# MAKING GIS AND E9-1-1 SUCCESSFUL

By Marc Berryman and Arnell Evans
Greater Harris County 9-1-1 Emergency Network

*Information integration is key when determining the location of a call when responding to an emergency.*

*Where is the emergency?* That is a question that can be answered quickly with geographic information system (GIS) technology integrated to E9-1-1 systems. Knowing the location of an emergency is crucial in knowing how to respond to a call. GIS technology combines powerful relational database information with a visual map display. GIS is not a mapping program; it is a complex mix of database management, display technology, and analysis tools that also can create maps. GIS technology can be integrated with applications at a PSAP.

## Spatial Data

People have described GIS technology as the great integrator of information, with the ability of bringing databases, maps, imagery, drawings and other information together. Any data or information that can be tied to a location on the earth can be used by a GIS. This GIS data and information often are called spatial data.

Location information of a wireless Phase II call is reported to the PSAP in the form of a longitude and latitude coordinate pair. It is on the call taker's console as part of an automatic location identification (ALI).

For these coordinates to be helpful, they need to be plotted quickly on a map display of streets and addresses. Once plotted, an address can be determined and emergency responders can be dispatched properly. Using GIS technology is the only efficient means of converting the X and Y coordinates into a meaningful location for dispatch.

The same spatial data used for plotting wireless calls also can be used to plot the locations of wireline calls. The ALI information is used to locate the corresponding address on the map display by performing geocoding. Geocoding is when the computer reads the ALI address and plots the location on the map display. City, county, emergency service number (ESN) and other information can be included on the map display so response time can be minimized.

## Sharing the Cost

PSAPs are becoming more dependent on GIS technology to locate wireless 9-1-1 calls. The cost of obtaining and maintaining accurate, complete and current spatial data can be shared by other agencies in the community. This sharing can reduce cost and increase accuracy of the spatial data. Many different public and private agencies will be extremely interested in having highly accurate address and street information because the street and address spatial data is the very backbone for building many useful applications.

Correct streets and addresses are essential in emergency response; they also are used widely by governmental and private sector agencies. The streets and addresses can be the common ground for building a cost- and data-sharing GIS database with the public and private sectors. The cost savings and improved accuracy merit developing these types of relationships. Data sharing and cost sharing lowers overall cost while improving the data quality.

Interested agencies for street and address spatial data may include the tax appraisal office, water and wastewater department, city and county engineering, planning agencies, code enforcement, law enforcement, fire and EMS agencies and private companies. The private companies that provide electricity, gas, telephone, cable television and delivery and pickup services probably are very interested in obtaining highly accurate street and address information. It is important to strive for communication, cooperation and coordination so all involved will be able to use and share the spatial data and information. Talk and meet with all possible interested agencies; the idea of sharing resources, information and cooperative purchasing must always be considered and fostered between organizations.

The uses of accurate and current spatial street and address data are limited only by the imagination.

Public safety–related applications for street and address spatial data include cell sector routing, wireline and wireless call display (mapped ALI), routing and navigation of emergency vehicles, emergency response planning, development of drive time–based response areas, analysis of past incidents or events, event planning, optimization of new resources, automatic crash notification (ACN), automatic vehicle location (AVL) and computer-aided dispatch (CAD). Public and private uses of this spatial data may include optimization of school bus routes and pickup/delivery services, long-range planning, facility inventories, mitigation, hazard analysis, homeland security and others. The uses of accurate and current spatial street and address data are limited only by the imagination.

### Processing the Data

Once the spatial data of the streets and addresses is obtained, the work of the PSAP is just beginning. Emergency service zones (ESZs) and their ESNs must be added, city boundaries verified and rechecked, and the synchronization of GIS data to the master street address guide (MSAG). If the GIS data does not match the MSAG data, the system will not function properly. In order to perform mapped ALI, the map and MSAG must agree.

Cleaning and scrubbing the GIS data with the MSAG is a time-consuming process and will require ongoing maintenance to keep them in agreement. Waiting for MSAG fallout is unacceptable; the data must be cleaned and synchronized well before an emergency call for service occurs. Keeping the MSAG up to date and accurate is time-consuming, and keeping the GIS data synchronized with the MSAG is crucial. Ongoing maintenance must be practiced. Cooperation, coordination and communication with the MSAG and the GIS coordinators must always be present. The consolidated approach to MSAG and GIS data integration will ensure accurate and timely maintenance of both databases.

The same coordination, communication, and cooperation should extend to the wireless service providers, the telecommunications providers and the call takers. All groups have different parts in a successful integration of GIS and E9-1-1 operations. All updating processing must be accomplished in a timely and accurate manner. No delays of a week or month can be tolerated. Quick correction of data and information is a critical issue for any GIS implementation. For GIS and E9-1-1 integration to work, all databases and their records must be maintained in near real-time, or at least in a day-by-day manner.

Wireless service providers supply information on the location and addresses of the cell towers, orientation of their cell sectors and other related information. Wireless carriers should recognize the need to provide this information, and PSAP jurisdictions should insist on accurate information from the wireless carriers. Wireless Phase II does not eliminate the need for accurate cell tower and sector information. When Phase II location cannot be provided, Phase I information is the backup.

The wireless service providers' information must be checked, addresses verified and sectors routed to the proper PSAPs. The GIS information regarding cell sector and cell site information should match ALI records for the map display to be effective. PSAP jurisdiction approval of this information is required before it is entered into the ALI database. If either the GIS or the ALI databases are not synchronized, many *no record found* errors will result. Additions of new sectors, rehoming of existing sectors and other changes by the providers may cause changes to existing routing. The PSAPs should be made aware of these changes, and the call takers should be aware of how to report any discrepancies.

Telecommunications providers should be able to update any changes in the MSAG and ALI records, and resolve other database issues as soon as they are reported. The telecommunications providers should have processes in place to quickly cor-

## A WARNING ABOUT GIS DATA USED FOR E9-1-1

A large misconception 9-1-1 officials need to be aware of concerning GIS is that the mere purchase of GIS software does not mean an agency has a GIS, or even a good one for that matter. GIS is a holistic system where computer software effectively uses geographic data to relate information and aid decision-making. Without the data, there is no GIS!

Some of these data sets are available for purchase, while others are available for free via the government or do not exist at all and require generation from scratch. Regardless of where the data comes from, great differences can exist in the quality of that data. And the hard truth about GIS data being used for E9-1-1 is that a very ugly pattern has emerged showing that the cheaper the data, the more unusable for E9-1-1 it is.

Geographic data is the heart and soul of a GIS, and the quality of that data determines the value of the system as a whole. In the GIS world, this idea is summed up in the term, *garbage in, garbage out.* Or rather, if one uses garbage data, garbage is all they will get out of their GIS … a potentially dangerous situation with E9-1-1. The quality of GIS data is determined by the methods and techniques used to collect or develop that data.

—*Directions Magazine* (www.directionsmag.com)

## Communication, coordination and cooperation between the PSAPs and telecommunications providers is essential.

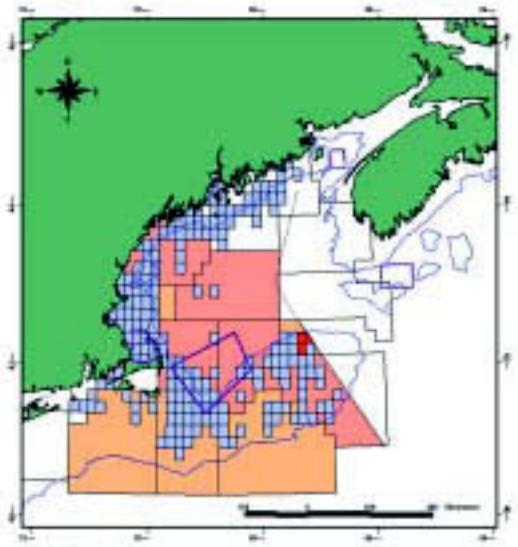

Image courtesy of NOAA.

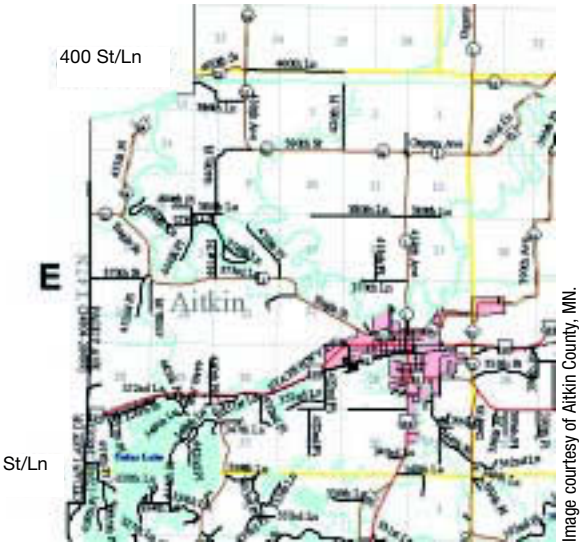


Image courtesy of Aitkin County, MN.

rect and update these records. Communication, coordination and cooperation between the PSAPs and telecommunications providers is essential.

### The Learning Curve

Training is key to the successful implementation of GIS data in a PSAP. You can have the most complete and accurate GIS data, but if a call taker does not read the data appropriately, it can impact the handling of a 9-1-1 call. Call takers not used to working with a map will need to spend some time orienting themselves to using spatial information along with ALI. They may need to acquire map-reading skills to be comfortable with the map display data.

Call takers must be trained on how to best use the GIS-mapped display. Naming conventions of streets, freeways, thoroughfares and highways should considered. The name a citizen calls a street may not be the legal street name. Call takers should know where the call-back number of the wireless devices will appear on their ALI display. They must be aware that some wireless call-back numbers may appear in different places on the screen (because of different solutions being used). They need to know the procedures for dealing with unprovisioned, uninitialized, nonprovisioned and non-initialized wireless calls. Procedures for dealing with mobile switch center defaults, *no record found* errors and other wireless call problems must be in place. In-house training and examples of all the possible issues often is the best and most economical approach to these issues.

In the past, maintaining ALI data accuracy has been the main focus. In the future, the maintenance of ALI and GIS information will be fundamental. Mechanisms should be in place that ensure the continued accuracy and synchronization of both ALI and GIS databases. The ALI database is the original database component for E9-1-1. Now and in the future, the GIS database will be the ALI database partner.

*Marc Berryman is the GIS manager with the Greater Harris County 9-1-1 Emergency Network (Houston, TX). He can be reached at (713) 625-9911 or via e-mail at mberryman @911.org. Arnell Evans is the database manager with the Greater Harris County 9-1-1 Emergency Network (Houston, TX). He can be reached at (713) 625-9911 or via e-mail at aevans@911.org.*