Hydraulic Analysis for Mill Creek below East Lake Road Bridge

The Town of Richmond (Town) is working in partnership with the U.S. Fish and Wildlife Service (Service) and Ontario County Soil and Water Conservation District (District) to implement a stream restoration project along 4,500 linear feet of Mill Creek near the Sandy Bottom Park in the Town of Richmond, Ontario County, New York. The Town identified the project area as a primary source of sediment that is adversely affecting hydraulic capacity in the Honeoye Outlet at its confluence with Mill Creek. The residents along Mill Creek have taken an active role in attempting to manage the erosion occurring in Mill Creek. Restoration of Mill Creek downstream of the East Lake Road bridge to a stable channel form will significantly reduce sediment inputs, improve aquatic functions, and reduce the potential threats to private residential homes and public infrastructure.

A hydrologic analysis was prepared to evaluate the proposed project. Analyses of the 100-year storm water runoffs for the drainage basin were performed utilizing the USGS regional regression method in association with the USGS StreamStats application. At the confluence with Honeoye Outlet, the drainage basin was determined to be 13 square miles. The current 100-year storm peak discharge (Q_{100}) for Mill Creek was computed to be 1,290 cubic feet per second (cfs).

<u>Existing Conditions:</u>
The hydraulic analysis was conducted utilizing the HEC-RAS software program which incorporates the US Army Corps of Engineers HEC-RAS modeling methodology. HEC-RAS was used to model the existing waterway along the project reach, and incorporated available topographical data. Cross sections used in the HEC-RAS analyses are shown in Figure 1. The HEC-RAS model was run under three different scenarios: 2010, 2018 existing and 2018 proposed. The 2010 run used existing topographical data and represents conditions when those data were collected in 2010. The 2018 existing model uses data collected in 2018 which captures the changes in the stream corridor that have occurred in the last decade. 2018 proposed includes the proposed streambank stabilization project design including flood benches. An overlay of the three scenarios at XS 11 is shown in Figure 2. The houses on the west end of Brookside lane are at or above the 836' elevation contour. The inundation boundary for 2010 Q_{100} is shown in figure 2. Since 2010 Mill Creek has migrated westward between XS 11.5 and XS 8 upwards of 50 linear feet and has downcut up to two feet. Under 2018 existing conditions Q_{100} flow at XS11 and XS10 water surface elevation would be 832.3' and 831' respectively (Figures 3 & 4).

<u>Design Conditions</u>:
The proposed design to address the high eroding bank is to build a 15' bankfull (floodplain) bench on the west side of Mill Creek to protect the eroding bank. Although the active channel

would be moved eastward by 15 feet, the overall size of the floodzone will not be reduced so the flood elevation would remain fairly consistent. Running a HEC-RAS model with the proposed channel cross sections returned Q_{100} water surface elevations for XS 11 and XS 10 of 832.3' and 831' (Figures 5&6). Recognizing that extreme weather events may become more frequent we also ran HEC-RAS models with the 500 year flood flow (1640 cfs). The water surface elevation for Q_{500} at XS 11 would be 832.6' and 831.4' at XS10.