Esri News
for State & Local Government
Spring 2013

Wisconsin Points Citizens to Recreational Areas

Web Map Shows Public Access to Private Lands

Wisconsin offers recreational activities during every season. Hunting, hiking, fishing, sight-seeing, and cross-country skiing are popular. Thanks to the Managed Forest Law (MFL) and Forest Crop Law programs, the state and private landowners are partners in making more than one million acres of privately owned lands available to Wisconsin residents for a variety of recreational opportunities. These laws give landowners a tax break when they sustainably manage the lands and the resources on them, such as trees and animal habitats, as well as provide the public with open access to their property for specific recreational activities.

For years, these private lands with public access have been listed on the Wisconsin Department of Natural Resources (DNR) website in reports, but the reports don't help people visualize where the land is physically situated. Citizens could locate the lands on plat maps in some counties or visit a local DNR office and talk to the forester. But to make the existence of these lands better known to the public, the DNR developed an online mapping application that would show the properties on a map. DNR accomplished the goal using ArcGIS for Server and ArcGIS API for JavaScript. The application (http://dnr.wi.gov/topic/ForestLandowners/openToPublicapp.html) went live on October 30, 2012.

The Private Forest Lands Open for Public Recreation map shows areas for hunting, hiking, fishing, sight-seeing, and cross-country skiing. The points on the map represent the approximate locations

continued on page 3

↑ Above is a winter depiction of land enrolled in the MFL program. (Photo courtesy of Courtney Klaus.)

Contents

Spring 2013

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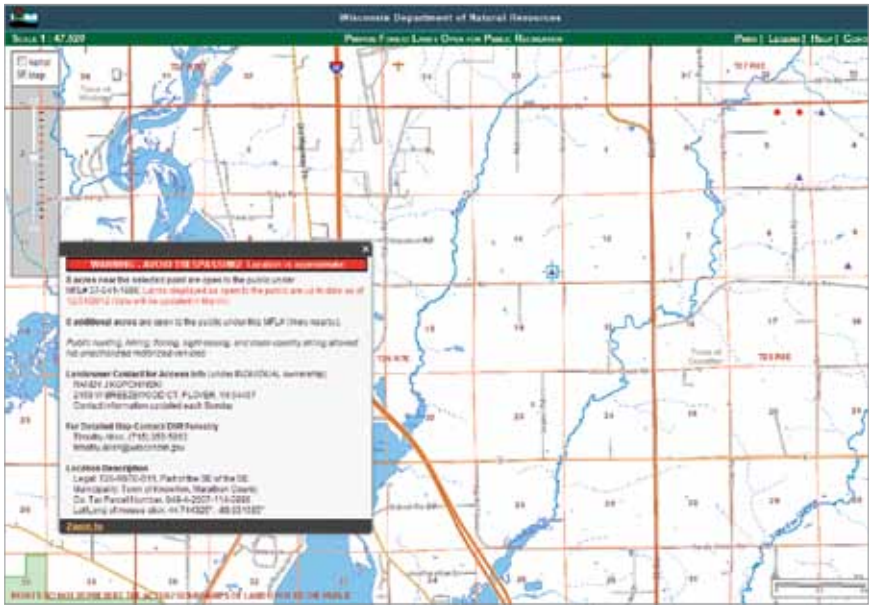
Wisconsin Points Citizens

continued from cover

of accessible properties. Clicking a point opens a window with landowner contact information, the activities allowed, the acreage available to the public, and forester contact information to get a more detailed location description.

The application uses a state GIS layer that includes each property's direction, township, range, and quarter-quarter section. The information, which is updated annually, shows the geography of the land at 1:24,000 scale. The DNR is working toward converting an old paper system to a new electronic system so more precise locational information can be provided to the public. This project will, however, take several years to complete.

To enroll a property in the Managed Forest Law program, a certified plan writer (private consulting forester) works with landowners to create recommended management plans to sustainably manage their forests while meeting their recreational, ecological, and economic objectives. These plans are approved by the DNR forester to ensure they comply with the tax law program.



↑ The DNR map shows where the public can access private lands; after users click a location, property details pop up.

A press release announced the application, and the DNR conducted a live web chat to promote the application and make it easy for the public to learn more about it. Within the first month, DNR reports, the application had more than 95,000 hits.

Visit http://dnr.wi.gov/topic/ForestLandowners/openToPublicApp.html to learn more about this application.

New and Noteworthy

MindMixer

MindMixer is an online community engagement tool that provides an interactive platform on which governments, school districts, universities, and other organizations can start a dialog with their constituents.

By participating in a combination of open-ended questions, polls, surveys, and other inquiry formats, community members can engage at different levels directly from their homes, sharing ideas and insights that leaders are often unable to generate at face-to-face meetings. Community members can engage by sharing photos or pointing out their ideas on an Esri map, directly on their MindMixer site. Tracking participant response, down to the ZIP code, is made easy on MindMixer's client-facing dashboard.

Transparent and constructive conversation between leaders and communities online leads to action offline by cities and schools, with a deeper understanding of the needs and wants of the people they serve. MindMixer's services include web hosting, application maintenance, and training on both the platform itself and marketing and outreach techniques.

Lake County, Florida, Promotes Economic Growth with Parks and Recreation Finder

ArcGIS for Local Government Application Template Speeds Release

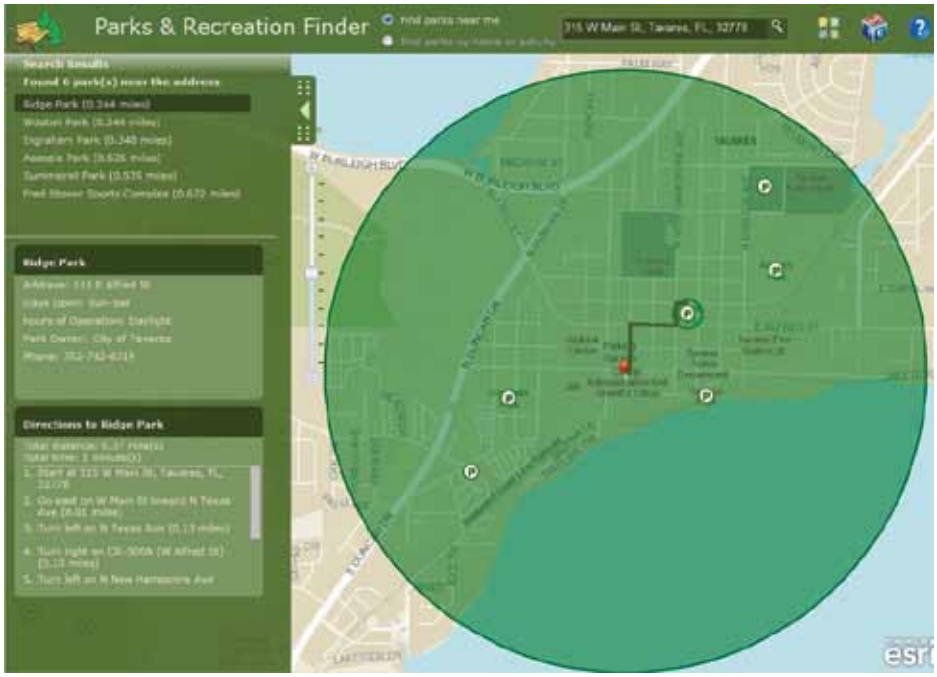
By Sue Carroll, Lake County Board of Commissioners

Historically an agricultural area northwest of Orlando, Florida, Lake County once thrived on citrus, truck crops such as corn and carrots, and sand mining. But after suffering several devastating freezes in the 1980s, it was swept up in the housing boom of the late 1990s and early 2000s, converting old groves and farms into housing developments. The once rural county grew to a population of nearly 300,000 people. Real estate and construction drove the county for years as the economy soared and business boomed. But after the bust in 2008 and the accompanying drop in property values, businesses failed and residents left. Now Lake County is looking for new ways to bring people back to its rolling hills and sparkling lakes.

One approach is to increase tourism, and the county Parks & Trails Division was an obvious avenue. The many natural resources available in the county—lakes, forests, hills, rivers, and canals—can be an oasis to those seeking to get away from the stresses of life and enjoy nature. Promoting these areas has become a priority with the staff in an effort to encourage tourism and economic growth.

But with more than 460 parks, trails, boat ramps, open spaces, preserves, and reserves managed by 18 different agencies, promotion has been problematic at best. The Parks & Trails Division web page catalogs the county's more than 50 recreational opportunities, but it can be overwhelming to someone unfamiliar with Lake County. Also, it does not include municipal, regional, and state recreational sites. The county wanted a more interactive and intuitive way to locate all its recreational assets and thus make it easier for residents and visitors alike to find what they are looking for.

As part of a Meet the GIS Division event, where the GIS coordinator promotes GIS to various county departments and gets feedback on future needs and wishes, the Parks & Trails Division requested an interactive map that would include all the managed recreational sites within the county. This was a great idea and absolutely feasible

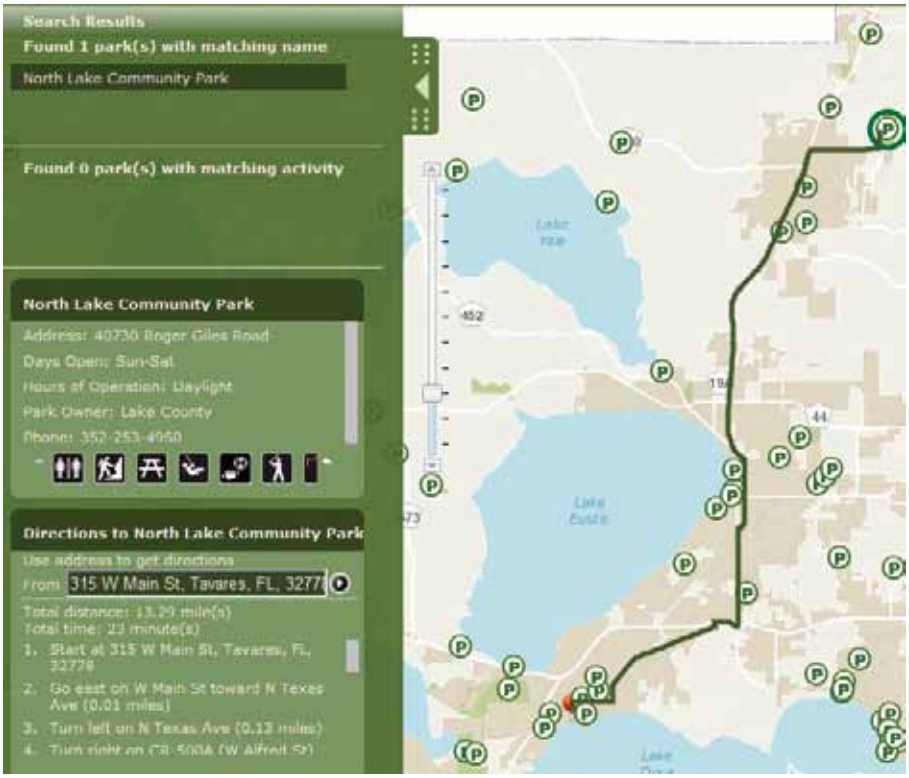


↑ By entering a local address, users can locate nearby recreational opportunities, along with days/hours of operation, managing agency and contact information, and driving directions.

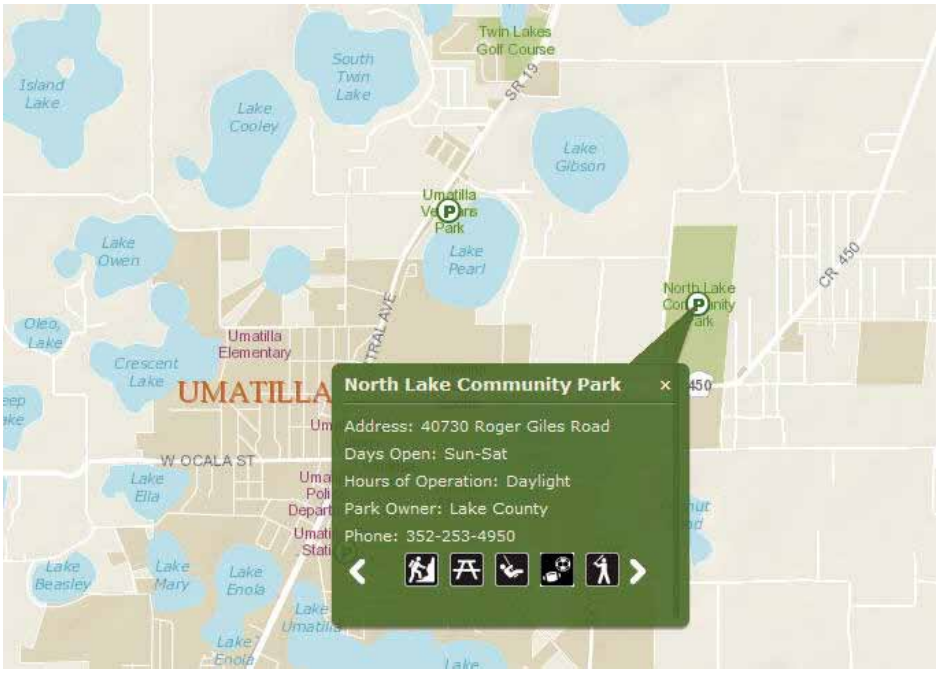
in concept—all the data already existed in one form or another—but the obstacle was the lack of available web/mapping developers. The Program and Application Support Services Division has only one programmer for custom web map development, and his list of pending projects is always long. But there is a GIS programmer/analyst with some programming skills. So the problem was solved quite naturally by using the free, downloadable Park and Recreation Finder template from Esri's ArcGIS for Local Government resources. The majority of the development was already done and packaged in a user-friendly application. Only minor adjustments and tweaks were required to give Lake County a fully functional interactive map it could call its own.

By using the predefined template, it was a simple matter of collecting all the data and inputting it into the standard ArcGIS for Local Government Information Model for use in the template. Organizing the data allowed the Parks & Trails Division staff to see and understand all of it in a new way and actually prompted some edits and updates, making the data even more accurate. It also afforded the perfect time to begin creating the standard basemap that is used in the template and will be used time and again for future projects.

Once all the data was entered, a draft application was shown to the Parks & Trails Division staff members for their comments. While they were thrilled with the look and functionality, they still wanted some customization. For the county's wide variety of recreational opportunities, the standard amenity types that came with the template did not cover all the types of the data. But it was a simple matter to add additional amenities fields to the table and icons to the pop-up display. The application can now identify tennis courts; dog parks; volleyball,



↑ Once a site is chosen, driving directions can be obtained for easy travel.



↑ Clicking on a park shows site details.

racquetball, and pickleball courts; birding sites; equestrian trails; concession stands; exercise stations; nature centers; and canoe/kayak launches, along with the standard amenities provided with the template. The names of the managing agencies and contact phone numbers were also added. After quick and easy edits were made, the opening splash screen and help file now instruct users to enter an address including commas to avoid the frustration of error messages and unfound addresses.

Through this collaboration between the Parks & Trails Division and the GIS Division, Lake County has launched its Parks & Recreation Finder web application at gis.lakecountyfl.gov/ParkFinder/. This interactive web map allows the user to enter a local address and see nearby recreational facilities, discover amenities, and get driving directions.They can also search by park name or type of amenity such as biking, playground, or hiking.

By interactively showing where all the recreational sites are, it is expected that more people will visit Lake County and take advantage of them, boosting tourism and the local economy in the process.

For more information, contact Sue Carroll, GISP, GIS project coordinator, Lake County Board of County Commissioners, at scarroll@lakecountyfl.gov or 352-343-9775.

Demographic State of the United States in 2012

Agencies Were Still Struggling with Effects of Economic Recession

Because economic recovery is proceeding much more slowly than expected, agencies are still coping with tight budgets and reduced tax revenues while fulfilling more requests for services. Although the year ended with positive signs, such as modest increases in consumer spending and slightly higher sales of existing homes noted in some areas, effects of the recession were still impacting overall economic recovery. The US population also continued to change in terms of more diversity and different family types and households.

Population Diversity and Change

In 2012, the US population was 313 million. Growing racial/ethnic diversity continued to produce striking changes in the population. This is evident from use of Esri's proprietary Diversity Index, which summarizes racial and ethnic diversity in an area. This measure shows the likelihood that two people, chosen at random from the same area, belong to different races or ethnic groups. The index ranges from 0 (no diversity) to 100 (complete diversity). Esri's Diversity Index for the United States has risen from 60.6 in 2010 to 61.4 in 2012, with a forecast of 63.8 in five years.

The composition of America's 118 million households was also becoming more diverse. Although husband-wife families remained the dominant household type, their share of all households continued to slip—from 52 percent in 2000 to 48 percent in 2010. From 2000 to 2010, the real increase in family households was in single-parent families, up by 22 percent, and multigenerational households, up by 30 percent. Husband-wife families increased by less than 4 percent in 10 years, and husband-wife families with children declined.

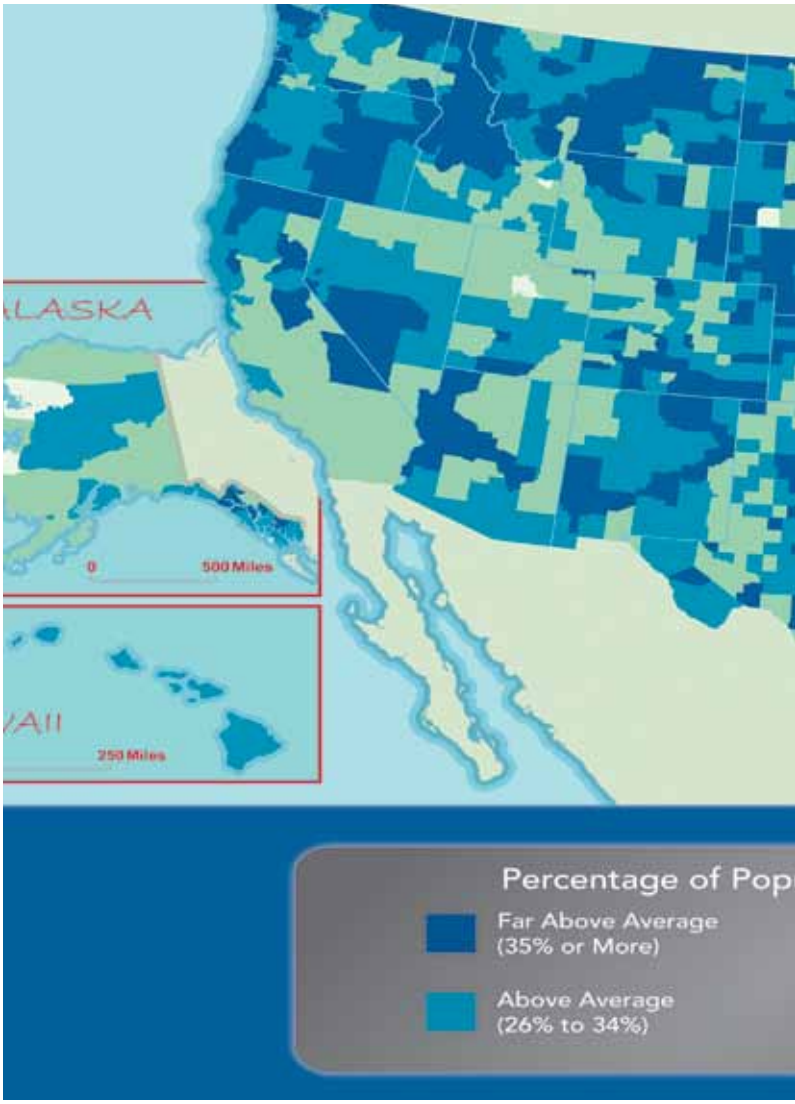
All family households increased by 8 percent from 2000 to 2010; nonfamily households, by 16 percent. The fastest-growing nonfamily households, however, were unmarried partners—opposite-sex partners by 40 percent and same-sex partners by 52 percent from 2000 to 2010. At 80 percent, single-person households retained the highest proportion of nonfamily households; however, the increase was less than 15 percent in the past decade. Nontraditional families are the types of households that were growing.

Housing

Although positive signs were noted in areas less affected by the housing boom/bust and employment decline, recovery of the overall housing market remained slow. The 2011 homeownership rate of 64 percent remained the same for 2012. Since 2010, housing growth has been sluggish. Fewer than 900,000 units were added annually, down from 2 million annually at the peak of the housing boom. Many markets are still coping with an excess of vacant, for-sale, and foreclosed properties left over from the collapse of the housing market and the Great Recession. Almost one in four counties showed no growth or a loss of housing from Census 2010 to 2012. Significant housing losses also occurred due to natural disasters in the past year, such as the wildfire in Bastrop County, Texas, and tornadoes in Indiana and Missouri.

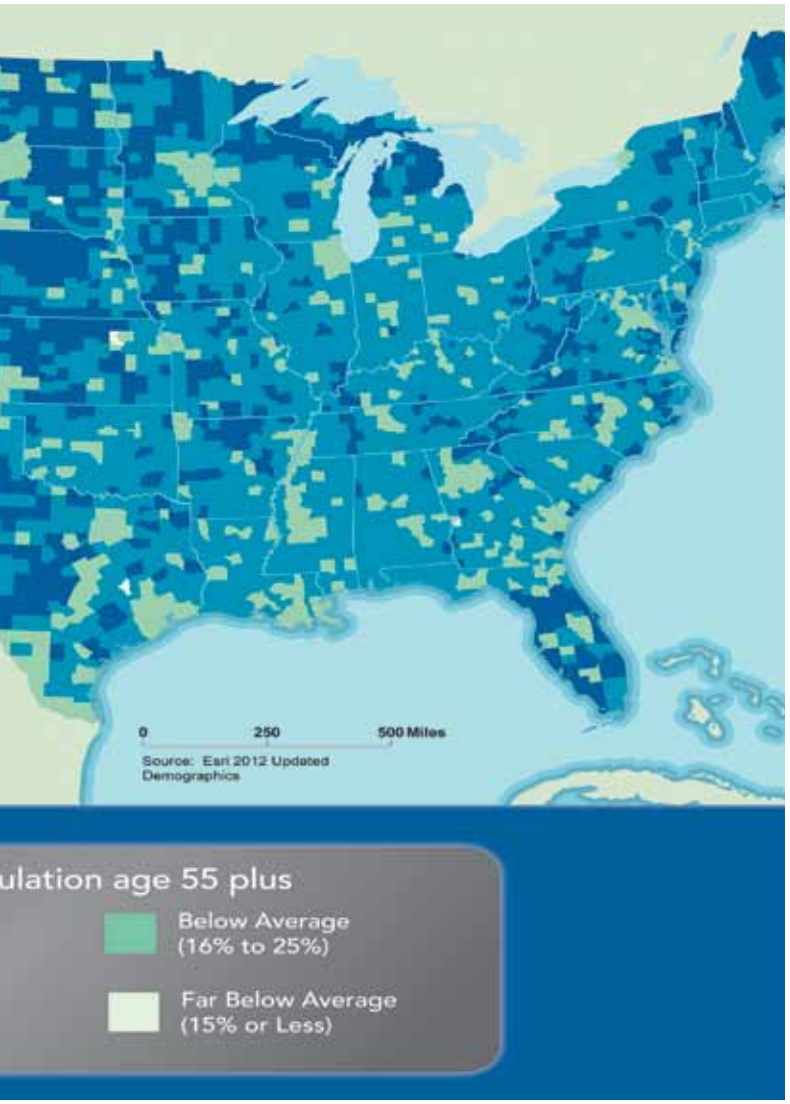
Recovery was happening at different rates across the nation. In many areas, no new housing units were being built; however, in other places, new construction was back in full swing, and demand was high.

Diverse reasons were causing housing growth in certain metropolitan statistical areas (MSAs). The military presence was driving housing growth in the Jacksonville, NC; Killeen-Temple-Fort Hood, TX; and Manhattan, KS MSAs. Growth was also apparent in Morgantown, WV; Auburn-Opelika, AL; Logan, UT-ID; and Manhattan, KS—large college towns with good climates and growing economies. Kennewick-Pasco-Richland, WA has become a retirement hot spot—especially for Californians. Growth also continued in the Austin, TX; Raleigh-Cary, NC; and Myrtle Beach, SC areas.



Employment

The US labor force was emerging from the most severe contraction since World War II. Since 2010, the economy added nearly 3 million jobs, raising the total work force to 142 million. This growth was geographically broad, with every region and division adding people to payrolls. Only Alabama, Arizona, Hawaii, and Rhode Island registered a net reduction in workers. The total number of unemployed shrank from 16.7 million to 14.9 million people. The US rate of unemployment (the percentage of unemployed people within the civilian labor force) declined. The US labor force participation rate (civilians employed, plus the unemployed as a percentage of the US population aged 16 years and older) also declined by less than 1 percent to 63.4 percent. Some of the reduction in unemployment resulted from increased employment or from workers leaving the labor force.



Impact of These Changes on Agencies

Cash-strapped agencies, funded by increasingly tightened budgets, continued to handle expanded requests for services. Providing options for more types of households could further strain available housing. Diversity also impacts agencies' ability to serve varied racial and ethnic populations. For example, additional staff may be required to serve those isolated by cultural issues and lack of language skills. Growth in senior populations may require more health and elder care services. Social service agencies are fulfilling increased demand for food, housing, and health care. In areas where population is declining due to job losses or young people moving away for better opportunities, the impact on agencies can be even more severe. Lower tax revenues require agencies to do more with less.

How can you learn more about your area's demographics? Esri's 2012/2017 Updated Demographics data can provide the answers.

About 2012/2017 Updated Demographics

To perform actionable location analytics in these challenging times, you need the industry's most accurate data. Esri's 2012/2017 Updated Demographics database includes a full roster of current-year estimates and five-year projections for population, income, race/ethnicity, home value, net worth, disposable income, and more.

Recently ranked #1 for accuracy in a blind, independent study, Esri's 2012/2017 Updated Demographic data was produced with proven methodologies to provide the highest possible accuracy.

Delivered in a variety of geographies, formats, and variables, Esri's Updated Demographics is available as an ad hoc database that integrates seamlessly into GIS software and is packaged in products including Esri Business Analyst Online, Esri Business Analyst for Desktop, Esri Business Analyst for Server, Esri Community Analyst, and ArcGIS Online.

For more information about Esri's 2012/2017 Updated Demographics, visit esri.com/demographicdata.

← Population growth among seniors in 2012 challenges agencies to provide more and different services that often must be produced with lower revenues. Areas of growth among the senior population are clearly illustrated in this map of the United States by county.

Los Angeles Maps Places That Matter

Residents Identify Sites with Historic Significance

The City of Los Angeles, California, is using Esri partner MindMixer's capacity for community engagement with Esri's mapping capability on an outreach project called MyHistoricLA (myhistoricla.org). This program is part of SurveyLA, a collaboration among city leaders and the city's Office of Historic Resources in the Department of City Planning to find buildings and sites in Los Angeles that are historic and worth preserving. With the MyHistoricLA component of SurveyLA, residents can point out sites they believe are historically significant using an online mapping application called the Idea Map.

"We're excited to be using MindMixer to spark a citywide conversation about places and neighborhoods that have historic meaning to Los Angeles residents," said Ken Bernstein, AICP, manager of the city's Office of Historic Resources.

Citizen input has been excellent. Not only are residents naming well-known historic spots, they are also sharing some sites that weren't on the city's radar.

On the map, the public can see historic spots in their own neighborhood, or they can zoom out to see spots like theirs all around the city. Popular attractions include places that best represent postwar suburbia and favorite historical and food-related spots.

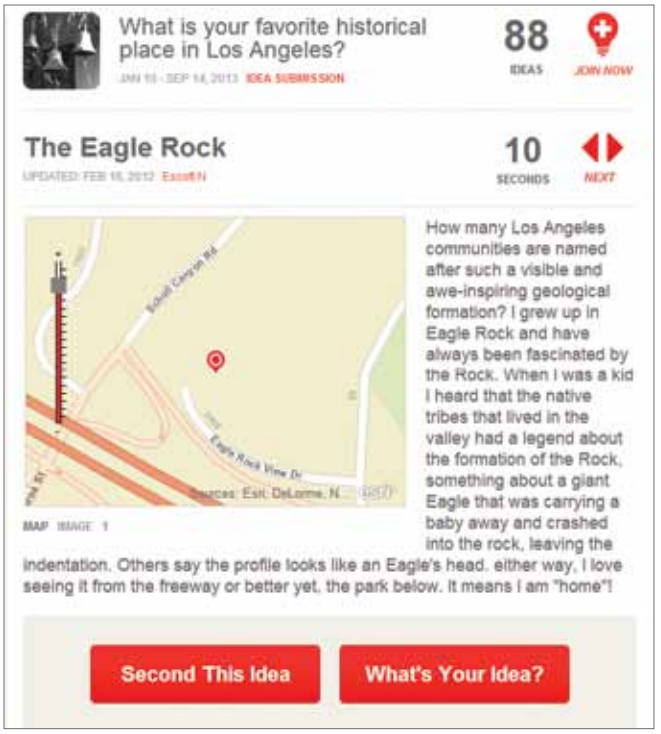
MyHistoricLA was launched in early 2012. As of early February 2013, 534 people had created accounts on the site, 205 original ideas had been shared, and 102 people had commented on those ideas. The site is also visited quite often: as of February 2013, more than 4,000 people had viewed the site, and there had been 17,308 unique page views.

Most contributors use the Idea Map to identify historic places—77 percent of those shared on MyHistoricLA are attached to a spot on the map of Greater Los Angeles. Members of the SurveyLA team constantly monitor these ideas and leave comments for contributors to help clarify or refine their ideas before crews hit the field to study the sites. The results are also being integrated into the organization's geodatabase.

"Because this conversation is inherently place based, the mapping feature provides a powerful tool to anchor the public's suggestions geographically within our large city," said Bernstein. "MyHistoricLA has significantly broadened and diversified the community input that is actively informing SurveyLA, the largest citywide historic resources survey in the nation."

For more information, contact Stephen Hardy, chief community builder, MindMixer, at shardy@mindmixer.com.

↑ MyHistoricLA Idea Map encourages the public to share significant places with the Los Angeles Office of Historic Resources.



↑ Clicking a point on the Idea Map takes people to information that contributors have included about the location.

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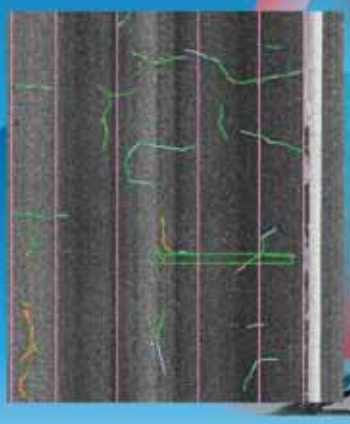

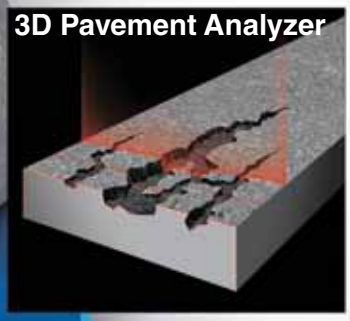

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Keeping Traffic Moving during Bridge Repair Project

By Matthew DeMeritt, Esri Writer

With 12 percent of US bridges declared structurally deficient by the Federal Highway Administration in 2006, bridge repair remains a top priority for most states. Three years before that, an extensive investigation of Oregon's bridges conducted by the Oregon Department of Transportation (ODOT) found that 365 of Oregon's bridges had structural problems that necessitated a large-scale bridge repair plan. Implementing that plan required that the department expand its GIS infrastructure and integrate a new traffic modeling application to ease congestion at multiple construction zones along the state's highway system.

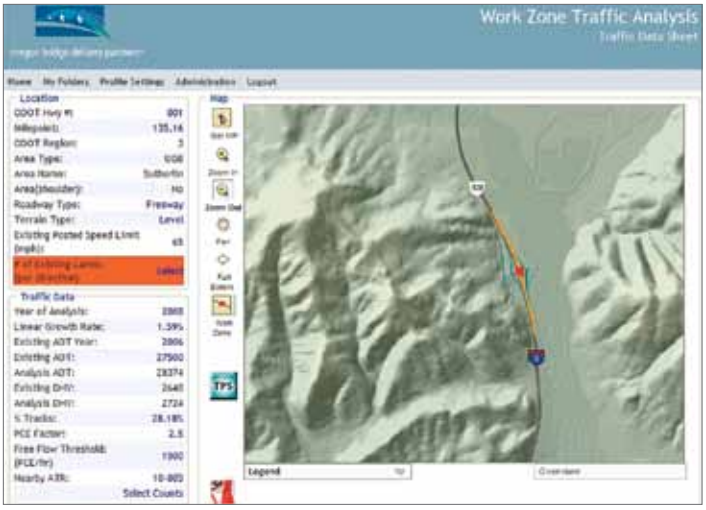
Oregon Transportation Investment Act

From 2001 to 2003, Oregon passed a series of funding packages called the Oregon Transportation Investment Act (OTIA I, II, and III) to improve its highway infrastructure. For OTIA III, which included the State Bridge Delivery Program, ODOT turned to engineering consultants Oregon Bridge Delivery Partners (OBDP), a joint venture between HDR Engineering and Fluor Corporation, to create practices that would ensure the project finished successfully and within budget. One of the primary goals of the program was to reduce the impact on commuter and business traffic during large-scale construction on the road system.

Many of the bridges built during the early development of Oregon's highway system used a reinforced concrete deck girder (RCDG) design specified in the regulations of that time. As specifications became more stringent in the 1960s, Oregon transitioned to prestressed and post-tensioned concrete bridges that improved structural integrity at a reduced cost. However, many RCDG bridges remained in service well past their expected decommission date and showed signs of deterioration upon deeper investigation. "In 2001, ODOT inspectors noticed that cracks identified in previous inspections had grown to the point of threatening structural stability," said Jim Cox, assistant manager of major projects at ODOT. "We immediately placed load restrictions on these bridges and started discussion on how to plan repairs with the least impact on commercial and commuter traffic."

GIS and Geodesign

Established in 2004, ODOT's GIS comprised the department's information-sharing infrastructure to plan and manage roadway projects. To integrate with ODOT's GIS, OBDP designed its system on the same ArcGIS platform for flexibility and scalability throughout the project life cycle and beyond. "We wanted easy adoption of tools and practices to smooth transition during project closeout and ensure usefulness beyond that," said Robb Kirkman, GIS services manager for HDR Engineering. "GIS provided the foundation to start linking program systems, automate tasks, and better mitigate environmental impacts."



↑ The department can run traffic scenarios in a matter of minutes (rather than hours), enabling ODOT engineers to modify traffic plans on the fly. Easy access to reliable data helped the agency determine how to stage projects with minimal delays.

Before any construction work began, ODOT collected comprehensive environmental data on more than 400 of its bridge sites to identify nearby environmental resources. Standard ODOT practice involves consultation with experts, such as biologists, wetland specialists, and archaeologists, to get a better understanding of the effects of construction zones in ecologically sensitive areas. "We took a different approach for the OTIA III Bridge [Delivery] Program by conducting environmental fieldwork before we did any design," said Cox. "In ArcGIS, we drew a box around a bridge site and identified all the resources inside the box. This allowed the engineers to develop designs that minimized impacts on the surrounding environment."

Improving Traffic Analysis

Prior to its collaboration with OBDP, ODOT had been using spreadsheets containing traffic counts and automatic traffic recorder information from across the state to document and predict traffic impacts for its various road construction projects. That process could take up to four hours for each scenario because data had to be searched and collected from multiple databases within the agency and then inserted into a spreadsheet. "Gradually, that process evolved to incorporate GIS processes," Kirkman said. "Using macros and automation tools in ArcGIS, ODOT's traffic group was able to automatically populate the spreadsheets with information from the database."

Although much leaner, the spreadsheet-only approach experienced crashes as the database grew ever larger. The traffic team worked with OBDP to develop a more efficient, GIS-based method for running traffic scenarios—one that tightly wove ODOT's geospatial data into

a dedicated web-based analysis tool. Using common protocols, they worked on tying the datasets together to give ODOT staff direct access to the department's databases from a single interface. Called the Work Zone Traffic Analysis (WZTA) tool, the application allowed traffic scenarios to be run and shared in a web browser.

WZTA serves as a repository for traffic and road data that can be accessed and queried in a browser. The system allows users to view ODOT data to determine the effects on mobility created by lane closures related to construction and roadwork. Today, the department can run traffic scenarios in a matter of minutes, eliminating redundancy and enabling ODOT engineers to modify traffic plans on the fly.

Using a GIS-based interface also improved accuracy by allowing ODOT analysts to select the location and other information for a specific project site from the map itself rather than tabular lists. "Lookup tables using numbering systems aren't intuitive to all users," Kirkman said. "GIS enabled users to find exactly what they were looking for and verify the correct project information within a more appropriate map-based user interface, where spatial relationships are more obvious."

Documented Return on Investment

In 2010, ODOT and OBDP documented their experience with the tools to evaluate the impact of ODOT's investments and determine whether the tools should be used after completion of the bridge program. With the assistance of economic consultant Mark Ford, the agencies analyzed every piece of software OBDP had created for the OTIA III Bridge Delivery Program to determine the economic benefits and cost to the department. The study concluded that ODOT experienced a combined benefit-cost ratio of 2:1 for all enterprise IT investments related to management of the bridge program. ODOT's GIS infrastructure alone returned a benefit-cost ratio of 3:1. "Integration of formats and standards proved to be important in generating value from the investment," said Ford.

In addition to these tangible benefits, ODOT experienced three types of intangible benefits: Migrating the data from disparate sources into a unified system allowed OBDP to employ consistent analysis methods, reducing the risk of calculation errors. The centralized database also made it easier for ODOT to maintain data integrity and reduce the risk that analysts working at different locations could use outdated information. "Systems like ODOT's GIS infrastructure generate accurate, consistent, and timely information for reporting and responding to inquiries," Ford said. "WZTA, and GIS in particular, has resulted in improved coordination with other agencies and interest groups, increasing the credibility of both ODOT and the bridge program in the eyes of the public and the legislature."

At the beginning of 2011, 351 of the 365 bridges in the OTIA III Bridge Delivery Program were free of construction zone delays. WZTA played a primary role in expediting the construction process by allowing the team to run lane closure traffic analyses in minutes as opposed to hours. The tool is now being used by ODOT to quickly determine impacts from lane closures for other roadway maintenance and construction projects across the state.

↑ Oregon Department of Transportation repaired the Snake River Bridge on Interstate 84 as part of the OTIA III State Bridge Delivery Program.

A Technology Trifecta

Lidar, BIM, and GIS Converge to Bring Business Efficiencies to Milwaukee Metropolitan Sewerage District

By Karen Richardson, Esri Writer

Milwaukee is the twenty-sixth-largest city in the United States, and its regional wastewater system is among the biggest and most innovative and well run in the country. In 1926, its Jones Island wastewater treatment plant (WWTP) became the first facility to produce fertilizer as the by-product of the water reclamation process; the district continues to push the envelope by producing an organic fertilizer known as Milorgranite.

Milwaukee Metropolitan Sewerage District (MMSD) provides wastewater services for 28 municipalities housing about one million people. The district's 411-square-mile planning area includes all cities and villages except the city of South Milwaukee. Serving these municipalities requires MMSD to develop spatial inventories and applications that meet internal and external needs for planning and design. Like any large facility, many of these efforts began organically within single departments to answer a specific need for one project.

To more readily facilitate the consolidation of facilities data information, MMSD called on HNTB, a national, employee-owned infrastructure firm, to conduct a practical research project that pilots a data management approach for lidar and building information management (BIM) data. The project specifically studied the practical business applications of integrating 3D design and construction data from an aeration system rehabilitation project into MMSD's enterprise GIS environment.

Put the Money Where the ROI Is

As part of this research and development project, return on investment (ROI) estimates were generated for distinct use cases, focusing on integrating lidar and BIM technology with GIS to greatly improve access and retrieval of as-built conditions for MMSD employees and consultants. The result of this effort was a list of 10 requirements that an application would have to meet to qualify as a sustainable integrated solution:

1. 3D model viewing capability
2. No (or minimal) loss of features in translation into a geodatabase
3. Ability to overlay aerial images
4. Ability to overlay other GIS layers
5. Unique ID of elements within the 3D model
6. Can select individual features within the 3D model
7. Ability to relate individual features to external data, such as the district's document management and asset management systems
8. Can symbolize the 3D model from attributes
9. Ability to relate individual features to documents
10. Querying of related data allowed

A number of different application development platforms and existing software solutions were considered for the project. Each software package was evaluated based on the criteria defined by MMSD. Esri's ArcGIS Engine was selected as the platform that met all 10 requirements. ArcGIS Engine is a collection of GIS components and developer resources that can be embedded into other applications, allowing dynamic mapping and GIS capabilities in many different environments.

← Users can interactively view the 3D geodatabase in the ArcGIS Engine application, including dynamic symbolization of features.

An Expandable Enterprise System

MMSD was already a user of Esri technology, having adopted ArcGIS for Desktop software in 2003 for department-specific solutions. In 2009, MMSD consulted with HNTB to facilitate its move into an enterprise environment using ArcGIS for Server. This was a multiphase implementation that included the development of a business data model. The data model focused on existing data inventory and application user needs at the time, including improving mapping and organizational efficiencies as well as bringing added value to MMSD business operations. In 2011, MMSD completed the project, developing several applications that addressed specific areas to map data related to the district's infrastructure resources and service areas.

"Historically, information regarding water quality, water quality improvements, and physical features of water were located in separate departments at MMSD," said Jeff Siegel, GISP, associate vice president of HNTB. "Consolidation of this information took time, money, and executive sponsorship to change priorities. Now, all staff can access and output this information from their desktops without the help or sponsorship of other staff. The staff has the information needed to make better and faster decisions, which was another of our guiding objectives."

continued on page 14

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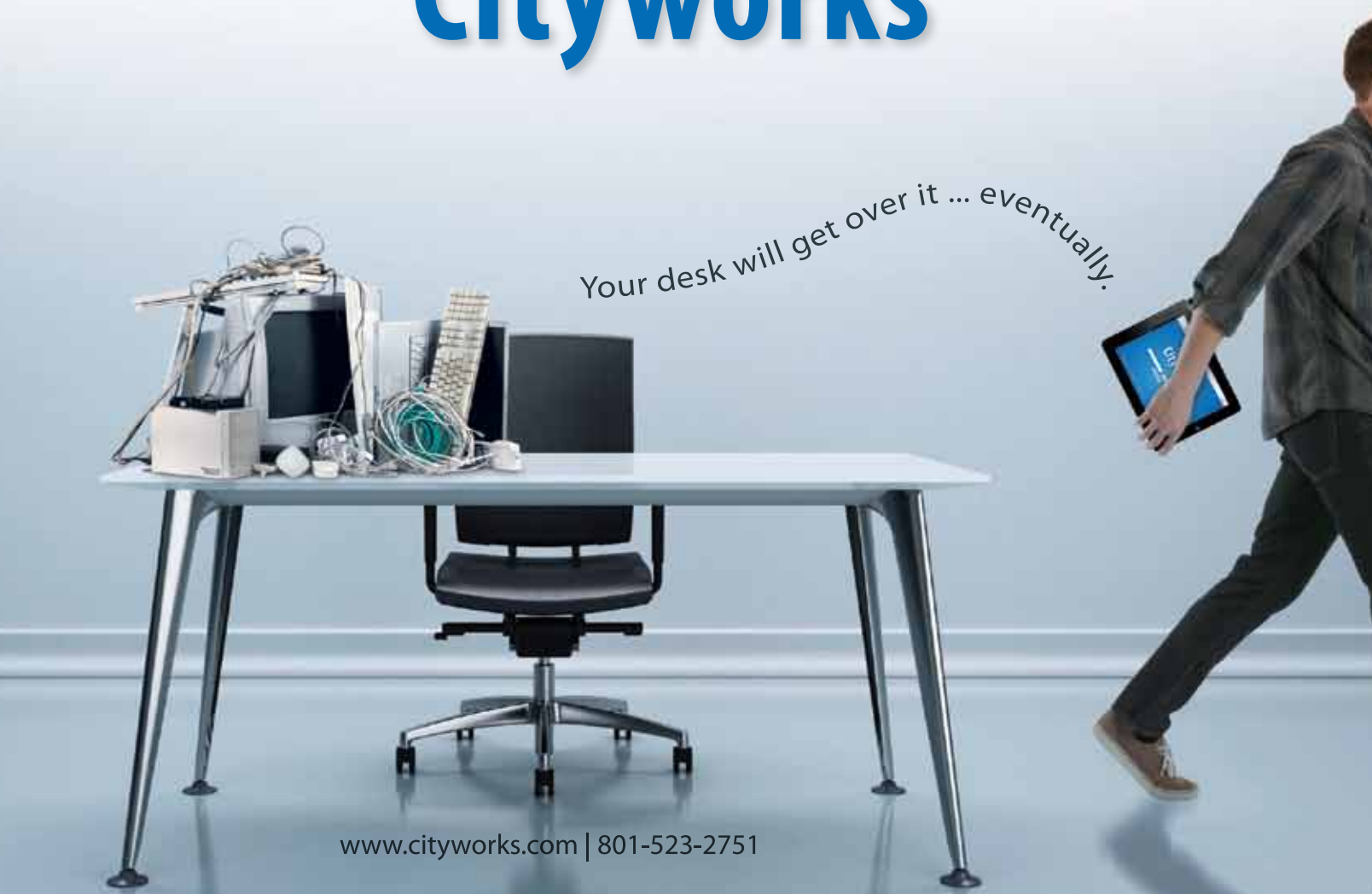

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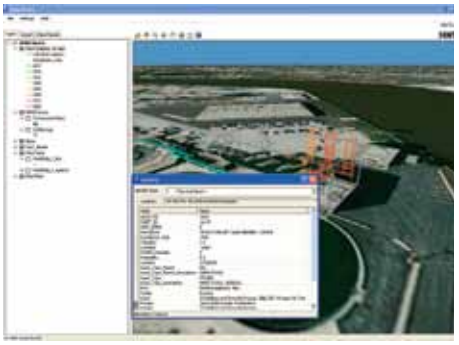
A Technology Trifecta

continued from page 12



← Asset inventory data from the district's asset management warehouse is integrated using the ArcGIS Engine application as the integrator.

For this new study area project, among the many criteria MMSD had, data and document access was again selected as a high priority. "In this scenario, a 3D model was created and integrated into ArcGIS," said Siegel.

The objective was for users to view and select features on their own. In this case, the 3D model would be displayed within an environment they are familiar with—the ArcGIS environment. Using this model, a user can access related data in external databases including documents relevant to the 3D model feature that has been selected.

Modern Technology Studies a Historic Facility

The study area included the Jones Island wastewater treatment plant, one of two wastewater treatment facilities within the district's service area. Jones Island is located on the shore of Lake Michigan in the city of Milwaukee. On average, the Jones Island WWTP collects and treats a maximum daily flow of 300 million gallons of wastewater, returning clean, clear water to Lake Michigan.

Opened in 1925, the facility, located on a 75-acre campus, was designated a National Historic Civil Engineering Landmark by the American Society of Civil Engineers in 1974 and is also on the National Register of Historic Places.

As part of the MMSD 2020 Facilities Plan, HNTB was tasked with developing design improvements for the Jones Island WWTP aeration system. The project will lead to a reduction of electrical energy usage through gains in aeration system blower and diffuser efficiencies, as well as enhancements to controlling air distribution to aeration basins and channels.

To gather accurate and precise as-built conditions of the aeration system, HNTB engineers decided to collect internal facility data to derive a business information model (BIM) from static lidar point clouds. This approach quickly brought dependable existing condition information to the designers in an interactive 3D design environment.

"Because static lidar scanning is a direct line-of-sight method of data collection, the entire interior of a facility required enough scans for every single feature to be captured," said Siegel. "The estimated number of scans required increases based on the number of floors and the complexity of the building."

A typical static lidar scan takes about 10–15 minutes, so a crew of two must have the ability to scan anywhere from four to six locations—typically rooms and hallways—in just one hour. For this project, more than 100 scans were collected in one day to gather point clouds of the entire facility.

The decision to use BIM to manage the design process allowed many different disciplines to collaborate at different phases of the facility design project. BIM is defined as a process using a combination of technologies and resources to capture, manage, analyze, and display a digital representation of physical and functional characteristics of a facility.

Realistic 3D Models for Everyday Use

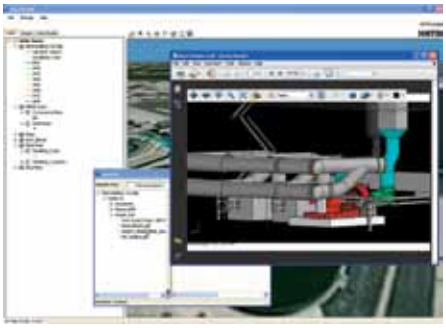
Integrating lidar and BIM data with MMSD's enterprise GIS offered many benefits to the agency. "In our opinion, this was the most well-organized way to package up and deliver all our 3D design and construction methods to our client," said Siegel.

By extending BIM and lidar into the ArcGIS environment, the district can benefit from the data and integration points between the technologies, realizing significant operational efficiencies. Asset and facilities management is one area where improvements to maintenance management and document management systems can happen. The ability to manage data and keep a record of work orders and maintenance activity is invaluable to managers.

← Historical as-built documents from the district's document management warehouse were integrated using ArcGIS Engine.

"GIS technology allows users to view, understand, question, interpret, and visualize data in so many ways that were difficult before," said Siegel. "Using ArcGIS, we can provide a way for our stakeholders to use the lidar and BIM technology and see and manipulate a dynamic and intelligent 3D model of a project."

Another area where the district is expected to realize efficiencies is in plant and facilities operations. "There are a number of ways a 3D, geographically based representation of the facilities will help our customers," said Siegel. "From safety and training to creating documentation and just having an operational database, GIS makes it easy to manage and use the collected information and model the facility dynamically in so many ways."



← The application employs dynamic linkages from the geodatabase to the BIM model for viewing greater 3D design detail.

Facility planning is another area where this approach can offer some real payback. From modeling proposed upgrades to capital improvements, the ease of sharing this information in an easily understandable format is a big win. "Since this is a historical landmark for the area, there are many complexities in maintaining the 3D model to the data management standards that MMSD expects," said Siegel. "Viewing a 3D model that is intelligent—meaning we can see more information about the facility picture we are displaying—makes it so much more efficient to answer questions, propose new scenarios, and move the projects along at a quicker pace."

Lessons Learned

The most critical factor preventing more robust integration between BIM and GIS is the native incompatibility of the two data formats. Defining spatial coordinates of the BIM file at the beginning of the project is important to circumvent this. "Defining the coordinates allows us and our client to accurately locate a building within a site and give it a physical location context at larger scales that can be overlaid with aerial imagery and topographic and other layers from an enterprise geodatabase," said Siegel.

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