Ohio's Location Based Response System:

How one set of highly accurate, shared mapping data is saving time, money and lives across the Buckeye State

Ohio Department of Administrative Services
Ohio Office of Information Technology
30 E. Broad Street, 39th Floor
Columbus, Ohio 43215
614.644.6446

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The Problem

Taxpayer dollars were being wasted.

In 2000, local governments in Ohio along with electric and gas utilities were spending an estimated $80 million to $100 million on digital mapping activities, not to mention all the geographic information system (GIS) hardware, software and application development that went into maintaining the maps. The spending was well intended, but a large portion of those dollars were spent on redundant data collection activities initiated by various entities for a number of different reasons and with a number of different needs.

Locals were spending taxpayer dollars to develop street and roadway maps for their own purposes. County engineers, auditors, and city officials were spending tax dollars independently of each other to develop property and roadway maps of the same areas to their own specifications. County 9-1-1 coordinators were spending tax money to buy commercial datasets to route emergency vehicles.

Ohio is a strong home rule state with 88 counties and more than 2,000 cities, villages and townships, resulting in a myriad of different approaches to collecting map-related information pertaining to real estate, roads, natural resources, school districts, utilities and so on. And in cities with a Metropolitan Planning Organization, separate maps for planning and development needs were being developed with taxpayer dollars on yet another level.

Add to that, the tax money spent by the Ohio Department of Transportation to maintain the State's Roadway Inventory, separate from the counties. Even the U.S. Census Bureau was spending tax dollars to develop their own version of the local roadway network. The duplication of effort was extensive.

While a few agencies cooperated on joint development activities, these were predominantly one-off projects with little consideration or resources dedicated to ongoing maintenance. It wasn't uncommon for some government entities with particularly lean budgets to be relying on map data that was more than 20 years out of date!

Services to citizens were being compromised.

The repercussions of having inaccurate and often conflicting, map data of various qualities and age went far beyond financial.

All too often, incidents of emergency vehicles being dispatched to the wrong side of a county because of inconsistent or erroneous map data were taking place. Precious minutes were being lost trying to figure out how to circumvent a drainage ditch that showed up as a road on 9-1-1 dispatch mapping software. Cell phone callers could not be located unless they knew and could communicate clearly to 9-1-1 dispatchers where responders could find them – a particularly difficult task for those traveling through unfamiliar areas, or involved in emergencies where speaking could endanger them. And what about those who became unconscious during a call? How could they get help?

The stories were numerous and endlessly frustrating. Some were heartbreaking – especially because they might have been preventable with more accurate and consistent, shared mapping data. But responders were doing the best they could with the data they had.

Clearly, something had to change.

The Solution

Almost 10 years ago, Ohio identified how it could reduce redundant mapping, cut spending, create greater efficiency in government and even save lives – all by building one unified set of highly accurate map data. The data had to be easily accessible and able to meet the vastly different needs of state, county and municipal governments throughout the state.

It was a tall order, but today, nearly three-quarters of Ohio's 88 counties are actively contributing high-quality, uniform map data to the Ohio Location Based Response System where it can be referenced by all levels of government and private industry.

Highlights

- All data in the Location Based Response System (LBRS) has to meet specific state standards in order for it to be accepted. The most accurate data in the system is field verified to ensure precision mapping and includes site-specific address locations – not just address ranges on road centerlines.

- Because it is field verified, all LBRS data boasts positional accuracy to +/- 1 meter. By comparison, the latest 2010 TIGER data used by the U.S. Census Bureau is accurate to +/- 7.6 meters.

- The LBRS is updated regularly to ensure accuracy. Although the state only requires counties to update data annually, most are choosing to update more frequently – some as often as daily. This creates an extremely reliable system for routing emergency responders since even short-term road closures can be noted and avoided.

The basic philosophy behind Ohio's Location Based Response System is: Capture it once; use it a bunch.

- The basic philosophy behind LBRS is: Capture it once; use it a bunch – and maintain it. After all, when highly accurate geographic information is painstakingly collected using taxpayer money, it should be placed in a user-friendly public repository that can be easily updated and shared with all levels of government for the benefit of all citizens.

- All information placed in the LBRS is public domain. This means it can be accessed by citizens, private enterprises and non-profit organizations for a variety of uses. For instance, commercial data companies – which provide mapping information to popular automotive GPS and many portable wireless devices – have access to LBRS information to update these navigational tools regularly, making them more accurate. The same information is available for Web-based map services. This means these commercial location based service providers can offer Ohio citizens and visitors to Ohio more precise navigational maps than those in states lacking an LBRS-type program. This is beneficial for saving time and aggravation.

- Participation in the LBRS program is completely voluntary, yet 75 of the 88 counties in Ohio have chosen to participate thus far. Of the remaining 13 counties, more than half have expressed some level of interest in joining the program.

- LBRS data is integrated into the Ohio Department of Transportation's Roadway Inventory and is used as the official transportation map for the State of Ohio. In addition to the Department of Transportation, numerous government agencies at all levels can benefit from having easy access to the precise, uniform map data provided by the LBRS.

Examples of LBRS users

Agency name	Function LBRS data supports
9-1-1 Dispatch / First Responders	Pinpoint call location; better response time
Department of Public Safety	Improved crash analysis; jurisdictional data
Department of Development	Enhanced economic development efforts
Department of Commerce	Location of underground tanks
Department of Taxation	Streamlined sales tax
Bureau of Motor Vehicles	Tax district determination
County Health Department	Improved disease and outbreak tracking
County Emergency Management Agency	Enhanced coordination & response capabilities
County Board of Elections	Easier voter precinct determination
County Engineer	Better road inventories, planning capabilities
County Auditor	Faster, more accurate assessments
Local School Districts	Improved school district determination
U.S. Department of Homeland Security	Enhanced coordination of response, prevention
U.S. Census Bureau	More precise map data; demographic analysis
U.S. Geological Survey	Better geographic & environmental data

This is just a sampling of entities using LBRS data throughout the state and country.

How could you use this sort of data?

Success stories

Show me the money: Getting accurate Census & road mileage counts

In a 2001 report to Congress by the U.S. Census Monitoring Board, the estimated funding loss to counties, based on eight federal programs, was as much as $2,913 per uncounted individual. Using this estimate, and Ohio's average household size of 2.48 individuals, at least one Ohio county made itself eligible to collect as much as $6.23 million in additional federal funding annually -- simply by using its field-verified LBRS data as a check against the Local Update of Census Address (LUCA) program.

Fairfield County, Ohio was able to use the accuracy and availability of LBRS data to identify and provide proper verification of 863 additional households within its borders that had previously been overlooked by the U.S. Census Bureau, according to Fairfield County GIS Administrator David Burgei. Including these additional households in the Census count means an estimated $6 million in additional federal funding is being channeled into Fairfield County *each year* for programs such as Head Start, Community Development Block Grants, Low Income Home Energy Assistance Programs, school lunch and breakfast programs, and child support enforcement. These are just a handful of the programs that counties receive federal funding to support each year, based upon the latest Census counts. Other Ohio counties have also used LBRS data as an independent benchmark to check the accuracy of Census data and realized similar results.

The Census Bureau has expressed interest in incorporating Ohio's LBRS data into the maintenance process for its TIGER Map Modernization program. This would alleviate the need for the Census Bureau to spend additional federal taxpayer dollars for data that is already being developed and maintained by local government, while improving both the spatial accuracy and attribution of field-verified street names and address ranges.

One Ohio county made itself eligible to collect roughly $6 million in additional federal funding each year by using field-verified LBRS data to identify and provide proper verification of households initially overlooked by the U.S. Census Bureau.

With LBRS, everybody wins. Being able to identify any missing address points in the Census data can ensure counties are receiving all the federal funding their residents are entitled to receive each year. And having the Census Bureau incorporate LBRS data into its database can save taxpayers money. Counties have also found the return on investment from identifying missing household data, alone, can be more than enough to offset the development cost of their LBRS program in the first year. And this is money that will be available to these counties on an annual basis.

In addition, local governments and taxpayers are benefitting from the accuracy of LBRS data when it comes to the annual distribution of gas taxes. Ohio distributes approximately $41 million each year in gas taxes, based on the road mileage in each county. Without proper road mileage data and precisely mapped jurisdiction information, disbursements can be

misallocated. Clearly, there are many ways counties can recoup the funding spent on gathering field-verified data for LBRS.

Saving lives: Every second matters

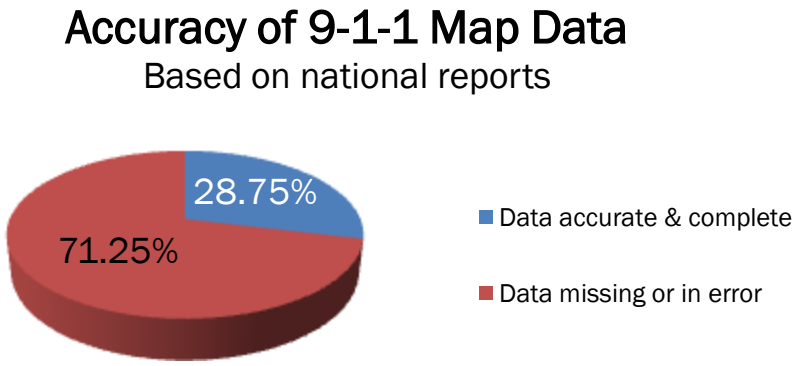
In an emergency, response times are critical. The first few minutes can make the difference between life and death. So mistakenly dispatching an ambulance, fire engine or police cruiser to the wrong location or using mapping data that provides a “best estimate” rather than precise locations can prove disastrous. "If we can provide a dataset that gets them there a few minutes early, you can't put a price on that," says Dave Blackstone, GIS Manager for the Ohio Department of Transportation.

Sheriff's Offices and EMS crews throughout Ohio know the accuracy of field-verified LBRS data has saved lives. "With LBRS, we have literally been able to cut minutes off the arrival time of responders because of our ability to give better directions," says Monte Diegel, 9-1-1 Administrator for the Mercer County Sheriff's Office. For example, before LBRS, responders trying to find an address on Wabash Road in Mercer County might end up nearly a mile south of the actual location, using only street centerlines and address ranges to plot the address.

Similarly, in Preble County, a call to a location on Factory Road previously geocoded to a stretch of road that abruptly ended before the desired location was reached even though the address range plotted it within that area.

Backtracking to reach the correct section of road where the address is located requires a four mile trip around neighboring roadways as the road ends and resumes several blocks away – not once, but twice. That's four or more minutes of response time that can now be saved since the county proactively had all of the addresses field verified to increase accuracy. Now, the exact location of a call from that address can be pinpointed the first time, and a long, potentially life-threatening delay can be avoided.

Address anomalies and other mapping errors that can slow emergency response time like this are rampant across the country. According to a 2011 report from the Communications Security, Reliability and Interoperability Council, 85 percent of map data was found to have some degree of error in Minneapolis-St. Paul and the State of Texas, for example. In addition, an analysis of 50 recent data validation reports from different areas across the country uncovered errors or omissions in more than 70 percent of 9-1-1 datasets.



In Ohio, Van Wert County was experiencing error rates of roughly 80 percent using off-the-shelf data in their 9-1-1 dispatching software prior to joining LBRS in 2005. Now, even if a caller doesn't know where he or she is, the field-verified LBRS data utilized by the county's dispatch software, which enables the county to harness the information-rich attributes of LBRS data, can help emergency response personnel locate them at least 99 percent of the time to an exact location, says Kim Brandt, 9-1-1 Coordinator for Van Wert County. In fact, once when a car drove into the side of a house, the LBRS data showed the call as coming, not just from the home's address, but from the precise side of the house where the car was located.

"The [LBRS] data is highly accurate because of the way it was collected and verified," Brandt says.

"The big benefit is 9-1-1," agrees Blackstone. "The ability to save a life. There are just errors. A road is closed, it's been relocated. To us, it's an inconvenience. But some 9-1-1 operators use that same dataset. So what might make us late for a meeting might cost someone else their life."

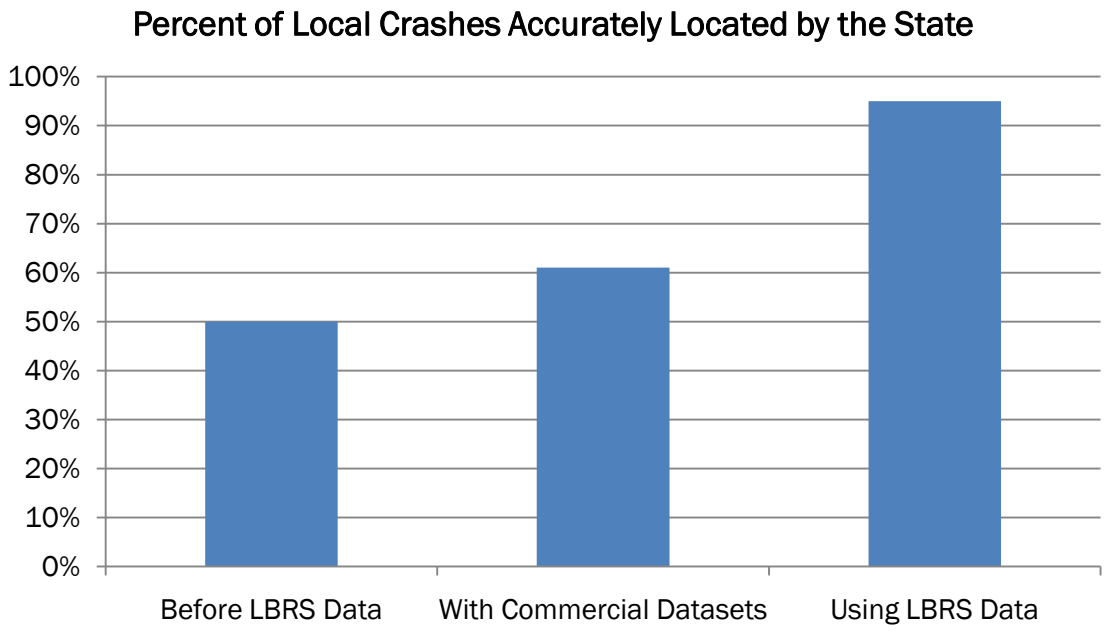
Creating safer roadways

More than 386,000 crashes took place on Ohio roadways in 2002 – the year before the first pilot of LBRS was launched in Fairfield County. Of those crashes, only 27 percent occurred on the roadway system that the Ohio Department of Transportation (ODOT) is directly responsible for maintaining.[1] While ODOT could accurately locate about 85 percent of the crashes that occurred on its system, it could only establish locations for about 50 percent of the remaining 282,000 crashes because they took place on local roadways or streets and detailed data consisting of street name and corresponding addresses simply weren't available to the state at that time.

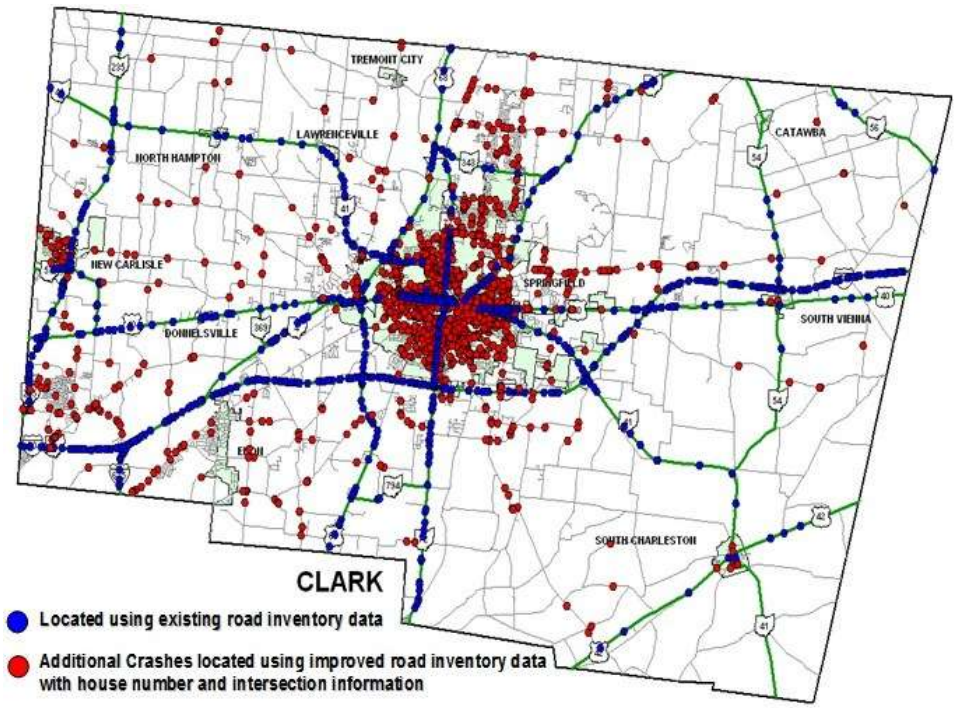
Even when using commercial datasets, purchased at taxpayer expense, only 61 percent of local crashes could be accurately pinpointed by the state. But when LBRS data came on the scene, the state's ability to identify local crash sites went up to more than 90 percent in some cases.

[1] The ODOT roadway system includes all interstate highways and any U.S. routes and state routes located outside of municipal areas with a population greater than 5,000

"That's extremely important since the bulk of our crashes do occur on that local system," says ODOT's Blackstone.



Perhaps an even better illustration of how LBRS data can enhance state crash data can be seen in the map below. It shows the crash locations in Clark County that ODOT was able to locate using its network prior to LBRS (blue dots) as compared to the crashes located after incorporating LBRS with the ODOT roadway network (red dots).

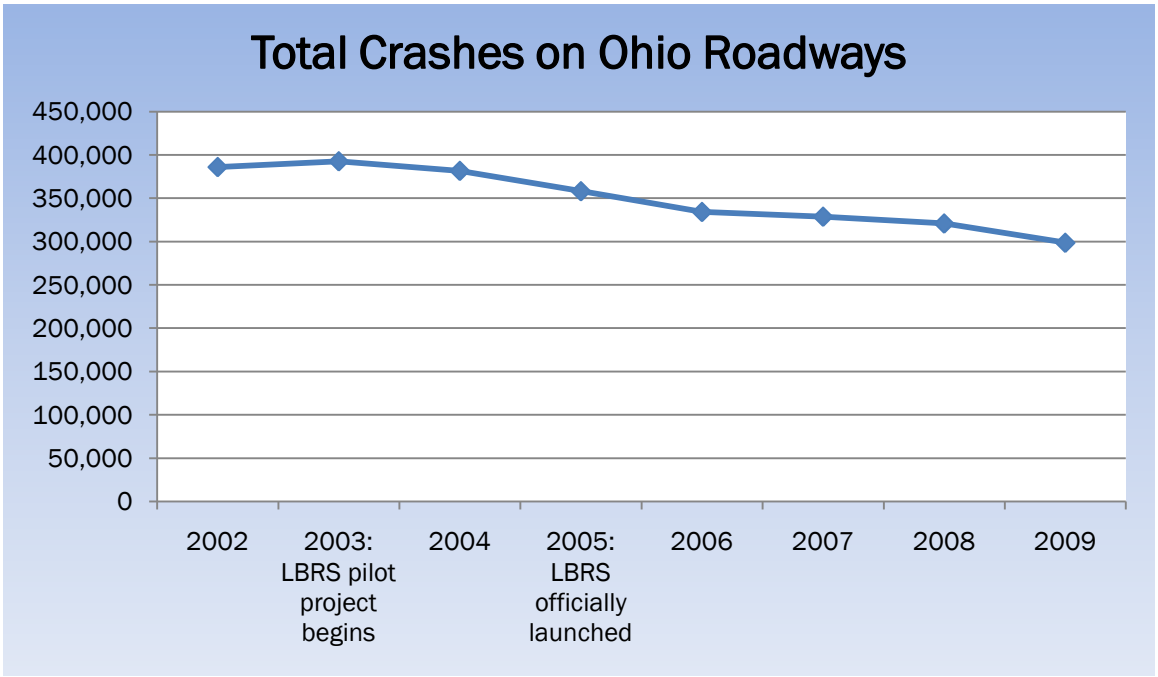


Being able to pinpoint more local crash sites throughout the state carries a two-fold benefit. First, it allows for better crash analysis and preventative measures – such as guardrails, no passing zones or better signage – to be added in an effort to curb additional crashes at those locations. Secondly, it helps Ohio get its fair share of federal safety dollars to finance such improvements to make roadways safer.

As it stands now, with the improved local data available through LBRS, Ohio's local safety stakeholders have been able to apply for and receive more federal safety funds annually to address high-crash areas throughout the state. And Ohio has received an additional $2.9 million from the Traffic Safety Information program's Section 408 funds to spend on the ongoing development of the LBRS database.

"It's a win-win," says Blackstone. "We're getting federal dollars to develop LBRS and, in turn, by using this data in our crash program, we're able to apply for and receive additional federal dollars for the safety program. By having better data, we may have prevented someone from being killed there. Good mapping can make the difference between life and death."

To that point, deaths on Ohio's highways in 2009 – the most recent statistics available – were at a historic low, representing the safest year on record for those traveling the state's roadways. In addition, the number of crashes within Ohio has dropped dramatically since the launch of LBRS. In 2009, there were 298,646 crashes on Ohio's state and local roadway systems combined – a drop of 22 percent since 2002.



The National Highway Traffic Safety Administration was so impressed by Ohio's use of its Section 408 funds to build a better dataset to encourage better crash identification and safety improvements that agency auditors told the state they were going to suggest other

departments of safety throughout the country consider using their Section 408 funds to develop similar systems.

Clearly, in the safety community, Ohio's LBRS has already become a best practice.

Increasing efficiency & streamlining programs

The advent of LBRS was expected to increase productivity approximately 10 percent – or four hours per work week – among state agency employees whose job functions routinely included working with mapped data, according to a statewide cost-benefit analysis.

Employees in the Ohio Department of Transportation, however, have become considerably more efficient by using LBRS data. According to Blackstone, before LBRS, it took an average of 10 days for ODOT workers to collect updated road mileage information from a single county to determine proper gas tax distributions. Now, being able to get the bulk of the necessary information directly from LBRS, it only takes ODOT workers an average of three days per county to collect the same data. That's an average productivity increase of 70 percent.

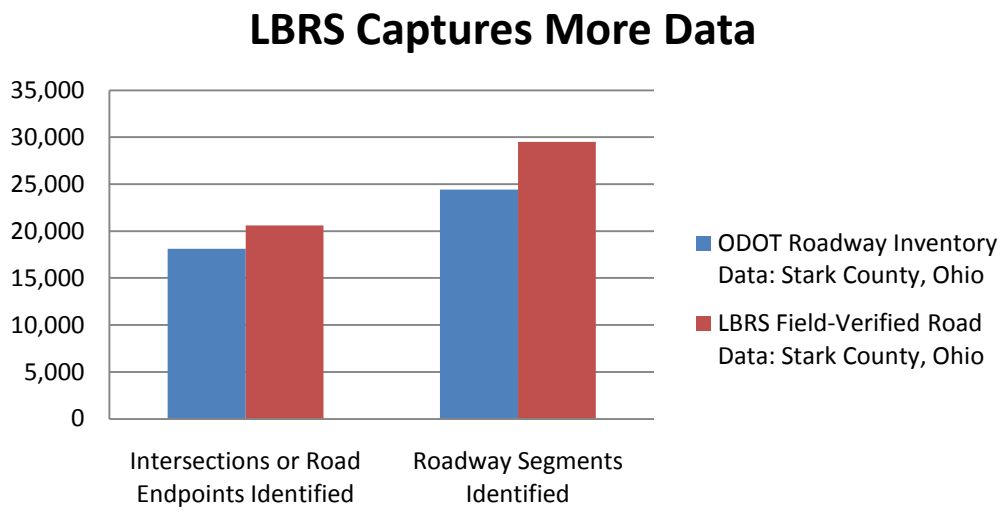
State workers are now spending less time and taxpayer dollars searching for data, too, thanks to LBRS. With LBRS data readily available through online map services and download capabilities, a significant dent has been made in the data discovery activities of state and local government workers and the process of locating appropriate, accurate datasets has been streamlined.

In addition to creating government efficiencies, LBRS has been utilized by non-profit and private entities to realize similar results. The Meals on Wheels program in Muskingum County, for example, was able to improve its routing capabilities by using LBRS data to plot the actual addresses where meals were being delivered and checking them against the routes drivers were using. This allowed the organization's delivery fleet to be reduced by 33 percent, saving this non-profit a significant amount of overhead.

Similarly, private sector businesses can save time and expense by using the many-layered LBRS datasets – and these savings can be passed along to government entities. For instance, the crash analysis for an intersection that typically costs $3,000 can be reduced to about $500 if there's an LBRS dataset for the intersection because so much more data is readily accessible. That's an 83 percent cost savings for the county or city engineer and a huge time savings for the company.

"In areas that do not have LBRS datasets, we spend twice as much time locating the crashes accurately to datasets that are not complete," explains Jeremiah Glascock, Crash Data Project Lead and GIS Systems Manager for Traffic Safety Analysis Systems & Services. Sometimes roads or road names that officers describe in their reports are missing from incomplete datasets, for example. Other times, no address point data is available at all, making it extremely difficult to map the address-based crash location appropriately to the roadway.

In Stark County, alone, LBRS data was used to identify 13 percent more intersections or road end-points, as well as 20 percent more roadway segments than could be identified using the State's existing roadway inventory. In addition, LBRS accurately located 164,250 individual address points in Stark County, information that was not previously available to either the County or the State.



Having easy access to detailed LBRS data can also increase efficiency by avoiding unnecessary expenditures in the first place.

"Perhaps the most added benefit of having LBRS is the county's ability to determine not only those intersections that are problems, but also to discount those that are not," Glascock says. So, for example, when Mr. Jones calls the city or county engineer complaining about all the crashes taking place at the intersection near his house and demanding that a stop sign be installed, the data for that intersection can be easily reviewed to determine whether a stop sign is, in fact, warranted.

On a state level, the Department of Administrative Services - Office of Information Technology has incorporated LBRS data into its Enterprise Geocoding Service. This provides state agencies with access to locally developed and maintained location information. For example, the Ohio Department of Taxation has incorporated this geocoding service into the Streamlined Sales Tax application for vendors, providing a point-of-sale determination of the correct tax rate based on the address of the purchaser. The service is available to brick-and-mortar businesses as well as for online purchases. This same geocoding service is leveraging LBRS data for the Ohio Bureau of Motor Vehicles when citizens register their vehicles. Addresses typed into that system automatically use the State's Enterprise Geocoding Service to determine the associated township or municipality, so gas tax revenues can be more accurately distributed to local jurisdictions based on the number of vehicles registered there.

The net result of having accurate address locations that are locally developed and maintained is more efficient government and a more accurate and equitable distribution of taxes back to local jurisdictions.

Reducing errors & confusion

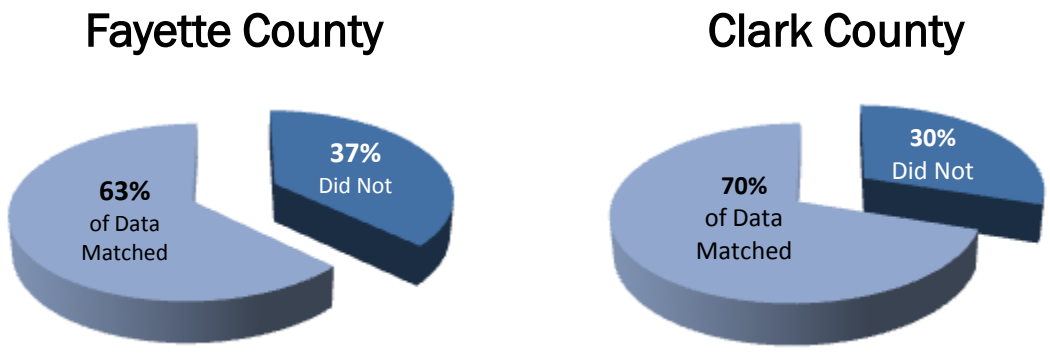
Having all government entities within a county – and most counties across the state – referencing LBRS data has helped eliminate inconsistencies in map data.

For example, although Erie County is the smallest of Ohio's counties, it's typical in that it's still home to 17 different addressing authorities. Before LBRS, that typically meant 17 different sets of map data and a lot of potential for confusion and errors. "There was no centralized addressing authority," says Erie County GIS Advisory Board Secretary Mark Wroblewski. "What we had in those independent databases wasn't consistent." And quite frequently, the information was inaccurate or out of date. Although the LBRS changed all that for Erie, the county's prior experience with inaccurate data was not uncommon.

In Fayette County, for instance, errors were found in 4,236 records – or 37 percent of the county's data – after a vendor was hired to field verify each and every address point throughout the county. This field verification was done in preparation for Fayette County to start participating in LBRS. A similar error rate was found in Clark County after field verifying their addresses, where 16,882 records – or 30 percent of the county's database – had non-matching address data.

Non-matching Address Data

Uncovered by LBRS Field Verification



LBRS has removed the guesswork involving roads with multiple names or non-intuitive access points and can even locate wireless callers with spot-on precision. "LBRS mapping has truly stepped up the game in the fact that we are now able to pinpoint nearly every wireless 9-1-1 caller to within feet," says Diegel of the Mercer County Sheriff's Office.

"Without question, the LBRS mapping has sped up our ability to get responders to the right location the first time," Diegel says.

In a comparison between LBRS data and the mapping data Sandusky County used prior to completing its LBRS development project, field-verification uncovered location errors of at least a quarter-mile in 20 percent of the county's rural addresses. Ten percent had location errors of at least a half-mile, and 5 percent had location errors of a mile or more. That is a frightening premise both for first responders and for those in need of emergency services.

Having field-verified addresses and top-notch call-tracking software incorporated into the data submitted to LBRS is paramount to reducing uncertainty, increasing confidence, and improving public safety.

Impact on education

School districts rely on property tax income more heavily than any other public entity in the state of Ohio. In fact, an estimated 70 percent of the property tax collected in Ohio goes to support education. That's why having up-to-date property records is so vital. LBRS has played an important role in improving the process of property assessment as well as the distribution of education dollars to area schools.

Now, with every address point in LBRS counties field-verified and carefully plotted on a system that allows both street-level and aerial photographs to be incorporated into it, as well as building permit and inspection reports, accurate assessment information can be found more quickly, with fewer resources and, sometimes, without ever leaving the office. "Auditors across Ohio are doing more desktop reviews, and if anything has changed or if questionable items come up, they can send someone out," says Mark Wroblewski, GIS Coordinator in the Erie County Auditor's Office.

LBRS data can be used to overlay school district boundaries with property tax records to ensure taxes are being paid to the correct district. Can your map do that?

When field visits are necessary, LBRS data can be used to route the properties that inspectors need to visit, making sure the routes are the most efficient possible to save on both gasoline and time.

In addition to the benefits of the state's Enterprise Geocoding Service for the Department of Taxation previously mentioned, LBRS can overlay school district boundaries and property tax records to verify taxes are being paid to the correct district.

LBRS data has also been used by high school and college students, Wroblewski says, in addition to university departments, as the foundation for specific projects and papers. LBRS provides accurate location-based points which can be used to create relationships to other existing or new points for any property in an LBRS county. This allows academic types to create thematic maps and perform other analyses, he says.

Stimulating the state economy

Another benefit of LBRS is its capacity to support economic development activities to encourage new businesses to locate, and existing businesses to expand or remain, in Ohio.

LBRS allows developers to easily access and display the geographic information they need to determine the best locations within the state to build or expand various facilities. For instance, LBRS data, when combined with other datasets, can be used to identify the location of properties in relation to utilities, highways, railroads and airports, or its proximity to a floodplain. Data housed in LBRS can also be tied to other databases, like county parcel records, and sorted by property size, allowing the location of undeveloped parcels of a given size to be located with a few keystrokes.

LBRS data can help developers quickly find key information about land uses and proximity to desired resources, allowing for better business development tools.

In addition, most of the money invested in LBRS development and maintenance has gone to Ohio-based companies, further stimulating the local economy.

Every vote counts

The Help America Vote Act of 2002, which required polling locations across the country to convert to electronic voting machines, was a big reason Ottawa County, Ohio and its Board of Elections started participating in LBRS. The initial goal was to use LBRS data to redraw voter precincts in order to reduce the number of voting machines that would need to be purchased. The benefits of LBRS, however, went a step further.

When reviewing voter registration records in preparation for redistricting, county officials discovered inaccuracies in 20 to 25 percent of the records, when compared to LBRS data. In a county with an average of 30,000 registered voters, that meant at least 6,000 records that needed to be cleaned up. About 5 to 10 percent of these contained misspelled street names. The other 15 percent contained address ranges that didn't match, duplicate streets or other, more complicated errors.

LBRS data can be used to double-check accuracy in voter registration records and even to direct voters to the correct precinct office.

"Once the databases were scrubbed and errors corrected, we then were able to link that with the voter registration data to geographically analyze how Ottawa County could reshape their precincts," says Mike Thorbahn, Ottawa County GIS Coordinator. "Upon completion of this project, the county was able to reduce the number of precincts from 78 to 44."

Voters in other Ohio counties have also benefitted from LBRS data. Putnam County, for instance, uses LBRS data as the foundation for its voter information website to direct voters to the correct precinct and to identify pertinent ballot issues based on the voter's place of residence. The Erie County Board of Elections has prepared district maps using LBRS data so people can see where they live and which voting district they reside in. Hancock County takes the map data a step further. Its Board of Elections has a web-based application that allows registered voters to simply type in their home address and not only does the correct precinct office where they should vote appear, but so do turn-by-turn directions to get there.

The potential uses for location-based service applications using LBRS data are seemingly limitless.

Read on to learn how you can start an LBRS-style initiative in your area.

How to Build a Better Map

The Structure

Studies show that more than 80 percent of data collected, stored and maintained by local governments include some reference to geography. Therefore, it makes sense for LBRS to be built using a ground-up structure, putting counties in the driver's seat since they have the greatest access to – and need for – detailed, accurate map data on a daily basis.

County engineers need to know where every individual road is located. County auditors or assessors need to appraise each individual property. Local planning and zoning officials need to know where new construction projects are happening. So if you're going to embark on a project like Ohio's LBRS, the counties need to be fully on board. You don't want to develop a dataset without local participation because no one else can build or maintain it with the proper degree of confidence.

Getting the buy-in at the county level doesn't mean just the county engineer or assessor, however. In Ohio, part of the Memorandum of Agreement each county signs with the state includes the stipulation that counties must have buy-in from multiple local entities in order to participate in LBRS. The suggested list includes: county auditor (who, in Ohio, also acts as county assessor), county commissioners, county engineer, county sheriff, county 9-1-1 coordinator, county emergency management director and the county health commissioner. Since the LBRS provides value to everyone in the county, not just a single entity, having multiple agencies involved and supportive at the outset helps to ensure smooth collection and proper maintenance of the data once it is gathered and submitted to the state. LBRS is

designed to be a community asset, so whole community involvement from the start is paramount.

How LBRS is structured in Ohio

Government Entity	Role
Individual Counties	Project management Data development Data quality assurance Data maintenance
Department of Transportation	Program sponsor Data verification Data integration
Ohio Geographically Referenced Information Program	Program administration Data dissemination

In Ohio, the responsibility of maintaining a public road inventory and reporting the certified public road mileage to the state lies with the County Engineer. Still, the addressing authority can be centralized within a single county entity and/or distributed among cities, villages and townships. In at least one instance, addressing is performed by the County Soil and Water Conservation District. But regardless of the legal setup, the work of researching and assigning addresses and maintaining the roadway inventory for LBRS is a local responsibility.

The LBRS program is structured in such a way as to leverage the existing maintenance activities of local government to assure data being developed is authoritative, current, accurate and complete. The state's role in the LBRS program is to publish and oversee compliance with the LBRS standards, to support the development of the data through partnership agreements with the counties and to integrate the county data into a seamless statewide dataset for roads and addresses.

The Standards

Since county, state and federal officials all have different needs for using map data, building a single, unified map that could be shared among all levels required finding a common interface and fusing together many layers of information. It also required getting various agencies to speak the same language. For example, state law enforcement officers typically identify roadway segments using route numbers and mile posts. Local law enforcement officers, however, use street names and address numbers. For LBRS to be user-friendly to both segments of law enforcement, a simple translation program had to be incorporated that allowed street names and addresses to be converted to route numbers and mileposts and vice versa.

Once details such as these were worked out, the next step was making sure all data collected for LBRS would adhere to the same level of detail and accuracy across all counties. This was done by establishing a clear set of standards for data collection and a process for state officials to verify that the standards had been met.

In order to be accepted into Ohio's LBRS, all county data submitted must:

- Be spatially accurate to +/- 1 meter horizontally and +/- 3 meters vertically;
- Include verified address ranges;
- Contain field verified, site-specific address points;
- Associate site addresses to digital street centerlines;
- Identify alternate street names, such as Main Street also being known as Route 40.

Having field-verified, site-specific addresses paired with centerline data eliminates all the guesswork involved in locating a specific property. With address ranges, interpolating must be done, which essentially means making educated guesses about where, within a given address range, each individual property may be located. Anomalies – like an odd-numbered address being located on the even-numbered side of the street, or long lanes that leave one dwelling tucked far behind other nearby houses located closer to the road – cannot be accounted for when using address ranges. In Ohio, typically 3 to 5 percent of addresses were anomalies in a given county. And accuracy is vital when multiple entities rely on a singular map.

Gathering such detailed addressing information is a challenge, state authorities say. While provisions exist to allow the use of previously field-verified and maintained datasets for address identification and verification, counties that have tried to rely solely on existing address sources have found them to be inadequate for LBRS purposes. Instead, re-verification of the data is typically required by physically driving every road in a county and picking up the site-specific addresses in order for the data to be truly accurate and reliable – and to ensure acceptance by the state.

The Funding

Data creation is roughly 60 percent of the cost of developing an LBRS. Another 20 percent is the cost of verifying and validating the data that's collected. The final 20 percent comes from data integration tools, including quality control and modification of data.

So where does the money come from?

In Ohio, the initial seed money for the LBRS came from the e-Secure Ohio Initiative with counties being responsible for 50-60% of a project's cost with the State's contribution being based upon a formula using the number of addressable structures and miles of public roads within the county. As a direct result of the early benefits realized through the LBRS project, additional funding sources were identified in the form of safety grants passed through the Ohio Department of Transportation and the County Engineers Association of Ohio. These safety dollars are allocated in a similar fashion based on total number of crashes within a county. In addition, some counties have been able to direct a portion of the monthly cell

phone surcharges they receive through 9-1-1 to help fund the continued development of Ohio's digital LBRS mapping data.

State officials say it is important for individual counties to be a financial partner in developing an LBRS to ensure a sense of ownership in the project and the resulting data. Counties must enter into a Memorandum of Agreement with the state to secure funding. And the state does not release funding for LBRS development to counties until the county provides data that meets the state-defined standards for program acceptance. Counties may contract with an outside vendor to collect this data or they may develop the information on their own. Either way, the Office of Information Technology, Ohio Geographically Referenced Information Program and the Ohio Department of Transportation provide technical guidance throughout the process to ensure the success of each county's project.

The Maintenance

Having a maintenance program that allows any authorized user at anytime to update data ensures the most recent map data is available to those who rely on it most.

A database is only as good as the information that goes into it. That's why maintaining and updating the LBRS data regularly is vital to its ongoing success. The responsibility for data maintenance falls to individual counties because they are closest to the data and they have the most vested interest in keeping it current. After all, they rely upon it every day to keep citizens safe.

Many Ohio counties, like Erie, contract with the data development vendor to use a secure maintenance application program, which has the LBRS state standards built into it. This allows any authorized individual, from a part-time zoning inspector to the County 9-1-1 Coordinator, to make edits or additions to the system and have them automatically published and available within minutes in many cases. "It's dynamic and user-friendly," Wroblewski says. "Everyone can use it."

Everyone benefits from regular data maintenance, too, especially when new developments are built, roads close or bridges are out. The data maintenance solution employed by some counties even allow small, but significant, map details such as street signs, traffic signals, fire hydrants, school zones and railroad crossings to be plotted precisely by local authorities, if desired.

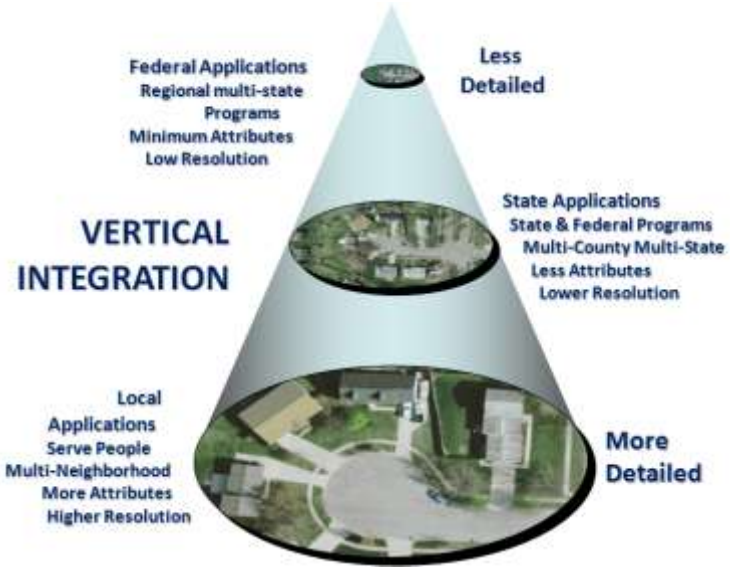
Although changes to LBRS data can be made as frequently as counties desire for their own purposes, the state only requires annual updates from each participating county. The goal is to fit the LBRS maintenance within the existing maintenance process already in place at the county level. Because of that, most counties choose to update their information more frequently than once a year. Some even do daily updates that are published and distributed automatically to the County GIS database so everyone using the data has access to the most accurate and up-to-date version.

"These datasets are living things that are always growing and changing," says Ottawa County's Thorbahn. It's a "big plus," he adds, to be able to maintain the data at a local level.

The Outcome: Collaboration

LBRS provides a bridge between counties, state agencies and the federal government. It makes sharing data between these entities easier because all levels of government are now speaking the same language and looking at the same datasets. Having such a unified foundation for map data has been instrumental in breaking down jurisdictional boundaries between organizations and, in turn, enhancing service to all Ohio citizens.

For instance, Erie County's 9-1-1 system, which relies on LBRS data for dispatching, includes the entire city of Vermilion, part of which is located in Lorain County, as well as the village of Milan, which bumps up against Huron County. Prior to LBRS, counties rarely found a need to share information or services. Yet it is vital to public health and safety for first responders to be able to assist neighboring residents when needed, and to read from the same set of map data when responding to emergencies across county lines.



Building its part of the LBRS database was also the catalyst for establishing the Erie County GIS Advisory Board, a consortium of 26 agencies that share the cost of maintaining the county's GIS system. The smallest township may contribute $500 annually to the maintenance fund, while the largest city may contribute $13,000, but the benefits of collaborating have paid off for all. "If they each had to go out and hire vendors to do the work, or do their own application independently, it would cost tens of thousands of dollars, maybe even hundreds of thousands of dollars," Wroblewski says. "So there's a huge cost savings there."

There's also a fair amount of inner-county and cross-county synergy being built to the benefit of all citizens. "There's a lot of networking that happens because of this," Wroblewski says, noting that the relationships built as a result of LBRS have allowed him to develop a "virtual staff" of other professionals he can call upon as resources for different projects or for advice. "It's been a wonderful thing for Erie County."

It's been a unifying force for Ohio, too. Departments on various government levels that were independently building their own maps for their own needs are now working with one

another to build a singular map that works for everyone. In doing so, Ohio is saving money, time and lives throughout the Buckeye State.

But that's not all. Even though Ohio's LBRS project is serving the state well now, it is likely to do even more for Ohioans in the future, as federal initiatives require increasingly more sophisticated and detailed geographic data from individual states.

Positioning for the Future

Transportation for the Nation

Ohio's LBRS partnership was cited as a best practice for statewide road inventory creation in the 2011 Transportation for the Nation (TFTN) Strategic Plan. The U.S. Department of Transportation specifically noted that the accuracy of LBRS data and the collaboration of organizations required to build Ohio's LBRS could serve as a model for the nation. Clearly, Ohio is well-positioned to meet future state reporting requirements associated with this initiative to build a nationally shared transportation dataset.

Next Generation 9-1-1

Ohio is also positioned to be well ahead of the pack in complying with Next Generation 9-1-1 (NG9-1-1) efforts. NG9-1-1 requires that a single, unambiguous, site-specific civic address be matched to every 9-1-1 call – including those coming from apartment complexes, office buildings and mobile home parks. Using a blanket address for an office building, for example, will no longer be good enough. Every suite within the building will need to have its own, individual address. This may sound cumbersome, but having more precise data will greatly improve the ability of first responders to locate callers. With the field-verified data already included in Ohio's LBRS, the vast majority of counties in the Buckeye State are already prepared for the NG9-1-1 rollout. LBRS will become the cornerstone for reliable mapping and, in turn, building emergency routing databases.

BroadbandUSA

The National Telecommunications and Information Administration (NTIA) was pleasantly surprised by Ohio's ability to supply all-inclusive coverage maps as part of the BroadbandUSA initiative. This initiative is aimed at expanding broadband into more rural areas so police stations, fire stations, hospitals and major businesses in those areas will have adequate coverage. When complying with the request to compile coverage maps for the initiative, Ohio offered site-specific data that wasn't originally required, prompting one official to note that Ohio was "far and away ahead of the other states because of LBRS."

Disaster Response

LBRS was built to be the cornerstone for emergency response in the event of a statewide or local catastrophe, such as a major tornado outbreak or flooding. After all, government entities at any level are far better positioned to respond to unpredictable events when more accurate geographic information is available. That point is driven home quite powerfully with each and every subsequent event. In 2005, a number of GIS professionals from Ohio deployed to Southern Mississippi and Louisiana after Hurricane Katrina hit the Gulf Coast.

What they found were entire areas where all the street signs, highway signs and other traditional reference points had been blown down or washed away. And without accurate map data from which to work or visual markers to assist the responders, it became quite challenging to locate utilities, find specific neighborhoods and even just navigate the area. "We looked at that and said, 'We, as a state, need to develop a statewide resource we can use in case something similar happens here, to minimize these logistical issues,'" says ODOT's Blackstone.

Homeland Security

LBRS can also help Ohio rapidly respond to man-made disasters, such as chemical spills, the release of toxic chemicals into the air or nuclear power mishaps. Identifying affected facilities or areas, as well as the best evacuation routes, can be done quite quickly with LBRS data and the coordination it allows between all levels of government. In addition, an emergency manager can promptly ascertain the location of all hospitals, fire stations, police stations, airports and the present capacity of every major roadway in a three-county area, for example, using LBRS.

Because of LBRS, Ohio is in a position to supply its citizens – both corporate and private – as well as all levels of government with precise, updated map data that eliminates redundancies within government while increasing efficiency and saving lives.

Can your map data do that?

Contacts

For more information on Ohio's Location Based Response System or advice on how to set up a similar system in your area, contact any of the following individuals involved in the writing of this white paper:

Stu Davis, Chief Information Officer, State of Ohio
614.644.3923 www.das.ohio.gov

Jeff Smith, GIS Administrator, Ohio Office of Information Technology
614.466.8862 www.oit.ohio.gov

Dave Blackstone, GIS Manager, Ohio Department of Transportation
614.466.2594 www.dot.state.oh.us

Monte Diegel, 9-1-1 Administrator, Mercer County, Ohio, Sheriff's Office
419.586.7724 www.mercercountysheriff.org

Kim Brandt, 9-1-1 Coordinator, Van Wert County, Ohio
419.238.3866 www.vanwertcountysheriff.com

Mark Wroblewski, Erie County GIS Advisory Board & GIS Coordinator, Erie County Auditor's Office
419.627.6647 www.erie.iviewauditor.com

Dave Burgei, GIS Administrator, Fairfield County, Ohio
740.652.7059 www.co.fairfield.oh.us

Mike Thorbahn, GIS Coordinator, Ottawa County Auditor's Office
419.734.6761 www.ottawacountyauditor.org

Jeremiah Glascock, GISP, Crash Data Project Lead & GIS Systems Manager, TSASS Inc.
614.539.4100 www.tsass.com

Ron Cramer, President, Digital Data Technologies Inc.
888.800.4003 www.ddti.net