmatic approach of providing an XML framework to harmonize data that is generated around aid investments. Put simply, this framework lets over 160 organizations share, compare, aggregate, and summarize data across themes and geographies so they can track projects, spending, and impacts.

Given that agricultural activity is inherently spatial, GIS, basemaps, and live web services are poised to become the backbone of a system that could help unlock the potential of understanding agricultural production within and between geographies.

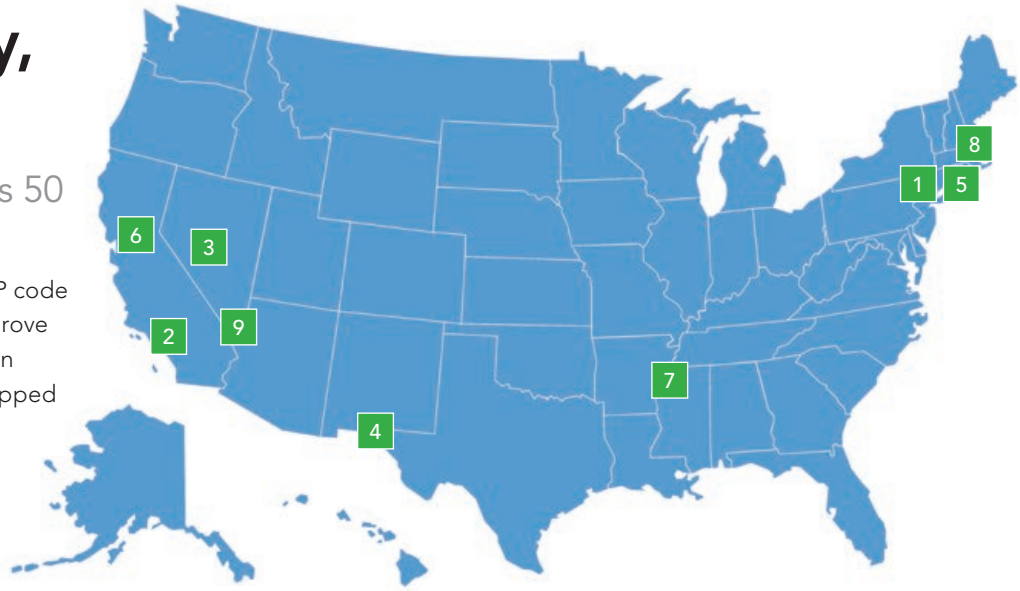
Once these sources of information find crosswalks between them, and the agricultural information systems that depend on them become truly interoperable, the industry will discover a new level of analytics and understanding put in service to address the challenges in the future.

For more information, contact Susana Crespo at screspo@esri.com or follow her on Twitter @AgMapper.

# Happy Birthday, ZIP Code!

## The Nation's ZIP Code Turns 50

The US Postal Service began using the ZIP code system 50 years ago. The idea was to improve the efficiency and speed of mail sorting. In recognition of this milestone, Esri has mapped the nine most trivia-worthy ZIP codes.




1

Photo: Wikimedia Commons

**10001 The One with the Most Businesses**
This New York City ZIP code includes the Chelsea neighborhood in Manhattan and, according to the US Census Bureau, contains more businesses than any other in the United States.

3


Photo: Wikimedia Commons

**89049 The Most Spacious**
This rural area in Tonopah, Nevada, has the largest ZIP code in the lower 48 states. At 10,000 square miles, it's a little larger than the state of Maryland.

2

Photo: Wikimedia Commons

**90210 The Coolest—In the 1990s**
This ZIP code covers posh Beverly Hills, California, and also provided the title of a popular teen TV drama series in the 1990s.

4


Photo: Wikimedia Commons

**79936 The Most Populous**
The population in this El Paso, Texas, ZIP code exceeds 114,000, according to the Census Bureau's ZIP code tabulation area database (which contains population and demographic statistics). That's more people than in any other ZIP code.

5


Photo: Wikimedia Commons

**11109 The Tiniest**
A two-block area across the East River from Manhattan, this ZIP code in Long Island City, New York, is among the smallest in the country at one-tenth of one square mile.

8

Photo: Wikimedia Commons

**02562 Among the Least Diverse**
In 02562 (Sagamore Beach, Massachusetts), 99 percent of the population is white.

6

Photo: Wikimedia Commons

**95834 Among the Most Diverse**
This North Sacramento, California, ZIP code is among the most diversely populated in the country.

9

Photo: Wikimedia Commons

**89109 The One with the Big Spenders**
Residents and political action committees in this Las Vegas ZIP code spent more money in the latest election cycle than they did anywhere else: $96 million.

7


Photo: Wikimedia Commons

**38639 Among the Least Diverse**
The population in 38639 (Jonestown, Mississippi) is 99 percent black.

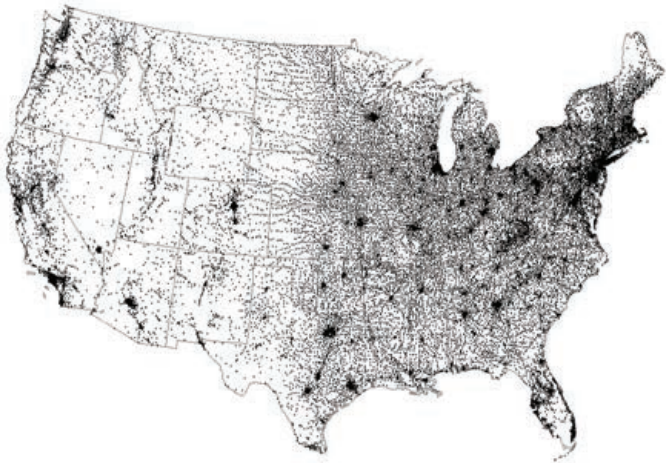
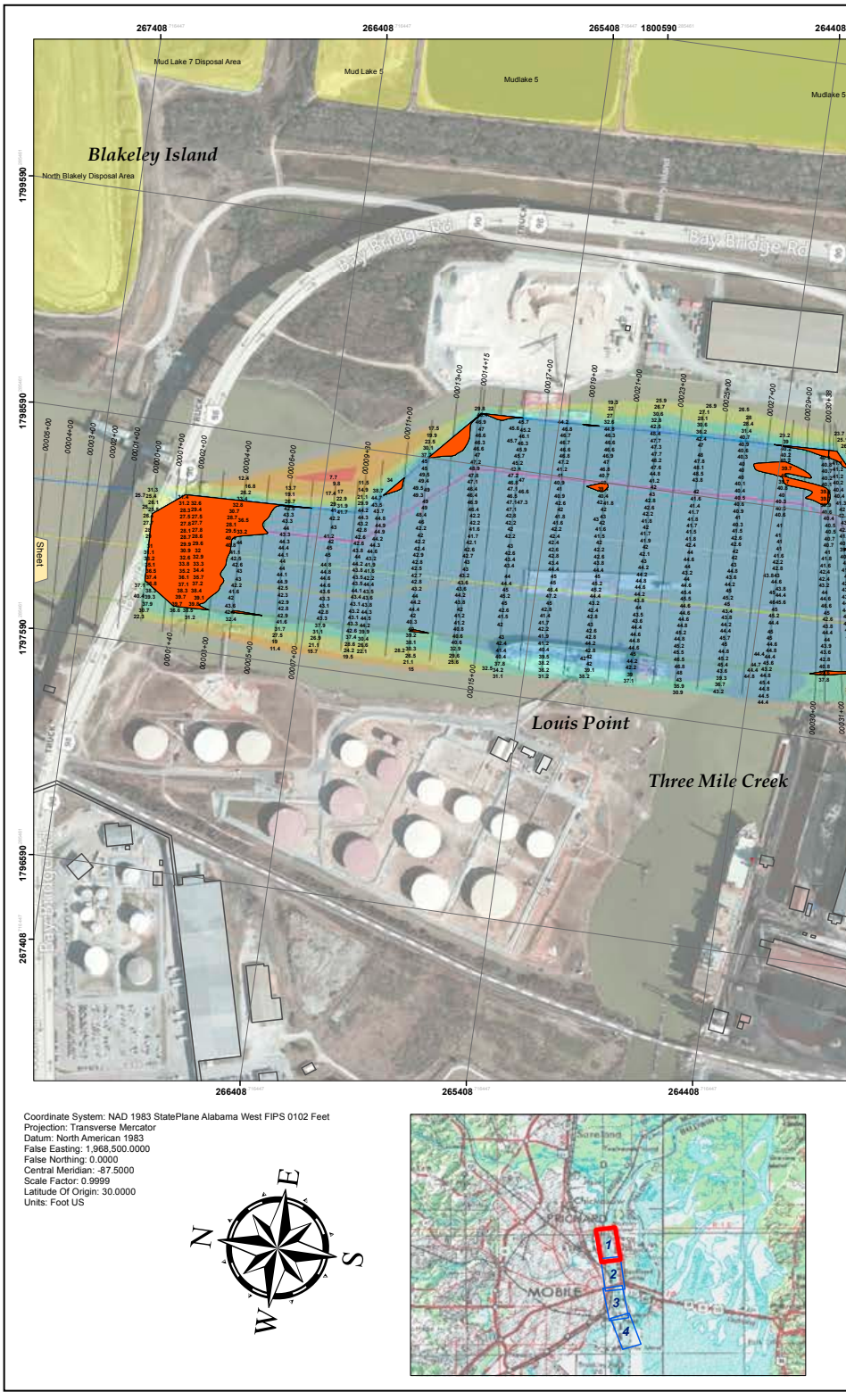


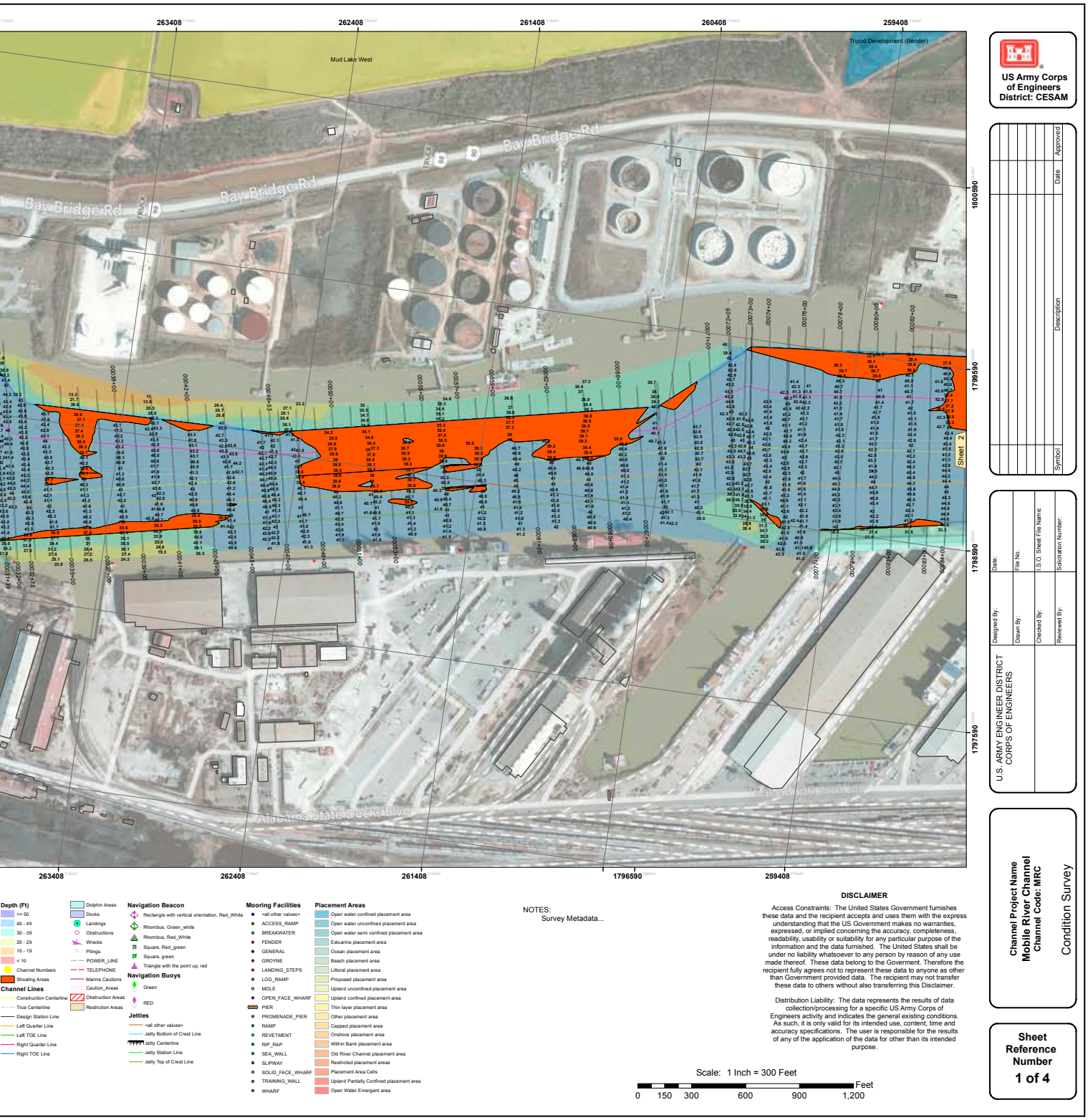
Photo: Matt Stiles, NPR Cartographer/US Census Bureau

The heavy clusters of dots on this map represent the centroid of data points, based on data compiled by the US Census Bureau and Esri. To interact with this map online, go to mediamaps.esri.com/interesting-zips/.

# Book Excerpt: *Mapping the Nation*

Dredging and the management of dredged materials are important responsibilities of the US Army Corps of Engineers (USACE). Periodic dredging of harbors and rivers nationwide is required for safe transit of ships, barges, ferries, and other vessels. To support this effort, the USACE conducts hydrographic surveys—the measurement and description of nautical features that affect maritime navigation—to collect data for assessing channel safety and prioritizing dredging needs. Until recently, each corps district used computer-aided design (CAD) to visualize the data, employing its own design standards, map templates, scales, and symbology. The USACE is conducting a pilot project to plot this data geospatially on georeferenced background images. The main goal is to identify areas of each channel that have shoaled—become shallow—and are thus in need of dredging. Additional benefits include collecting the data in an enterprise geodatabase and maintaining consistency of mapping across districts. The automated process begins by plotting the National Channel Framework (a collection of all congressionally authorized channels) on a basemap, adding the hydrographic survey data (sounding points), and finally generating shoaling contour lines and polygons. The resultant ArcGIS map is displayed on data-driven pages. This map shows the north end of the Mobile River channel in Mobile, Alabama. Orange polygons identify all areas of the channel between the green line (left channel edge, or "toe line") and the blue line (right channel edge, or toe line) that have shoaled (less than a depth of forty feet) and, therefore, require dredging.



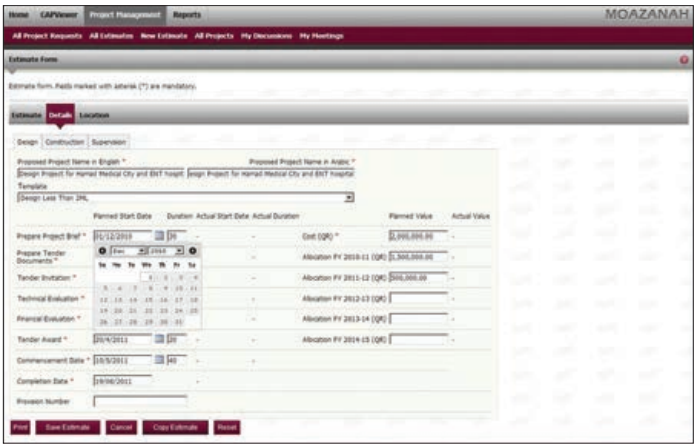

↑ This is an excerpt from the new Esri Press book *Mapping the Nation: Pioneering a New Platform for Government*. The book is a collection of maps developed by US federal agencies using both desktop and web-based GIS tools and applications. More than 25 agencies across nine US departments have contributed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

# Qatar Implements Geocentric Budgetary System

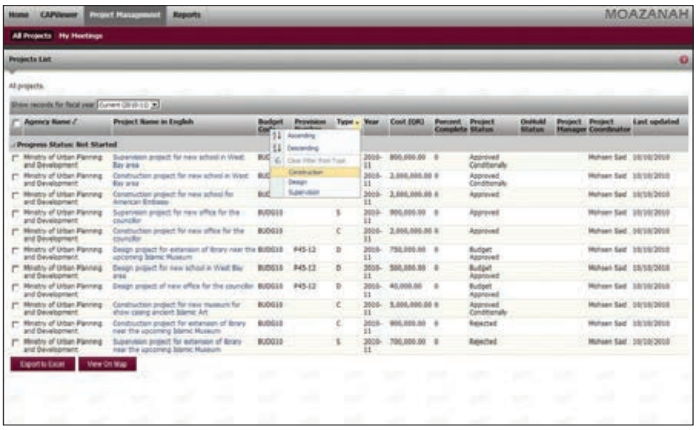
By Jim Baumann, Esri Writer

With its wealth in oil and natural gas reserves, resulting in an expansion in trade and investment, the small Middle Eastern nation of Qatar has seen its population more than triple to 1.7 million in fewer than 15 years. This population growth has sparked an unprecedented boom in construction and infrastructure development projects.

Though the Qatar public works authority, Ashghal, is responsible for a significant amount of the country's infrastructure, including roads, wastewater systems, and public buildings, there are numerous other government organizations that are in charge of designing, building, and maintaining government facilities. Because all government infrastructure projects compete for public funding, Ashghal was assigned the responsibility of implementing a system to coordinate the annual capital project budget application process.




↑ Under Project Manager View, Looking at High-Level Project Estimate for a Medical Facility

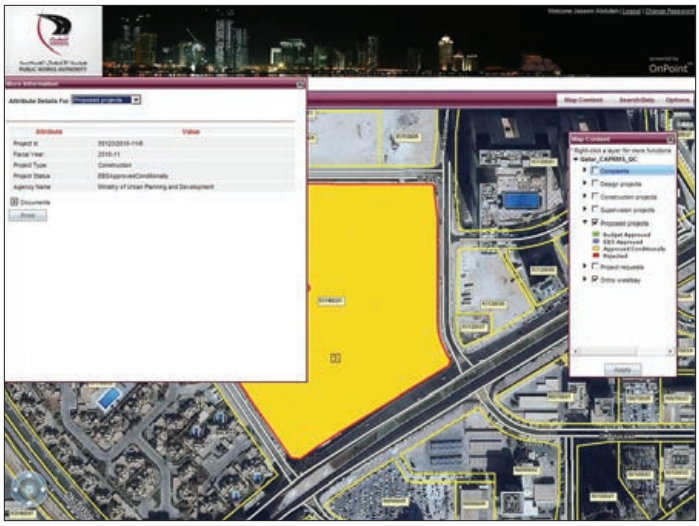



↑ Reviewing a List of All Projects by Project Coordinator

## Traditional Budget Process Led to Errors and Delays

Historically, the budget application process for major infrastructure projects was primarily paper based. This often led to paperwork being incomplete and lost, resulting in protracted meetings between the ministries and Ashghal to resolve conflicts and miscommunications, as well as late project submissions and frequent submission deadline extensions. It also limited the opportunity to collaborate on projects and complicated the tracking process.

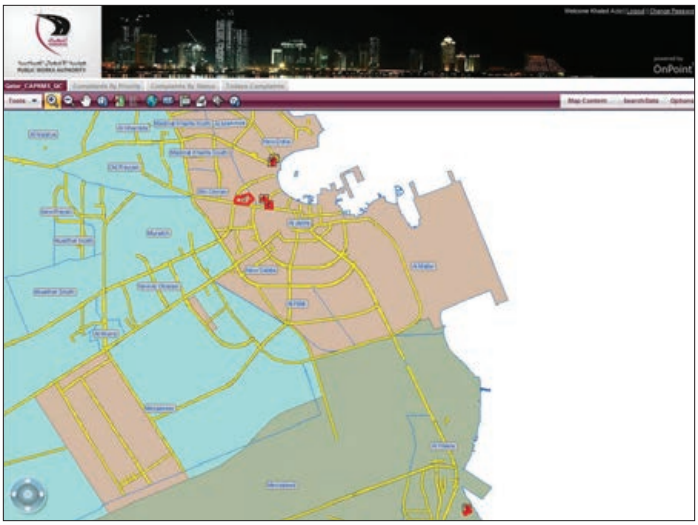
To automate this antiquated process, Ashghal's Engineering Business Services Department defined the requirements for a capital project request management system, Moazanah (Arabic for "budget"), to facilitate the country's budgetary review and approval process. The overarching aim of Moazanah is to make sure that all capital project funding applications move forward smoothly and with greater clarity for the agencies and individuals involved in the review process. The Moazanah project was announced in a competitive bidding process in 2009 and ultimately awarded to Rolta Middle East, an Esri partner.



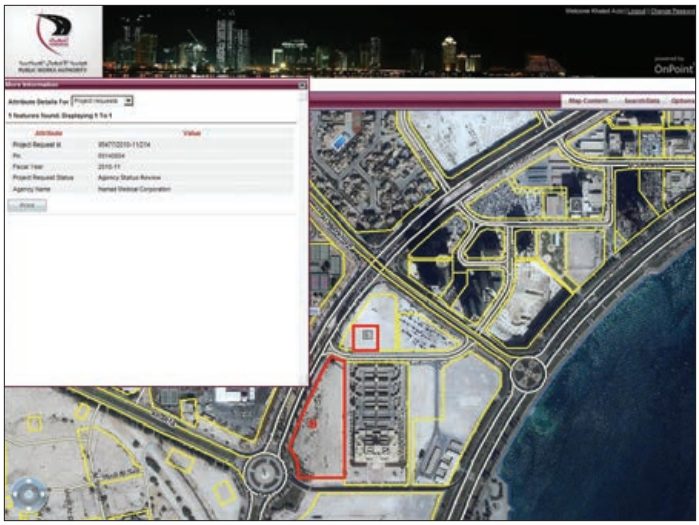
↑ Map View of a Proposed Project of Interest, with Attribute Details

## GIS-Based System Resolves Budget Process Bottlenecks

On the surface, a capital budget review process—with its mix of estimates and textual details covering legalities, materials, construction services, and logistics—may seem to lack geographic content. However, georeferencing is central to Moazanah. Each project has a geographic extent, which draws



↑ High-Level Map View of Multiple Projects Being Proposed



↑ Attribute Details and Map View of Proposed Project for an Agency Spread over Two Parcels

attention to any overlapping neighboring project. Each overlap becomes an opportunity for coordination and cost savings. For example, it is obviously costly and inefficient to repeat construction work on the same stretch of roadway. However, in the past, projects were proposed, funded, and completed without consideration for other projects scheduled for the same area that would require tearing up the same stretch of road that had just been resurfaced. These repeated disruptions were costly for the government and unnecessarily impacted local business and impeded traffic flow throughout the affected area. Using ArcGIS—a key component of Moazanah—to track project locations helps coordinate neighboring or associated work, which reduces construction costs and the disruption to local businesses and residents.

Engineer Nasser Ali Al Mawlawi, Ashghal president, says, "Moazanah manages our government infrastructure projects from beginning to end. It has not only expedited the review and approval process, but we are already seeing a costs savings, which will undoubtedly result in a significant return on investment."

Central to the Moazanah solution is Rolta's OnPoint, a web-based GIS application; SharePoint Web Parts; and Microsoft SQL Server. The underlying engine is based on the Esri ArcGIS for Server platform, which manages the spatial data for subsequent analysis and distribution. Moazanah is also integrated with Primavera's Project Portfolio Management (PPM) to organize and manage the proposed projects once the budget is approved.

## Simplicity of Use Key to System's Effectiveness

The system features a series of interconnected SharePoint forms that are specific to the role of the individual who logs in. Because the user experience was of utmost importance to the successful deployment of Moazanah, the user interface was deliberately kept clean and intuitive.

Shafik Jiwani, executive vice president of global business development at Rolta, explains, "We recognized early on that Ashghal had very ambitious plans for this system. With over 23 agencies involved in the process, hundreds of users, and hundreds of projects filled with numerous details, it was quite a challenge to present it all in a way that felt intuitive to the user. As tempting as it was to build a sophisticated interface with lots of complex tools, the smart approach was to keep the interface clean and simple. It had to be easy to find needed information to make informed assessments and immediate decisions."

Key performance indicators (KPI) are extracted from the data and displayed on a dashboard that is customized for a department head's interest and responsibilities. Moazanah is used throughout the project assessment process to evaluate the suitability and impact of a proposed project on its specified location. GIS is also used to drive other geospatially based analyses, such as the number of project requests submitted within a particular municipality and the status of those projects.

## New System Increases Efficiency

The introduction of Moazanah has increased the efficiency of Qatar's budgetary process by allowing the digital submission and examination of required information. It allows all stakeholders to evaluate and discuss the same information as it proceeds through the review procedures and facilitates collaboration and coordination. With Moazanah, Qatar has an immediate status report for all proposed projects in the country.

Concludes Abdussamad Mohamed Al Makei, Ashghal manager of the Engineering Business Services Department, "Moazanah provides us with a forum to discuss and analyze the country's infrastructure project proposals so that we can confidently move forward with them, knowing they are properly managed and within budget."

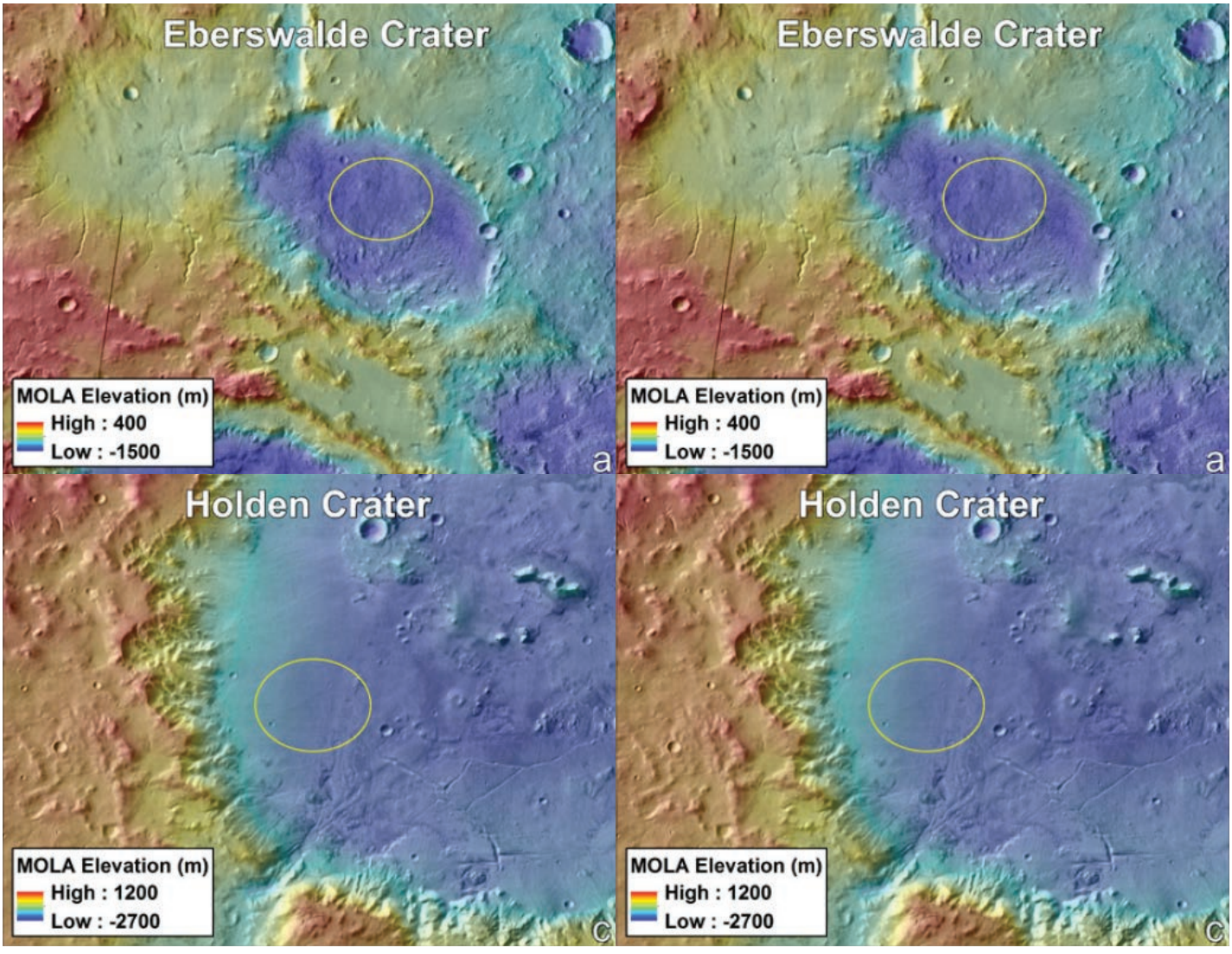
# Mapping a Mission to Mars

## GIS Aids in Planning the Terrestrial Phase of Mars Science Laboratory Mission

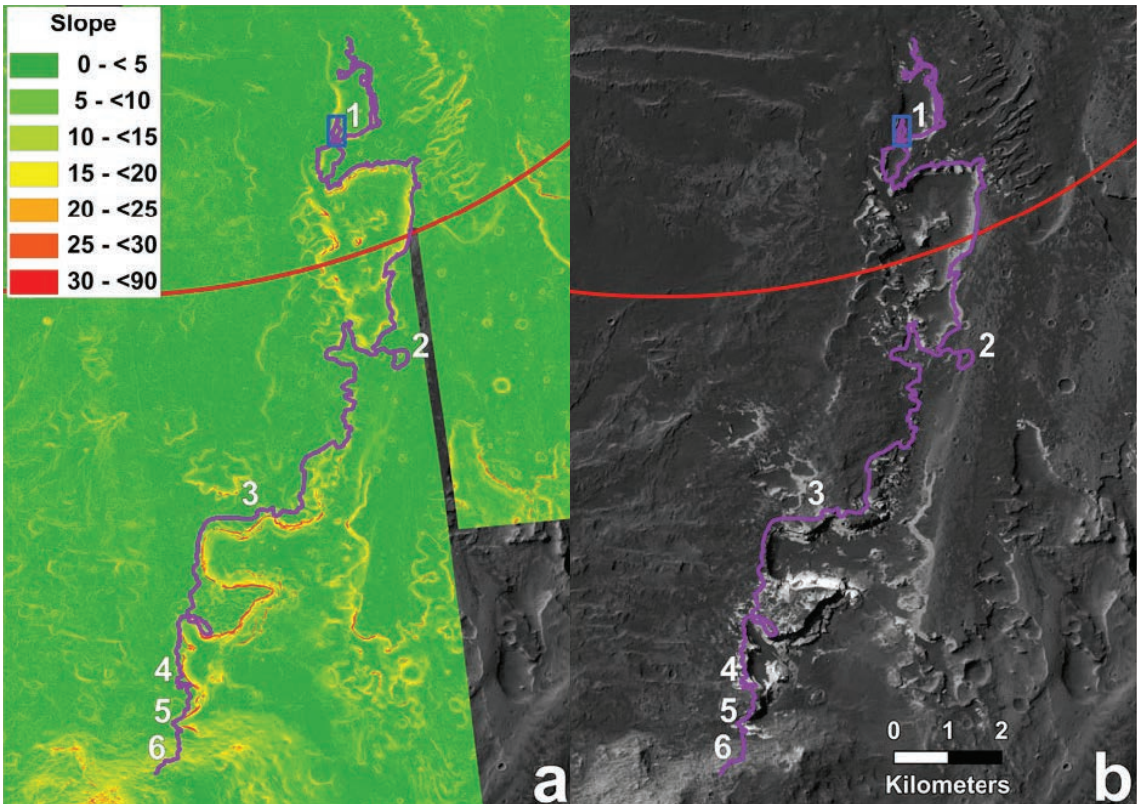
By Matthew DeMeritt, Esri Writer

Mission planners at the National Aeronautics and Space Administration (NASA) and Jet Propulsion Laboratory (JPL) hugged, hollered, and high-fived when the most sophisticated scientific instrument in the history of interplanetary exploration gently landed on the desert planet in August 2012. The Mars Science Laboratory (MSL), a compact-car-sized rover designed to roam an ancient impact crater searching for clues to Mars' dynamic history, marks the seventh successful landing of a NASA craft on the planet. Outfitted with state-of-the-art optics and sensors, MSL will collect and transmit data back to earth for two years or perhaps even longer.

Navigating through space en route to another planet's surface was only half the battle for MSL engineers. To interact with Mars, *Curiosity*, the six-wheeled vehicle that transports the laboratory to predetermined locations to conduct various experiments, must contend with the Martian terrain itself. Strewn with jagged rocks and boulders, Mars presents innumerable physical hazards that can hobble—or bring to a screeching halt—any mission not meticulously modeled and planned. For this reason, NASA and JPL choose to map their missions using geospatial tools to perform modeling and analysis. MSL mission planners used




↑ MSL Landing Ellipses for Final Four Landing Site Candidates Derived from HiRISE Imagery




← One-Meter Slope Map (a) and Corresponding HiRISE Image (b) Showing Traversable Paths (in purple)

a combination of ArcGIS and remote-sensing imagery collected in prior Mars missions to achieve the best possible awareness of Mars' diverse terrain and complicated geography.

## Reconnaissance Imagery

Imagery resources are crucial to construct maps for any terrestrial exploration of a planet, moon, or asteroid. Imagery datasets for MSL mission planning came from three active remote-sensing satellites that have been orbiting Mars for years collecting visible and multispectral photographic data of the Martian surface for their respective assignments. Of those three satellites, the Mars Reconnaissance Orbiter was the last to reach the planet in 2006 and, hence, contains the most advanced optics and richest imagery datasets. Called the High Resolution Imaging Science Experiment (HiRISE), it provided the foundational basemap imaging that NASA and JPL needed to construct maps for future rover-based missions.

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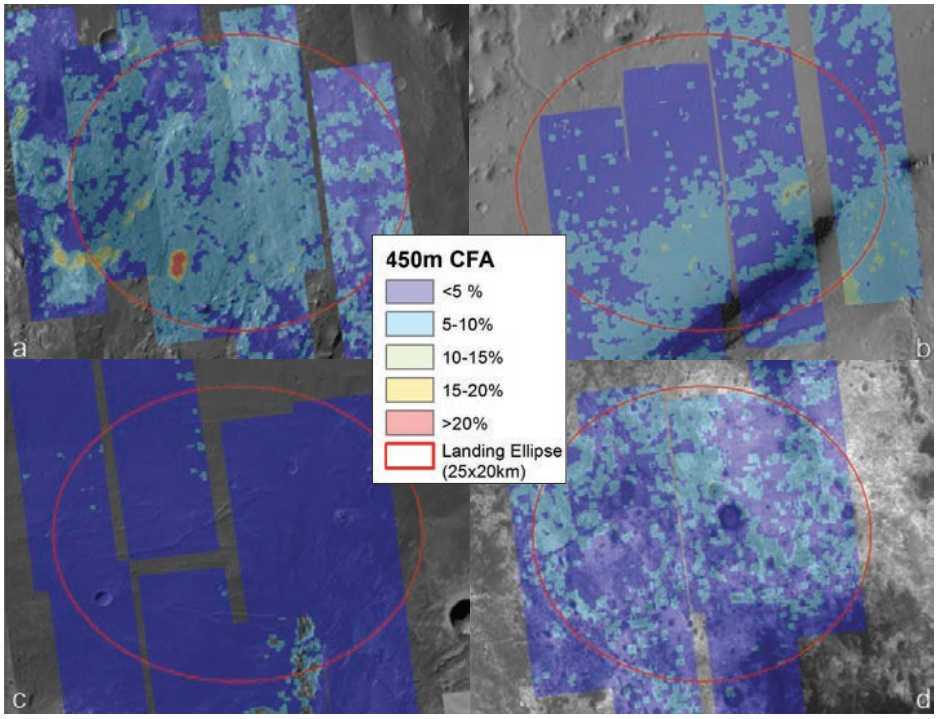


↑ Rock abundance maps of the final four MSL landing sites: (a) Eberswalde, (b) Gale, (c) Holden, and (d) Mawrth. Cumulative fractional area covered by rocks is less than 10 percent for most of the landing ellipse areas.

## Mapping a Mission to Mars

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JPL imported or created hundreds of datasets derived from HiRISE surveys into ArcGIS so that models could be run to process potential landing sites. From that imagery, 30 possible landing locations were considered. Variables important to landing feasibility are geographic in nature, and geospatial analysis helped the mission team narrow down the list of possible landing locations. Geography-related factors included latitude for thermal management of the lab, elevation for sufficient atmosphere to slow the spacecraft, relief for control and fuel management during descent, and slope for rover stability at touchdown, among other factors. An area called Gale Crater was finally chosen as the study area because it best met the required science and safety requirements of the expedition.

### Scientific Significance

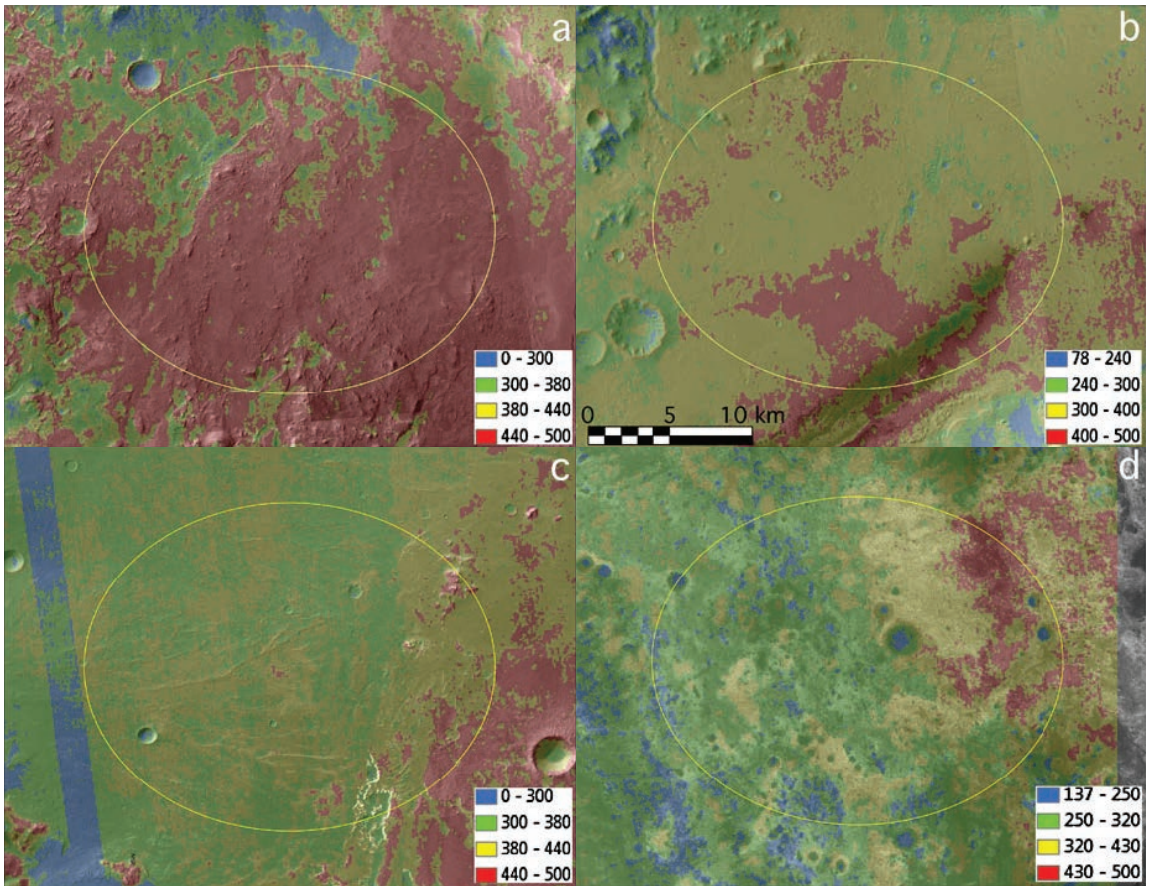
Channels and canyons on Mars indicate evidence of large amounts of moving liquid water in the planet's distant past. As such, MSL's primary assignment is to provide a more detailed understanding of Mars' chronology, geophysical processes, and life-harboring potential. MSL needed to land in a geologically rich area, but that also required relatively flat terrain nearby so that the rover can land safely and navigate with the least amount of obstacles. Small-scale HiRISE imagery with derived rock density and abundance mapped within ArcGIS were essential in determining which sites were safe for landing as well as traversable to conduct its scientific experiments.

MSL mission planners created GIS projects for each site candidate to manage and quantify tens of gigabytes of geospatial information, such as digital elevation models (DEMs) and rock abundance maps from HiRISE. Processing the images and DEMs in ArcGIS helped the team establish the best horizontal and vertical geodetic control possible for entry, descent, and landing of MSL. The resultant maps covered roughly 85 percent of the landing ellipses—a percentage more than sufficient to support locational awareness during the entire mission.

### Future

Planning interplanetary missions requires software that works with geographic data and puts it in a format that allows mission planners to continually run scenarios and modify missions as needed. GIS will serve as a tactical and strategic planning tool during MSL's traverse operations, as well as serve as a pivotal dataset for creating and evaluating new science throughout the mission.

→ Material Properties Maps of Final Four Landing Site Candidates Derived from Supervised Classification of Thermal Inertia Data and Materials Observed in HiRISE Images



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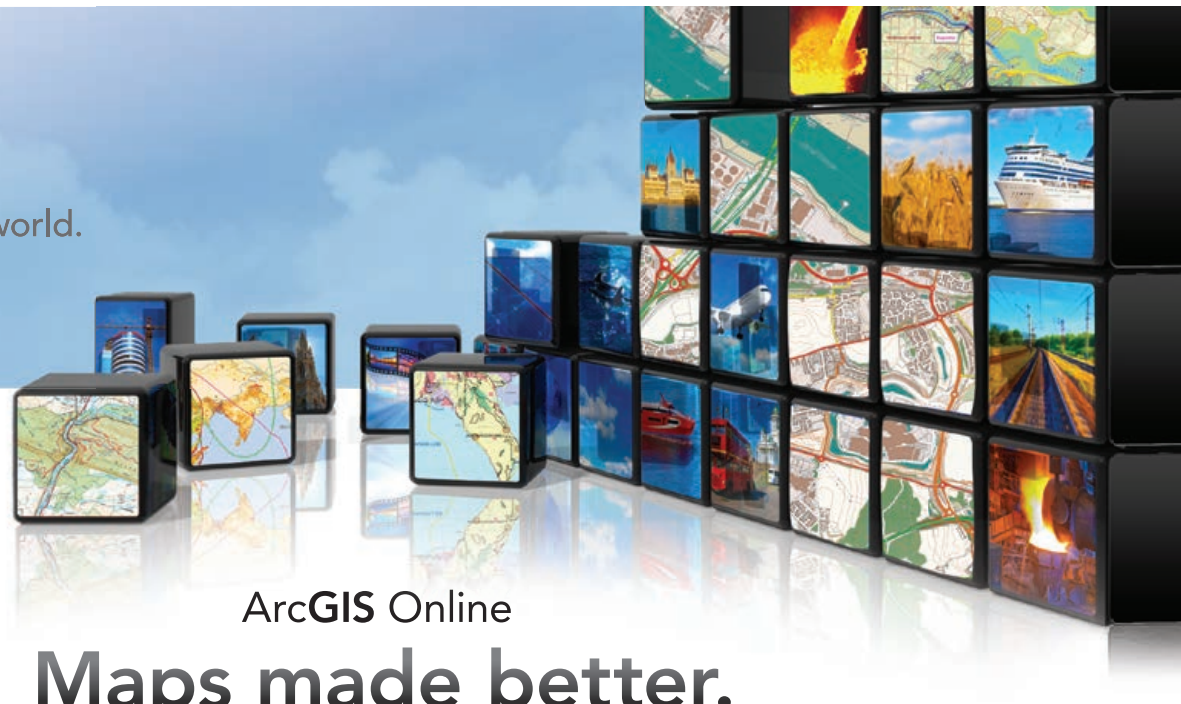

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