

# How Digital Mapping Has Changed at KRWA

**T**he Kansas Rural Water Association's (KRWA's) mapping department has been working to improve maps for water and wastewater systems since 2001. KRWA has also mapped gas and electrical utility systems for nearly two decades now. Time flies when you are having fun, right? I thought it might be good to review the history of KRWA's GPS mapping and discuss how improvements in technology during that time have made mapping more efficient and accurate today.

In November 2001, KRWA was awarded a demonstration contract through the Kansas Corporation Commission in conjunction with the Kansas Water Office, and the Kansas Department of Health and Environment, to acquire resources to determine the process to help local water systems gain access to methods to improve their utility mapping and map products. These new methods would focus on and employ the use of Global Positioning System (GPS) technology along with ESRI's ArcView mapping software. Leo Haynos, who continues today as Chief of Gas Operations and Pipeline Safety at the Kansas Corporation Commission, was the main advocate to help KRWA find ways to help local utility systems gain better mapping products. ESRI stands for Environmental Systems Research Institute which is an international supplier of geographic information system (GIS) software, web GIS and geodatabase management applications.

## Trying out the options

Before GPS data collection would be completely deployed as the method of choice, a process called heads-up digitizing was performed. This process entailed digitally scanning a system's current maps giving the points and lines real-world coordinates, which would in turn, offer the city or RWD a new geographic information system (GIS). Though this option would include far less time and effort, accuracy was lacking. To improve accuracy, data collection was conducted to obtain actual reference points. It was readily realized that collecting data in the field with GPS was far more accurate. Just digitizing the same old maps would not offer any improvement other than putting lines on



**This example of a location using a cell phone. The blue dot is the location of the phone. The actual meter location is at the corner of the building. The free app helps an operator determine the locations of infrastructure.**

new paper – but that idea would not improve the accuracy of mapping. Many of the as-built construction maps are ripe with errors. And if field data needed to be collected to verify the existing maps, why make double work out of the process. Instead KRWA decided to just collect all data in the field and use existing maps as a general guideline. The idea of “heads-up-digitizing” was scrapped.

## Trying to keep up with technology

The first GPS mapping equipment purchased by KRWA consisted of three Sokkia Axis 3 GPS receivers along with Panasonic Toughbook data loggers. Accuracy with this receiver was adequate, especially at that time, which was usually less than a meter. The data loggers also functioned fine – when they worked, but battery life was an issue, and the connections to the receiver didn't always fasten very well. Also, hauling around the antennae that this system required across a RWD or city could get tiresome, leading to slower progress. In 2005, KRWA purchased Trimble GeoXH units. These are just a hand held, all in one unit that has greatly improved efficiency with data collection. They

also have accuracy capabilities of sub-foot, and are usually at that limit. There have been more advances with utility mapping grade GPS units in the last few years with the new Trimble R1. The R1 is a receiver the size of a smart phone with the same accuracy of the GeoXH, that blue-tooths to a smart phone to do the data logging. KRWA has not gone this route yet, as our newest GeoXH 6000 series still works fine. If it isn't broken, why fix it? Having something new for the sake of "having new" is expensive.

### Improved imagery

Another improvement the GIS industry has undergone has been with the quality and resolution of aerial imagery. Also, that imagery is readily available via streaming. ESRI has this available in ArcView, and the Kansas Data Access and Support Center, or DASC, made statewide imagery with one-foot resolution, leaf off, natural color available to state and local government agencies since 2014. Having high resolution aerial imagery instantly available has greatly reduced project downtime. When I first began working for KRWA back in 2006, one-meter resolution was available for every county with a download lasting one to two hours via DASC. With one-meter resolution lacking good clarity, we would always check with county appraiser offices to see if they had imagery with higher resolution. If they did, and it seemed rare at that time, we would need to fill out data request forms and wait for the imagery to be burned to disks and mailed out. And generally, the county wanted payment



**Utilizing Google Earth with a phone is so much easier and more effective than flipping through map pages.**

for the imagery which we reminded them, was provided to them already at taxpayer expense. This whole process would usually require up to two weeks just to get a background layer – and in some cases would be denied by the county offices.

### The marvels of changes in technology

At the completion of mapping projects, KRWA typically prints mapbooks and wallmaps for the city or RWD that we are working for. Printed maps are great, and there will always be a use for them, but the amount of information that they reveal is limited. The concept of GIS and what it can accomplish has slowly started to be more popular among smaller municipal and RWD utilities. One reason for that is free viewing software has become less complicated. KRWA used to burn all of the shapefiles and aerial imagery

to a disk and mail it to the system to import into ArcExplorer, Tatum GIS, or ArcView if the city or RWD chose to invest in that technology. Because many people are not familiar with layers in a shapefile format or a geodatabase, and because they do not use their GIS enough due to the lack of familiarity, paper maps still remained more popular among water systems in Kansas. That began to change three or four years ago when KRWA encouraged systems to use Google Earth. All it takes is a free download on desktop computers, and an email from me with a KMZ file attached. A KMZ is a file extension for a placemark file used by Google Earth. KMZ stands for Keyhole Markup language Zipped. It is a compressed version of a KML (Keyhole Markup Language) file. Keyhole was the founding company of the Earth Viewer software that Google Earth was built upon. The free Google Earth App on phones has also become really popular. For example, if a new operator is going to read meters for the first time in a RWD without knowing where all the meters are, it will not be nearly as difficult if he or she has the system maps available on a cell

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phone. The “my location” feature easily allows the user to see where they are, and where the meter or other facility is on any property.

Since 2001, KRWA has completed GPS mapping projects for 143 rural water districts and 171 cities and 20 other water, wastewater or gas utilities.

Though Google Earth is a bit modest when it comes to GIS, the usability factor and the fact that it is free are the main reasons KRWA is recommending it. If a system has had their data collected and would like to take their GIS to the next level with ArcView, or any other editing software, there are a lot of options out there. If KRWA collected the data, we can email your data to any vendors that offer this software so bids or quotes can be obtained.

### Kansas Water Office subsidy

It’s appropriate also to mention the financial support that staff of the Kansas Water Office provided to help municipal and rural water districts improve their mapping. In 2007, KRWA was contacted about use of some remaining funding that the agency had and how that might be utilized to help public water systems. In meetings with the agency, KRWA General Manager Elmer Ronnebaum suggested a subsidy program to encourage local systems to undertake improved mapping using GPS. Of the various suggestions, the agency staff liked that idea and developed a program that provided a subsidy of up to \$4,000 or 50 percent of the project cost. The program was not limited to KRWA being the only

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contractor. However, KRWA ended up doing nearly all the work. As of October 1, we are completing the final projects under that program which no longer accepted applicants as of July 1, 2016. Why so long to complete remaining projects? It’s because several small cities have had numerous changes in operators and no one returned the draft “checkplot” maps that were printed by KRWA. All total, that subsidy program provided approximately \$650,000 to 188 RWDs and cities. The value of that program

will continue for decades to come in those systems. First, those utilities have new – and much more accurate maps – and second, it has helped those utilities continue to realize how convenient it is to update map files when done digitally.

KRWA continues to work with many water and wastewater utilities on their mapping projects. I would be pleased to attend any council or RWD board meeting or work committee meeting if anyone has questions or wants to have a presentation on how mapping technologies have changed and how those may be of help to their community.

*Mark Thomas has been a GIS Mapping Tech since September 2006. Mark has a bachelors degree in geography from Kansas State University and has specialized studies in ESRI's ArcView and ArcPad software.*



**KANSAS RURAL WATER association**

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TECHNICAL ASSISTANCE > Mapping

Our GIS Department  
The Process  
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Mapping Products  
Mapping Subsidy Program

**Maps. Who needs them?**

Why don't we have them? Where can we get new maps made? How much will it cost? Our original maps are not correct? Why will our engineer not give us the maps we paid them to make?

These are the typical questions that cities and rural water districts have been asking for decades. Now newer technology holds promise of giving local utilities better options. These will be options that local systems can choose and make sure they -- the systems -- maintain control of their maps.

Visit [www.krwa.net](http://www.krwa.net), find out how KRWA can help with your GIS mapping projects!