Government Matters

ESRI • Spring 2010

GIS for State and Local Government

Mapping Mortgage Fraud in Boulder County, Colorado

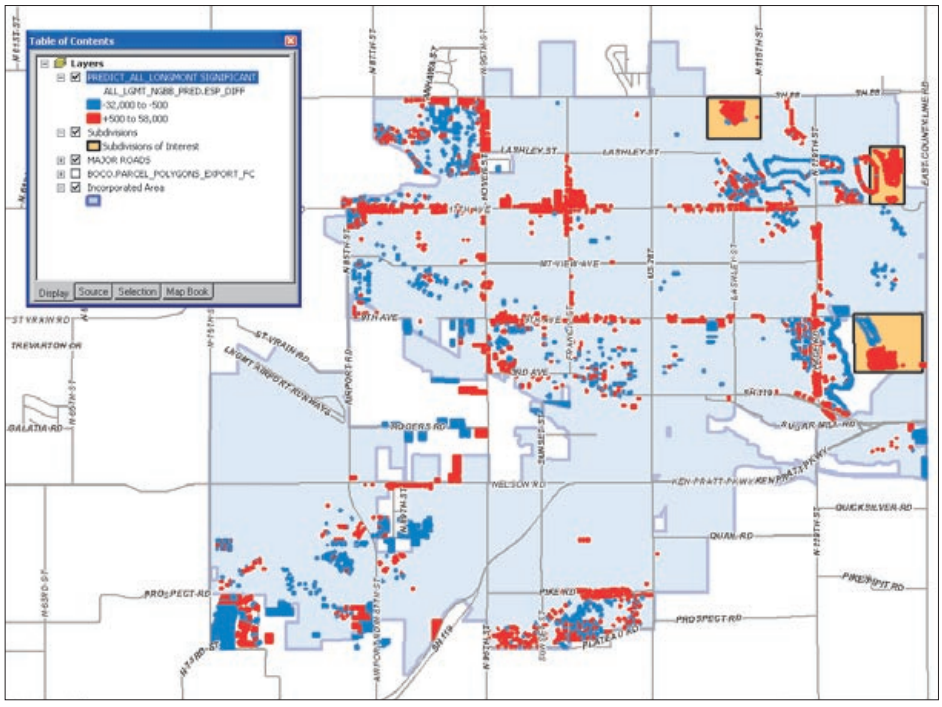
Removing Suspicious Sales Protects Home Values in City of Longmont

In This Issue

County assessors strive to deliver independent, fair evaluations of property values. However, in 2007, as the housing market began to crash and foreclosures rose, accomplishing that mission grew more difficult. Foreclosures can depress property values and potentially skew valuations. As Boulder County, Colorado, quickly discovered, foreclosures can also artificially inflate property assessments when they are a result of mortgage fraud.

The United States Federal Bureau of Investigation (FBI) recently reported that during fiscal year 2008, mortgage fraud suspicious activity reports (SARs) increased 36 percent for a total of 63,713. By the end of April 2009, the FBI already had 40,901 SARs on record for the year.

The Boulder County Assessor's Office has become well acquainted with the tactics of mortgage fraud and the effects they have on communities. During its 2009 mass reappraisal, the geographic information system (GIS) team and appraisers decided to take a closer look at areas with high numbers of foreclosures to ensure the accuracy of their reports. Initially, the statistics appeared sound, but after conducting GIS analysis, the team began to see a different story unfold, especially in the city of Longmont, a foreclosure hot spot with approximately 650 between July 2006 and June 2008.



The Boulder County Assessor's Office determined that approximately 4,000 properties in the City of Longmont would be falsely under- or overvalued by $500 or more due to nearby mortgage fraud and suspicious sales. Red indicates properties falsely overvalued by $500 or more; blue indicates those falsely undervalued by $500 or more. The yellow areas are the three subdivisions with the majority of fraudulent and suspicious sales.

The county's appraisers uncovered 15 suspicious sales in Longmont, 5 of which the Colorado Division of Real Estate deemed fraudulent. The big surprise came when subsequent GIS analysis showed that the high sales prices of these properties were improperly affecting the values of homes in communities miles away.

Prime Conditions

Foreclosure is often the intended outcome of fraudulent mortgage transactions. Frequently, accomplices work together to secure properties at artificially inflated prices and attain large loans. The criminals walk away with the money from the loans, and the bank eventually repossesses the houses and sells them at a loss.

The housing bubble of the early to mid-2000s and loose financing practices created a perfect storm for mortgage fraud, explained Danielle Simpson, residential real estate ap-

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ELA Modernizes Operations in Cowlitz County, Washington

In July 2008, Cowlitz County, Washington, secured an ESRI Small Government Enterprise License Agreement (ELA) to gain access to unlimited amounts of ArcGIS software. Soon, data management moved to a centralized geodatabase, experts across disciplines began contributing authoritative data, and more employees were using GIS.

"We've moved away from having scattered shapefiles into a world where we have an enterprise geodatabase set up on a server, and we have ArcGIS Desktop for the increasing number of users who want to get deeper into GIS and create their own datasets. We have 100 users in the county now instead of 8," said David Wallis, GISP, chief appraiser, Cowlitz County Assessor's Office. "It's exciting. We wouldn't have been able to do this without the ELA."

Terry McLaughlin, Cowlitz County assessor, manages the small GIS department—it has 2 employees, down from 11 in previous years due to budget constraints. The assessor's office is responsible for maintaining a county basemap, which had been the primary GIS initiative for some time, though other departments used GIS for activities such as environmental review and permitting. Before securing the ELA, the county operated with fewer than 10 copies of ArcGIS Desktop and one ArcIMS license.

"Getting the ELA has opened a lot of doors," noted McLaughlin. "Though our budget hasn't grown, we can now give more people access to ArcGIS Desktop as well as extensions and ArcGIS Server."

The county's approach to acquiring and managing data is also changing. Historically, staff members sent data requests to the GIS department, which would then deliver data and maps. The new model has experts in each department beginning to use GIS to create their own datasets. "They are working with data more deeply than we ever could because of their expertise. We want that model to flourish," said Wallis.

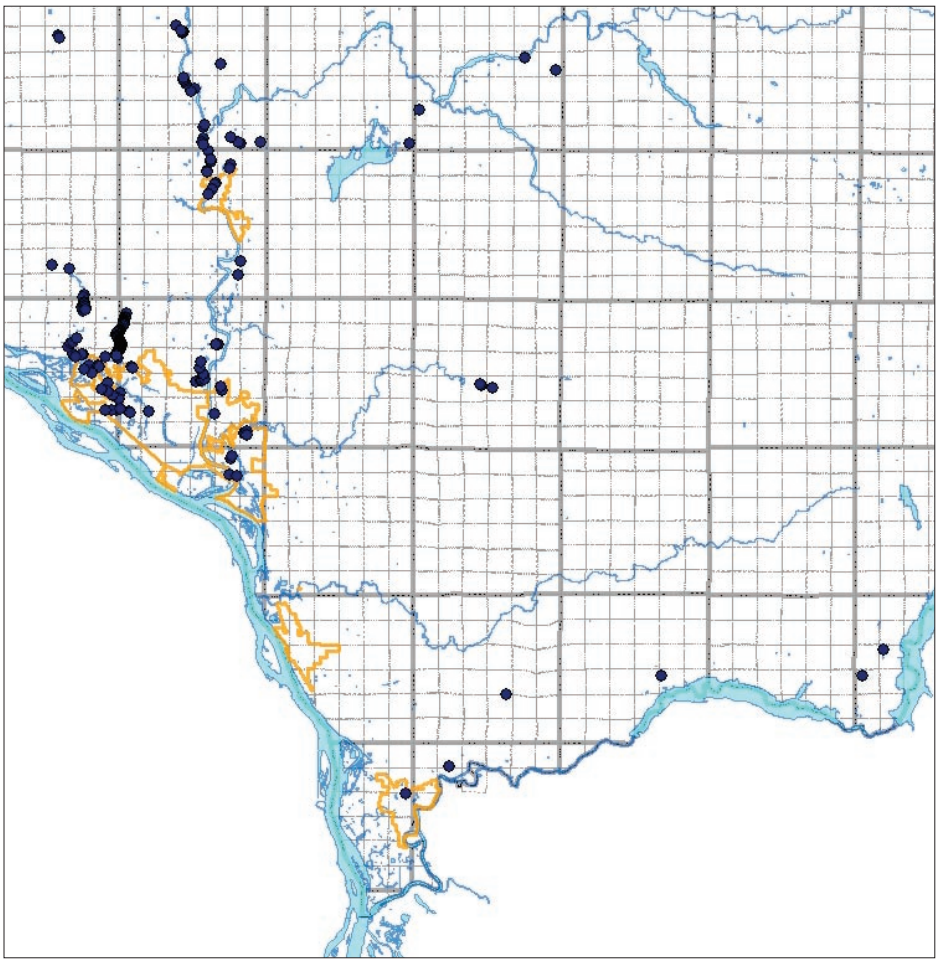
> "Getting the ELA has opened a lot of doors. Though our budget hasn't grown, we can now give more people access to ArcGIS Desktop as well as extensions and ArcGIS Server."
>
> Terry McLaughlin, Cowlitz County Assessor

McLaughlin added, "The elections department, for example, is now geocoding voter registrations to place voters in the correct jurisdictions, which had been problematic at best in the past; the software is helping tremendously."

GIS implementations are expanding across the organization. Appraisers in the assessor's office are using GIS in the field, and the public works department is capturing field data and integrating it with existing GIS base layers in the geodatabase. The planning department is using a new environmental and planning Internet clearance program written by Patty Kero, the in-house programmer for the assessor's office. "Patty has been the catalyst for the implementation of the software available through the ELA," noted Wallis.

"Having the sky as the limit has really allowed our creativity to grow," he added.

For more information, contact David Wallis at WallisD@co.cowlitz.wa.us or visit www.esri.com/ela.



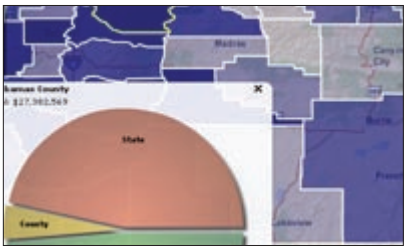
Noxious weed locations in Cowlitz County, Washington, captured in the field with GPS and imported into an enterprise geodatabase

Government 2.0

Visit www.esri.com/liveusersites to see how governments use GIS on the Web to support open government.

State of Oregon

The Oregon Stimulus Tracker allows citizens to see where stimulus dollars are being spent.



City of San Bernardino

This crime mapping application makes incident information available to the public for enhanced community awareness.

City of Midland

This interactive map is a public service mapping and information retrieval application that provides citizens with access to GIS data such as aerial photography, property information, and other resources.

ESRI Online

Watch ESRI TV

ESRI has its own YouTube channel. Visit www.youtube.com/esritv to see the latest videos such as Social Media and Geoservices: Real Time and Creating Notes in ArcGIS Explorer.

Connect Place History to Health

Bill Davenhall, the head of health and human services marketing at ESRI, gave an entertaining and enlightening talk at the TEDMED Conference in San Diego, California, in October 2010. Watch the video about the connection between place history and health at www.esri.com/geomedicine.

Participate in the Online Community

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Visit www.esri.com/podcasts to see the latest offerings and explore the new format, which makes searching for podcasts easier.

Recommendations

ArcGIS 9.4 Is Renamed ArcGIS 10

ESRI president Jack Dangermond discusses what's coming in the next release of ArcGIS as well as why it will be called ArcGIS 10.

Preparing Redistricting Systems for 2010 Census Data

Cathy McCully and Deirdre Bishop, chief and assistant chief, respectively, of the U.S. Census Bureau Redistricting Data Office, discuss the use of GIS in testing tabulation and processing systems for the 2010 U.S. Census.

Pull Up a Chair to the Spatial Roundtable

On www.spatialroundtable.com, GIS industry thought leaders share their opinions about business and organizational challenges in the geospatial community. Gain insights and join the conversation. Discussion topics change monthly. Recent posts have covered participatory planning, health 2.0, smart grid, and climate change.

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Mapping Mortgage Fraud in Boulder County, Colorado

praiser, Boulder County Assessor's Office. "There was a feeding frenzy a few years ago when it was so easy for people to get loans, and there was such a rush to secure financing," she said. "It was a perfect scenario for this kind of thing—for people to be opportunistic. Everything was happening very quickly, and people were making lots of money legitimately, so it was easier for illegal deals to get pushed through unnoticed."

As the 2009 mass appraisal got under way and staff in the assessor's office mapped their data, they noticed that fraudulent and suspicious sales, the majority of which took place in 2006, were clustered in three subdivisions in Longmont. All three areas were newly constructed, so the homes did not have a previous level of value—an advantage for criminals, since it is harder to falsely inflate value in an established neighborhood.

Location, Location, Location

The 15 suspicious properties in Longmont had relatively high sales figures for the neighborhood, but the appraisers noticed something curious—these homes did not have the most desirable characteristics in the neighborhood. In some cases, they were interior lots in golf course communities or were right next to a busy road. Though they had less desirable features, they sold for more than those with greater appeal.

The appraisers and GIS analysts set out to determine the impact of the 15 suspicious, or "dirty," sales, which occurred between 2003 and 2008 in Longmont. To do that, they ran analyses with and without the dirty data.

With 26,000 residential properties in the city, there were 8,714 clean sales in that five-year period. The SPSS Inc. regression analysis, which is exported into ArcGIS software, showed that with the dirty sales included, 40 percent of properties were falsely inflated for a total of $7.8 million, or falsely deflated for $5.5 million. The net difference was more than $2.3 million.

The approximately 4,000 properties that were inflated or deflated by more than $500 were mapped. Using GIS to visualize those properties that were falsely valued due to inclusion of suspicious sales, the analysis showed some important spatial patterns.

Home sales related to mortgage fraud falsely raised the assessment of similar homes outside the neighborhood with similar negative characteristics. Factors such as location next to a busy street were being weighted positively. "It even made it look like a benefit to back up to a highway," noted Brooke Cholvin, senior GIS specialist, Boulder County Assessor's Office.

Those properties with suspicious sales, located just one street away from premier golf

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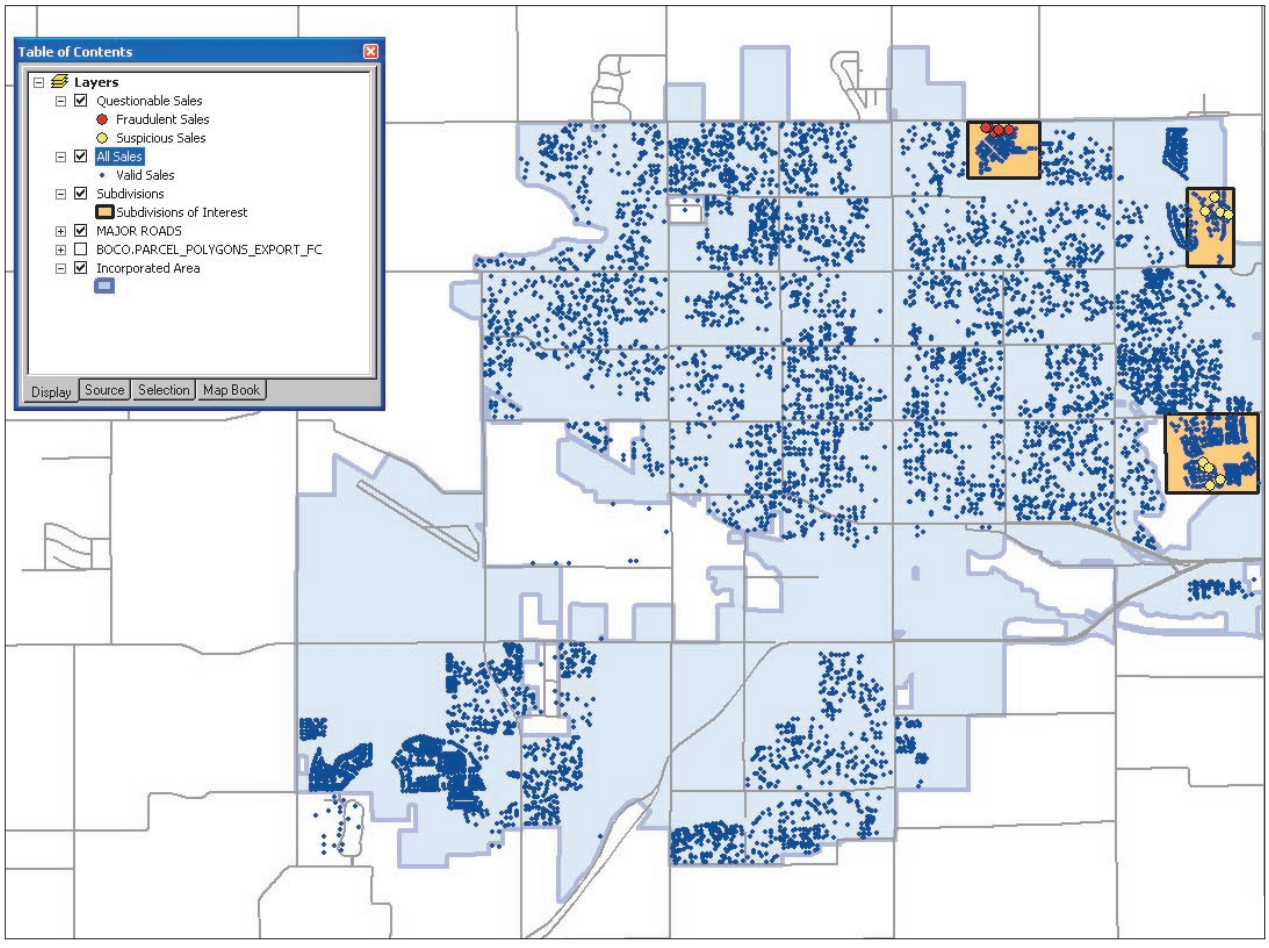

Mapping fraudulent (red) and suspicious (yellow) sales showed clustering in three neighborhoods in Longmont. Blue dots represent valid sales.

Leveragability

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Function: transitional adjective

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Mapping Mortgage Fraud in Boulder County, Colorado

courses, diminished the positive influence of adjacency to such coveted places. They caused an artificial reduction in the value of golf course homes.

When included in the mass appraisal process, the range of influence of suspicious sales extended well beyond the neighborhoods in which they occurred. "Realizing how far-reaching the implications would have been if we had not caught the mortgage fraud was a huge wake-up call," said Simpson. "Seeing that the impact could occur as far as six miles away from properties with fraudulent transactions was something we would not have guessed."

A New Outlook

Using GIS analysis helped raise appraisers' awareness of the value of each characteristic they use to appraise a property and the potential damage of overlooking a corrupt sale. "The ripple effect of including 15 corrupt sales in a model with thousands and thousands of other properties was shocking," said Cholvin. Though the statistics were technically compliant, appraisers were unable to see the full picture without visualizing the information. "Mapping the data with GIS changed the way we looked at our statistics," added Simpson. "It was really interesting and educational to present data spatially instead of on spreadsheets and have appraisers understand in a whole new way how what happens in one place affects what happens in another. Fortunately, by using GIS, we were able to avoid unfair assessments."

Based on what it learned in Longmont, the assessor's office also changed the way it evaluated the city's historic district. West of Main Street, the district had one foreclosure. To the east, there were several, which was easy to ascertain from the map. To prevent an underassessment of the west historic district and an overassessment of the eastern side, the sections were evaluated separately to ensure accuracy.

"If we hadn't put the foreclosures on a map, we would have left it the way it had always been," noted Simpson. "In the past, we had not seen a statistically significant difference between the district's areas, but foreclosures started to come into play and change that."

Cholvin agreed. "I recommend other assessor's offices put their data on a map," she said. "Then they can see angles and patterns that weren't obvious and ensure a fair and balanced assessment."

For more information, contact Brooke Cholvin at bcholvin@bouldercounty.org or Danielle Simpson at dsimpson@bouldercounty.org. GM

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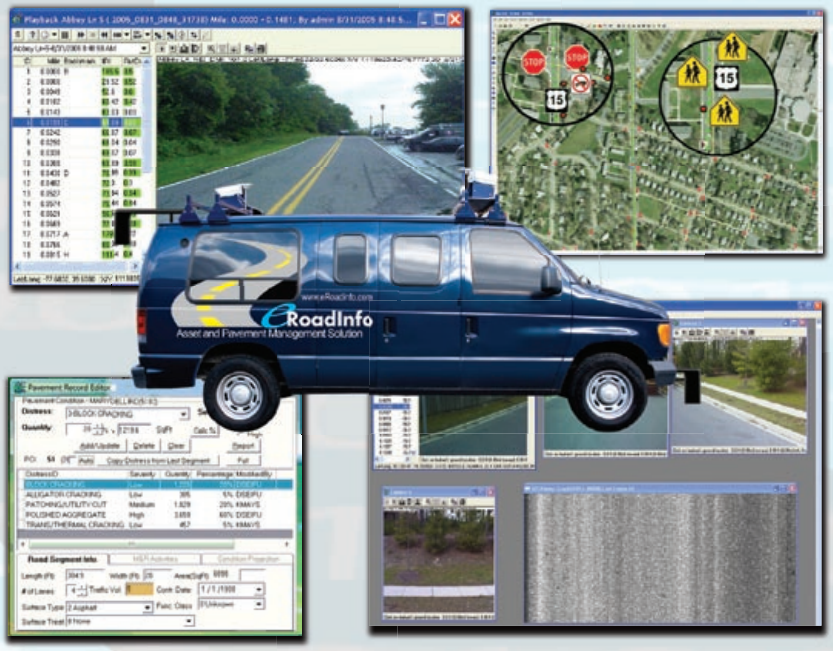

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GIS

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Geographic information system (GIS) technology has been acknowledged as a powerfu
with GIS often result in a strong return on investment. To learn more about a

Emergency Management

Organization
Lee County, FL

Discipline
Emergency Management

Problem
Lee County, Florida, has lost potential government funding due to inefficient collection of damage assessments after natural disasters. Many of the paper forms collected after disasters were illegible and took weeks to process. The county needed to streamline its damage assessment process to increase its federal aid funding.

Solution with GIS
In a mock damage assessment exercise, the county used ArcGIS Server and ArcGIS Mobile to showcase how mobile applications can assist emergency management. These two applications will be able to capture data in the field and provide live reports to emergency management centers.

Return on Investment
Lee County's human resources department estimated that improved efficiency in the collection of damage assessments will increase funds from the federal government by $1,000,000.

Property Value Administration

Organization
Jefferson County, KY

Discipline
Property Value Administration

Problem
The Jefferson County, Kentucky, Property Value Administration (PVA) is required to evaluate 243,000 parcels every four years with just seven inspectors. The 10,000 parcel evaluations per inspector per year proved to be virtually impossible.

Solution with GIS
Integrating oblique aerial imagery into the physical properties inspection process using ArcGIS Server drastically cut the time required for each inspection. Workers could now do estimates in an office setting.

Return on Investment
Incorporating GIS into the inspection process effectively cut the time required to perform inspections from 54 to 11.4 minutes per parcel. Increased efficiency also translated directly into a decrease in the miles driven to each parcel location; this resulted in the county saving $419,164.72 in just over a year.

Public Works

Organization
Jefferson County, KS

Discipline
Public Works

Problem
Location data for Jefferson County's water utilities network only existed in the form of old paper sketch maps and in the minds of the cities' workers.

Solution with GIS
Jefferson County teamed up with the Kansas Rural Water Association (KRWA). By working with KRWA, the county collected its water utility information with high-precision GPS receivers. The organization was then able to make the data available to the separate cities within the county using ArcGIS Server.

Return on Investment
By utilizing GIS technologies, the dissemination and accuracy of data became feasible within Jefferson County and its incorporated cities. Grants became available to some of the cities, paying up to 50 percent of their expenses. The City of McLouth's superintendent said that the city had saved more than $10,000 by doing the mapping work with its own resources instead of hiring an outside contractor.

Public Works

Organization
City of Fontana, CA

Discipline
Public Works

Problem
The City of Fontana, California, wanted to be able to verify its sewer connections and confirm that the city is collecting sewer service charges for each individual connection.

Solution with GIS
Using ESRI's ArcSDE for data storage and ArcGIS Desktop for analysis, the city was able to join two separate databases that linked lateral connections to the department's sewer system geodatabase. This joining of data revealed connections of the sewer system to unique parcel identification numbers.

Return on Investment
To date, the City of Fontana has found 660 homes out of 50,000 that weren't paying for sewage treatment. The discovery of these missed connections adds up to more than $150,000 in recovered annual revenue.

ecision Support
c Policy Making

l management tool in an age of data-driven decision making. Public policies formulated
applying GIS to the art of public policy, visit **www.esri.com/decisionsupport**.

Code Enforcement

Organization
Phoenixville, PA

Discipline
Code Enforcement

Problem
The Borough of Phoenixville, Pennsylvania, needed to identify and locate possible rental housing units that were not in the borough's rental database.

Solution with GIS
The methodology Phoenixville used with GIS was to compare its rental database with assessment data by land-use code to find possible missing rental residential units.

Return on Investment
For each rental unit the borough finds, it receives $50 per year. By successfully adding 120 previously missing rental units to the program, the borough will now realize a $30,000 benefit over five years.

Census LUCA

Organization
Moreno Valley, CA

Discipline
Census LUCA

Problem
The City of Moreno Valley, California, chose to participate in the Census LUCA program in an attempt to provide the Census Bureau with up-to-date information while increasing the city's federal and state compensation.

Solution with GIS
Using ArcGIS, Moreno Valley compared the Census Bureau's raw tables of addresses to the county's parcel database. The city was then able to determine which parcels were missing, allowing quick correction of census data. This analysis uncovered 10,540 housing units that were missing from the census database.

Return on Investment
The addition of 10,540 housing units is anticipated to increase the city's state per capita compensation by $2,222,031 and the federal per capita compensation by $3,829,287. The annual total increase is expected to be an additional $6,051,318 per year. From 2010 to 2020, the city's revenue will increase by $60,513,178 as a result of this program.

Automated Information Mapping

Organization
Johnson County, KS

Discipline
Automated Information Mapping

Problem
Johnson County, Kansas, has produced a very large amount of geospatial data but needed a method to standardize and share its utility infrastructure data between various internal county departments and noncounty organizations within a secure environment.

Solution with GIS
The Automated Information Mapping System created the Collaborative Utility Exchange (CUE), an online mapping interface powered by ArcSDE 9.3; it houses and shares utility data between the various entities in need. This application provides a secure, password-protected environment that allows users to view, search, and generate maps of utility layers, along with existing land records data, and access any supporting documentation provided.

Return on Investment
Many organizations have come to use the CUEView application on a daily basis, some of them realizing time savings of up to 90 percent. This has allowed the county's organizations to better serve their customers. Multiple subscribers to CUEView have remarked that they have potentially saved their customers thousands of dollars.

Public Works

Organization
City of Hudson, OH

Discipline
Public Works

Problem
The City of Hudson, Ohio, intended to spend $8,000,000 on storm water and sewer projects over a five-year period. Like all organizations, the city was looking for ways to cut costs.

Solution with GIS
By integrating GIS into the waterline replacement process, the city of Hudson was able to decrease many hours of labor required traditionally by its public works staff. The city saved 10 hours in the planning process, 16 hours in surveying, 4 hours in design, and numerous hours in the change order process.

Return on Investment
The savings seen from the use of GIS in waterline replacement equals $7,060. The City of Hudson will realize a 5 percent cost reduction in its planned projects over the next five years. This cost reduction will save the city $400,000.

City Leverages GIS to Jump-Start Fiber Marketing Initiative

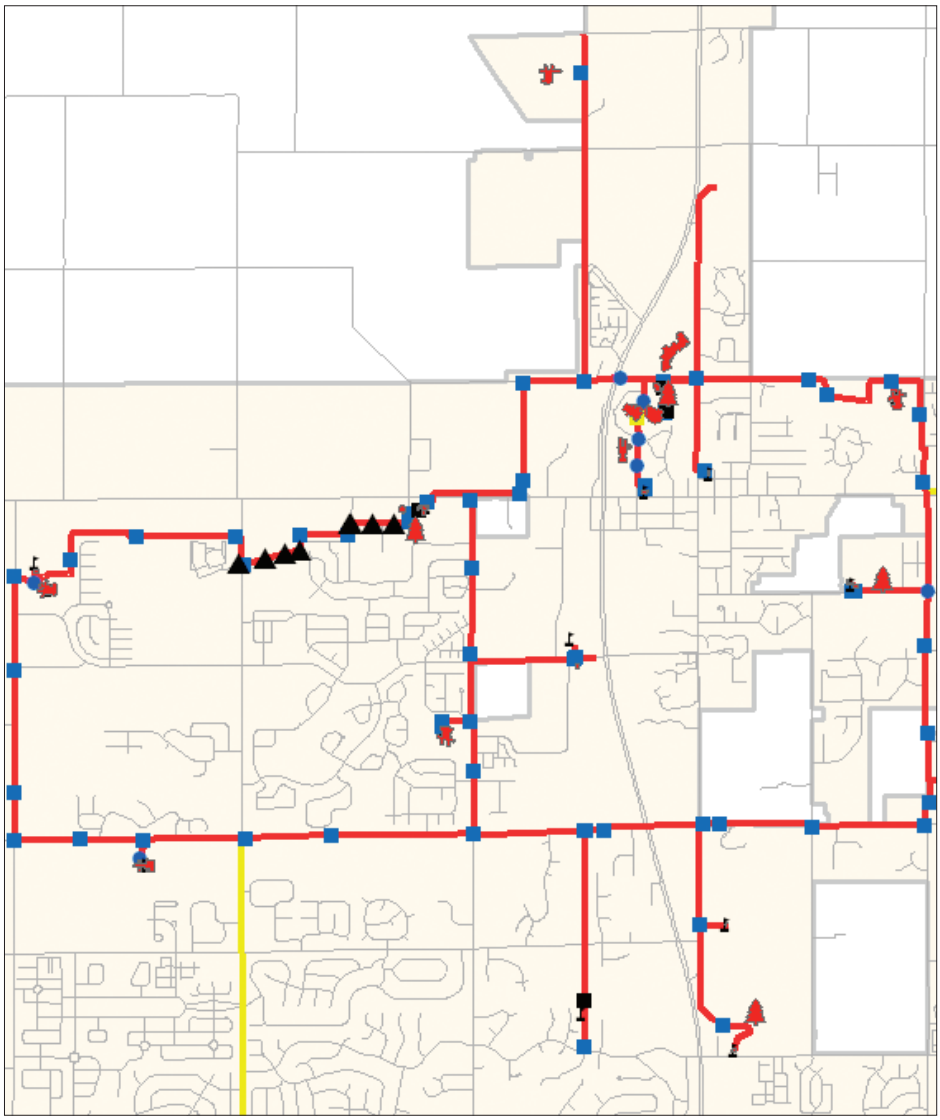
By Susan Harp, ESRI Writer

Economic opportunities are scarce these days, so when administrators for the City of Westfield, Indiana, identified a way to encourage business retention and growth in the community, they acted quickly. They saw a chance to leverage an existing—but mostly unused—fiber network to offer local businesses more diverse and cost-effective access to high-speed Internet. In developing a marketing plan, they devised a way to leverage the city's existing GIS datasets to generate potential customer leads.

Westfield, a city of more than 23,000 residents, is located just north of Indianapolis in Hamilton County and ranks as the fastest-growing county in the state. Its original fiber network was established by Westfield-Washington Township School Corporation to provide district schools with economical access to broadband communications. The 72-strand fiber system delivered fast connectivity, but 35 percent of its capacity remained unused because of the small number of clients (10 schools and four municipal and public safety buildings). In addition, the outside plant design was linear, which could not provide redundant backup connectivity should one of the branches go down.

To remedy this design problem, in 2008 the city and school system formed a joint venture, Westfield Connects, with plans to update the network to a 15-mile-long hub-and-spoke, local loop design that would improve service reliability.

The improved design and available dark fiber created an opportunity to offer dependable voice, video, and data services to local businesses through broadband service providers. The challenge was to present an economic opportunity that would entice service providers to participate. This was accomplished by making the city's dark fiber available to the service providers, forming partnerships with them through an open service-provider network and devising a marketing plan that generated confirmed sales leads.



This shows the locations served by the original fiber network established for area schools.

"This created a win-win situation," said Eric Bishop, Westfield Connects fiber marketing coordinator. "Service providers avoid the expense of installing and maintaining the fiber network, so they gain customers with very little asset investment. Businesses gain by having access to fiber broadband services in a competitive market." The city also gains by recovering the cost of the new fiber infrastructure through revenue sharing agreements with service providers.

To generate sales leads, Westfield Connects personnel needed a marketing plan to identify potential customers near the fiber network and create a list of their addresses and phone numbers.

The city's Informatics Department already maintained a GIS, based on ESRI's ArcGIS Desktop and ArcGIS Server, to track fiber infrastructure assets and manage land parcel information. The department works in tandem with city officials, departments, staff, and community partners to advance the mission of the city, its departments, and citizens. Leane Welsh, a GIS technician in the department, devised a way to use GIS to merge data from several sources and generate the contacts list.

Viewing the infrastructure and parcel data-

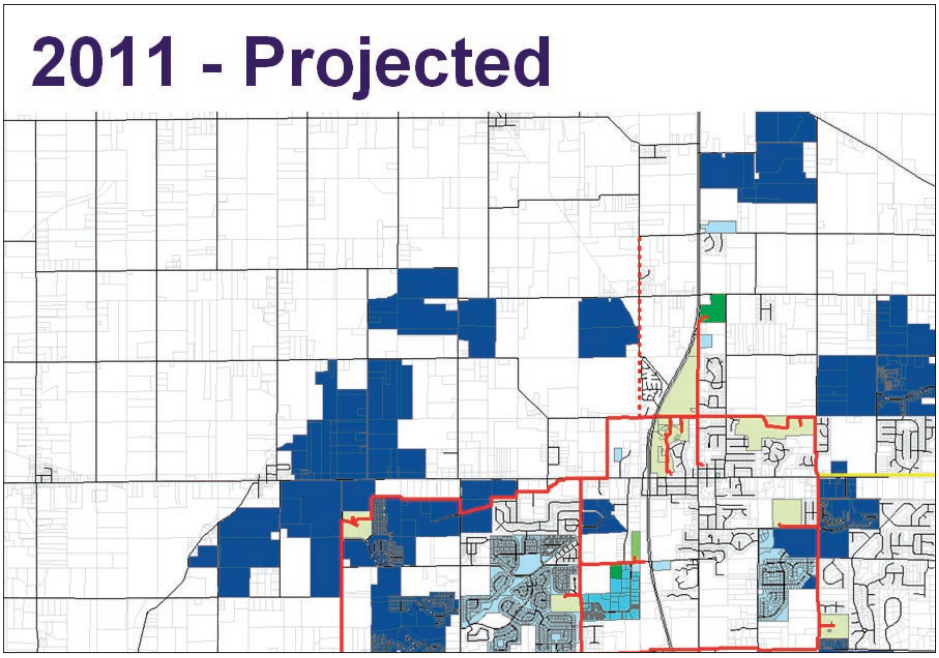
sets on a map showed that existing fiber was near approximately 650 parcels. Commercial buildings would provide the highest density of target customers. Using GIS to establish a connecting network of parcels on each side of the network, 750 serviceable address points were identified. The next step was to match phone numbers with the addresses so sales calls could be made.

The city also used a water and sewer utility billing management system, which provided an account database containing both addresses and phone numbers. The solution was to merge the parcel and utility databases by matching the address fields, which would align phone numbers with addresses. The city's parcel dataset held E-911 address points, which made it a reliable dataset, and the merge produced an 85 percent match on the addresses. The remaining phone numbers were obtained by making online searches using owner/business names.

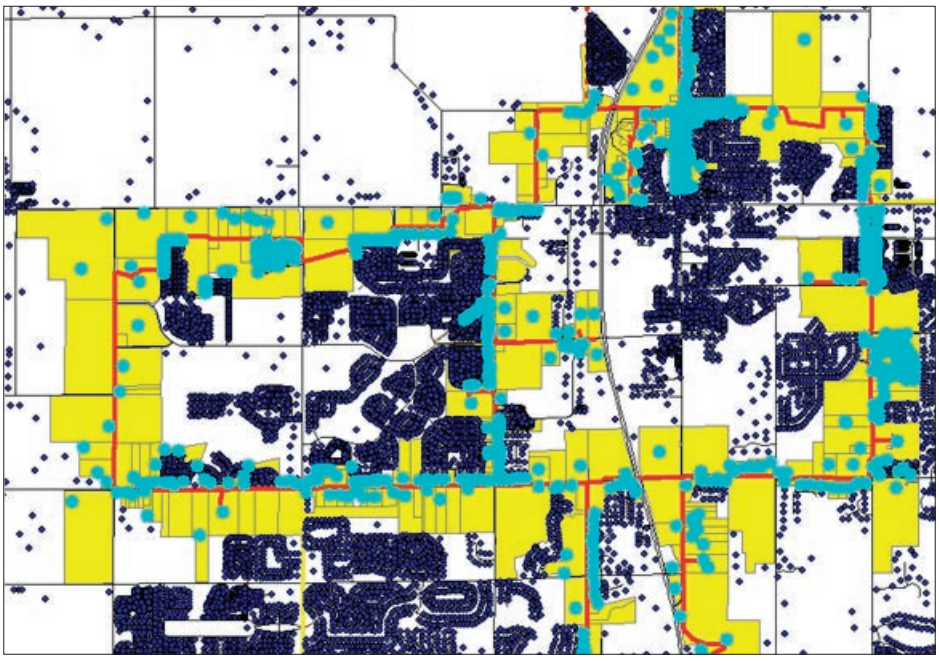
ESRI technology also enabled shared access to the data online and through Microsoft SharePoint. Through ESRI's ArcGIS Server technology, the Westfield Connects team could view the information online as interactive maps. "We also developed a database site on Microsoft SharePoint, which we call Fiberforce, that uses the GIS data to aid in sales leads and customer relationship management," said Welsh.

The contacts list brought the team to the next step, contacting first-tier targets (building owners) to offer service for an entire building. The premise was that the owner would see the advantage of providing broadband access as an added value to tenants. Second-tier marketing efforts were directed to individual businesses. All confirmed sales leads were passed on to the participating service providers for further action.

In just one year of operation, Westfield Connects attracted three service providers that are now using the network, and two other competing providers have shown interest.



Near-term projections for service expansion are shown in light blue, with possibilities for future growth in dark blue.



A map combining the fiber network and city parcels identified 750 serviceable address points.

City businesses using the network are already reporting savings. IMMI, an international company with corporate headquarters in Westfield, found it could reduce monthly costs by about $1,500 by switching to VoIP phone service and thereby converging data and voice services onto the fiber.

For more information on Westfield Connects, contact Eric Bishop at ebishop@westfield.in.gov or visit the Public Works Department's Fiber Division page at www.westfield.in.gov.

Recovering from Katrina

GIS Helps Gulfport Weather the Storm and Manage the Aftermath

By Matt Freeman, ESRI Writer

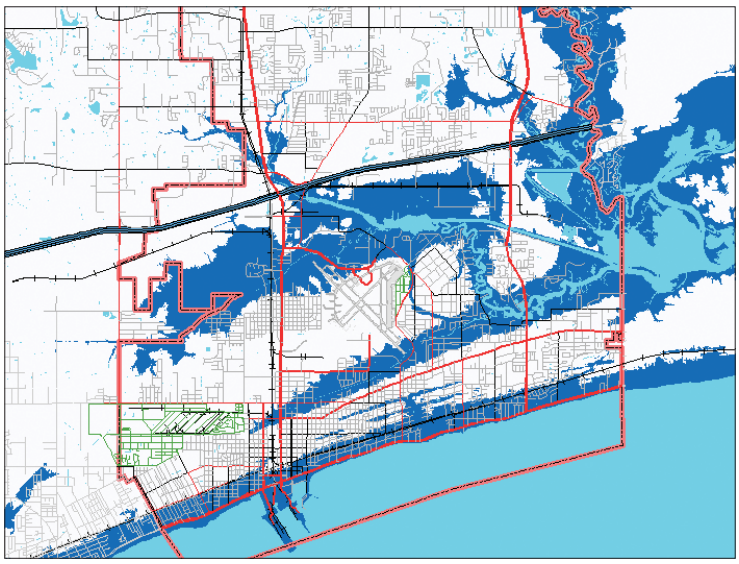
Since 1900, more than three dozen major hurricanes have hammered the Gulf Coast, from Texas to the Florida panhandle. Located in the middle of this troublesome zone is Gulfport, Mississippi. The 64-square-mile city, which is bordered to the south by seven miles of the Gulf Coast, was severely damaged in 1969 by Hurricane Camille and in 2005 by Hurricane Katrina. Until recently, Camille was considered the benchmark for destructive hurricanes in Gulfport, but Katrina has become the new standard.

Hurricane Katrina hit Gulfport on the morning of Monday, August 29, 2005, with wind speeds of up to 150 miles per hour and a storm with surge levels of up to 30 feet that left downtown streets underwater. Nearly all structures within half a mile of the southern-facing Gulfport coastline were destroyed. The surge forced ships, casino barges, large dredging barges, and shipping containers inland, knocking down buildings and houses like a bowling ball knocks down pins.

A railroad line on an elevated berm that traverses the length of the city and parallels the coastline from one-quarter to three-quarters of a mile inland served as a makeshift levee for the storm surge and its dangerous, drifting debris. Because of this berm, damage north of the railroad tracks was significantly less but still catastrophic due to the high winds, multiple tornadoes, flying debris, and pouring rain. Katrina hammered the Mississippi coastline for more than 17 hours, leaving Gulfport and its neighboring Gulf Coast cities in utter destruction. More than four years later, cleanup and rebuilding efforts are still taking place.

A City under Surge

Being prepared for a natural disaster the size of a category 5 hurricane may sound like a paradox, but from an information services standpoint, Gulfport's public works department was as prepared as possible. The lengthy infrastructure recovery process that followed the storm was expedited by the city's GIS-based asset and work management system. The system helped mitigate damages by generating crucial utility and street maps, locating assets under piles of debris more than 10 feet high, and serving as a geospatial damage report depository. The latter was instrumental in gaining federal assistance and aid from the U.S. Environmental Protection Agency (EPA) and the Federal Emergency Management Agency (FEMA).



Gulfport's GIS-based asset and work management systems show that much of the city's 64 square miles were inundated with floodwaters as a result of Hurricane Katrina.

Gulfport's public works department actually became more prepared for such a storm in 2002. In an effort to improve its asset and work management system, the city implemented Azteca Systems' Cityworks software and supported it with ESRI's ArcGIS technology. Cityworks is a GIS-centric software program used by public works, utilities, and other organizations tasked with managing capital assets and infrastructure. Utilizing the data stored in a GIS geodatabase, Cityworks gave Gulfport the tools for creating a custom solution for managing its public works infrastructure. With Cityworks in place, Gulfport began handling requests for service, conflict resolution, work orders, tests, and inspections in a GIS environment. The city and its 30,000 customers enjoyed the reliability and efficiency of the system, but no one could predict just how valuable the investment would turn out to be until after Hurricane Katrina had passed.

"When Katrina hit, it destroyed our infrastructure—water, sewer, storm drain—for about three to four blocks inland, all along our beachfront," said Ron Smith, Gulfport's assistant director of public works. "Almost everything south of the railroad tracks to the beach was destroyed. All the utilities that linked to all the businesses and homes in that area were completely wiped out. The storm wiped it all off the map, but it didn't wipe it off our Cityworks."

As soon as it was humanly possible, the city had people in the field repairing its severely damaged water and sewerage system. The recovery effort began in the middle of the storm and went around the clock amid chaos as workers labored to plug and cap holes and shut off valves to keep Gulfport's water tanks from completely draining. Many of the damaged lines were underwater or beneath rubble and debris, making their exact location difficult to pinpoint and access. The city's water pressure, normally 60 psi, was down as low as 25 psi for a week after the storm hit land. In addition to its water system, debris had clogged and crippled the city's storm drain and sewerage system, which only intensified its flooding

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Recovering from Katrina

problem. "You couldn't have packed concrete into our storm drains any tighter," said Smith.

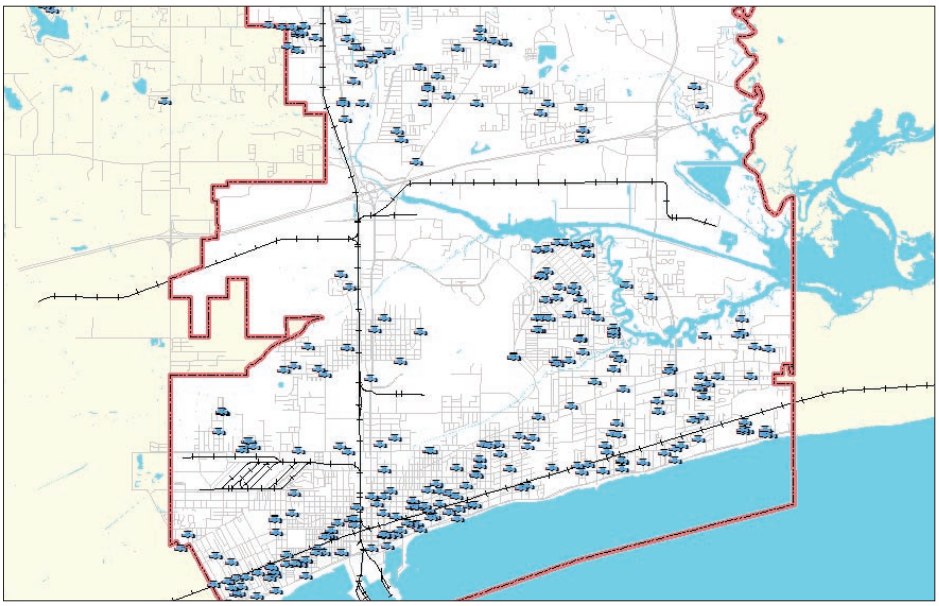
GIS to the Rescue

Five days after the storm passed, the Cityworks server, which had been taken offline and stored in a secure area as Katrina approached, was back up and running. "We immediately started entering and documenting all the waterline breaks, plugs, and caps into Cityworks," said Smith. "We were also very busy tracking, mapping, and documenting the damage done after the storm."

Not all the destruction in Gulfport was done by Katrina. Before Cityworks was rebooted, the city was unable to provide cleanup crews and contractors with accurate locations of its assets. This became a big problem because contractors were frequently destroying waterlines, valves, gas meters, and fire hydrants with the bulldozers and excavators used for the cleanup effort. Each time a waterline or fire hydrant was broken, water pressure would once again drop, and public works crews would be dispatched to make the necessary repairs. The problem was finally resolved when the city was able to provide contractors with GIS-based printed maps marking the locations of fire hydrants, valves, and waterlines.

Crews worked around the clock, and within a week of the storm, most of Gulfport's major roads were cleared and water pressure was restored to 90 percent of the city. The other 10 percent of the city's waterlines were damaged beyond repair. By the third week, the public works department was able to lift the "boil water" notice, and by the fourth week, the sewerage system and traffic signals were restored to working order. As cleanup and rebuilding progressed, it was determined that nearly 15,000 traffic signs needed to be replaced. The GIS functionality of Cityworks helped public works justify sign replacement by identifying the attributes and original locations of the destroyed signs.

Replacing traffic signs was a small task compared to the estimated 3 million cubic yards of debris that needed clearing from Gulfport's coastal area and the 50 miles of water, sewer, and drainage pipe that needed to be replaced. Early on, EPA had representatives in Gulfport to advise on environmental issues and concerns. Seven months into the recovery process, EPA brought in a team to analyze the entire impact the storm had on the city's public works infrastructure.



The City of Gulfport relied on Cityworks to plot its hundreds of service calls. The data was later used by EPA and FEMA to analyze the scope of damage to the water, sewer, and storm drain infrastructure.

"We used Cityworks to show the EPA all the areas in our lines that were destroyed and had water leaks and damage and where they had been fixed or needed repairs," explained Smith. "When we looked at all the points on the map, it looked like a shotgun blast. From our GIS maps, the EPA [representatives] determined that there was no way we could just repair it. They recommended that we replace all our lines near the beach."

The plotting that the city did in Cityworks provided EPA with a highly detailed geospatial platform for visualizing the entire scope of damages. From the city's analysis, EPA made a recommendation to FEMA that Gulfport receive the funding to rebuild its water, sewer, and storm drain infrastructure near its coast. Such a project also required new sidewalks, curbs, gutters, and asphalt roadwork. With EPA's recommendation, FEMA approved the multiyear project at an estimated overall cost of more than $100 million. EPA's endorsement came as a huge relief for the city because, prior to its analysis, Gulfport was having difficulty justifying the need for FEMA funds. "The EPA came in and, using our maps, communicated with FEMA to get the issue handled," said Smith.

Gulfport's GIS also served in the role of an expert witness, helping residents file insurance claims and receive federal funding for damage done to private property. The mapping functionality in the GIS was used to generate lists and identify the addresses of buildings that fell in the flooded areas.

As recovery and reconstruction continue more than four years later, the GIS component of Cityworks is still paying off. Because accurate data exists regarding public works assets prior to Hurricane Katrina, Cityworks has helped show contractors and planners where new valves, hydrants, waterlines, and meters should be placed. However, Smith noted, "In construction, nothing ever goes exactly the way that you want it to go. Something always needs to be rerouted or redesigned, and when that happens, its new location, size, and material type is getting plotted in Cityworks."

Completion of Gulfport's public works infrastructure repairs is expected by fall 2011, more than six years after Hurricane Katrina made its permanent imprint on the city and the minds of its citizens. GM

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The Federal, State, and Local Government Solutions Team
Christopher Thomas, Government Industry Solutions Manager
E-mail: cthomas@esri.com

Jeff Allen, State and Local Government Coordinator
E-mail: jallen@esri.com

Richard Leadbeater, State Government/Trade Associations Manager
E-mail: rleadbeater@esri.com

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