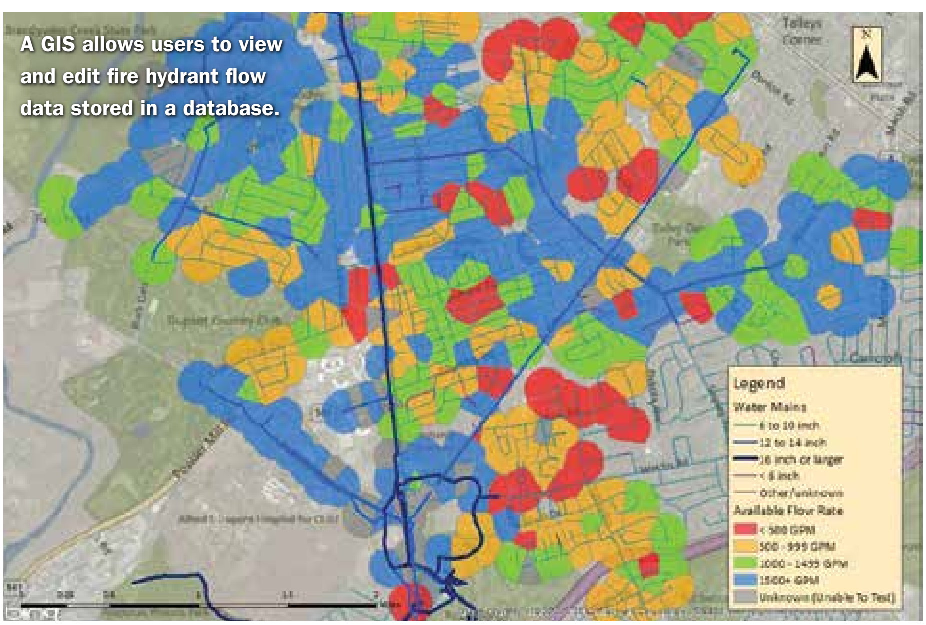
Fire Hydrant Inspections Produce a Wealth of Data

The focal points of fire hydrant maintenance are usually procedures, tools, and techniques used to keep the equipment in working order. Utilities can also focus on data collection and analysis.

SOME WATER UTILITIES inspect fire hydrants on a biannual basis; others inspect on two- or four-year cycles. Regardless, the substantial documentation collected during inspections is a valuable data asset.

Although many utilities still collect fire hydrant inspection and maintenance data on paper or in spreadsheets, a better approach is to use databases, including geographic information system (GIS) and computerized maintenance management system (CMMS) technology. Fire hydrant maintenance documentation should provide a complete activity and condition record, allowing users to perform various distribution system analyses.



A GIS allows users to view and edit fire hydrant flow data stored in a database.

CONDUCTING AN INSPECTION

Fire hydrant inspections help determine if a fire hydrant can be located easily, is mechanically operable, or needs repairs. It can be difficult to separate inspection tasks from repair tasks, so it's best to be prepared to make some repairs during an inspection, such as replacing missing caps or chains, replacing nozzle cap gaskets, and uncovering or raising fire hydrant isolation valves to grade.

A key aspect of hydrant documentation is to note all observations made and actions taken during an inspection. Most of the data, if properly recorded, will have meaning in the right context.

For example, consider the insight that could be gleaned from knowing where turbidity levels were higher and lower after flowing a fire hydrant to apparent clearness and from knowing how long it took to flow apparently clear. To effectively create this level of documentation, field crews must be properly equipped and capable of testing turbidity and chlorine residuals and measuring observed flow rates. They also should be aware of previous inspection results and outstanding work orders. Data should include mechanical operability, work-order triggers, and materials used.

DOCUMENTING LOCATION

Inspectors should be able to use a mapping system to locate all the fire hydrants in their distribution system. A mapping system should have adequate detail to lead an inspector to a hydrant even when it's obstructed from view. If the mapping system doesn't provide such detail, it should be updated immediately.

A system also should be updated when a located fire hydrant doesn't appear on a map. A best practice is to use Global Positioning System (GPS) technology to establish permanent ground truth for the fire hydrant or a GPS-enabled instrument to create an intrinsic link between the documentation and the fire hydrant itself. As

Fire hydrants should periodically undergo flow testing to provide data on distribution system flow and fire flow capabilities. A meaningful maintenance program should include a record on each hydrant to track inspection and condition history.

a result, records are organized geographically, reducing data errors that could represent the wrong fire hydrant.

In addition to locating fire hydrants, field crews should locate fire hydrant isolation valves and determine relationships between valves and hydrants. Doing so is important because, if there's adequate distance between an isolation valve and a fire hydrant (7 ft or more), the hydrant can be replaced without interrupting service simply by isolating the hydrant from the hydraulic grade line using the valve.

This practice reinforces the need to use more accurate GPS data (< 1-ft resolution), which is currently atypical. GPS data at this resolution must be carefully collected, filtered, and post-processed. Field crews must be trained to capture positions consistently, such as directly atop the valve or fire hydrant operating nut.

DOCUMENTING VISUAL INSPECTION

The most obvious visual tests relate to caps, chains, aesthetic problems, breakaway flange installation, and proper rotation of the pumper nozzle relative to the roadway. Less obvious, but equally important, information includes manufacturer, model, year of fabrication, and hydrant valve-operator size, all of which are inscribed on the fire hydrant. Such information helps to maintain adequate parts inventories for repairs. Other fire hydrant attributes to be documented include identification plates, available flow rates, and different colors.

Every observation has some documentation value. Field technicians should measure the bury from the pumper nozzle to the valve seat and nozzle heights from the ground to identify hydrants that should be raised. It's best to measure the bury first to see if there's standing water, which would indicate drains need to be serviced.

DOCUMENTING A MECHANICAL TEST

Fire hydrant operation follows a simple rule: "If you open it, you own it." This means if you open a fire hydrant, you own the consequences of doing so, such as property damage, dirty water complaints, and safety.

From a safety standpoint, there's always a potential for catastrophe. For example, the ejection of a nozzle from a fire hydrant under full system pressure could seriously injure a pedestrian or field technician.

There's a lot of variability in mechanically testing fire hydrants, and there's some impedance regarding hydrant security devices that lock hydrants and prevent backflow. Utilities may partially or fully operate fire hydrants or flow only a small amount of water. Some utilities diffuse and dechlorinate discharged water; others don't. In any event, basic documentation should include

- how much water was flowed from the fire hydrant.
- the velocity pressure at which it flowed.
- how the stem turned.
- condition of the operating nut and bolts.
- leakage, if applicable.

The mechanical test's primary function is to determine if the fire hydrant is in service, out of service, or in service but requiring repair. Most mechanical problems can be repaired, but a lack of parts for some models and fabrication dates make repair impractical. Equally important, ensure out-of-service fire hydrants are clearly marked as such. Knowing these circumstances lowers overall maintenance costs and helps expedite the most-urgent maintenance.

LEVERAGING DOCUMENTATION

Three basic analyses often can be performed out of the box in popular GIS packages by linking inspection documentation to a feature in the GIS that represents corresponding fire hydrants. An analysis of low-flow conditions is developed by thematically displaying observed fire hydrant flow rates and identifying fire hydrants fed from the same water main directly adjacent to each other but with substantially different flows. This analysis indicates a flow problem that could be related to closed valves or the beginning of severely tuberculated water mains.

Another simple analysis involves thematically mapping turbidity to identify areas that may be targeted for more frequent flushing or to identify a need for implementing unidirectional flushing. Finally, a cluster analysis displays clusters of like repairs for like fire hydrants to leverage efficiency in the field—working by repair type on hydrants in clusters to reduce mobilization between assets, which could represent significant savings.

DATA AREN'T JUST FOR INVENTORY

The traditional view of documenting fire hydrant maintenance activities is that it's for inventory and historical record purposes. However, utility maintenance departments should be encouraged to integrate inspection and resulting data with GIS and CMMS to improve decision making and productivity.