Assigning Risk in Asset Management Undergoing Digital Transformation

TOP TECH

TECH BOX

A **digital transformation** has occurred in the architecture, engineering, construction (AEC), and facilities management (FM) sectors. Pen, measuring tape, paper, velum, and rulers are still being used in construction. But, new digital tools are available and will become mandatory for practitioners within these business sectors. Tools such as smartphone LiDAR devices, GIS combined with building information modeling (BIM) or GeoBIM solutions, remote sensing using drones and software to produce photogrammetry mapping, tablets or smartphones equipped with RTK antennae or GNSS mapping hardware can support survey collection of the as-installed state of infrastructure. These tools can also capture exposed utilities and are new methods used in today's workflow. Assigning risk in the digital world requires new tools to validate, produce, and collect asset information.

What drives a digital transformation in AEC/FM work business sectors? California's Code 4216, Common Ground Alliance Best Practices Guide, ASCE C-I 38-02, and states like Montana and Colorado have adopted ASCE-75 as the standard for as-constructed three-dimensional (3D) collection of new infrastructures. Subsurface utility engineering (SUE) and subsurface utility modeling (SUM) will create new challenges and opportunities for asset managers and owners alike. California Assembly Bill 1037 requires AEC participants to adopt and use a digital tool for construction management. Due to the current nature of many owners' archived drawings being composed on paper, a gradual lean toward a digital method is required to validate infrastructure asset information.

The future team managing assets will focus on the site (civil site drawing) map accuracy and associated local datum to enforce map photogrammetry standards and principles. Subsurface utility investigation will increase as the need for additional utility infrastructure occurs. As seen with California's ban on the sale of new gas-fueled vehicles by 2035, new electrical vehicle requirements shall increase the need for new charging stations. So it becomes critical for proper geo-registration of the asset collection to the base map (civil site drawing) and preparedness to collect exposed utilities with a smartphone/tablet/drone. New base map imagery and a digital model are required to migrate and validate planned, exposed, and installed subsurface utilities.

A. Photo of exposed utility for collection

B. Photo of base map CAD from photogrammetry

Where and how do I start a digital migration? Asset owners like city managers, state representatives, or privately owned operators start a digital migration by analyzing the base map accuracy (photogrammetry). One approach is to evaluate your base map, which is traditionally taken by fixed-wing aircraft. A licensed surveyor and photogrammetrist will provide digital linework based on remote sensing techniques. Due to technological advances in remote sensing, a 3D/2D base map can now be obtained. This step into 3D provides a new opportunity to obtain, collect, and migrate new installations of subsurface utilities into the new base map. Photogrammetry data is collected on the ground via smartphone with a LiDAR camera or done by air with drone aerial photogrammetry. The data is later processed with photogrammetry software which provides deliverables for map integration.

New technology in remote sensing provides files such as:

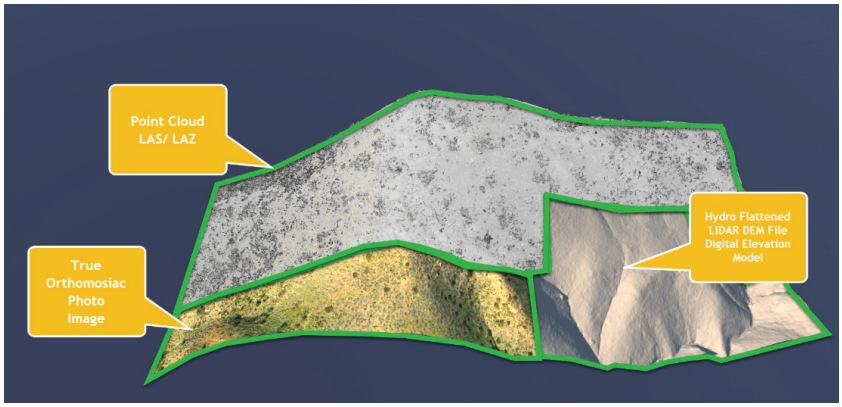
- Point Cloud (LAS/LAZ Files)—Orthomosiacs images (TIFF files)—DEM or Digital Elevation Model
- DSM or Digital Surface Model—DTM Digital Terrain Model—DSM or Digital Surface Model

Choosing a repository for your team's new geodatabase is fundamental. ArcGIS Esri and Autodesk have partnered to establish BIM and geo datasets interoperability. InfraWorks, established in 2018, took an approach to bridge the gap between geospatial, built environment, and asset lifecycle planning activities.

Why is it important to collect data digitally and start a digital migration? According to the Common Ground Alliance (CGA) 2020 Damage Information Report, damages to buried utilities cost $30 billion annually in the United States. Standards such as ASCE C-I 38-02, ASPRS Positional Accuracy Standards for Digital Geospatial Data, and USGS Map Accuracy Standards inform services and techniques to ensure the highest level of care in your operation. Subsurface utility modeling (SUM), subsurface utility engineering (SUE), and subsurface utility investigation (SUI) are costly activities. Collecting data from ground penetrating radar (GPR), exposed utilities, and locating services allows the owner to grade utility map depictions. The collection using new digital technology like smartphones and drones allows owners to regain confidence in their infrastructure once buried.

In summary, a digital migration with the applicable tools, expertise, and software can be achieved as soon as opportunities arise. For example, a broken water utility pipe or a gas line replacement is a great opportunity to deploy the unmanned aerial vehicle (UAV). Training, a firm knowledge base, and adherence to industry standards are fundamental for digital migration. These actions will allow your team to reduce risk, understand your infrastructure, develop a sustainable workflow, and access utility information in the future.

Illustration of the different file types from remote sensing activities with drones and smartphones



New base map in LiDAR (digital transformation)