2. INTRODUCTION

The City of Chesapeake's Master Drainage Plan models form the basis for planning and design of regional BMPs, are instrumental in setting the capital improvements projects (CIP) budget, and provide hydraulic grade line elevations for use by private-sector engineers in designing new developments.

In the time since the models were first coded, some City watersheds have experienced prolific development—altering the landscape and drainage infrastructure to the degree that the original watershed models are increasingly in need of updates. While these watersheds were developing, so was computer modeling capability, primarily due to gains in processing power and data processing technology. In 1986, SWMM modeling on desktop computers using the DOS operating system was a painstakingly slow process, and many workarounds—such as the use of equivalent length conduits to allow larger computational time steps—were commonplace. A one-second computational increment was unthinkable for desktop modeling on microcomputers. Likewise, there was no desktop Geographic Information System (GIS) platform that could be used to process the model input data. Data reduction was performed using manual methods on paper prints. Watersheds and drainage networks were discretized in somewhat bulky but effective fashion to develop working models. The limitations of 1980s computing technology had an undeniable bearing on the approach to modeling at the time.

The City is committed to maintaining its master Drainage Plan models, and has decided to update the modeling in those watersheds that have experienced the heaviest development since 1986. The St. Julian Creek watershed has experienced significant development during this period, and is expected to incur additional development in the near future.

Not only has engineering and computing technology changed since the original watershed management plans were completed, but so have expectations about the format and distribution of the final study documents. In the past, there was little or no link between the watershed data and the computer models, most of which were completed using very large-scale paper maps. In this respect it was difficult to obtain detailed input data, and empirical models were developed and employed in part to compensate for the lack of detailed information. Now, with the advent of advanced desktop computer system and software platforms, engineers expect a substantial amount of digital backup data to be delivered with a detailed drainage study. The study deliverables now include not only the computer input and output data files and report documentation, but also a robust set of GIS coverages that can be used to work with the models in the future. The reports themselves are set up for on-screen viewing, and contain complete, full-size CAD and GIS plots for instantaneous use by the reader. The use of portable document file (.pdf) formats also enables those users who do not have CAD or GIS software to easily review the plots.

This report contains several highly detailed GIS plots in pdf format that can be printed on standard 8.5x11 printers, along with the regular-sized pages. If the user has access to a large-format printer/plotter, clear large-format plots can easily be obtained, which will make it easier to follow the model layout and construction by referring to the node and link identifiers labeled in these figures. If the user does not have a large format plotter, the freely available Adobe Acrobat Reader software program can be used to zoom in on these plots to reveal the tiniest details and labels, because the figures are produced in vector formats.

One of the greatest advantages today's engineers enjoy is high-resolution aerial imagery. The aerial imagery used in this study — and presented throughout this report — was provided by the Commonwealth of Virginia, Copyright ©2002.

The modeling performed for this Master Drainage Plan update was completed using PCSWMM. This software package is available for approximately $400 and is an excellent low-cost SWMM modeling platform. All of the SWMM files were provided to the City of Chesapeake Department of Public Works as part of the project deliverables. Engineers can easily find important detailed hydraulic information by using any text editor to review the output files, as explained in Section 5. With PCSWMM there are several additional tools that allow the hydraulic results to be reviewed dynamically, that aid in developing an appreciation and feel for how the system behaves. One of these is the Dynamic Hydraulic Grade Line tool, which shows the hydraulic heads changing over time through selected portions of the drainage system.

Figure 2-1 shows a screen capture taken during a review of the 50-year existing (2004) conditions hydraulic response near Deep Creek Boulevard.

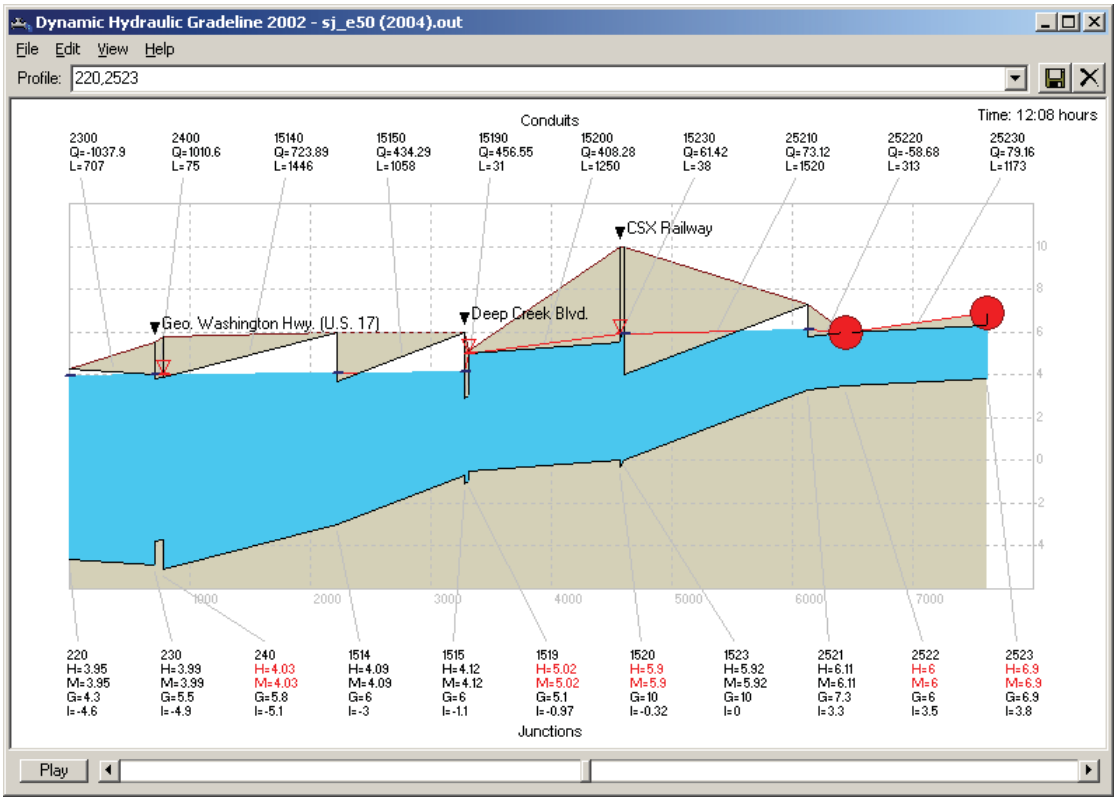

Figure 2-1. 50-Year Existing (2004) Conditions Dynamic Hydraulic Grade Line Through Deep Creek Boulevard

The engineer can check the link-node diagrams presented in this report, then pull up PCSWMM and easily review the hydraulics in this manner using PCSWMM.