

Helps Virginia DOT Inventory and Maintain Roads and Highways



Urban and Municipal

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Have you heard the story about the driver who ran a red light, and who later received a ticket in the mail, along with a photo of his car running the red light? To pay the ticket, the driver mailed back a photograph of some money. Fortunately or unfortunately, cameras are just one tool in use today to aid in highway safety, along with signs, lights, sensors and other devices. When you consider the thousands of miles of roads, freeways, and highways across the United States, the total number of these devices easily adds up.

The state of Virginia is home to the nation's third largest state-maintained highway system. With a population of just over 6 million, and an area of over 40,000 square miles, Virginia boasts well-maintained major highways as well as miles of scenic byways. Virginia's highways make it easy for travelers to access its many tourist destinations, including Mount Vernon, the Manassas Battlefield, Yorktown, and Colonial Williamsburg.

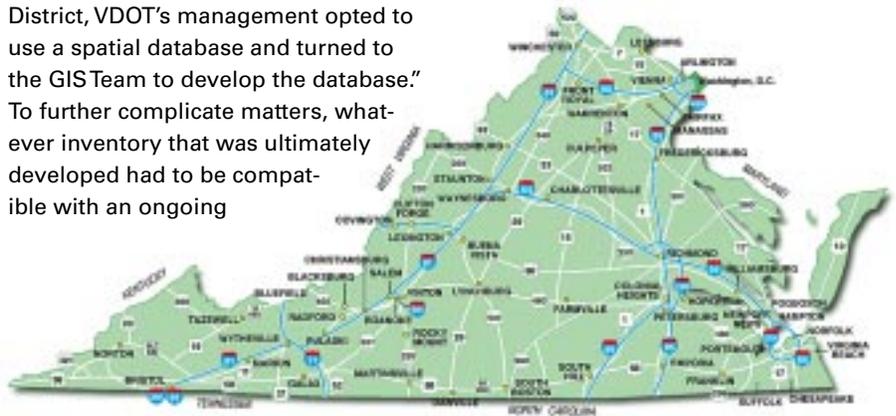
The Virginia Department of Transportation (VDOT), has the responsibility of inventorying, maintaining, and replacing all road signs and other assets on roadways throughout the state. VDOT divides the state into nine districts, each of which oversees maintenance and construction on the state-maintained highways, bridges and tunnels in its region. In all, VDOT manages over 56,000 miles of state highways, primary, and secondary roads.

In order to better manage roadways and traffic flow, VDOT implemented "Smart Travel" technologies to reduce congestion, improve road conditions, and deliver services to Virginia's motorists. Specifically, an Intelligent Transportation System (ITS) is an umbrella term for all of the Smart Travel technologies (VDOT's assets and devices), including variable message signs, CCTV cameras, ramp control signals, lane control signals, traffic detection sensors, interstate lighting, low-powered radio transmitters, electrical service panels and other support equipment.

Tom Phillips, GIS Manager of VDOT's Northern Virginia District, was tasked with developing a methodology to inventory all of the ITS assets and devices in his district. Phillips elaborates, "We knew we needed a more comprehensive inventory system to keep track of the literally thousands of devices along our highways. In the Northern Virginia District, VDOT's management opted to use a spatial database and turned to the GIS Team to develop the database." To further complicate matters, whatever inventory that was ultimately developed had to be compatible with an ongoing

GIS-based pilot program within VDOT called Inventory Condition and Assessment System (ICAS). In one part of the Northern Virginia District, many of the assets had been or were going to be captured through ICAS.

Phillips immediately began to research a suitable tool that VDOT could use to inventory the ITS assets. According to Phillips, "We needed an efficient tool for gathering spatial and attribute data in the field, in a suitable format that could be integrated by the office GIS personnel into a spatial database using our existing ESRI GIS software. In many cases we had a good position of the asset but had very limited or erroneous attribute data. As in most asset inventories, there were numerous data sets in several different formats (i.e. CAD, spreadsheets, and previous GPS inventories) available that pertained to some of the assets. To verify



The state of Virginia contains over 56,000 miles of highways.

the existing data and get all of the new assets, a significant field data collection effort would be required.”

In 1999, VDOT purchased a Leica GS50 GPS/GIS receiver. Previously, much of the inventory consisted of paper construction drawings, spreadsheets, and a few small databases, which made existing VDOT personnel very valuable. However, much of that data was lost when that same personnel left or retired. Phillips says, “Before we purchased GPS, much of the ITS inventory was based on institutional knowledge. For instance, when staff worked in a certain area, they learned where devices were. However, when we had staff turnover, that knowledge was lost. There weren’t any good maps or databases, and we realized that having spatial databases showing locations of equipment along with maintenance history and other key attributes would be helpful. Using GPS to conduct the inventory was the most cost-effective, simplest solution.”

VDOT uses Leica GIS DataPRO™ software to create a codelist, or an inventory form that can be used in the field for data collection. This was important, so that attributes, including condition of the asset, could be collected in the field. Once the ITS asset data has been collected, it is automatically in ESRI shapefile format, which is one reason why VDOT chose the Leica unit. All of the ITS information is stored in an ESRI GIS database. When new assets are added or are modified, revisions can be made to the GIS inventory database.

VDOT then takes the GIS inventory and displays it in a map-based interface on their Intranet (internal Internet site). All of the maintenance databases are then available to VDOT personnel who can view the status of assets in real-time.

VDOT also uses GIS DataPRO to overlay the GPS data onto aerial photos. This allows VDOT to immediately check the accuracy of the GPS data. Phillips explains, “Sometimes we post-process, and sometimes we use the U.S. Coast Guard Beacons to correct the data in real-time. One of the nice things about Leica’s GIS DataPRO software is that it will load aerial photos easily. Another reason we like it is that once we build the data we keep our inventories in ESRI shapefiles. With DataPRO, it automatically creates a shapefile, so it was easy to transfer and manipulate the database files.”

Overall, VDOT has realized many benefits from using the Leica GPS equipment. According to Phillips, “Leica’s equipment was easy to learn, so it was easy to teach VDOT personnel how to use it. The GIS Team did not have adequate resources to collect all of the field data, so I taught our maintenance workers how to use it. In turn, they took it with them out in the field on their regular maintenance runs. It saved us money because the workers did not have to make a special trip, and we did not have to hire specialized people.”

In closing, Phillips says, “The Leica receivers have helped us meet our project goals. In fact, we have expanded the use of GIS and GPS together, and



Virginia DOT used a Leica GS50 GPS/GIS unit to record highway signs, traffic cameras, and electrical service panels, along with many other pieces of equipment along state highways.

the state has purchased several additional receivers since we purchased the first one in 1999. Currently, we are using the receivers for wetlands delineation. Leica’s MaxTrak™ feature is very useful, because typically this type of work is done under a heavy canopy of brush and trees. Now, Leica has introduced the GS5+ and we are looking to use that with ArcPad as a solution in our pavement management program. Today, all of our assets have a spatial component. In the end, VDOT’s use of GPS will help us better manage and maintain our assets and more effectively utilize our limited resources.”

To learn more, call 1-866-LEICAGIS or visit www.gis.leica-geosystems.com

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Printed in USA

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