

VDOT and VMS Highway Maintenance Performance Evaluation

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The maintenance and upkeep of highways and interstates affects drivers daily. The lack of adequate maintenance can cause safety issues as well as inconveniences in travel. The Virginia Department of Transportation (VDOT) in coordination with Virginia Maintenance Services (VMS), a private entity, works to keep the interstates and highways of Virginia in satisfactory condition. In order to track their effectiveness and improve the overall road condition, they joined with Virginia Tech to create an evaluation program. The Virginia Tech team began research in 2000 to develop a program that accurately illustrates and compares the performance of VDOT and VMS each year. The assessment is performance-based, evaluating the existing conditions for specific areas against a specified goal set by VDOT. The evaluation has continued each year and is contracted to continue until at least 2007.

The main asset groups are shoulders, roadside, drainage, traffic, bridge structures, pavement, and timeliness of response to road incidents. Within these asset groups specific items that are inspected. Each year data is collected for randomly selected 0.1 mile segments of interstate in Virginia for a number of specified asset items. Once the raw data is collected, it is then analyzed by the Virginia Tech team to determine the effectiveness of the highway maintenance in that year. The results are compared with the performance target set by VDOT to determine if the 0.1 mile segment has a pass or fail status. A final report is issued each year to VDOT that includes an overall “report card” for that year along with spreadsheets, bar graphs, and written descriptions.

In 2002, a GIS component was added to provide a visual tool to the report. While the graphs and tables do communicate the data, they do not show a clear illustration of the specific conditions on each road segment. Using ArcGIS software, maps of each individual stretch of highway are plotted with the pass and fail areas indicated by green and red marks as seen in the below figures. This allows the data to be represented in an easily understood illustration. Individual asset item maps, as well as trend analysis maps, are created. The trend analysis maps allow the reader to see the change in performance of sites inspected over the course of the project.

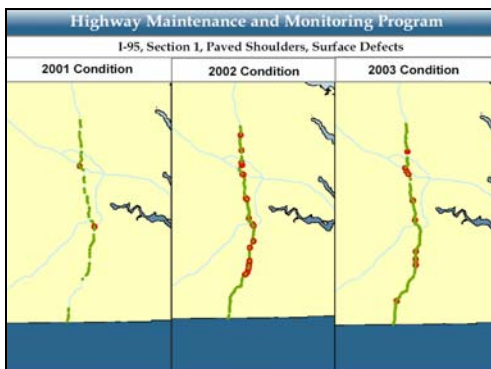


Figure 1: Original Display of GIS Data

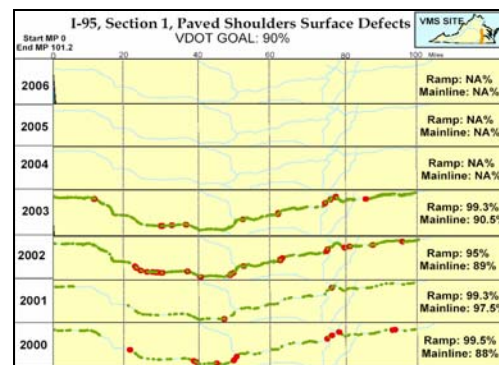


Figure 2: Improved Display of GIS Data

My role in the project began in early 2004. In addition to assisting with the data analysis and GIS visualization, I performed a study in the visual display of data to determine the most effective layout for the GIS illustrations. The main challenges were displaying large volumes of data within a small space effectively, referencing the data shown, and marking the data with indicators other than color. The relationship between space, color, layout, and orientation was studied to create a number of options to display the data. Figure 1 above is the original layout. This displays the data over the course of three years for a specific section of highway and a specific asset item. Figure 2 is one of the options created after the study. This format can display seven years of the same highway and asset item in the same space with more efficiency. Many features were added to Figure 2 to increase the effectiveness. These include a scale, a reference map, the starting and ending mile-markers, an indication of who maintains the site, and the specific passing percentages for the segment. The improved GIS illustrations assist the reader in easily visualizing the progression of the inspections while also giving them valuable information.

This project allows VDOT, VMS, as well as the public to see how effective the highway maintenance is from year to year. Each year improvements are made to make the data more reliable and the communication more effective. With the improving of available technology and addition of time and research, this process will continue into the future to better the interstates that are driven daily.