

Geolocation, Inspection Workflow, and Ideal Data Sets

Matt Stahl is a nationally recognized civil engineer with decades of experience working alongside municipalities, utilities, and engineering firms on the planning, design, and management of underground infrastructure. In this interview, we focus on geolocation, inspection workflow, and ideal data sets from Matt's perspective as an independent engineer.

1. Accurate geolocation—specifically pipe trajectory, depth, and grade—has become increasingly important for stormwater and sewer infrastructure owners and engineering firms. What has led to this urgency?

The location of infrastructure assets is incredibly important! Where a pipe segment runs sub-surface strongly influences how and when it deteriorates, the failure modes it is exposed to, and the repair options that owners can consider for cost-effective renewal to extend the life of the pipe. The urgency for knowing each pipe's geolocation stems in part from the increasingly crowded sub-surface environment, where multiple utilities (water, storm, sanitary, gas, cable, fiber, etc.) compete for space beneath the ground. Accurate location of these utilities is essential to safely and efficiently repair the many pipe assets that are "aging out" as they reach the end of their service life.

2. The role of GIS and other digital asset management systems continues to grow. Do you see any lapses or weaknesses in the quality and completeness of pipe location data that need to be addressed for these systems to be truly useful?

GIS and geospatial data is a powerful tool that utility engineers and owners leverage heavily for decision-support. It combines location data with attribute information to enable decision-making that is spatially aware. The primary weaknesses we encounter are GIS data gaps and data quality. GIS information that is approximate or missing weakens the data's effectiveness for decision-making. This often leads to additional effort and expense to locate the pipe defect for verification or repair. As an industry, we need better tools to map pipe networks to more effectively help cities renew aging systems and maintain a high level of service to customers.

3. Historically, collecting detailed pipe location data often requires separate surveys or additional field deployments. In your view, are separate surveys important for collecting critical data in a distinct way, or would combining geolocation with an existing inspection workflow be a step forward?

Mapping pipe alignments even today is an involved process that typically requires various data sources and skillsets. A workflow might combine survey-grade data collection for access points (manholes, outfalls, valves), as-built drawing review and CAD

to GIS digitizing for pipes (sanitary, storm, water), CCTV data collection and review for condition and connectivity, manhole inspection and review to verify lines in service and their orientation, and potentially the use of radio beacon “sonde” technology to estimate XY location samples along a pipe alignment.

Besides the intricacies of the data collection itself, each of these field activities also involves unique challenges and unknowns related simply to accessing the assets. So yes, I believe a simplified data acquisition workflow and merged data stream that could collect the necessary field data all at once would be a huge improvement upon current practices!

4. Dramatic pipeline emergencies in the news, such as the recent Potomac River sewage spillage, call attention to infrastructure fallibility. From your perspective, is there an ideal combination of data sets planners should have when thinking about maintenance, risk reduction, and reaction and repair time?

The Potomac River spill was indeed an unfortunate event. We can expect to see an increasing incidence of similar spills, collapses, and other pipe-related emergencies as the municipal systems we depend on day-in and day-out reach end of service life. To reduce these types of high-cost (safety and repair dollars) emergencies using a modern asset management framework, I’d say the key datasets needed by planners include location, condition, and quantified risk. For known issues in pipes, an approximate rate of deterioration would also be highly valuable, but the extra data points needed to establish a rate often don’t exist. For this reason, I see a need to develop a viable and cost-effective methodology that can gather data about the same pipe more frequently.

5. Budget is always top of mind for municipalities. What are one or two adjustments in approach or thinking municipalities could make that would allocate infrastructure management dollars as effectively as possible?

Just as we look at the comprehensive lifecycle costs of pipes and other assets, it’s important to consider the cumulative cost of multiple field deployments to gather the essential information needed for effective management of pipe systems. As new technologies and methods come to market, I encourage utility owners to look beyond a simple comparison of method A’s unit costs versus method B’s unit costs. Consider the cumulative costs, and take into account the expense (time, access, post-processing) that each method offers. A single, combined mobilization using emerging methods with simplified data streams may offer surprising value! Also look for opportunities to bundle the high-quality data services and products that deliver what you as the owner need to make critical decisions about your community’s infrastructure.