



MEMORANDUM

TO: Mayor Lawlor and Members of Council

FROM: Kate Sapozhnikova, Senior Water Resources Engineer

DATE: July 25, 2023

MEMO NO.: TPW-2023-003

SUBJECT: Installation of the new hydrometric data collection equipment – streamflow gauge and water temperature measurements system at Hornby Creek

PURPOSE OF THE MEMORANDUM:

To inform Council of the installation of the first weather station by the Town.

The following are key points for consideration with respect to this memorandum:

- One of the priorities in the Town of Halton Hills Climate Change Adaptation Plan is to become resilient to increased precipitation and flooding.
- In the next 30 years, the Town of Halton Hills is expected to experience growth and intensification as per the direction from the Province.
- Access to local hydrometric data is critical to understand precipitation and flooding impacts. This information will help prepare us for the projected population and employment growth.
- In 2022, a streamflow gauge was installed at the Hornby Creek bridge at Sixth Line south of Steeles Avenue, close to the southern boundary of the Town, in the Sixteen Mile Creek watershed, where there is an apparent lack of any streamflow data.
- Rain gauges (to measure the amount of rain), streamflow gauges (to measure flows in the creeks) and stream water temperature are typical sets of monitoring equipment to collect local hydrometric data. The temperature of the creek's flow is an important ecological parameter.
- There are some sources of local data available, however data is insufficient in some parts of our municipality (e.g., Conservation Halton's watershed).
- The monitoring equipment will help to support future monitoring programs as part of the new CLI-ECA #328-S701 permit issued by MECP and approved by Council Report No. TPW-2023-009.

BACKGROUND:

The local hydrometric and environmental data is fundamental to support stormwater management guidance for municipal planning and design projects. As part of the climate change mitigation initiative, it is required to document local meteorological changes. Local data also serves as a good basis for the planning of future watershed conditions including support of flood line delineations. Without local monitoring data and local watermarks, the floodplain modelling results are theoretical and flood risk maps are ambiguous. In 2021 the Town identified a lack of local hydrometric and environmental data to support future growth and to fulfill the pledge from the Climate Change Adaptation Plan to become resilient to increased precipitation and flooding.

Approximately 19,840.86 ha or 71.38% of the Town's total lands are protected environmental areas within the boundaries of the Greenbelt, the Niagara Escarpment, Source Water Protection Areas, and the Region of Halton Natural Heritage System in accordance with the Regional Official Plan Amendment, dated 2022 (ROPA 49). The existing urban boundaries which include Georgetown, Acton and the Premier Gateway Area are approximately 4,348 ha (or 16% of the total Town's lands). The expansion lands allocated through ROPA 49 to accommodate growth to 2051 will increase the urban boundary to approx. 6,274 ha or 23% of the total Town's lands (an increase of approx. 7%).

The Town's population is anticipated to grow to 132,050 by 2051. As the Town continues to grow, protection of the natural environment and enhancement where possible becomes a pronounced and overarching goal through the development review process. In addition to the pressure of the future growth and intensification, there are a number of the Town's programs that must be supported by local data including but not limited to the following:

- The main goal of the Climate Change Adaptation Plan is to become resilient to increased precipitation and flooding, which starts with the understanding of the local meteorological and flooding conditions.
- Conservation Halton (CH) is planning to undertake a Sixteen Mile Creek watershed floodplain mapping project which needs to be verified by the local stream gauge readings.
- The ongoing Stormwater Management Master Plan, which will support verification of the existing IDF curves; and
- Recent changes introduced by the Ministry of the Environment, Conservation and Park (MECP) would require municipalities to develop and implement a local monitoring program as part of the new CLI-ECA #328-S701 permit issued by MECP. Staff continue to assess how best to implement the future requirements based on the new CLI-ECA program and the need to be supported by local hydrometric data to confirm no negative impact from the development on the natural environment.

Monitoring Equipment Installation

Installation of monitoring equipment and collection of data will help support the above programs, The project, which was funding in the 2022 capital budget, included the purchase, installation, and calibration of the Town's first-owned local weather and flow monitoring station and the establishment of a data collection system that can be used by Staff, Conservation Authorities, and the Region.

1. Location.

To confirm the best location for the future monitoring station, an evaluation of the existing hydrometric equipment within the municipal boundary was undertaken. A vast range of monitoring equipment maintained by different organizations was confirmed. The overall accessibility to existing coverage can be characterized as partially limited due to the unique location of the Town (in the headwater areas straddling three different Conservation Authority jurisdictions).

In summary, data accessibility ranges from good coverage (CVC's watershed – 51.50% of the Town's lands) to limited coverage (CH's watershed – 46.73% of the Town's lands) to non-existent (GRCA's watershed - 1.77% of the total Town's lands). The existing monitoring equipment is summarized in Table 2 below.

Table 2. Summary of the existing monitoring equipment (refer to Appendix A, B and C for additional details).

Conservation Authority	Number of units			Ownership
	Water temperature loggers	Rain gauge	Streamflow gauge	
GRCA	0	0	0	N/A
CVC	1**	6	7*	CVC (4 stream, 4 rain) Halton Region (2 rain) Water Survey of Canada (3 stream)
CH	0	3	1***	CH (2 rain) Halton Region (1 rain)

* There is one streamflow gauge on Credit River at King St. in Terra Cotta; located just inside the Region of Peel/Caledon boundary, but very close to Town of Halton Hills.

** only permanent loggers are recorded in the table.

***there is an existing reservoir level monitoring equipment at Scotch Block Dam.

The quality of coverage should be assessed against the watershed coverage of the existing urban areas. The summary is presented in Table 3 below.

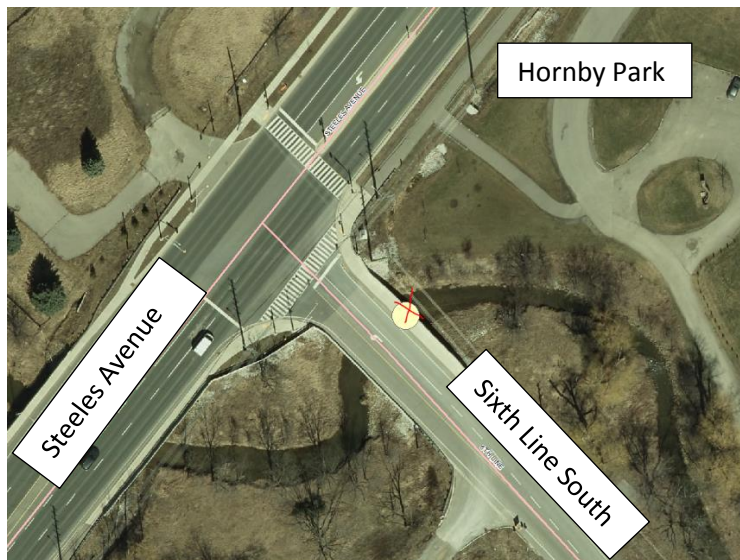
Table 3. Area vs. watershed (approx.)

Urban Lands	Area, ha	Watershed area, ha		Watershed area, %	
		CVC	CH	CVC	CH
Acton	670	670	0	100	0
Georgetown	3,800	2,204	1,596	58	42
Future employment lands including Premier Gateway Lands	2,060	463	1,597	22.5	77.5
Total	6,530	3,337	3,193	51.1	48.9

There is an apparent lack of the monitoring data in Sixteen Mile Creek watershed; therefore, it was prudent for the Town to establish a local environmental program and start the collection and utilization of local data to monitor weather patterns, particularly in the face of climate change.

After evaluating potential areas for installing a weather station, the Hornby Creek Bridge on Sixth Line south of Steeles Avenue was chosen for the installation. Given the existing rain gauge installed one block west of Hornby Park by the Region of Halton in 2021, the weather station was determined to include a streamflow gauge and a water temperature logger only.

Figure 1. General location of the weather monitoring station.



The streamflow gauge is located close to the southern boundary limits of the town, in the Sixteen Mile Creek watershed, where there is a lack of any streamflow data. The gauge is installed downstream of the confluences of the West Branch of Sixteen Mile Creek (drainage area of approx. 2,200 ha) and the East Branch of Sixteen Mile Creek (drainage area of approx. 800 ha). The total drainage area hydrologic response which

will be monitored by the Town is approximately 3, 000 ha, which is approx. 25 % of the total area of the town's lands located in the Sixteen Mile Creek watershed.

The location is deemed strategic for flood hazard evaluation in light of future development in the lands identified for growth. The station is installed on the Town's property (bridge) and will help to operation budget and maintenance effort.

The following equipment was successfully installed at the Hornby Creek bridge at Fifth Line south of Steeles Avenue in 2022:

- Phoenix –non-contact radar level sensor for flow measurements in rivers or wide channels.
- Water Temperature Probe (-40 to +70 C).

Figure 2. Photos of installed equipment



Station (1)



Streamflow gauge (2)

(1) The station includes solar power and data logger equipment protected by the enclosed box.

(2) The streamflow gauge (Phoenix –non-contact radar flow meter unit and Vega radar sensor for continuous level measurement) is attached to the downstream bridge soffit and protected by a metal shield.

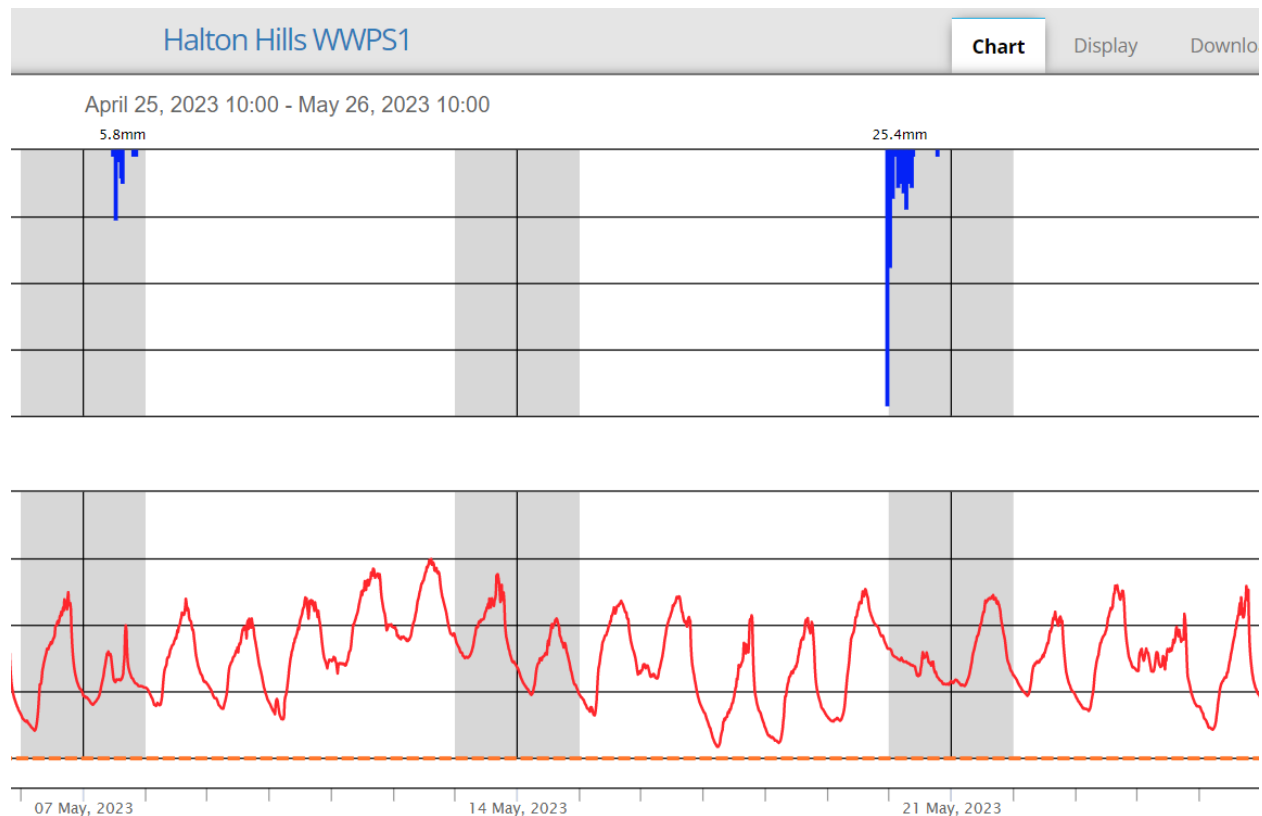
Note: Water temperature probe is installed in the creek and connected through the same data logger.

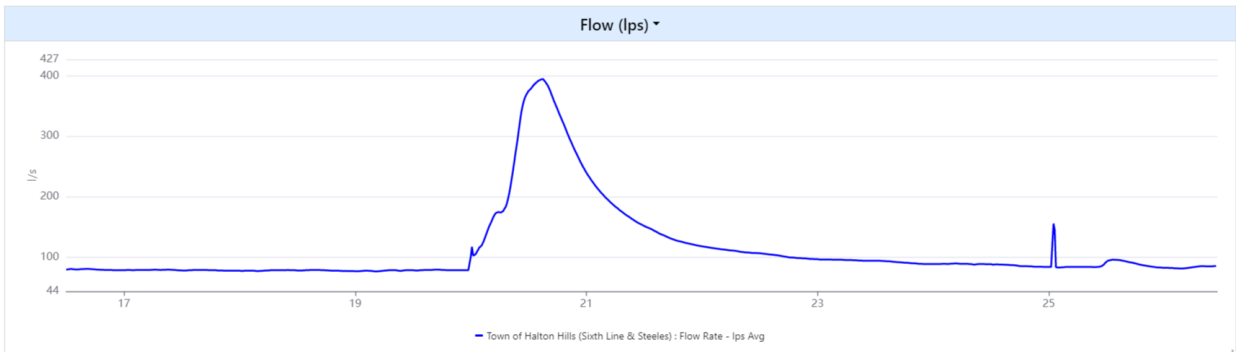
Results Monitoring and Collection

The equipment collects readings on the flow depth (m) and surface velocity (m/s) every 15 min, converts data into flow rate (m³/sec), and provides it in a live format.

Figure 3 below provides a visual representation of the local hydrologic response of a creek to a rain event. The diagram illustrates how the total of approx. 25.4 mm of rain would impact flows in the creek at Hornby Park. The top diagram shows a rainfall distribution of total of approx. 25.4 mm of rain started at 11 pm on May 19 and ended at 9 am on May 20, 2023. This Region of Halton data was obtained from the DataCurrent platform run for Conservation Halton by Civica. The lower diagram illustrates changes in the streamflow at Hornby Park. The normal stream flow of 78.81l/sec started to increase from 11 pm on May 19, 2023, reaching a peak of flows in the creek (393.3 l/sec) by 3-15 pm on May 20, 2023. The recession back to the normal level was completed by 9 pm on May 24, 2023. The data presented on the lower chart is generated for the Town's new hydrometric station called "Hornby Park" and recorded as #19 in Appendix B and C.

Figure 3. Rainfall vs. streamflow.





The streamflow data can be easily extracted from the web platform (Campbell Cloud) and can be provided to the partners and town's consultants upon request.

After the installation, operation, and maintenance of the stations will be required continuously which was already included in the operating budget. With the collection of data, the need for a GIS database will be explored.

COMMENTS:

The Climate Change Department was consulted and supported this initiative.

To support the pilot project, the Engineering and Construction Section of the Transportation and Public Works Department provided a detailed survey of the river cross-sections and established checkpoints for future surveys. The group would support the program on an annual basis by providing annual survey services.

The Public Works Department was consulted on the potential operation and maintenance help with the equipment.

Parks and Recreation Group was consulted. The group is most interested in the rain data, which addition will be assessed as part of the first station.

CONCLUSION:

The new hydrometric equipment has been installed as per the work plan completed in 2021. Data collected will be used to support both Town's initiatives including the Town's Climate Change Adaptation Plan and regional's initiatives including Sixteen Mile Creek Floodplain mapping. Town staff will continue to assess the program and evaluate if future upgrades are required. A copy of this report will be forwarded to the Region of Halton, Conservation Halton, Credit Valley Conservation, Grand River Conservation, Town of Milton, Town of Oakville, City of Mississauga, and the Ministry of the Environment, Conservation and Parks.

Reviewed and approved by,

Jeff Jelsma, Director of Development Engineering

Bill Andrews, Commissioner of Transportation & Public Works

Chris Mills, Chief Administrative Officer