Simple Sign Solution

Traffic operations department streamlines sign mapping process

McAllen, TX, is a rapidly growing city in the Lower Rio Grande Valley. Its southern border is located just five miles from the Mexico border—the Rio Grande River—and McAllen is just 60 miles from the Gulf of Mexico.

With a tropical climate, tall palm trees, an abundance of flowers year-round, along with a thriving business environment, more than 120,000 people now call McAllen home. The city's population grew 25 percent from 1990 to 2000 and yet another ten percent from 2000 to 2003. If you include Reynosa, Mexico, more than one million people reside within a 15-mile radius of McAllen.

Along with an increasing population base comes many challenges, including the continual update of the transportation and public works infrastructure, and adding new assets as needed in a timely manner and on budget.

The Traffic Operations Department is challenged with keeping traffic in McAllen running smoothly and efficiently. A big part of being successful in their overall mission to keep the city safe is the location and condition of its street signs. Without proper signage, accidents, jams, and confusion occur while liability increases. And, without a proper accounting of where each and every street sign is located, there is no way to keep up with routine maintenance, let alone the replacement of damaged or missing signs, or the analysis of traffic accidents and traffic patterns. An accurate record of new signs as they were installed was also required.

Locating every single street sign using paper maps and making notations about the sign with a pad of paper and pen, and then going back to the office and inputting all of that information into a city-wide database is not only time consuming and cumbersome, but it also allows for human error during data entry (e.g., the person entering the information cannot read the field technician's handwriting, the wrong information is entered, etc.), not to mention the most important fact—how would they get an exact location of a street sign? Not all signs are located directly inside of named street intersections.

Initially, the city acquired a GPS receiver cabled to the field data collector that allowed them to get accurate GPS positions and collect and update the proper data for each sign (type, condition, installation, or maintenance date), but the system really did not allow for easy mapping in the field due to its bulk and configuration. They were also using off-the-shelf software resulting in a rigid system configuration that did not allow for easy manipulation of the data. The Traffic Operations department's daily mapping statistics yielded less than 55 signs per eight-hour day. It was clear they needed a more efficient system for both the field and the office.

Barcode scanner screen shot shows sign locations.

Jacob Benfield, McAllen's traffic operations manager design coordinator, devised a plan to minimize sign mapping field time while leveraging the field and office work already being conducted.

"The sign installers typically note the type of sign, approximate location, date, sign type, their crew name, and even the number of bolts they use to hang it," said Benfield. "We simply created an Access database so the installation information could later be entered into the computer back in the office."

The department then added one extra step to the sign installation process—each sign was assigned a unique barcode number that was printed on a one-in. long vinyl sticker and then attached to the back of the sign. The installation crew noted this number on the paper sheet with all other details, and this barcode identifier was entered into the database following sign installation.

Benfield searched for a solution that would allow his team of technicians to take all of the sign information from the database into the field for updating. In addition, he wanted to be able to acquire a GPS location for each sign. After that, his department would use all of the information for asset maintenance.

The solution provided by Tri-Global Technologies, LLC (Athens, GA), consisted of the following hardware: Trimble® (www.trimble.com) GPS Pathfinder® ProXH™ receiver capable of achieving subfoot accuracy, Trimble Recon® handheld ultra-rugged field computer, and a rugged Baracoda Roadrunner Series Barcode Scanner (www.baracoda.com). There is a Bluetooth® connection between the Trimble Recon handheld and the ProXH receiver and also between the Trimble Recon handheld and the barcode scanner. The end result is no more

unwieldy cables. In addition to not having cables to tangle while working in the field, each piece is lightweight.

The software is the ESRI (www.esri.com) ArcPad software suite for data collection along with a customized ArcPad extension developed by Tri-Global (www.triglobal.net) called BarcodeMapper. Tri-Global took McAllen's existing database of barcode information and created a larger and more user-friendly geodatabase using ESRI ArcGIS software.

"We developed a routine to convert the Access database into a geodatabase in the enterprise GIS," said Dennis Heath, managing partner of Tri-Global. "This enabled the field technician to check shapefiles containing sign attributes out of the office GIS and load them into the mobile GIS device."

Traffic Operations department workers take the Recon handheld with the backpack/polemounted GPS Pathfinder ProXH receiver and the barcode scanner out into the field each day. The Recon handheld field computer contains digital maps of the entire road network, individual parcel maps, and building footprints, in case workers need to reference any other relevant information while out working in the field.

Once in the field, the technician walks from sign to sign within a predetermined area and swipes the barcode scanner across the vinyl label, usually positioned at the bottom of the sign. In most cases, the scanner needs only to pass within nine in. of the tag to read the identifier. While the GPS receiver collects the subfoot location data, the mobile GIS field software correlates the barcode number to the correct shapefile and accesses it. The software automatically links the location coordinates to the accessed shapefile and queries the file to determine if additional data collection is needed. If an attribute field is empty or if no data is available for that sign, the Recon handheld (also linked to the GPS receiver by Bluetooth) prompts the field technician to input the required information. Otherwise, if all attributes are in order, the technician pauses just long enough to obtain the location coordinates and then continues on to the next sign.

Following the implementation of this solution, city workers increased their production significantly—more than three times over the previous system. Sign technicians now are able to map about 25 signs per hour for a total of about 200 per eight-hour workday. Now, the information collected from each day of fieldwork is immediately available to generate both routine work orders and emergency repairs.

In addition, when a sign is stolen, knocked down, or damaged, Benfield usually gets a call first from a citizen or other city worker. He asks for an address or intersection, which he keys into the GIS. The inventory map identifies the sign in question and shows him precisely where it goes. In most cases, Benfield can request a new sign and generate a work order without even visiting the site.

"We know where all of our signs are, who installed them, and when they were installed," said Benfield. "From a management perspective, that is great information to have."

McAllen has found that this highly efficient solution can be used for any kind of field asset inventory tracking as it streamlines the entire process of future maintenance of those assets. GE

GPS hardware, GIS software, and barcode technology work together to make McAllen's streets safer.