by Pete Koenig

A data logger, software and a printer – sounds simple enough!

At recent mapping training sessions conducted by KRWA, many water system representatives asked how to get started with Global Positioning System (GPS) data collection for purposes of creating a Geographic Information System (GIS). Municipal operators, RWD district managers and system operators all seemed to see the benefits of creating a GIS for a utility. Many board members though, assume money can be saved by doing the work in-house. I'd like to share some thoughts in this article on the topic of affordability of GPS mapping.

While the gesture to save customer money by taking GPS mapping training in order to conduct the "grunt work" of data collection is generous, it may not be entirely practical. Board members tend to think their operators are Supermen or Wonder Women who can accomplish any task put before them. Typically, they can. But also typically, utility staff have a limited amount of time, a high number of daily issues (many with customers), and a lack of operational knowledge about GPS collection equipment. This calls attention to the need for training to successfully operate data collection equipment. A limited amount of time is the main reason why data collection cannot be efficiently conducted by system personnel and may cost customers more money in the long run.

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There is value in knowledge and that value is directly related to the amount of time invested in acquiring that knowledge. The KRWA mapping staff has dedicated hundreds of hours to learning how to operate the GPS equipment owned by KRWA. Engineering firms hire educated and trained personnel to operate the equipment involved in collecting GPS data. Mapping firms hire students after college graduation and train them intensely on how to trouble shoot numerous issues that may arise during field data collection. Because the technology is in its infancy, it's not as easy as "point-and-click" practices used to navigate through Windows XP on a desktop computer. There are still a fair number of programming skills required to set up, activate and operate a GPS data collection device.

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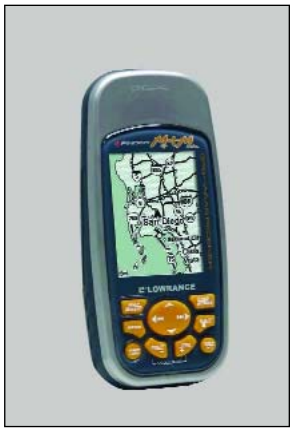
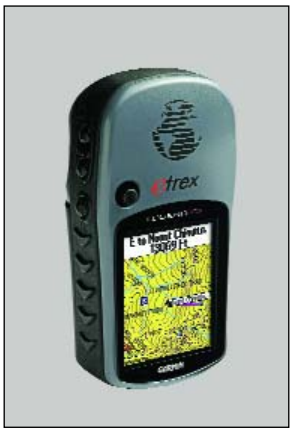
Mark Thomas, KRWA Mapping Tech, as others at KRWA attest, the software used to create maps requires a very high level of computer skill. Thomas says that the instruction manuals for the software are not nearly detailed enough to answer technical questions. Online or phone tech support costs hundreds of dollars per year per software license.

Grades of units

There are three grades of GPS data collection units tailored to different consumer needs, requiring different regimens of training and software for each to operate. The first, consumer grade, is the easiest to master.





Two popular consumer grade GPS units are shown above: A Lowrance unit on the left, and a Garmin on the right. Sportsmen and outdoors people like these units because of affordability and features.

Small, hand-held, consumer grade GPS units can be purchased at sporting goods stores, retail stores and on-line gift sites. They are easily identified by a most notable lack of sizeable antennae dome or external appendage. On close scrutiny, a user quickly discovers that there is no operating system and the device is only usable for one or two functions. Generally, these functions include determining a current location, marking waypoints, and navigating to known points or locations. Magellan, Garmin and Lowrance are among popular brands of consumer grade GPS units. Such units are attractive to sportsmen and casual outdoorsmen because of the price range. They can be purchased from between $89 to $600 depending on how many "bells and whistles" a buyer wants. The units are not practical for mapping water utility infrastructure because of inconsistency and lack of accuracy. The least expensive model KRWA reviewed was advertised with only 50-foot accuracy and a $699 model was touted as being "… a 12-channel powerhouse with WAAS (for increased accuracy) of up to 10-feet." This is great for finding a way back to grandma's house, but not very practical if a contractor and backhoe are waiting to dig near a 6-inch water main.

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Consumer grade units also require the least amount of training to operate. They are meant to be given as Christmas and birthday gifts so every average consumer can open the box, install the batteries, read the 16-page "how to get started" booklet, go outside and identify what town they are standing in. Make no mistake. They are fun to play with and useful for general navigation, but don't plan on using one for water utility data collection.

Mapping grade GPS units feature ever-changing designs. Later model units are generally small and have noticeable antennae domes or external antennae attachments. The most notable difference is when a mapping grade unit is

"powered-up." It is not as "user-friendly" and can be confusing without prior operator training. The manual that accompanies a mapping grade unit is usually a Web link with a search engine. It's not uncommon to download several software programs in order to collect a useable first GPS data point. The different brands of software available are enough to scare a person away from a career in GPS data collection. But the 'scariest' thing in my opinion is the equipment price. A stand-alone unit will cost nearly $5000. And $5,000 only buys the handheld unit. To accurately collect useable data, expect to pay as much as an additional $4000 to purchase the software.

Survey grade, the final equipment category, is sophisticated enough that to just power-up the unit, it *requires* a certain level of training. Engineers and surveyors utilize survey grade equipment to collect very accurate data for purposes of legal description or land transactions. In comparison to the 10-foot, 5-foot or even 1-foot accuracy that can be acquired with consumer and mapping grade units, survey grade equipment can provide accuracy within ¼-inch. However, for $30,000 it had better get "above-average" accuracy readings.

Just "make a map!"

Now that the software and collection equipment have been purchased, let's go make maps, right? Wrong! We still don't know how to do it. A notice of training was mailed to KRWA advertising an introduction to GIS class that was described as, "day training, devoted to introducing personnel to GIS software and GPS equipment at $650 per person, per day." For a city or large system that has several infrastructure types including water, sewer, storm drainage, signs, lights, addresses and maintains daily changes to these infrastructure types, it may be feasible to invest in equipment, software and training. But for a smaller rural system or city, these costs and personnel time are beyond most budgets. A GIS is a beneficial maintenance tool for several different aspects of a utility but it is advisable to investigate associated costs of development compared to contracting for the same GIS services.

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There is something new on the horizon for municipalities that might be described as "more governmental regulations" but it has meaning and is pertinent when discussing development of a GIS. The Governmental Accounting Standards Board (GASB) has published a new statement (statement 34) which outlines comprehensive changes in state and local government financial reporting. From the GASB Web site:

Under the new standard, anyone with an interest in public finance – citizens, the media, bond raters, creditors, legislators, and others – will have more and easier-to-understand information about their governments. Among the major innovations of Statement 34, governments will be required to:

- *Report on the overall state of the government's financial health, not just its individual "funds,"*
- *Provide the most complete information ever available about the cost of delivering services to their citizens,*
- *Include for the first time information about the government's public infrastructure assets – such as bridges, roads, and storm sewers,*
- *Prepare an introductory narrative section analyzing the government's financial performance.*

While not all municipalities need to comply with GASB 34, the third point from above, "Include for the first time information about government's public infrastructure…" is precisely the type of information that can be quickly accessed from a working GIS.

If data about a city's infrastructure is accurately and properly entered into a GIS, reports about size, age, value and condition can be quickly produced. That is opposed to spending many expensive hours generating the same reports by many staff members scrutinizing system maps, measuring line length, counting valves and meters and multiplying by a price per unit to generate the same report.

Report information is available using GIS software even as infrastructure changes are entered on a daily basis. New calculations are automatically generated for the latest updated information going into the reports that are needed.

Engineering firms also appreciate data that can be accessed by a GIS database including distance between manholes or valves and how many obstructions like service hook ups, or surface conditions present that can affect an estimate on a project.

The possibilities are exciting. However, setting up an effective GIS takes time, money and patience.

KRWA has been offering map updates with the aid of GPS technology for five years. KRWA now has staff members who are dedicated to and are focused on updating existing maps and providing assistance to systems and cities that have undergone an "entrance" to the digital era.

KRWA's goal is to continue providing this service and expanding knowledge and to working in partnership to develop expanded Geographic Information Systems for RWDs and cities in Kansas. If you are interested in learning more, give us a call at 785/336-3760 or e-mail pete@krwa.net.

Also, watch for the 2007 KRWA Annual Conference Program which will feature an entire all-day pre-conference session on GPS/GIS on Tuesday, March 27. There will also be two additional concurrent conference sessions on the subject.