

# The Importance of Documenting Line Location Data Related to GPS, Witching and Memory

**I**n KRWA's work with water and wastewater systems in Kansas, we know that it is very important to record the locations of system features. System maps are littered with hand-drawn sketches and hand-written notes that attempt to depict where a valve is buried in a field or how a waterline was installed through a ditch. These notes from years ago were often written in pencil; today many of those notes are no longer even legible. Transposing the notes into a notebook or in a digital format on a computer would have been a great idea, but in most cases it's too late now, due to the condition of the maps on which the notes are written.

I've heard operators say, "Well, we'll always be able to find that line. We'll just have 'so-and-so' witch it for us." There are several potential problems with this solution. "So-and-so" may not be around at a time when "that line" needs to be found! Or, if "so-and-so" is still around, he just may not want to do it. Maybe "so-and-so" has lost the ability to

locate water lines with dowsing rods and simply can't do it anymore. This brings up the scientific based questions about whether the ability to dowse actually exists.

Some system personnel wish to place the task of finding system infrastructure with the one who was there before them. They may be relying on the memory of those who do not work with the system on a regular basis anymore, and once again, there seem to be many potential issues that could arise from such an arrangement. Landmarks in certain locations get torn down or destroyed, land use changes from pasture to row-crop and people's memories can simply fade.

A simple solution could be to record the data digitally or collect GPS data for infrastructure. When data is archived manually, i.e., written down on paper and stored, it has a greater chance of being lost or destroyed because generally, people do not wish to make additional copies. In the world of digital data where the KRWA mapping department does its work, "The RULE" is "backup, backup, backup!" There



Graphic No. 1: A trench line is visible on this aerial. The red crosses are line points that were collected with a GPS coordinate based on the operator's instruction. The line point in the middle was collected at a waterline marker post; it is located directly over the trench line in the photo. The two line points on either side are identified as "witched" and it is obvious that the rods were not cooperating that day. So much for witching.



Graphic No. 2: In this photograph, all of the buildings appear to be on “a slant” which reveals the north face of the building fronts. This makes it appear as if the south sides all have overhanging roofs. This is not a trick, but it is an illusion of using a two-dimensional perspective in a three-dimensional world.

is security in redundancy which is why GPS data that is collected by KRWA is backed up no less than three times in-house, at least once to the data owner (system), once to the Kansas Geospacial Community Commons (DASC) and at least once to an out-of-state computer server location. There is little fear that if a fire destroyed the maps that they could not be replaced!

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points on either side are identified as “witched” and it is obvious that the rods were not cooperating that day. So much for witching! The witched point on the left is more than sixty feet from the apparent trench line! This information would be useless if passed from one operator to his successor. When the final map corrections are conducted for Hope, KRWA staff will measure

### Locating by memory

Unfortunately, by relying on someone’s memory or the notes that were scribbled on the 1973 “as-builts”, systems are putting their faith in a system that has no backup plan. This problem can be compounded by inaccurate assumptions of line locations. Recently, KRWA was hired to collect data for the city of Hope. The data was collected, post processed for accuracy and a correctable set of maps was printed to be sent to the city for review. With generation of the waterline locations over an aerial photograph of the area, it is obvious to see a few mistakes.

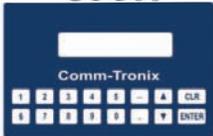
Graphic No. 1 shows a clearly visible waterline location on an aerial photograph. The trench line has not completely “healed” and is visible from above. The red crosses are line points that were collected with a GPS coordinate based on the operator’s direction. The line point in the middle was collected at a waterline marker post and is located directly over the trench line in the photo. The two line

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## Documenting line location

from a visible object on the aerial photograph, go into the field, find any remnants of a trench line and probe to verify the line's location before collecting an accurate GPS coordinate. After the data is corrected, it will be archived for future generations to utilize.

Perspective can also be a contributing factor to error in location. Whether that perspective is from ground level, or from above, it can lead to serious issues. Graphic No. 2 shows the location of water meter No. 173 in reference to its surroundings. When standing on the ground and next to this meter, it can be seen that it is located inside the building on the back wall. However, when looking at it as depicted on the aerial photograph, it appears to be well inside of the building. In fact, it appears to be located 9.9595 feet inside the building! This aerial photograph was taken from a location that is north of town. In the photographs, all of the buildings are on "a slant" which reveals the north face of the building fronts and makes it appear as if the south sides all have overhanging roofs. This is not a trick, but it is an illusion of using a two-

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dimensional perspective in a three-dimensional world. If a person were to try to locate this meter with just the picture as shown, he would be looking in the middle of the floor, ten feet inside the back of the building! However, if the coordinate were entered into a GPS unit, it would guide him to the back wall of the building.

Perspective can change over time as well. How often have we said, "Things look different than I remember?" As we get older, our capacity to recall information becomes more of a challenge. On a mapping project, it's easy to hear, "Boy, I sure thought that tree was over there..." or, "I was certain that we went through this gate in the fence!" This loss of "real-world" perspective due to memory loss can cause some operators to mis-locate

infrastructure. Relying on memory to locate waterlines in today's information-oriented world is a very difficult if not impossible task. Today, people are over-stimulated with an influx of data that makes it difficult to sort it all out and even more difficult to retain and recall. Keeping a journal is a great way to remember one's life. It can be revisited and even modified as a person grows. Keeping a journal of information is also a great tool that can be used to assist with a mapping project. Transposing that "information journal" into a format that can be easily archived and recalled will benefit generations and other partners in the business of maintaining a water or waste water system.

If your city or RWD is interested in learning more about GPS mapping, please call KRWA at 785-336-3760 or email me directly at [pete@krwa.net](mailto:pete@krwa.net).

*Pete Koenig is a GPS/GIS Tech at KRWA where he has been employed since 2004. He also provides some help on KAN STEP projects and supports other KRWA programs.*



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