



Mobile Mapping Sees It All



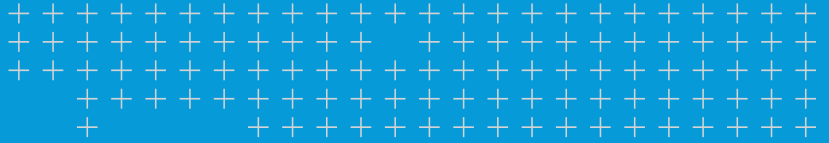
Charlotte Water adopted innovative technology to save time and money locating its 300,000 water meters.

How mobile mapping and artificial intelligence (AI) combine to identify and map water meters

360-degree street-level imagery supports automated object detection in a fraction of the time

Solution

- Trimble® MX7 Mobile Mapping System
- Trimble Business Center
- Applanix® POSpac MMS™ Software
- Applanix POS LV



overview

North Carolina's Charlotte Water turned to Trimble and Esri for help creating an innovative mapping solution to verify the locations of its revenue-generating water meters. By integrating the precision detail of Trimble's MX7 mobile mapping system with Esri's artificial intelligence (AI) algorithms, the agency developed a system that automatically detects each meter and maps its exact location. The new approach is providing a cost-effective, repeatable alternative to manual verification.



Location
NORTH CAROLINA
US



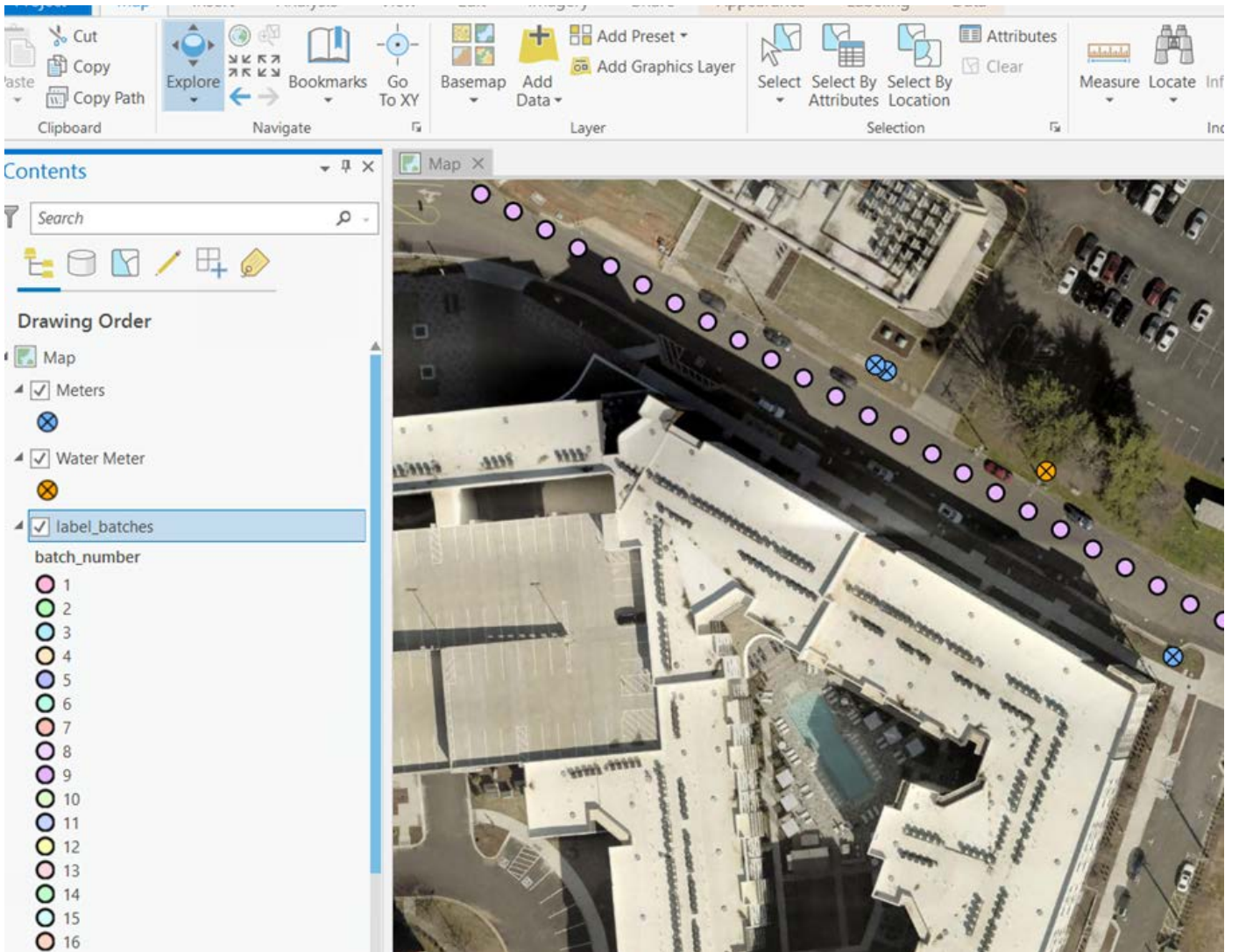
The City of Charlotte operates the largest water/wastewater utility in the Carolinas and serves around one million customers. However, only 30 percent of nearly 300,000 water meters throughout Charlotte Water's service area have verified locations. Several sources of information have been used in the past to establish meter sites, including as-builts, Google Street View, aerial imagery and surveys. These approaches were primarily manual and costly—the City spent around \$400,000 to locate meters in 2019.

In search of a better process, the City of Charlotte sought help from consultants in the Esri Advantage Program, who suggested an AI solution that could detect water meters in high-resolution imagery. To test the viability of the concept, Charlotte Water first collected 200 images with a GoPro camera and applied Esri's algorithms. The results showed

that algorithms could be trained to identify water meters and the approach is scalable for a city-wide program; however, the image accuracy was inadequate for delivering precise location information.

Esri provided a comparison of potential mobile mapping systems that are better suited for comprehensive, high-accuracy image collection. After evaluating the pros and cons, Charlotte Water decided to move forward on a large-scale effort using a Trimble MX7 mobile mapping system.

"The GoPro could be as much as 30 feet off and the front-facing camera was often blocked by on-street parking, pedestrians, and mailboxes," said Shannon Martel, GIS Manager, Charlotte Water. "Trimble was our top choice because we really needed the 360-degree high-resolution coverage, combined with the integrated GPS accuracy."



Charlotte Water uses Esri ArcGIS Pro to map and display meter locations with other GIS layers.

COMPLETE AND ACCURATE INFORMATION

The vehicle-mounted Trimble MX7 mobile mapping system offers several advantages for Charlotte Water's high-volume data capture needs. The synchronized navigation sensors and imaging sensors are designed to collect georeferenced images at highway driving speeds for maximum productivity. In addition, driving routes can be imported into the Trimble software to guide the operators and increase their efficiency.

The built-in GNSS and inertial technology, along with the optional Applanix POS LV, delivers precise location information. The navigation data is downloaded and processed using Applanix POSpac MMS and Trimble



The Trimble MX7 collects 360-degree images and IMU/GNSS data from a moving platform.

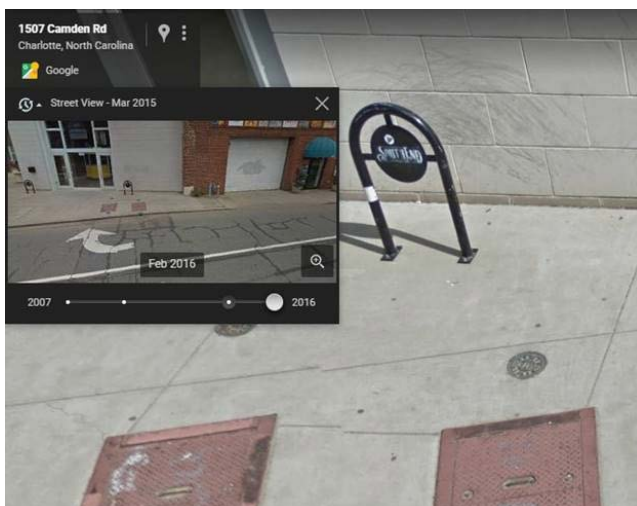
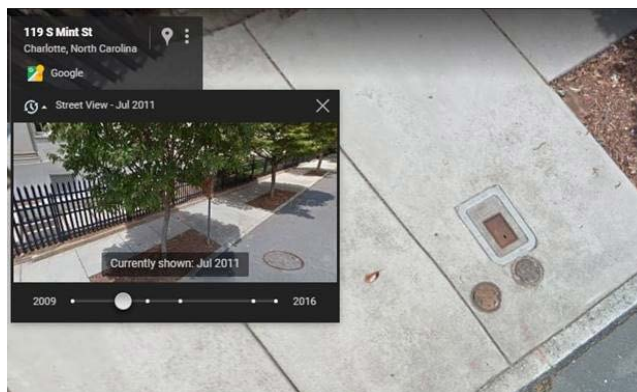


Business Center software to obtain spatial accuracy of 2 to 10 inches. The MX7 has six cameras for 360-degree collection, which is helpful for seeing around obstacles, and the 30-megapixel (MP) resolution shows fine detail in every image.

“From the perspective of artificial intelligence—specifically the photogrammetry—the combination of accurate GPS information linked to each image, as well as the ability to easily collect images from different angles simultaneously, are key to the success of this type of analysis,” said Dr. Wendy Keyes, Esri Data Scientist.

The AI portion of the solution integrates open-source tools with Esri ArcGIS Pro. Charlotte Water uses Esri ArcGIS Pro to map and display multiple GIS layers, such as parcel boundaries and streets, along with the lat/long coordinates of the water meters generated by the model. With the object identification handled automatically, human workers can focus on maintaining the City’s assets and maximizing its resources.

“The price point and performance of the MX7 was just what we needed, and we hope to repeat the meter data collection every 1 to 2 years to keep our database current,” said Martel. “Other departments are exploring using the MX7 images to manage assets like fire hydrants and street signs, which further improves our return on investment.”



The AI algorithms are trained on images representing seven different types of water meters.

“The Trimble MX7 mobile mapping system will allow us to accurately map all 300,000 water meters in 2 to 3 years, compared to 8 to 10 years using manual methods. Up-to-date location information is vital for reducing our maintenance costs and enhancing our customer service.”

—Shannon Martel, GIS Manager, Charlotte Water

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