

## Background

URS was directed by the City of Chesapeake and the U.S. Army Corps of Engineers to conduct a watershed study on the area of New Mill Creek 1 & 2, covering approximately 3,600 acres. The New Mill Creek Watershed is bordered on the west by the Dismal Swamp Canal and to the South by the Great Dismal Swamp. The runoff discharges to the northeast corner of the watershed to New Mill Creek and ultimately drains into the southern branch of the Elizabeth River. There are two primary drainage outlets, Willis Creek and the Lindsey Canal. The Willis Creek channel conveys flow from 1,400 acres passing under an 18-foot bridge at Cedar Road (link 13621) before leaving the watershed. The Lindsey Canal conveys flow from 1,850 acres passing under a 30-foot bridge at Cedar Road (link 15921). A third crossing under Cedar Road (link 16601), consists of a 48-inch pipe and conveys flow from less than 300 acres upstream.

The 3,600-acre watershed was delineated into 125 subbasins in order to distribute point sources for inflow throughout the entire watershed. New Mill Watershed is largely agricultural and contains several large, undeveloped tracts of land that are expected to be developed in the future. This study addresses existing drainage and storm water issues, as well as expected future conditions.

An overall Master Drainage Plan study for this watershed was completed in November of 1985 by Gannett Fleming Corddry & Carpenter. The study was conducted on all four New Mill Creek study areas: The Main Channel/Willis Creek (NM-1); Lindsey Canal (NM-2); Tributary 1/Grassfield (NM-3); and Tributary 2/Shillelagh Road (NM-4). URS was directed to conduct a drainage study of only NM-1 and NM-2. At the time of the 1985 study, the New Mill Watershed was predominantly undeveloped with 85% of the area as agricultural or wooded.

Several recommendations were made to NM-1 and NM-2 in order to reduce flooding throughout these areas for the 1985-version of future conditions. These recommendations included: increasing the Willis Creek Bridge at Cedar Road from an 18-foot span to a 30-foot span; increasing the Lindsey Canal Bridge at Cedar Road, from a 30-foot span to 50-foot span; and to widen the bottom of the Lindsey Canal starting at Number Ten Lane (25-foot) to Dominion Blvd (30-foot) to Cedar Road (45-foot).

It is important to note that this study reported the existence of double 8-foot-by-8-foot box culverts along the Lindsey Canal, under Dominion Boulevard. During the survey efforts for the 2005 study it was found that the crossing is in fact double 8-foot-by-12-foot box culverts. Upon reviewing this finding with the City of Chesapeake, it was determined that there is no known improvement to that crossing and therefore the double 8-foot-by-12-foot box culverts most likely existed during the 1985 study. The two bridge replacements were never constructed as recommended by the 1985 study. The Lindsey Canal improvements were also not constructed, with the exception of 2,700 linear feet of channel improvements made to the section upstream of Dominion Boulevard, adjacent to the West Road Estates subdivision.

In addition to the 1985 Master Drainage Study, the City of Chesapeake conducted a 1999 West Road Drainage Study. This study addressed significant flooding during the hurricanes and storm events of October and November 1999. During these storm events, Chesapeake received in excess of 24 inches of rain in a 45-day period. The study area started behind 1009 West Road with a 15-inch culvert and ended at the 48-inch culvert crossing at Cedar Road (from node 622 to 662 in Figure 5).

The following is a list of recommendations from the 1999 drainage study:

1. Clean and re-grade the farm ditch from 905 to 1009 West Road (from node 624 to 630 in Figure 5).
2. Replace the 15-inch farm ditch culvert behind 1009 with a 36- or 48-inch RCP (from node 622 to 624 in Figure 5).
3. 48-inch pipe culvert just downstream of Dominion Boulevard be replaced with a 60-inch RCP (from node 634 to 632 in Figure 5).
4. Double 30-inch pipes be replaced with a 60-inch RCP (from node 654 to 656 in Figure 5).
5. 48-inch culvert under Cedar Road received the recommendation of an additional culvert to be placed so that the minimum equivalent opening will be equal to that of a 60-inch pipe (from node 660 to 662 in Figure 5).

As of 2005, recommendation number 3 and a portion of number 1 had been completed. In July of 2000, plans were 'APPROVED FOR CONSTRUCTION' to replace the 48-inch culvert just downstream of Dominion Boulevard with a new 60-inch RCP. In addition, over 600 linear feet of drainage improvements were made to the West Road farm ditch from the upstream side of Dominion Boulevard to 929 West Road.

Upstream of the Willis Creek Bridge crossing (node 362 in Figure 5) there exists low-lying, widely spread contours that create natural floodplain storage for this watershed. URS modeled the existing and future conditions utilizing this 'true' storage.

The City of Chesapeake provided URS with several plan sets for projects within the subject watershed, two of which have been approved for construction but have not yet been completed. The U.S. Route 17 and the Borrow Pit Recreation Lake were still under construction during the 2005 URS study. As directed by the City, URS modeled these as existing conditions. While these two developments were not expected to be complete by the end of this study, they were considered "Existing Conditions" since the approval of the project assures its near-future development. The City of Chesapeake surveyed selected points in the subject watershed at the request of URS. These selected survey points are presented in Appendix B. The City also provided URS with GIS-related topographic data. URS utilized these three main sources—plan sets, survey data, and GIS data—to extract channel and infrastructure information, such as inverts, pipe type and size(s), and channel characteristics, throughout the subject watershed.

The City did not provide URS with any plan sets to be considered in the future conditions modeling. However the future conditions models consist of the future hydrology (reflecting the City's 2005 Adopted Land Use and Transportation Plans as applied to the New Mill Creek Watershed) along with the recommended improvements identified by URS, described elsewhere in this report.