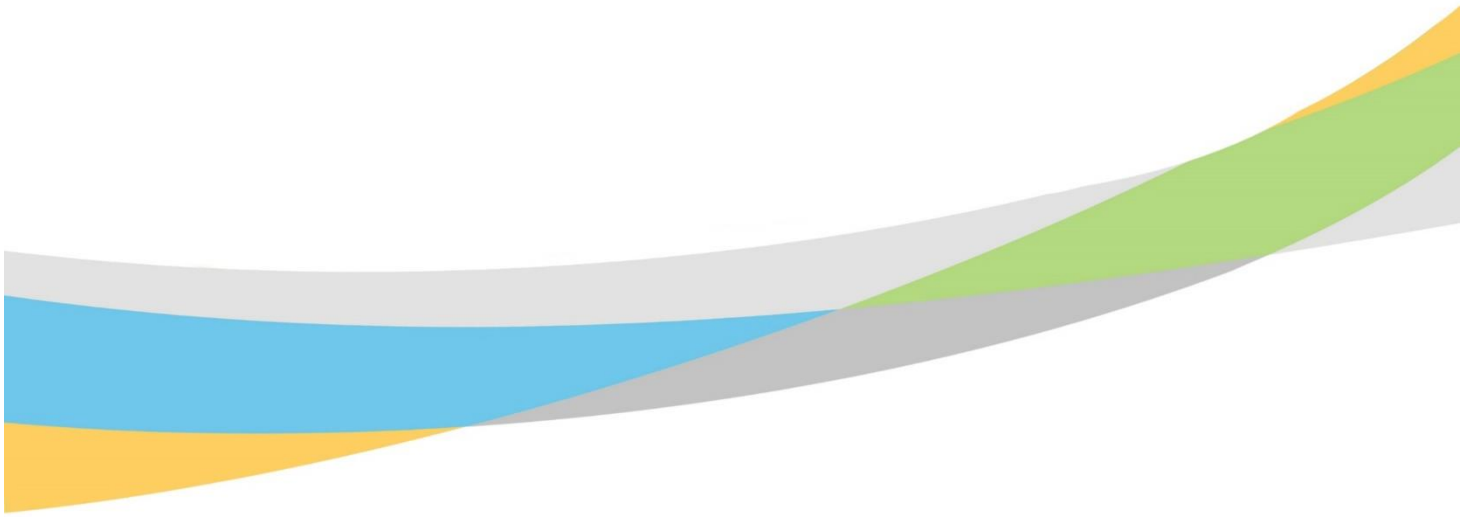

Toronto and Region Conservation Authority

2019 Annual Surface Water Quality Summary

Prepared by Environmental Monitoring and Data Management

April 2020

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1 Introduction

Since 2002, the Toronto and Region Conservation Authority (TRCA) has monitored stream water quality at selected locations within the watersheds in and around the Toronto region on a monthly basis. These activities have been undertaken as part of TRCA's Regional Watershed Monitoring Program (RWMP) in partnership with the Ministry of the Environment, Conservation and Parks (MECP) and the City of Toronto. The data collected are shared with partner municipalities and other external agencies. The results are used for planning, implementation and reporting activities including the development of watershed plans and report cards as well as watershed characterization reports in support of source water protection planning.

This report presents results for selected parameters from the 2019 surface water quality sampling. It provides a general overview and description of the range of water quality conditions across the TRCA jurisdiction during 2019. Results include data collected as part of the Provincial Water Quality Monitoring Network (PWQMN) and RWMP. This report and associated data can assist in identifying areas of concern, elevated levels of contaminants and can be used to affirm both poor and good water quality in different land use areas. The 2019 results should be interpreted with caution since water quality samples were collected independent of precipitation, and one year of data is insufficient to represent normal conditions at stations and watersheds. For example, 12 monthly samples from one site may be biased towards baseflow or stormwater runoff conditions. The 2011-2015 Surface Water Quality Summary report should be used as the most recent characterization of stream water quality across the region (TRCA 2017).

2 Methods

Surface water quality samples were collected at 47 stations throughout the TRCA's jurisdiction in 2019 (Figure 1). Thirteen stations were sampled by TRCA under the MECP's PWQMN and 34 stations were sampled by TRCA for the RWMP.

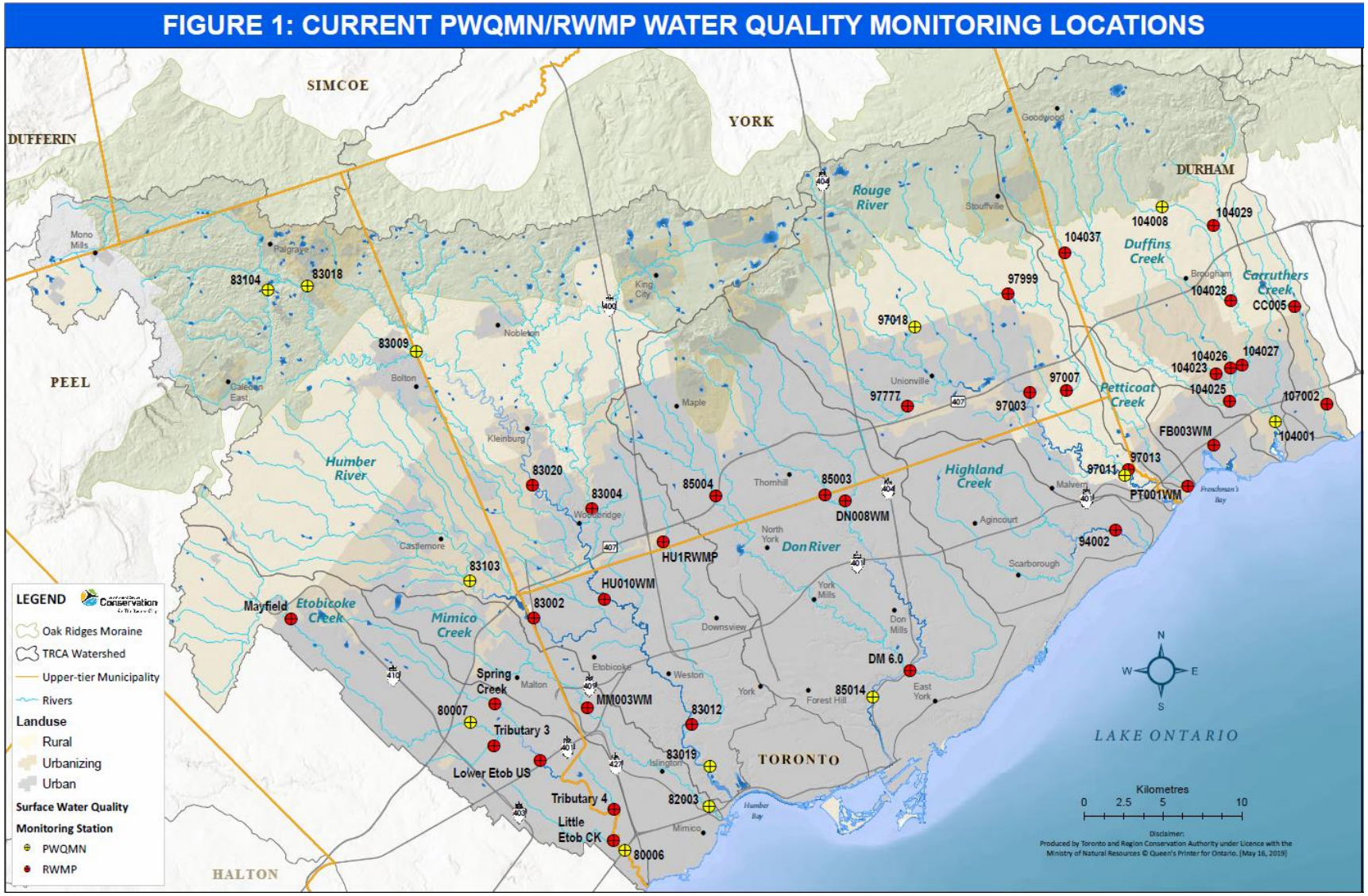

Figure 1. Current PWQMN/RWMP water quality monitoring locations 2019

Monthly samples were collected using in-stream "grab" techniques following the MECP PWQMN protocol (MECP 2020) and also included in-situ measurements (e.g. water temperature, pH and dissolved oxygen) collected using a hand-held water quality multi-probe (YSI or ProDSS). Water quality samples were collected throughout the year, typically in the third week of each month, irrespective of precipitation. Samples from the 13 stations that are part of the PWQMN partnership were submitted to the MECP Rexdale Laboratory. The remaining samples from stations or months not included in the PWQMN (e.g. December to March) were submitted to the City of Toronto Dee Avenue Laboratory in order to augment water quality data from these stations, and to maintain a year-round dataset (Table 1). Starting in December 2019, the MECP requested that 14 parameters for stations 97018, 104008, 80007 and 83018 be sent to the MECP Rexdale Laboratory for analysis from December to March in an effort to increase the amount of winter water quality data. These parameters included alkalinity, dissolved inorganic carbon, dissolved organic carbon, chloride, conductivity, ammonia, nitrates, nitrite, pH, orthophosphate, total phosphorus, silicon, total suspended solids and total nitrogen. These sites would have been sent to the City of Toronto for analysis of these parameters between December and March but now only metals and *E. coli* are analyzed by the City of Toronto during these months.

The two laboratories analyzed a standard suite of nutrients, metals, microbiological and conventional water quality parameters (Table 2). The 16 parameters in boldface are those that were selected for discussion in this report including chloride, pH, total suspended solids as well as additional forms of nitrogen (ammonia+ammonium, nitrate, nitrite and total Kjeldahl nitrogen), *Escherichia coli* and several metals. These parameters provide a quick but comprehensive overview of the water quality at each station. Elevated concentrations of these parameters may point to natural and/or anthropogenic sources within the watershed.

The results for each parameter were compared to the Provincial Water Quality Objectives (PWQO) guidelines where applicable. The PWQOs are a set of numerical and narrative ambient surface water quality criteria that represent a desirable level of water quality. These guidelines were developed to protect all forms of aquatic life and all aspects of their aquatic life cycles during indefinite exposure to the water as well as protecting recreational water usage based on public health considerations and aesthetics (OMOEE 1994). When PWQO guidelines were not available, other objectives were used such as Canadian Water Quality Guidelines (CWQG; CCME 2007) and Recommended Water Quality Guidelines for the Protection of Aquatic Life under the Canadian Environmental Sustainability Indicators (CESI) Initiative (EC 2012). All laboratory results that were reported as less than the minimum detection limit (MDL) were set to the MDL value for the purposes of interpretation. Surface water quality data are maintained in a relational SQL database that is part of the TRCA's corporate database web applications. For the purpose of this report, no project sites and/or their associated wet event sampling were included (i.e. only data from the long-term monthly sample sites were included).

Water quality laboratory results for 2019 for each parameter are presented in box plots which summarize the distribution of values for each parameter over the course of the year (Figure 2). Box plot graphs display a range of results where the majority (50%) of results are located within the box section. The ends of the boxes represent the 25th and 75th quartiles and the difference between the quartiles is the interquartile range. The line across the middle of the box identifies the median sample value. Box plot graphs use median values because annual mean values can be skewed by one or two high values. The "whiskers" above and below the box represent the range of data plus or minus 1.5 times the interquartile range, excluding extreme values.

Water quality stations are arranged along the x-axis of each graph from upstream to downstream (left to right) and grouped into watersheds which are arranged from west to east.

Table 1. TRCA surface water quality stations, associated laboratories and Environment Canada precipitation stations

Station	Watershed	Subwatershed	UTM Coordinates		Precipitation	Laboratory	
			Northing	Easting	Station	Dec-Mar	Apr-Nov
Mayfield	Etobicoke	Upper Etobicoke	4843488	595028	Pearson	TOR	TOR
80007	Etobicoke	Upper Etobicoke	4836746	606933	Pearson	TOR*	MECP
Tributary 3	Etobicoke	Tributary 3	4835477	607825	Pearson	TOR	TOR
Spring Creek	Etobicoke	Spring Creek	4838157	607990	Pearson	TOR	TOR
Lower Etob US	Etobicoke	Etobicoke Main	4834442	610933	Pearson	TOR	TOR
Little Etob CK	Etobicoke	Little Etobicoke	4829577	615520	Pearson	TOR	TOR
Tributary 4	Etobicoke	Tributary 4	4831543	615546	Pearson	TOR	TOR
80006	Etobicoke	Lower Etobicoke	4829016	616234	Pearson	MECP	MECP
MM003WM	Mimico	Lower Mimico	4837916	613849	Pearson	TOR	TOR
82003	Mimico	Lower Mimico	4831713	621585	Pearson	MECP	MECP
83104	Humber	Main Humber	4864112	593560	Pearson	TOR	MECP
83018	Humber	Main Humber	4864329	595961	Pearson	TOR*	MECP
83009	Humber	Main Humber	4860243	602980	Pearson	TOR	MECP
83103	Humber	West Humber	4845870	606385	Pearson	TOR	MECP
83020	Humber	Main Humber	4851861	610386	Pearson	TOR	TOR
83002	Humber	West Humber	4843562	610459	Pearson	TOR	TOR
83004	Humber	East Humber	4850423	614148	Pearson	TOR	TOR
HU010WM	Humber	Lower Main	4844744	615027	Pearson	TOR	TOR
HU1RWMP	Humber	Black Creek	4848311	618678	Pearson	TOR	TOR
83012	Humber	Black Creek	4836845	620488	Pearson	TOR	TOR
83019	Humber	Lower Main	4834265	621663	Pearson	MECP	MECP
85004	Don	Upper West	4851207	622014	Pearson	TOR	TOR
85003	Don	Upper East	4851256	628954	Pearson	TOR	TOR
DN008WM	Don	German Mills	4850889	630236	Pearson	TOR	TOR
85014	Don	Lower Don	4838576	632000	Pearson	MECP	MECP
DM 6.0	Don	Taylor/Massey	4840251	634378	Pearson	TOR	TOR
94002	Highland	Main Highland	4849056	647429	Pearson	TOR	TOR
97777	Rouge	Middle Rouge	4856823	634214	Pearson	TOR	TOR
97018	Rouge	Bruce Creek	4861770	634680	Pearson	TOR*	MECP
97999	Rouge	Little Rouge	4863887	640589	Pearson	TOR	TOR
97003	Rouge	Lower Rouge	4857669	641985	Pearson	TOR	TOR
97007	Rouge	Little Rouge	4857816	644300	Pearson	TOR	TOR
97011	Rouge	Lower Rouge	4852511	648007	Pearson	MECP	MECP
97013	Rouge	Little Rouge	4852830	648243	Pearson	TOR	TOR
PT001WM	Petticoat	Lower Petticoat	4851804	652005	Pearson	TOR	TOR
FB003WM	Frenchman's	Frenchman's	4854151	653659	Pearson	TOR	TOR
104037	Duffins	West Duffins	4866462	644191	Pearson	TOR	TOR
104008	Duffins	East Duffins	4869299	650372	Pearson	TOR*	MECP
104029	Duffins	East Duffins	4868158	653641	Pearson	TOR	TOR
104028	Duffins	East Duffins	4863433	654742	Pearson	TOR	TOR
104023	Duffins	Ganatsekiagon	4858867	653796	Pearson	TOR	TOR
104026	Duffins	Urfe Creek	4859199	654730	Pearson	TOR	TOR
104025	Duffins	West Duffins	4857115	654656	Pearson	TOR	TOR
104027	Duffins	East Duffins	4859419	655458	Pearson	TOR	TOR
104001	Duffins	Lower Main	4855880	657579	Pearson	MECP	MECP
CC005	Carruthers	Carruthers	4863072	658808	Pearson	TOR	TOR
107002	Carruthers	Carruthers	4856972	660850	Pearson	TOR	TOR

*TOR only for metals and *E.coli* starting in Dec 2019. MECP for others.

Table 2. Standard suite of water quality parameters analyzed by City of Toronto and MECP laboratories. The results of the 16 parameters in boldface are discussed in this report

General Chemistry	Nutrients & Microbiological	Metals
Alkalinity	**Total ammonia**	**Aluminium**
Biochemical Oxygen Demand	***Nitrate (2.93 mg/L)**	**Arsenic (5 µg/L)**
Calcium	***Nitrite (0.06 mg/L)**	Barium
***Chloride (120 mg/L; 640 mg/L)**	**Nitrogen, Total Kjeldahl**	Beryllium
Conductivity	Phosphate	Cadmium
Dissolved Oxygen	***Total Phosphorus (0.03 mg/L)**	Chromium
Hardness	***E. coli* (100 CFU/100mL)**	Cobalt
Magnesium		***Copper (5 µg/L)**
pH (between 6.5 and 8.5)		**Iron (300 µg/L)**
Potassium		***Lead (5 µg/L)**
Sodium		Manganese
Total Dissolved Solids		Molybdenum
***Total Suspended Solids (30 mg/L)**		**Nickel (25 µg/L)**
Turbidity		Strontium
Water Temperature		Vanadium
		***Zinc (20 µg/L)**

Note: additional parameters may be analyzed on a site or project specific basis.
*PWQMN recommended indicator parameters

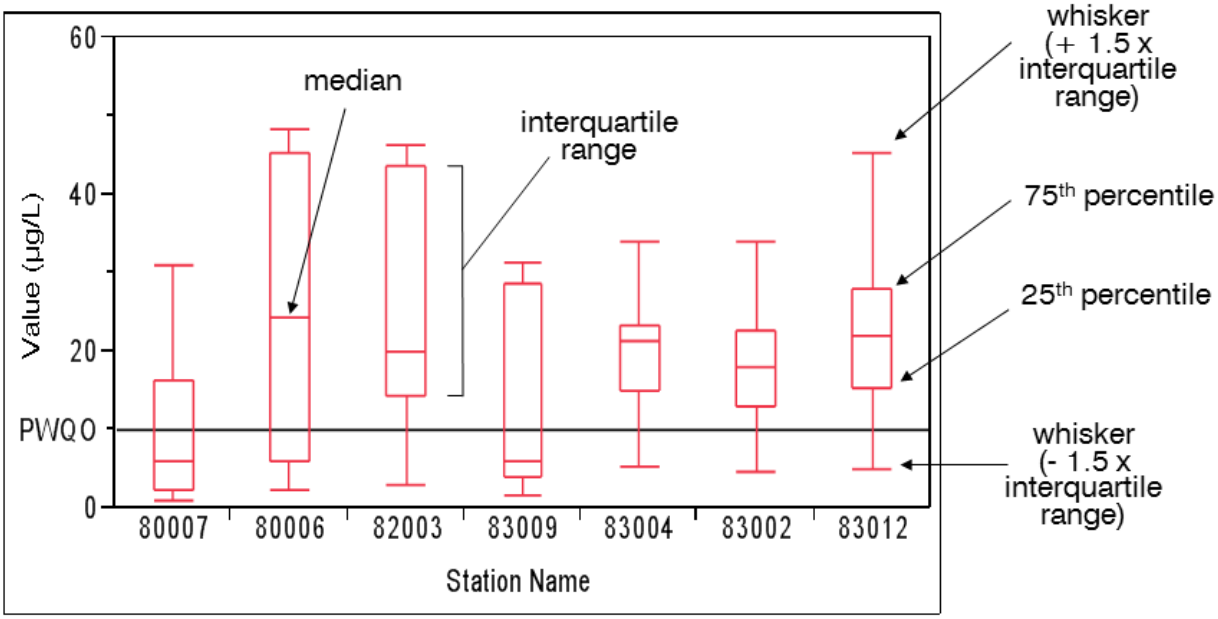

Figure 2. Box plot graphic example

Stream conditions were recorded at the time of sampling to help characterize the sample with respect to flow response to recent or occurring precipitation. These field notes (Appendix A) as well as 2019 precipitation data from Pearson International Airport were included in this report to provide context to assist with interpretation of results. Precipitation data from Buttonville Airport were used in past reports to characterize precipitation for several sites; however, data from Buttonville were not consistently available for 2019.

Daily precipitation data were downloaded from the Environment Canada National Climate Data and Information Archive website (http://climate.weather.gc.ca/). Precipitation data from the meteorological station at Pearson International Airport were used for all stations (Table 1). When determining whether samples were collected during precipitation events, both precipitation on the day of sampling as well as the day prior to sampling were used. Wet events were assumed if there was greater than 10 mm of rain or 10 cm of snow on the day prior to sampling and before 3 pm on the day the sample was obtained. Dry events were assumed when there was less than 10 mm of rain or 10 cm of snow on the day prior to sampling and before 3 pm on the day the sample was obtained.

The results of the 2019 data are intended to provide a general characterization of TRCA surface water quality conditions. Due to the small annual sample size (n=12) for each station, only one or two high values (e.g. storm events) are required to skew results upwards. Therefore, one year of data cannot be assumed to represent normal conditions in the TRCA jurisdiction. The 2019 results should be considered a general overview of conditions and description of ranges of water quality parameters at stations across the jurisdiction. For more informative interpretation of results the MECP recommends a minimum sample size of 30 samples per station (or 2.5 years of monthly data) to reduce the influence of unusual conditions such as spills, extreme runoff events and drought (OMOEE 2003). The results of the 2011-2015 Surface Water Quality report (TRCA 2017) provides sufficient sample sizes to characterize conditions at stations, watersheds and across the jurisdiction, and can be considered the most current representation of typical conditions within the jurisdiction.

3 Results

3.1 Precipitation

The jurisdictional precipitation discussed in this section was from Environment Canada's Pearson Airport meteorological station. In 2019, rainfall was above average. The total amount of precipitation recorded in 2019 was 950 mm, which is 106 mm above the 18-year average of 844 mm (Figure 3).

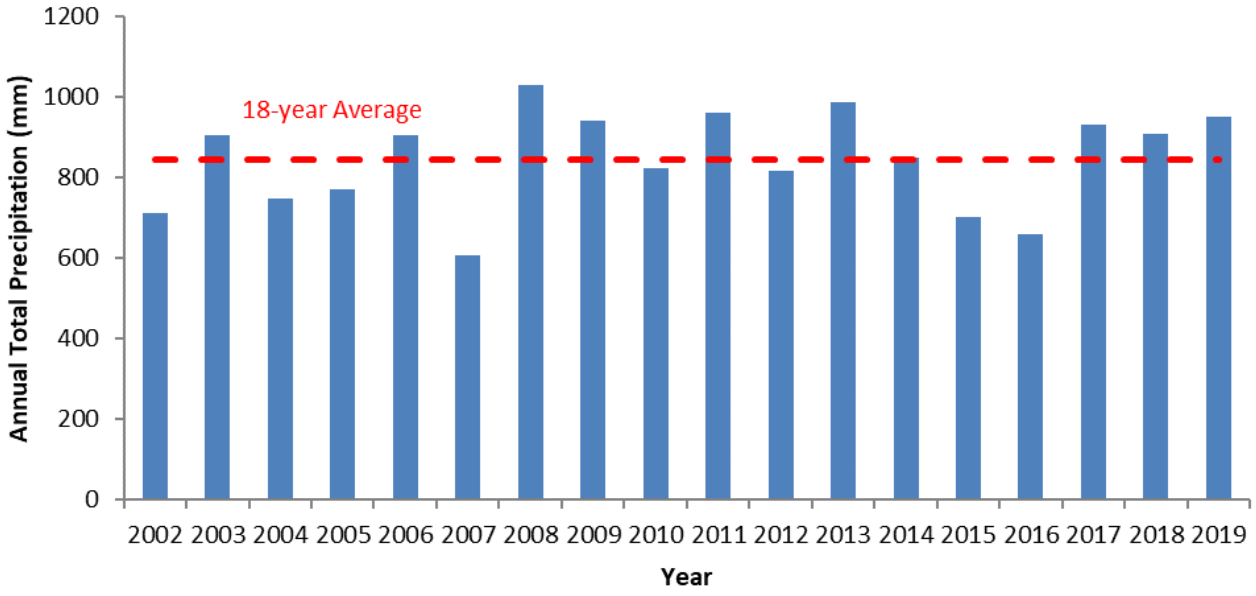

Figure 3. Annual precipitation for the TRCA jurisdiction from 2002 to 2019

To reduce the influence of annual variability in order to visualize longer term trends, 5-year moving averages of rainfall, snowfall and total precipitation were plotted (Figure 4). The data point for each year was an average of the previous five years. For example, the rainfall, snowfall and total precipitation values displayed in Figure 4 for the year 2002 were an average of values from 1998-2002. There was a significant increase in the 5-year moving averages for rainfall (p=0.003) and total precipitation (p=0.012) between 2002 and 2019 using the Mann-Kendall trend test. There was a significant decrease in the 5-year moving average for snowfall between 2002 and 2019 (p=0.015).

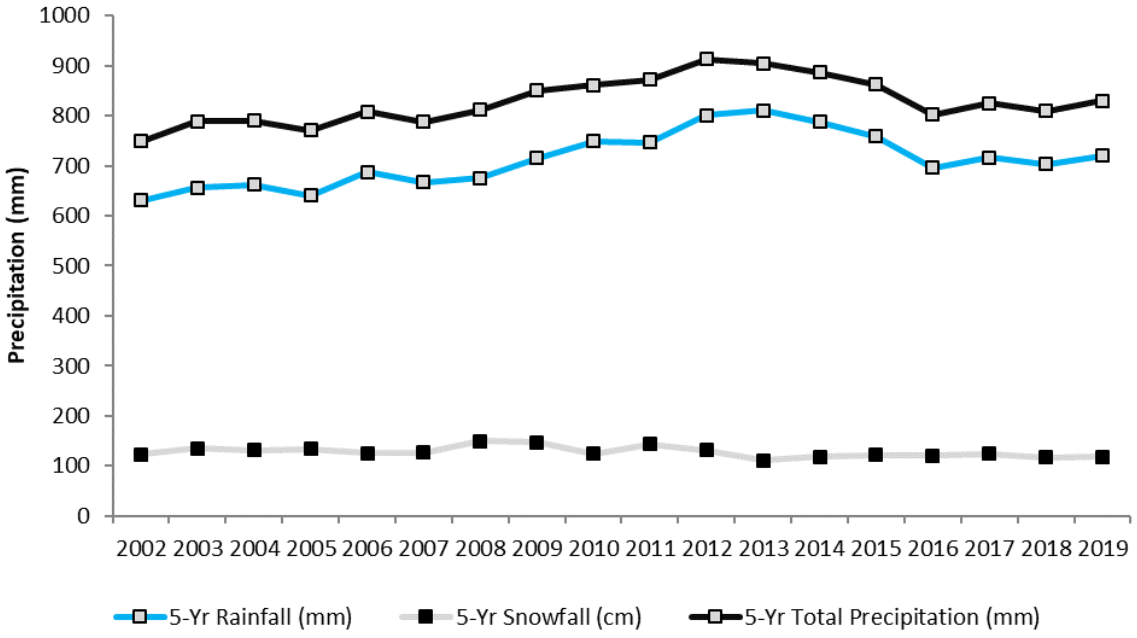

Figure 4. Five-year moving averages for rainfall, snowfall and total precipitation from 2002 to 2019

Figure 5 displays 2019 monthly precipitation and 18-year monthly precipitation averages. April, May, June, July and October had higher than average precipitation; however, every other month had lower than average precipitation. Stations may exhibit elevated concentrations of water quality parameters and pollutants as a result of high precipitation.

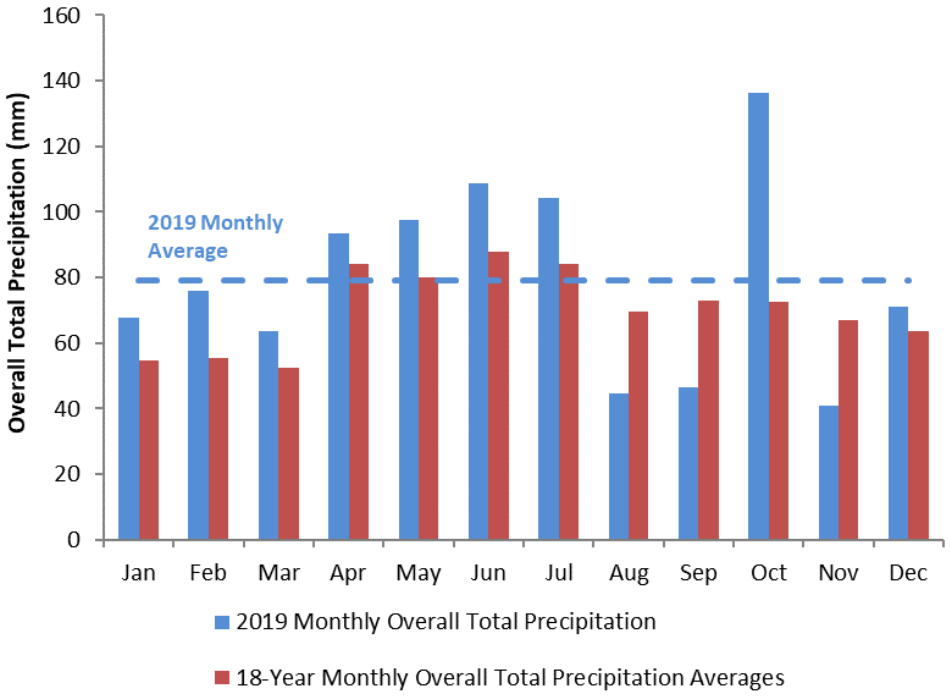

Figure 5. Monthly precipitation for 2019 compared to 18-year monthly precipitation averages

Snowfall in 2019 (164 cm) was above average (129 cm) while 2006, 2010, 2012 and 2015 showed snowfall well below average and only 2008 (253cm) showed snowfall amounts well above average (Figure 6).

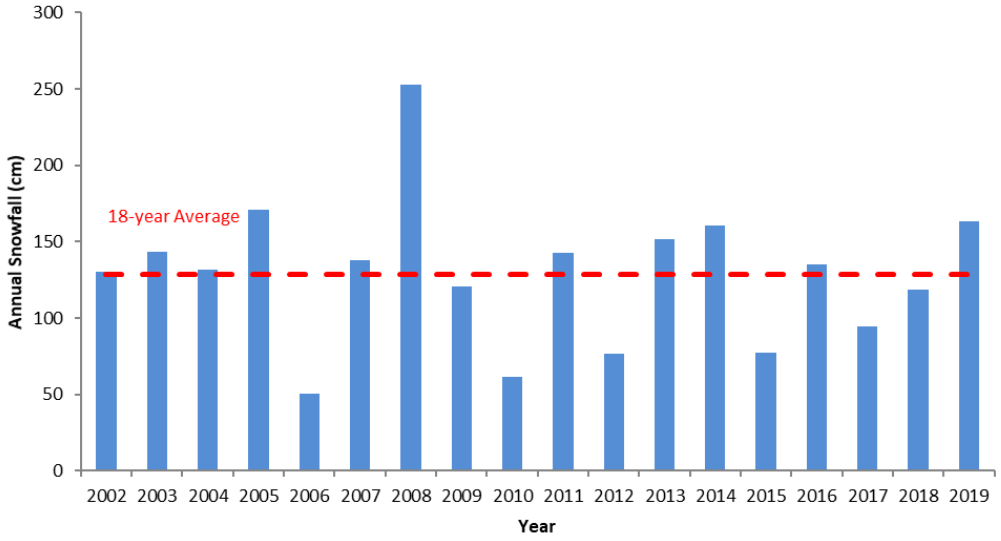

Figure 6. Annual snowfall from 2002 to 2019

Stations were sampled independent of precipitation; however, Environment Canada precipitation data from the day of and the day prior to sampling were used to calculate the percentage of wet and dry sampling events (Table 3). The annual total number of sampling events ranged from 433 in 2009 to 600 in 2013 and this is due to a general increase in the number of stations. Annual wet sampling events ranged from 9% in 2019 to 71% in 2011, with an average over the most recent five years of 22%. Dry events ranged from 29% in 2011 to 91% in 2019 and over the most recent five years averaged 78%.

Table 3. Wet and dry sampling events based on Environment Canada's Pearson Airport, from 2009 to 2014 and 2016 to 2019

Year	Wet Events	Dry Events	Total Events	Wet Event Percentage	Dry Event Percentage
2019	51	513	564	9.0	91.0
2018	177	387	564	31.4	68.6
2017	67	497	564	11.9	88.1
2016	60	504	564	10.6	89.4
2014	259	284	543	47.7	52.3
2013	355	245	600	59.2	40.8
2012	255	237	492	51.8	48.2
2011	349	143	492	70.9	29.1
2010	300	156	456	65.8	34.2
2009	252	181	433	58.2	41.8
Average	**212.5**	**314.7**	**527.2**	**41.7**	**58.3**

3.2 General Chemistry Parameters

3.2.1 Chloride

Chloride does not readily absorb onto mineral surfaces, and thus concentrations can be high in surface water and shallow aquifers, the latter releasing chloride throughout the year (CCME 2011). It can be toxic to aquatic organisms with acute toxic effects at high concentrations and chronic effects (on growth and reproduction) at lower concentrations (OMOE 2003). The CCME has two guidelines for chloride: acute, or short-term, and chronic, or long-term. The short-term guideline is 640 mg/L and the long-term guideline is 120 mg/L. A primary source of chloride is the application of road salt in winter months.

Station HU1RWMP in the Black Creek had the highest median chloride value (893 mg/L) while station 83009 in the upper reaches of the Main Humber River had the lowest median chloride value (37 mg/L; Figure 7). Most stations had concentrations above the chronic threshold except for stations in the upper Humber River, upper Rouge River and Duffins Creek watersheds. All stations in the Etobicoke Creek, Mimico Creek, Don River, Highland Creek, Petticoat Creek and Frenchman's Bay watersheds had chloride concentrations above the chronic threshold. Three stations had median chloride concentrations above the acute guideline meaning that most aquatic species will experience severe effects, including mortality, above this guideline. These stations included Tributary 3 and Little Etob CK in Etobicoke Creek, and HU1RWMP in the lower Black Creek.

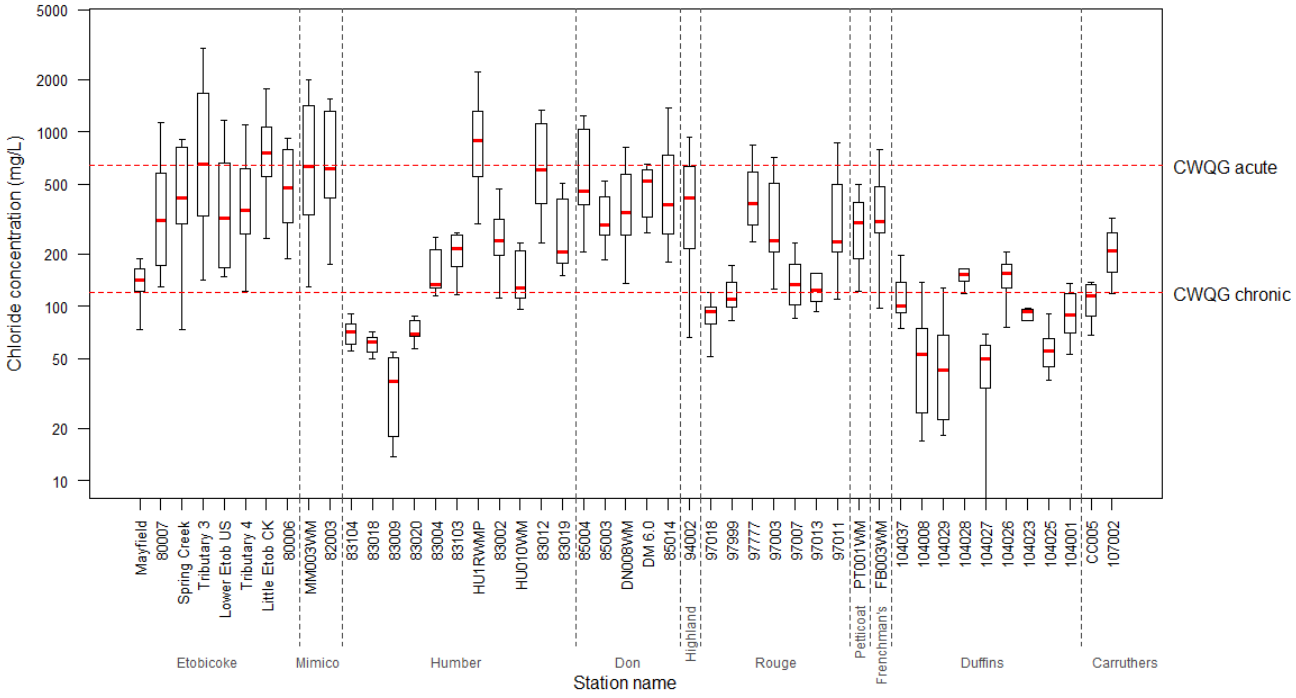

Figure 7. 2019 chloride concentrations (mg/L) at TRCA surface water quality monitoring stations (CWQG: long-term 120 mg/L (chronic) and short-term 640 mg/L (acute); CCME 2011)

3.2.2 Total Suspended Solids

Turbidity refers to the cloudiness of water due to suspended particles. Turbidity can be caused by stormwater runoff, erosion, increased stream flow, as well as by construction and agriculture. Higher turbidity can increase the likelihood that bacteria are present (which can attach to the particles), block light from penetrating to lower depths negatively affecting species dependent upon such light, reduce the absorption of oxygen by fish gills and impair stream aesthetics. Suspended particles can cause abrasion on fish gills and reduce the amount and quality of spawning habitat. Toxic organics and metals often adhere to suspended solids and may become available to benthic fauna when the solids settle (CCME 2007). The amount of total suspended solids (TSS) increases with higher precipitation, stream flow, erosion and higher agricultural or urban land uses. The Canadian Water Quality Guidelines contain a narrative guideline for TSS: the maximum increase of TSS should be no more than 25 mg/L from background concentrations (with TRCA using a background TSS concentration of 5 mg/L determined using data from the jurisdiction; CCME 2002).

Median TSS values exceeded the CWQG of 30 mg/L at station 83020 in the middle Humber River watershed (Figure 8). This station, and several others, had a wide range of values indicating that some samples were collected during turbid conditions which could have been caused by precipitation events or an unidentified source of sediments.

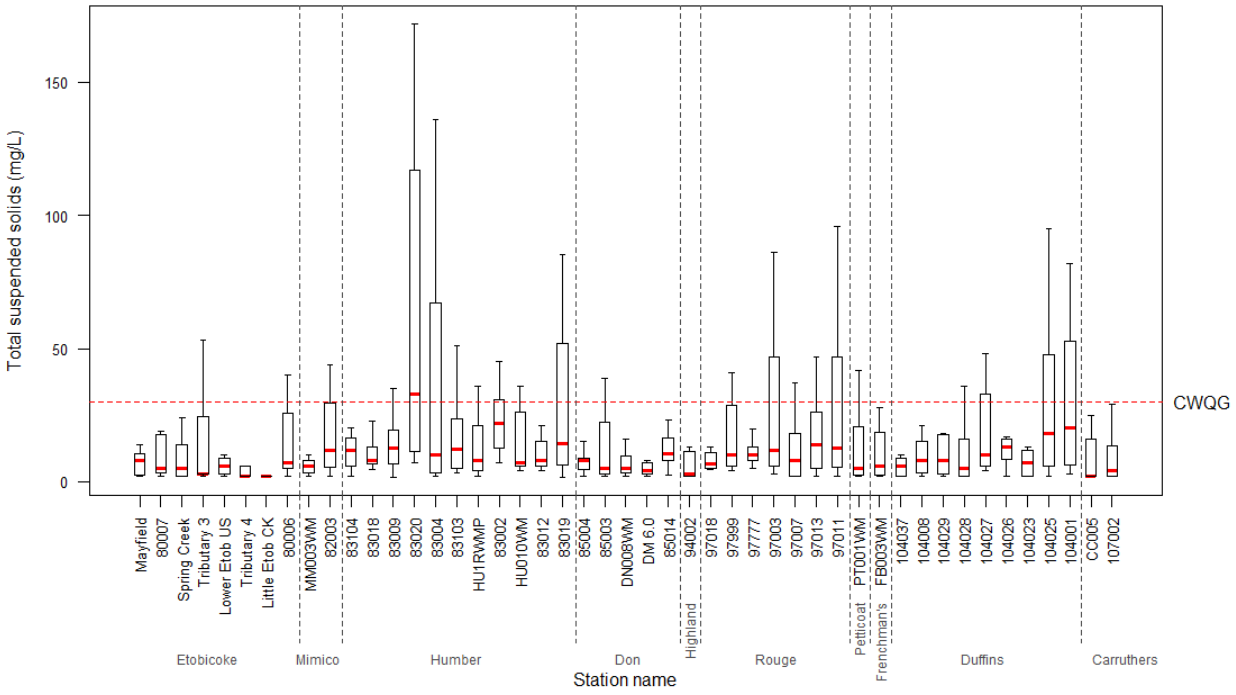

Figure 8. 2019 TSS concentrations (mg/L) at TRCA surface water quality monitoring stations (CWQG: 30 mg/L)

3.2.3 pH

pH is a measure of the acidity, neutrality or alkalinity of water. Fluctuations in pH can affect fish communities directly and indirectly by facilitating the release of organic and metal contaminants bonded to sediments. The pH of water also affects the toxicity of ammonia. Nutrient cycling, the discharge of industrial effluent and spills can result in pH fluctuations.

In 2019, no stations had median pH values that exceeded the upper PWQO guideline of 8.5 (Figure 9). The majority of stations exhibited limited variation in pH; however, station 83019 at the mouth of the Humber River displayed the greatest range of data values.

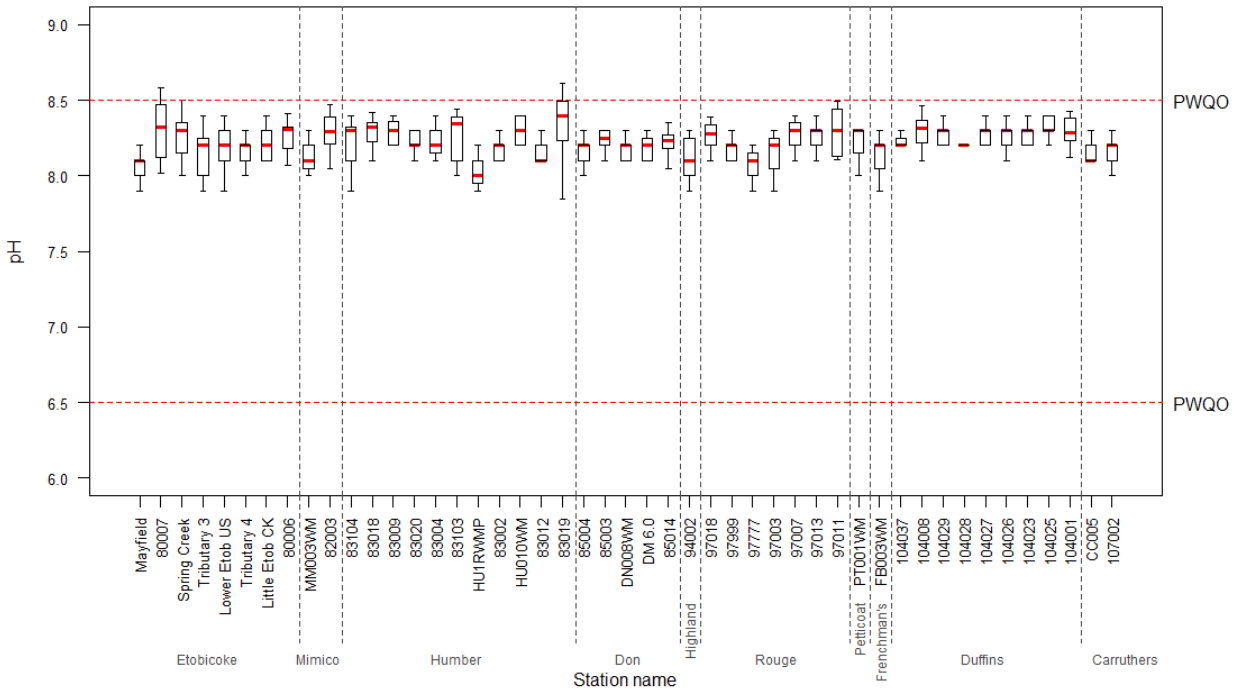

Figure 9. 2019 pH values at TRCA surface water quality monitoring stations (PWQO: 6.5-8.5)

3.3 Metals

Metals occur naturally in the environment usually in low concentrations. Industrial processes and increased stormwater runoff in urban areas can dramatically alter the distribution of metals and increase their concentration. High concentrations of metals can be toxic, cause disruptions to aquatic ecosystems and decrease the suitability of a waterbody to support aquatic life and supply water for domestic uses.

3.3.1 Aluminium

Since over 8% of the earth's crust is comprised of aluminium, the amount of aluminium in the environment from natural sources exceeds that from agriculture, industry and other anthropogenic sources. Acidic precipitation, poorly buffered soils and rapid spring snowmelts can increase concentrations of aluminium in streams (Wetzel 2001). Currently, there are no PWQO, CWQG or CESI guidelines which define the amount of allowable total aluminium for the protection of aquatic life.

In 2019, there was a wide degree of variation in aluminium concentrations although this is not unique to 2019 (Figure 10). The highest median aluminium value was at station 83002 on the West Humber River just south of the Claireville Reservoir. Four stations had noticeably large interquartile ranges and whiskers (83020 in the middle Humber River watershed, 83004 in the middle Humber, 83002, and HU010WM in lower main Humber River).

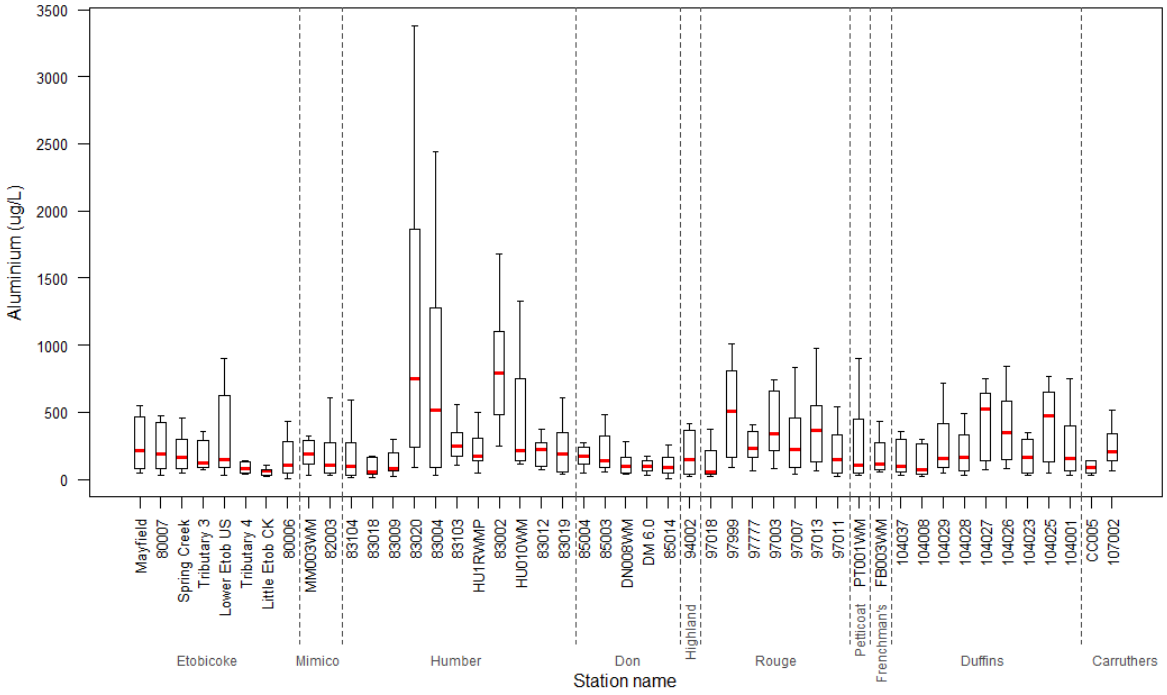

Figure 10. 2019 aluminium concentrations (ug/L) at TRCA surface water quality monitoring stations

3.3.2 Arsenic

The weathering of rocks and soils, and smelting and refining industries are sources of arsenic. Arsenic is an odourless, tasteless and toxic metal, for which the PWQO is 5 ug/L. Median arsenic concentrations at all stations in 2019 were well below the PWQO of 5 ug/L (Figure 11). Tributary 3 in the Etobicoke Creek watershed had the highest median arsenic concentration of 1.52 ug/L.

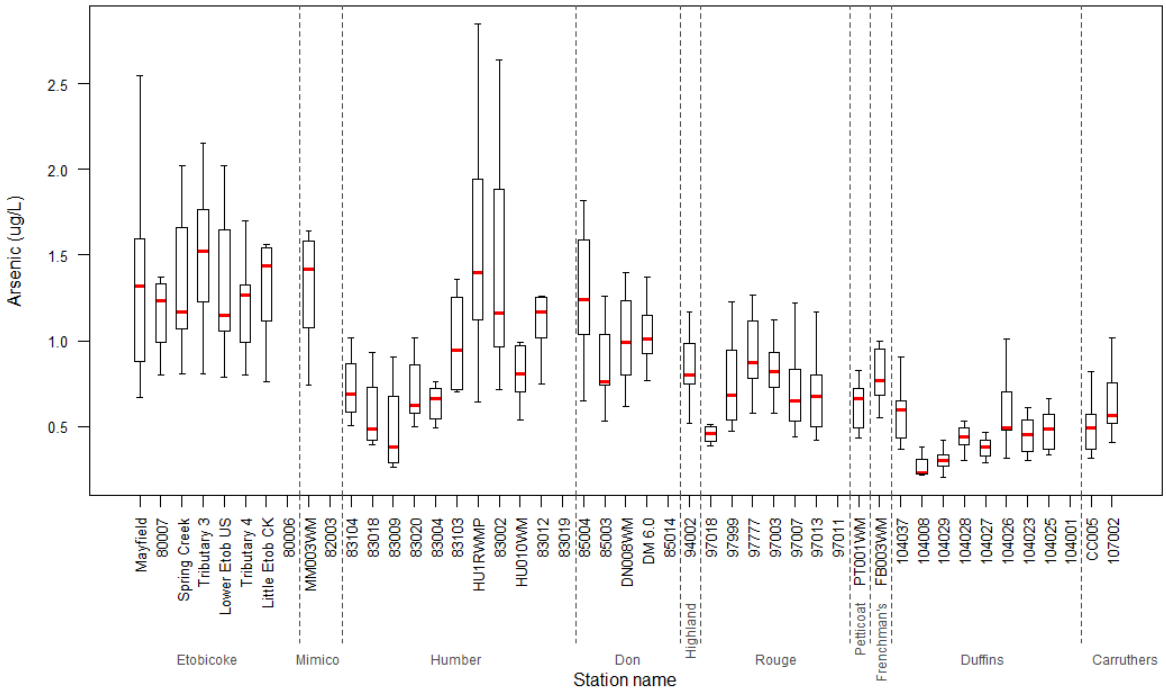

Figure 11. 2019 arsenic concentrations (ug/L) at TRCA surface water quality monitoring stations (PWQO: 5 ug/L)

3.3.3 Copper

Copper is a trace metal whose elevated concentrations are associated with urbanization. It may readily bind to soil particles (particularly organic matter) and is therefore relatively immobile. Anthropogenic sources of copper include textile manufacturing, paints, electrical conductors, plumbing fixtures and pipes, wood preservatives, pesticides, fungicides and sewage treatment plant effluent (OMOE 2003).

Median copper concentrations exceeded the PWQO guideline at station 82003 at the mouth of Mimico Creek. This station is located in the urbanized lower reaches of the Mimico Creek watershed.

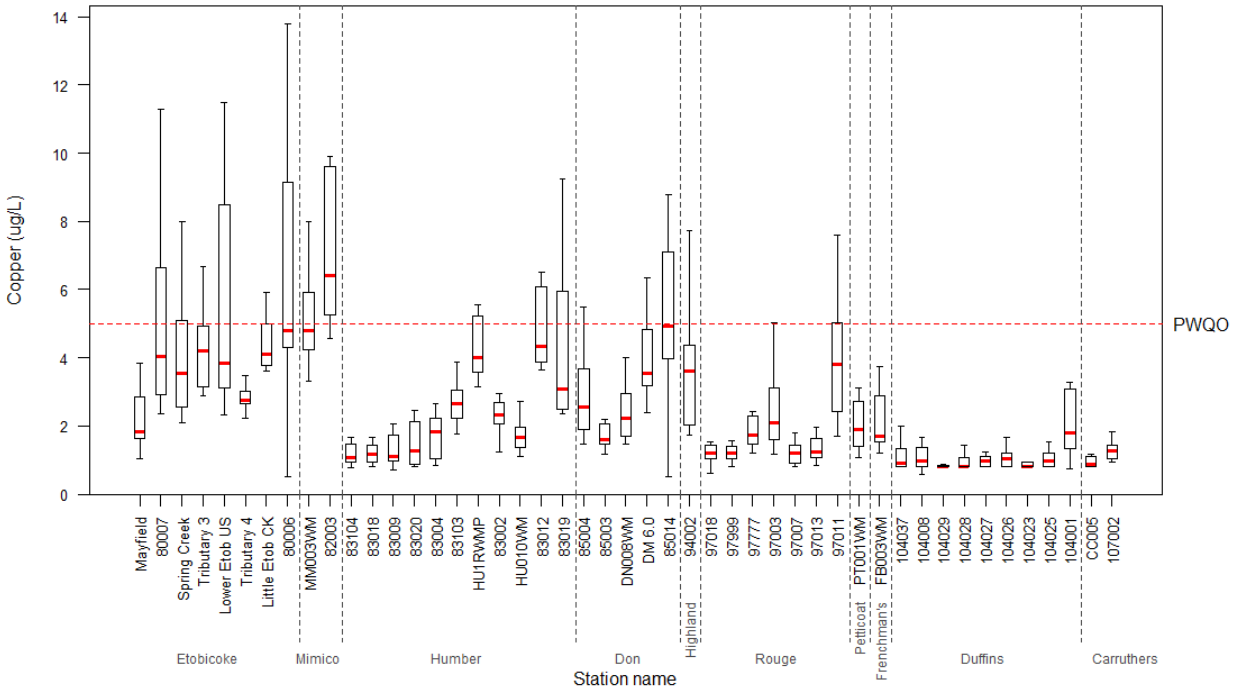

Figure 12. 2019 copper concentrations (ug/L) at TRCA surface water quality monitoring stations (PWQO: 5 ug/L)

3.3.4 Iron

Iron comes from various natural and anthropogenic sources in the environment. Natural sources include weathering of bedrock and anthropogenic sources include landfills, water purification and sewage treatment systems and pesticides and fertilizers (Dodson 2005). Iron is needed for proper ecosystem functioning as it is a necessary component of many biological processes for plants and animals; however, it can be toxic in higher concentrations (Dodson 2005).

Median iron concentrations for 11 of 47 stations in 2019 exceeded the PWQO of 300 ug/L (Figure 13). The highest median iron concentration was 498 ug/L at station 83002 on the West Humber Creek just south of the Claireville Reservoir. The lowest median iron concentration was 125 ug/L at station PT001WM on Petticoat Creek.

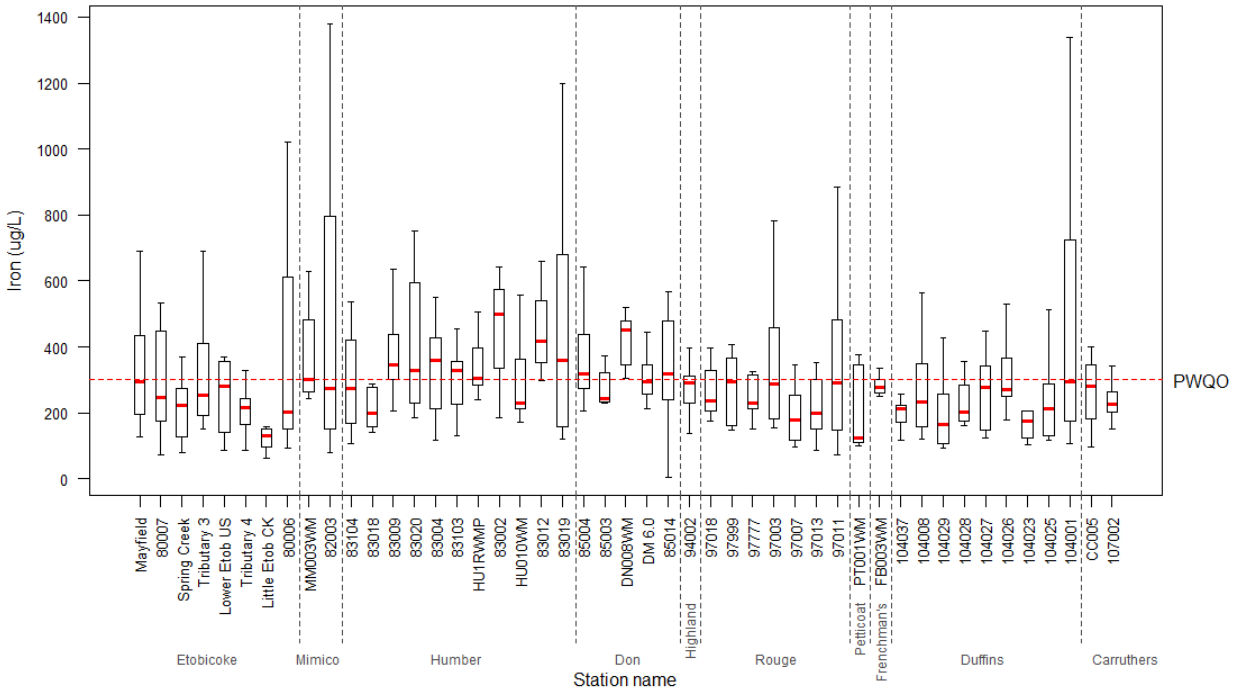

Figure 13. 2019 iron concentrations (ug/L) at TRCA surface water quality monitoring stations (PWQO: 300 ug/L)

3.3.5 Lead

Laboratory results for lead from the MECP were excluded from analysis because the MECP minimum detection limit (MDL) of 7 ug/L is much higher than the MDL for the City of Toronto (0.05 ug/L) and the PWQO of 5 ug/L. Lead results discussed here represent 41 stations whose samples were analyzed by the City of Toronto Dee Avenue laboratory.

All 41 stations had median lead concentrations well below the PWQO (Figure 14). Lower Etob US on the Etobicoke Creek in the lower Etobicoke watershed and station 83012 on the lower Black Creek had maximum lead concentrations above the PWQO (5.18 ug/L and 7.33 ug/L, respectively).

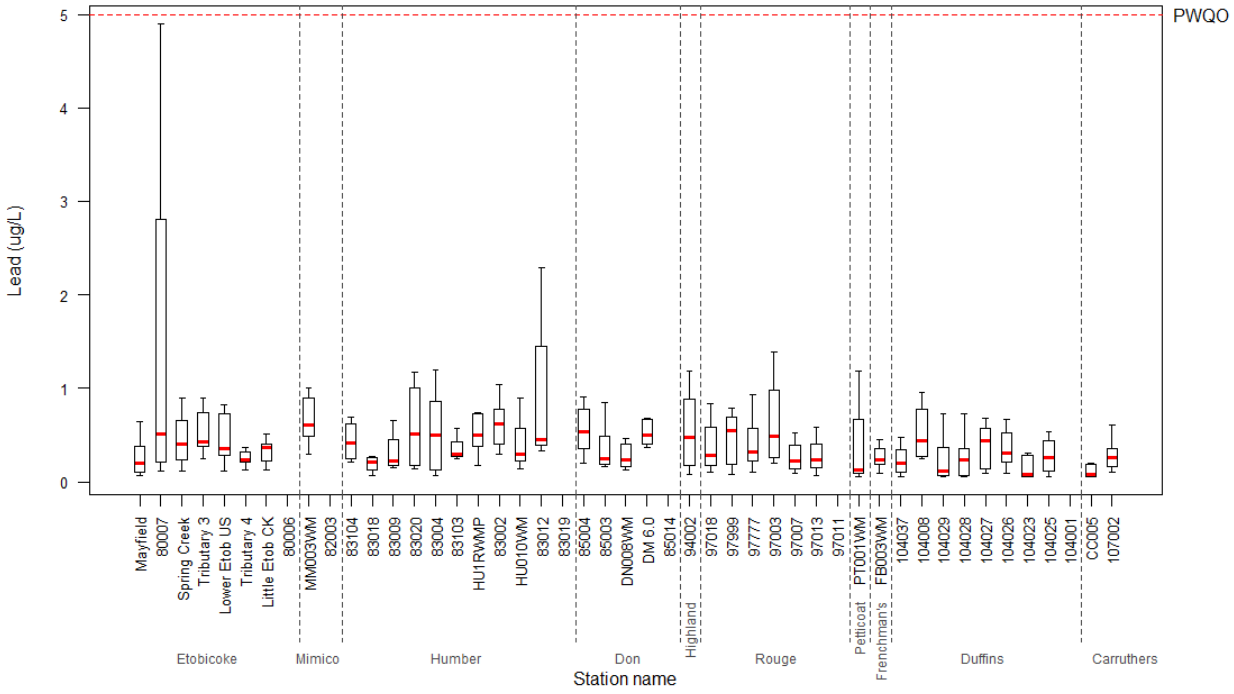

Figure 14. 2019 lead concentrations (ug/L) at TRCA surface water quality monitoring stations (PWQO: 5 ug/L)

3.3.6 Nickel

Due to a higher MDL, MECP laboratory results for 2019 were excluded and only City of Toronto results were analyzed. Median nickel concentrations were highest at stations Tributary 3 (1.48 ug/L) in Etobicoke Creek, MM003WM (1.46 ug/L) in middle Mimico Creek, HU1RWMP (1.25 ug/L) on the upper Black Creek and 83012 (1.66 ug/L) on the lower Black Creek. All stations were below the PWQO of 25 ug/L.

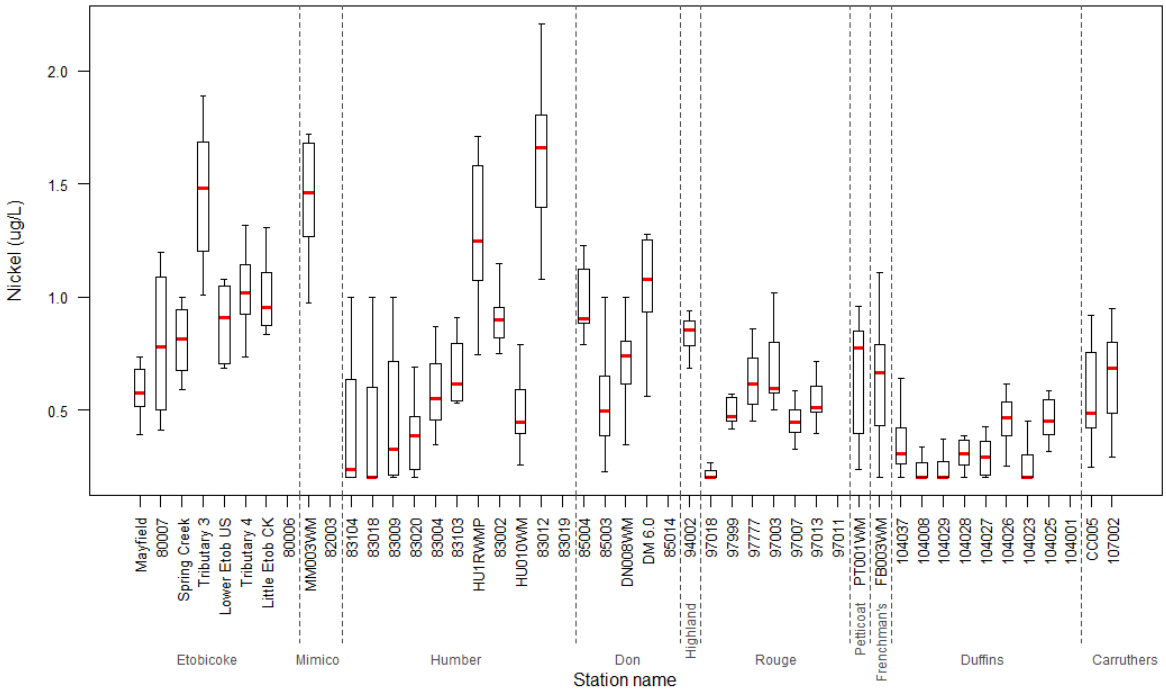

Figure 15. 2019 nickel concentrations (ug/L) at TRCA surface water quality monitoring stations (PWQO: 25 ug/L)

3.3.7 Zinc

Similar to other metals, the natural process of weathering makes zinc available in ecosystems. Anthropogenic sources include municipal wastewater, wood combustion, iron and steel production and waste incineration (OMOEE 2003).

The MDL for the City of Toronto laboratory was 10 ug/L and these appear as a straight line on the graph. Only station 82003 at the mouth of Mimico Creek had a median zinc concentration above the PWQO in 2019 (Figure 16). Zinc concentrations tended to be the lowest in the Humber River, Rouge River, Duffins Creek and Carruthers Creek watersheds.

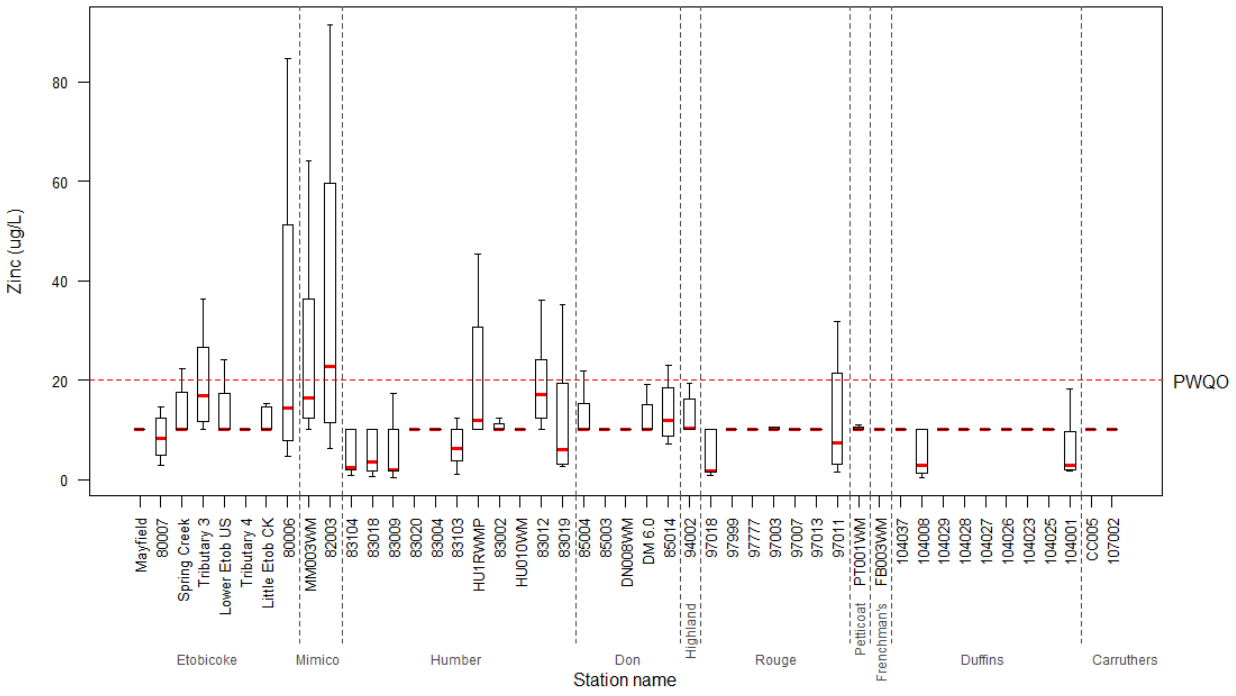

Figure 16. 2019 zinc concentrations (ug/L) at TRCA surface water quality monitoring stations (PWQO: 20 ug/L)

3.4 Bacteria

Escherichia coli are part of the coliform group of bacteria commonly found in the digestive systems of warm-blooded animals (Health Canada 2012). *E. coli* are used to indicate the presence of fecal contamination in water since it is not naturally found on plants or in soils and water. *E. coli* can affect human health by causing gastrointestinal illness and potentially more serious health problems (Health Canada 2012). *E. coli* levels may increase in urbanized areas due to inadequately designed combined sewer systems, illegal connections between storm and sanitary sewers and precipitation events that overflow those sewer systems (CCME 2003). Municipalities use *E. coli* as an indicator to ensure that drinking water and recreational bathing waters are safe; however, RWMP monitoring of *E. coli* levels in TRCA streams was designed to measure and track long-term watershed health.

Station 83012 on the lower Black Creek had the highest median *E. coli* count of 1500 CFU/mL (Figure 17). The lowest *E. coli* counts were generally found in the upper reaches of the watersheds, but tended to be generally low in the Duffins Creek and Carruthers Creek watersheds.

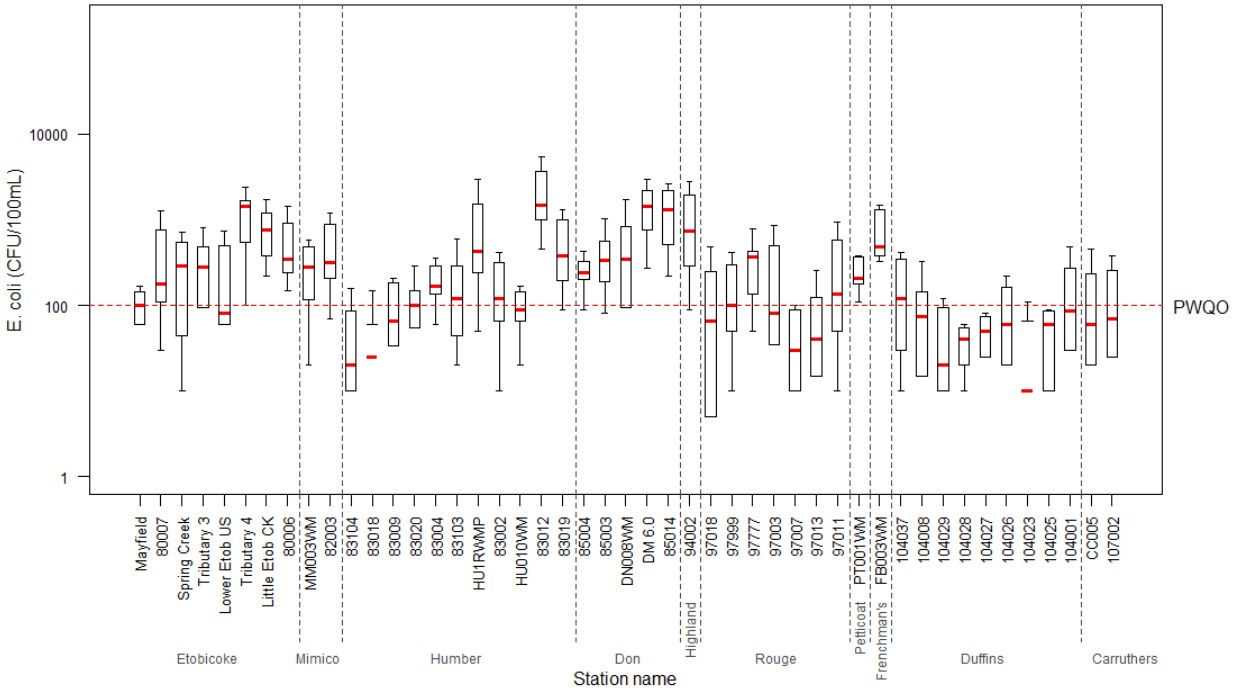

Figure 17. 2019 *E. coli* concentrations (CFU/100 mL) at TRCA surface water quality monitoring stations (PWQO: 100 CFU/100 mL)

3.5 Nutrients

Nitrogen and phosphorus are critical to plant and animal life and their concentrations determine the productivity of aquatic systems. Phosphorus is commonly the growth limiting nutrient in aquatic systems; however, if there are substantial phosphorus loadings, nitrogen becomes the limiting nutrient.

Nitrogen occurs in various forms such as nitrate, nitrite and ammonia. Nitrate is the most common form of nitrogen entering freshwater systems and is assimilated by plants. Upon the decomposition of plant matter, dissolved organic nitrogen is converted to ammonia, an energy-efficient source of nitrogen for plants (Dodson 2005). Bacteria convert ammonia into nitrate, nitrite and nitrogen. Nitrite is easily converted and rarely accumulates unless organic pollution is high (Wetzel 2001). Total Kjeldahl nitrogen (TKN) is a quantitative determination of nitrogen and ammonia that is required in the analysis of sewage treatment plant effluent.

Anthropogenic sources of nitrogen and phosphorus (agricultural fertilizer, animal wastes and municipal sewage) that move into aquatic systems can cause unusually high concentrations of these nutrients. This over-nutrition, or eutrophication, of aquatic environments can promote excessive plant and algae growth. Eutrophic lakes can be characterized by algal blooms which reduce recreational use and deplete oxygen levels to the detriment of other biota, especially fish. Excessive growth of aquatic plants in streams can cause dissolved oxygen concentrations to decrease during the night to levels that may not sustain certain aquatic species, as well as reduce the aesthetic appeal of the stream.

3.5.1 Ammonia

Currently, there are no PWQO, CWQG or CESI guidelines which define the amount of allowable total ammonia (ammonia + ammonium) for the protection of aquatic life. The highest median ammonia concentrations were at stations 85014 in the lower Don River (467 ug/L) and 83012 on the lower Black Creek (330 ug/L).

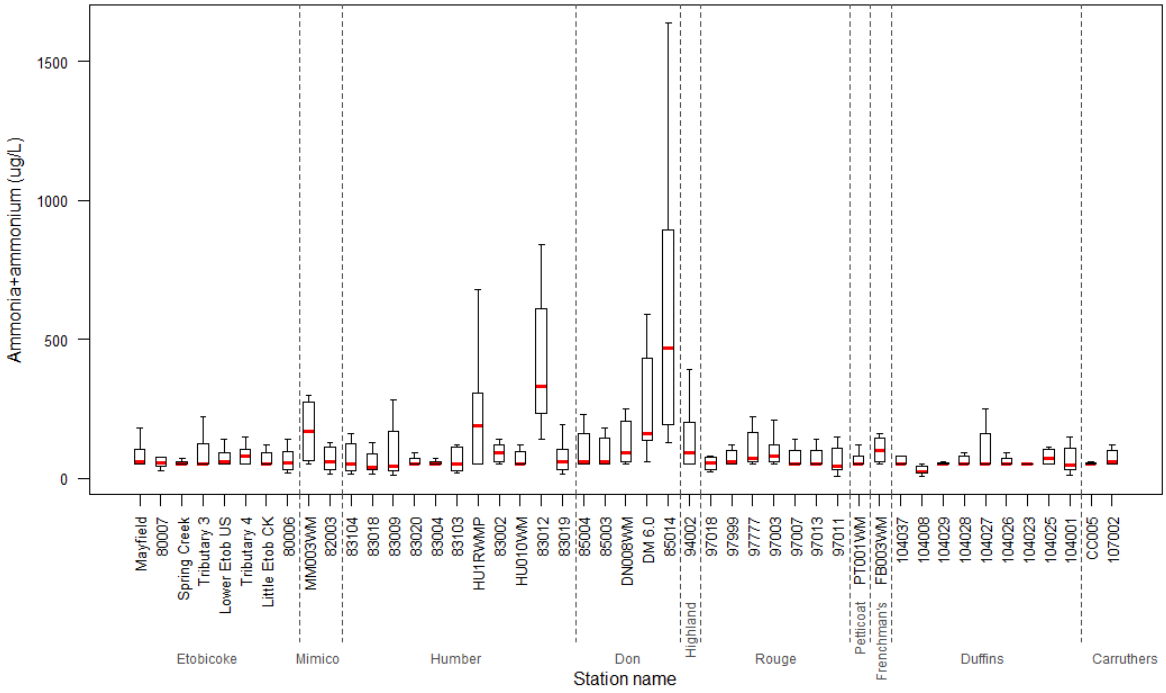

Figure 18. 2019 ammonia concentrations (ug/L) at TRCA surface water quality monitoring stations

3.5.2 Nitrate

There were no stations with median nitrate concentrations above the CWQG guideline of 2.93 mg/L (Figure 19). Stations DM 6.0 and 85014 in the Lower Don had the highest nitrate concentrations of 1.89 and 1.67 mg/L, respectively followed by Tributary 4 in Etobicoke Creek (1.66 mg/L).

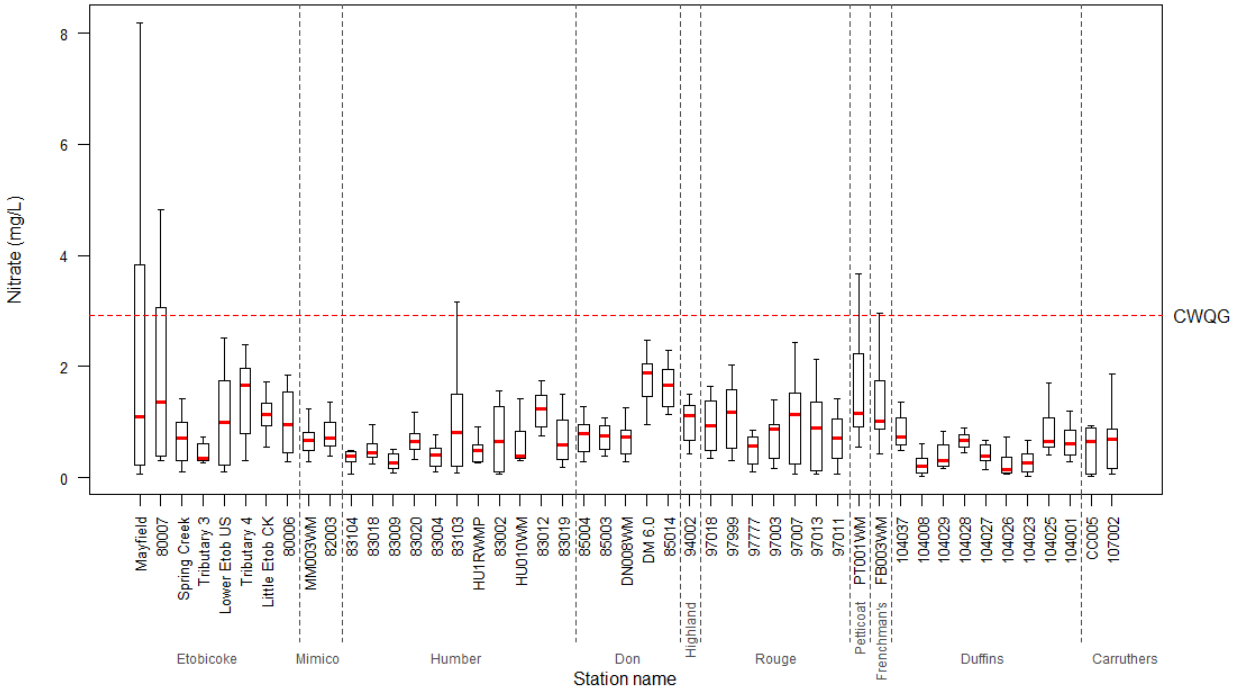

Figure 19. 2019 nitrate concentrations (mg/L) at TRCA surface water quality monitoring stations (CWQG: 2.93 mg/L)

3.5.3 Nitrite

Median nitrite concentrations exceeded the CWQG of 0.06 mg/L at station 85014 in the lower Don River watershed (Figure 20). Both station 83012 on the lower Black Creek and DM 6.0 on the lower Don River had interquartile ranges suggesting higher nitrite. The upper Humber River, Rouge River, Duffins Creek and Carruthers Creek watersheds had the lowest nitrite levels and Etobicoke Creek, Mimico Creek, lower Humber River and Don River had higher nitrite levels.

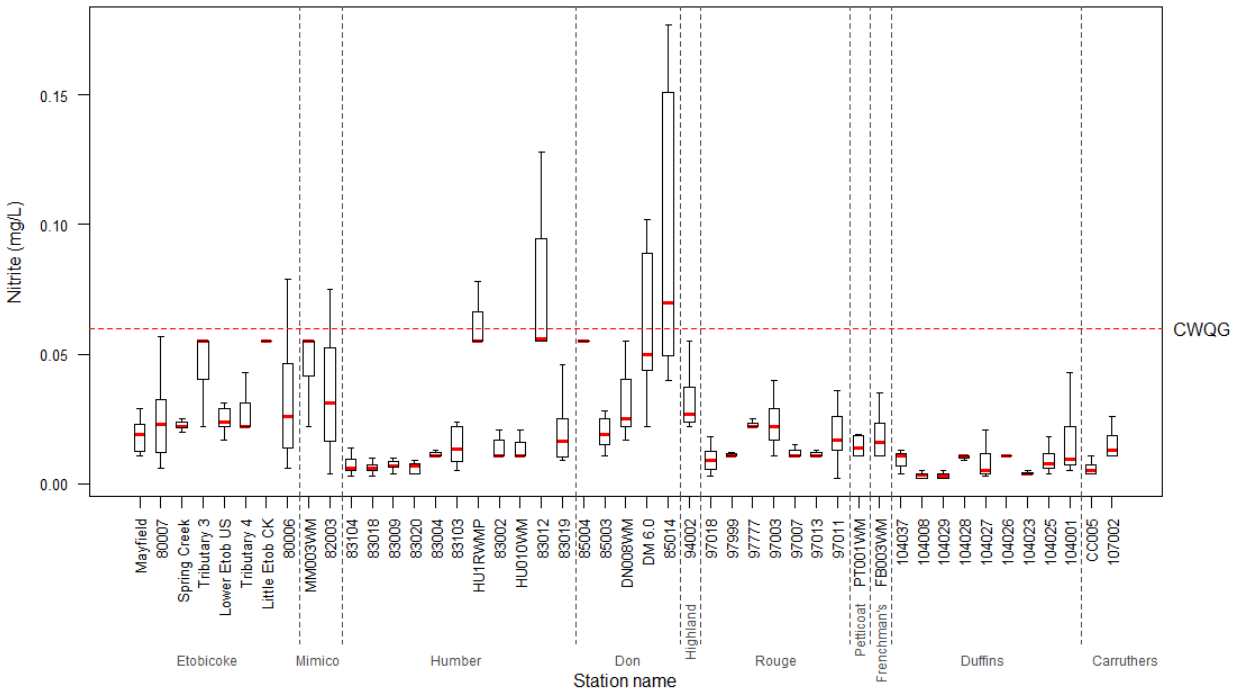

Figure 20. 2019 nitrite concentrations (mg/L) at TRCA surface water quality monitoring stations (CWQG: 0.06 mg/L)

3.5.4 Total Kjeldahl Nitrogen

The MECP stopped providing TKN values with its lab results in 2015 so there is a limited site list with missing values for stations analyzed year-round by the MECP laboratory (80006, 82003, 83019, 85014, 97011 and 104001). The highest median TKN concentrations were found at 97018 (1.57 mg/L) on Bruce Creek in the upper Rouge River watershed, 83012 (1.45 mg/L) on the lower Black Creek and 83103 (1.39 mg/L) on the west Humber River. The lowest median concentrations were found at station 104029 (0.53 mg/L) on Mitchell Creek in the east Duffins and 104023 (0.51 mg/L) on Ganateskiagon Creek in the lower Duffins Creek watershed.

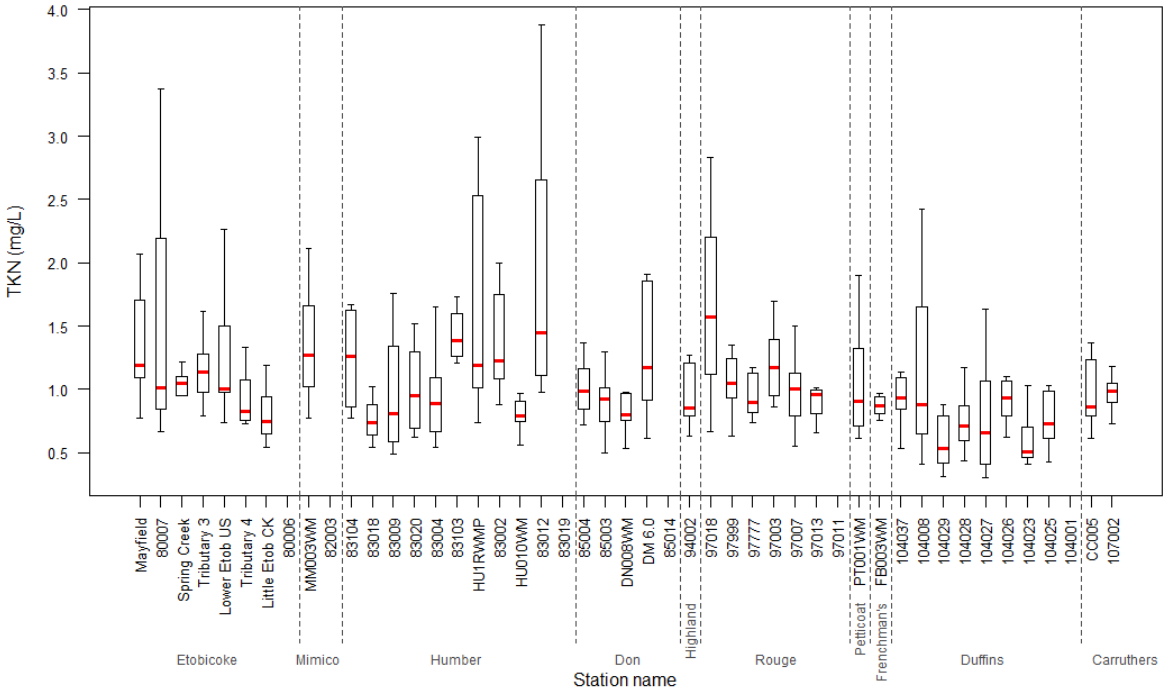

Figure 21. 2019 TKN concentrations (mg/L) at TRCA surface water quality monitoring stations

3.5.5 Phosphorus

Phosphorus readily binds to sediment particles and increases in phosphorus concentrations are typically associated with storm events and elevated levels of turbidity. The highest median phosphorus concentrations were at stations 85014 (0.123 mg/L) and DM 6.0 (0.144) in the lower Don River watershed (Figure 22). Forty-two stations had median phosphorus concentrations above the PWQO of 0.03 mg/L, and 5 stations were below the guideline.

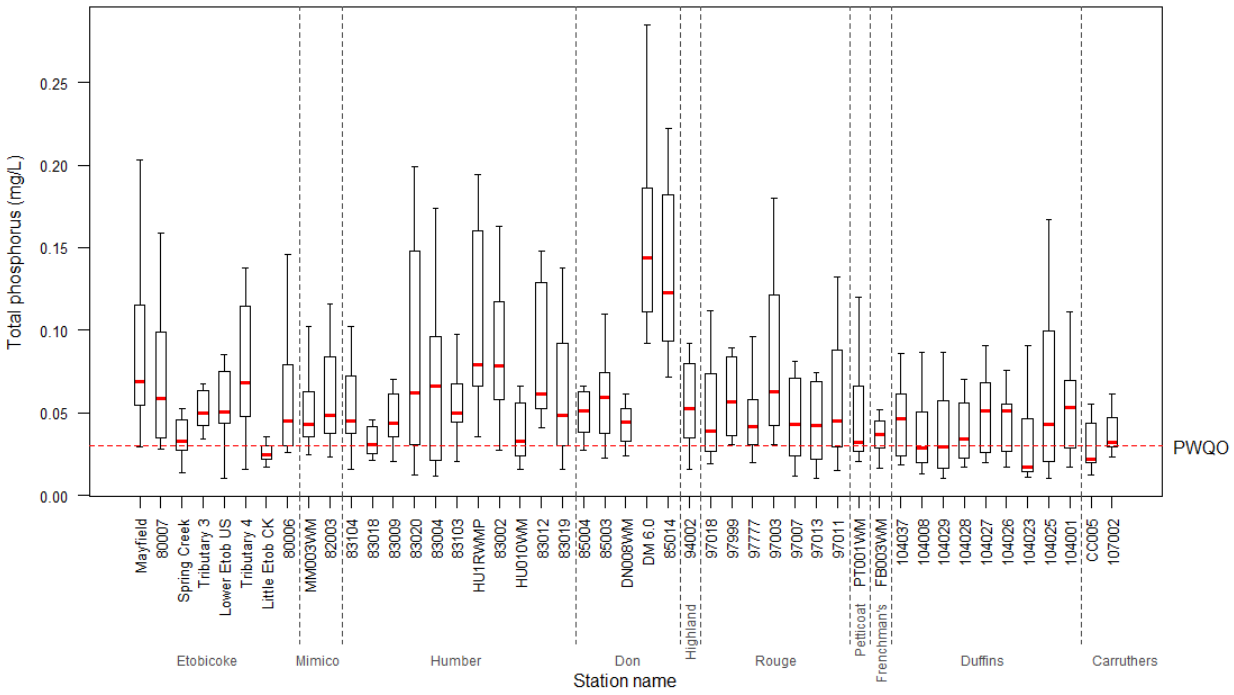

Figure 22. 2019 phosphorus concentrations (mg/L) at TRCA surface water quality monitoring stations (PWQO: 0.03 mg/L)

4 Summary

This report represents a summary assessment and characterization of 47 water quality stations based on 16 water quality parameters collected throughout 2019. Annual total precipitation in 2019 was above the 18-year average. Monthly precipitation in April, May, June, July and October was higher than the monthly 18-year average but all other months were lower. Snowfall in 2019 was above the 18-year average. Sampling was performed irrespective of precipitation, and it should be expected that levels of many of the parameters presented in this report would be higher when mobilized by storm events.

Chloride concentrations appear to be highest in areas of each watershed that are known to be urbanized. This observation has been supported in the literature and can also be specifically related to the Toronto region (Williams et al. 1999, Kaushal et al. 2005, Findlay and Kelly 2011). Stations with the highest chloride concentrations were in the Etobicoke, Mimico and lower Humber watersheds (Little Etob CK, Tributary 3, MM003WM, 82003, HU1RWMP). Stations with the lowest chloride concentrations were in the upper Humber River, upper Rouge River and Duffins Creek watersheds.

Stations with particularly high median concentrations of multiple metals include stations MM003WM and 82003 in the Mimico Creek watershed, most stations in the Etobicoke Creek watershed but particularly Tributary 3 and HU1RWMP and 83012 in the middle to lower Humber River watershed. Metals did not show clear and consistent patterns among stations and this could be due to the variability in the location of point-sources and/or temporal variation in when they are discharged. Arsenic and lead are two metals that are not required for biological activity and are toxic to aquatic organisms (Dodson 2005). Several stations had maximum arsenic values exceeding the PWQO of 5 ug/L including Spring Creek, Tributary 3 and Little Etob CK in the Etobicoke Creek watershed and MM003WM in the Mimico Creek watershed. Maximum lead values exceeded the PWQO of 5 ug/L at Lower Etob US on the Etobicoke Creek and 83012 on the lower Black Creek. Metals were consistently the lowest in the upper Humber River watershed and the upper Duffins Creek watershed.

Median nutrient and *E. coli* values were highest at stations DM 6.0 and 85014 in the lower Don River watershed and at station 83012 on the lower Black Creek. Station 85014 is downstream of the North Toronto Wastewater Treatment Plant and stations DM 6.0 and 83012 are in the lower Don River and Humber River watersheds, respectively. The upper Humber River, Duffins Creek and Carruthers Creek watersheds had the lowest median nutrient concentrations and *E. coli* counts. The upper Rouge River watershed also had low nutrients and *E. coli* in general; however, nitrate concentrations were higher and compared more closely to the Etobicoke Creek watershed with moderate concentrations.

Overall, stations in areas known to be more heavily urbanized or industrialized had poorer water quality with higher concentrations of chloride, metals, nutrients and *E. coli*. Stations in watersheds with less urbanization/industry or in more rural areas of watersheds tended to have better water quality with lower concentrations of chloride, metals, nutrients and *E. coli*. Stream water quality varied across the Toronto region and demonstrates the diversity of land uses and point-sources affecting streams and potential opportunities for further investigation, remediation/restoration and protection.

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6 Appendix

6.1 Appendix A. Water quality stream conditions from field notes for 2019

Station	January	February	March	April	May
80006	PARTIAL FROZEN, HIGH TURBID		CLEAR	CLEAR, HIGH SLIGHTLY	CLEAR, HIGH SLIGHTLY
80007	FROZEN, CLEAR	PARTLY FROZEN, TURBID SLIGHTLY, OIL SHEEN IN WATER	CLEAR	SLIGHTLY HIGH & TURBID	TURBID, HIGH SLIGHTLY
82003	PARTIAL FROZEN, HIGH TURBID		CLEAR	TURBID, HIGH SLIGHTLY	
83002	FROZEN, CLEAR	PARTLY FROZEN, HIGH SLIGHTLY, TURBID SLIGHTLY	TURBID/HIGH SLIGHTLY	TURBID, HIGH SLIGHTLY	TURBID, HIGH
83004	FROZEN, CLEAR	PARTLY FROZEN, HIGH SLIGHTLY, TURBID SLIGHTLY	TURBID	HIGH & TURBID	HIGH, TURBID SLIGHTLY
83009	PARTIALLY FROZEN, HIGH SLIGHTLY, SLIGHT TURBID	PARTLY FROZEN	TURBID SLIGHTLY	TURBID SLIGHTLY, HIGH SLIGHTLY	CLEAR, HIGH SLIGHTLY
83012	TURBID, HIGH	SLIGHTLY TURBID, HIGH SLIGHTLY	TURBID SLIGHTLY/HIGH SLIGHTLY	CLEAR, HIGH SLIGHTLY	CLEAR, HIGH SLIGHTLY
83018	PARTIALLY FROZEN, HIGH SLIGHTLY, SLIGHT TURBID	FROZEN	TURBID SLIGHTLY	TURBID SLIGHTLY, HIGH SLIGHTLY	CLEAR, HIGH SLIGHTLY
83019	FROZEN, CLEAR		TURBID	SLIGHTLY TURBID, HIGH SLIGHTLY	CLEAR, HIGH SLIGHTLY
83020	PARTIAL FROZEN, CLEAR	PARTLY FROZEN, HIGH SLIGHTLY, TURBID SLIGHTLY	TURBID	HIGH & TURBID	TURBID, HIGH
83103	PARTIALLY FROZEN, SLIGHTLY HIGH, TURBID SLIGHTLY	PARTLY FROZEN	TURBID SLIGHTLY/HIGH SLIGHTLY	TURBID SLIGHTLY	CLEAR, HIGH SLIGHTLY
83104	PARTIALLY FROZEN, SLIGHTLY HIGH, TURBID SLIGHTLY	FROZEN, CLEAR	TURBID SLIGHTLY	CLEAR	CLEAR, HIGH SLIGHTLY
85003	PARTIALLY FROZEN, CLEAR		TURBID SLIGHTLY	CLEAR	TURBID SLIGHTLY
85004	PARTIALLY FROZEN, CLEAR		CLEAR	SLIGHTLY HIGH & TURBID	CLEAR, HIGH SLIGHTLY
85014	HIGH SLIGHTLY, TURBID	PARTLY FROZEN, TURBID SLIGHTLY	TURBID SLIGHTLY	CLEAR	CLEAR, HIGH SLIGHTLY
94002	FROZEN, CLEAR	PARTLY FROZEN, CLEAR	CLEAR	SLIGHTLY TURBID	HIGH SLIGHTLY, TURBID SLIGHTLY
97003	FROZEN, CLEAR	PARTLY FROZEN, HIGH SLIGHTLY, TURBID SLIGHTLY	TURBID	HIGH & TURBID	TURBID, HIGH SLIGHTLY
97007	FROZEN, CLEAR	PARTLY FROZEN, HIGH SLIGHTLY, TURBID SLIGHTLY	TURBID	HIGH & TURBID	TURBID, HIGH
97011	PARTIAL FROZEN, CLEAR	FROZEN, CLEAR	CLEAR	HIGH & TURBID	HIGH SLIGHTLY, TURBID SLIGHTLY
97013	PARTIAL FROZEN, CLEAR	PARTLY FROZEN, TURBID and HIGH SLIGHTLY	SLIGHTLY TURBID	HIGH & TURBID	TURBID, HIGH
97018	PARTIAL FROZEN, CLEAR	CLEAR, HIGH SLIGHTLY	CLEAR	CLEAR	TURBID SLIGHTLY, HIGH SLIGHTLY
97777	FROZEN, CLEAR	TURBID SLIGHTLY	CLEAR	CLEAR	TURBID SLIGHTLY, HIGH SLIGHTLY
97999	FROZEN, CLEAR	TURBID, HIGH	TURBID SLIGHTLY	CLEAR	TURBID SLIGHTLY, HIGH SLIGHTLY
104001	PARTIAL FROZEN, CLEAR	PARTLY FROZEN, HIGH SLIGHTLY, TURBID SLIGHTLY	SLIGHTLY TURBID	TURBID SLIGHTLY, HIGH SLIGHTLY	TURBID SLIGHTLY, HIGH SLIGHTLY
104008	FROZEN, CLEAR	HIGH SLIGHTLY, TURBID SLIGHTLY	TURBID SLIGHTLY, HIGH SLIGHTLY, PARTLY FROZEN	CLEAR, HIGH SLIGHTLY	TURBID SLIGHTLY, HIGH SLIGHTLY
104023	FROZEN, CLEAR	FROZEN, CLEAR	SLIGHTLY TURBID	TURBID SLIGHTLY	TURBID SLIGHTLY, HIGH SLIGHTLY
104025	FROZEN, CLEAR	PARTLY FROZEN, HIGH SLIGHTLY, TURBID SLIGHTLY	TURBID	TURBID SLIGHTLY	HIGH & TURBID
104026	FROZEN, CLEAR	CLEAR,FROZEN SLIGHTLY	SLIGHTLY TURBID, HIGH SLIGHTLY	TURBID SLIGHTLY	TURBID SLIGHTLY, HIGH SLIGHTLY
104027	FROZEN, CLEAR	HIGH SLIGHTLY, PARTLY FROZEN, TURBID SLIGHTLY	SLIGHTLY TURBID	TURBID SLIGHTLY	TURBID SLIGHTLY, HIGH SLIGHTLY
104028	FROZEN, CLEAR	HIGH SLIGHTLY, PARTLY FROZEN, TURBID SLIGHTLY	SLIGHTLY TURBID	CLEAR	TURBID SLIGHTLY, HIGH SLIGHTLY
104029	FROZEN, CLEAR	HIGH SLIGHTLY, PARTLY FROZEN, TURBID SLIGHTLY	SLIGHTLY TURBID	CLEAR	TURBID SLIGHTLY, HIGH SLIGHTLY
104037	FROZEN, CLEAR	HIGH SLIGHTLY, PARTLY FROZEN, TURBID SLIGHTLY	TURBID SLIGHTLY	CLEAR	TURBID SLIGHTLY, HIGH SLIGHTLY
107002	FROZEN, CLEAR	PARTLY FROZEN, HIGH SLIGHTLY, TURBID SLIGHTLY	SLIGHTLY TURBID	TURBID SLIGHTLY, HIGH SLIGHTLY	TURBID SLIGHTLY, HIGH SLIGHTLY
CC005	FROZEN, CLEAR	HIGH SLIGHTLY, PARTLY FROZEN, CLEAR	SLIGHTLY TURBID	CLEAR, HIGH SLIGHTLY	TURBID SLIGHTLY, HIGH SLIGHTLY
DM 6.0	HIGH SLIGHTLY, TURBID SLIGHTLY	PARTLY FROZEN, TURBID SLIGHTLY	CLOUDY	CLEAR	CLEAR, HIGH SLIGHTLY
DN008WM	PARTIALLY FROZEN, HIGH SLIGHTLY		CLEAR	CLEAR	TURBID SLIGHTLY
FB003WM	FROZEN, CLEAR	PARTLY FROZEN, HIGH SLIGHTLY, WATER HAS COVER	SLIGHTLY TURBID, HIGH SLIGHTLY	CLEAR	CLEAR, HIGH SLIGHTLY
HU010WM	PARTIALLY FROZEN, SLIGHTLY TURBID		TURBID/HIGH SLIGHTLY	SLIGHTLY HIGH & TURBID	HIGH, TURBID SLIGHTLY
HU1RWMP	HIGH SLIGHTLY, TURBID SLIGHTLY	PARTLY FROZEN	TURBID SLIGHTLY	CLEAR	CLEAR, HIGH SLIGHTLY
Little Etob CK	PARTIAL FROZEN, CLEAR	HIGH SLIGHTLY, FROZEN CLEAR	CLEAR	CLEAR, HIGH SLIGHTLY	
Lower Etob US	FROZEN, CLEAR	PARTLY FROZEN, CLEAR	CLEAR	TURBID	TURBID SLIGHTLY, HIGH SLIGHTLY
Mayfield	FROZEN, CLEAR	PARTLY FROZEN	TURBID SLIGHTLY	TURBID, HIGH SLIGHTLY	TURBID SLIGHTLY, HIGH SLIGHTLY
MM003WM	PARTIAL FROZEN, CLEAR	PARTLY FROZEN, CLEAR	CLEAR	SLIGHTYLY TURBID	TURBID SLIGHTLY, HIGH SLIGHTLY
PT001WM	FROZEN, CLEAR	PARTLY FROZEN, HIGH SLIGHTLY, CLEAR	CLEAR, HIGH SLIGHTLY	CLEAR/HIGH	CLEAR, HIGH SLIGHTLY
Spring Creek	PARTIAL FROZEN, CLEAR	PARTLY FROZEN, CLEAR	CLEAR	CLEAR	TURBID SLIGHTLY, HIGH SLIGHTLY
Tributary 3	FROZEN, CLEAR	PARTLY FROZEN, CLEAR	CLEAR	CLEAR	TURBID SLIGHTLY, HIGH SLIGHTLY
Tributary 4	FROZEN, CLEAR	HIGH SLIGHTLY, TURBID SLIGHTLY, PARTLY FROZEN	CLEAR	TURBID, HIGH SLIGHTLY	CLEAR, HIGH SLIGHTLY

Station	June	July	August	September	October	November	December
80006	CLEAR	CLEAR	CLEAR	CLEAR	TURBID SLIGHTLY, HIGH SLIGHTLY	TURBID, HIGH	TURBID, HIGH
80007	CLEAR	CLEAR	CLEAR	CLEAR	TURBID, HIGH	CLEAR	TURBID, HIGH
82003	CLEAR	CLEAR	CLEAR	CLEAR	TURBID	TURBID, HIGH	TURBID SLIGHTLY, HIGH SLIGHTLY
83002	CLEAR	TURBID SLIGHTLY	CLEAR	CLEAR	TURBID, HIGH SLIGHTLY	TURBID SLIGHTLY	TURBID, HIGH
83004	CLEAR	TURBID	CLEAR	CLEAR	CLEAR, HIGH SLIGHTLY	CLEAR	TURBID, HIGH
83009	CLEAR	TURBID SLIGHTLY	TURBID SLIGHTLY DUE TO RAIN EVENT	TURBID SLIGHTLY (RAIN EVENT)	HIGH SLIGHTLY	TURBID SLIGHTLY	HIGH, FROZEN SLIGHTLY
83012	TURBID, HIGH	CLEAR	TURBID, SLIGHTLY HIGH	TURBID	CLEAR	TURBID SLIGHTLY, HIGH	TURBID SLIGHTLY
83018	CLEAR	CLEAR	CLEAR	HIGH SLIGHTLY (RAIN EVENT)	HIGH SLIGHTLY	TURBID SLIGHTLY	CLEAR,FROZEN SLIGHTLY
83019	CLEAR	CLEAR	CLEAR		CLEAR	TURBID SLIGHTLY, HIGH	TURBID SLIGHTLY, HIGH SLIGHTLY, ICEFROZEN SLIGHTLY
83020	CLEAR	TURBID	TURBID, HIGH	CLEAR	CLEAR, HIGH SLIGHTLY	HIGH SLIGHTLY	TURBID, HIGH
83103	CLEAR	CLEAR	TURBID SLIGHTLY	TURBID SLIGHLY (RAIN EVENT)	CLEAR	TURBID, HIGH SLIGHTLY	TURBID, HIGH, FROZEN SLIGHTLY
83104	CLEAR	CLEAR	CLEAR	CLEAR	LARGE BEAVER DAM US	TURBID SLIGHTLY	CLEAR,FROZEN SLIGHTLY
85003	TURBID	SLIGHTLY TURBID	CLEAR	CLEAR	CLEAR	TURBID, HIGH	CLEAR
85004	CLEAR	CLEAR	CLEAR	CLEAR	TURBID SLIGHTLY	TURBID, HIGH	TURBID SLIGHTLY, HIGH SLIGHTLY
85014	CLEAR	CLEAR	TURBID SLIGHTLY		CLEAR	TURBID, HIGH	TURBID SLIGHTLY, HIGH SLIGHTLY
94002	CLEAR	TURBID SLIGHTLY	CLEAR	CLEAR	TURBID, HIGH	CLEAR	TURBID, HIGH
97003	CLEAR	TURBID	CLEAR	CLEAR	TURBID, HIGH	CLEAR	TURBID, HIGH
97007	CLEAR	TURBID SLIGHTLY	CLEAR	CLEAR	CLEAR	CLEAR	TURBID, HIGH
97011	CLEAR	TURBID	CLEAR	CLEAR	TURBID, HIGH	CLEAR	TURBID, HIGH
97013	CLEAR	TURBID SLIGHTLY	CLEAR	CLEAR	CLEAR, HIGH SLIGHTLY	CLEAR	TURBID, HIGH
97018	CLEAR	CLEAR	HIGH/SLIGHTLY CLEAR	CLEAR	CLEAR	CLEAR	TURBID, HIGH
97777	CLEAR	CLEAR	SLIGHTLY HIGH/TURBID	CLEAR	CLEAR	CLEAR	TURBID, HIGH
97999	CLEAR	CLEAR	SLIGHTLY HIGH/CLEAR	CLEAR	CLEAR	CLEAR	VERY HIGH+VERY TURBID
104001	CLEAR	TURBID	HIGH/SLIGHTLY TURBID	CLEAR	CLEAR	CLEAR	VERY HIGH+VERY TURBID
104008	CLEAR	CLEAR	HIGH/SLIGHTLY CLEAR	CLEAR	CLEAR	CLEAR	VERY FAST+SLIGHTLY TURBID
104023	CLEAR	CLEAR	CLEAR	CLEAR	CLEAR	CLEAR	HIGH+VERY TURBID
104025	CLEAR	CLEAR	SLIGHLY TURBID/ HIGH	TURBID SLIGHTLY	CLEAR	CLEAR	TURBID, HIGH
104026	CLEAR	CLEAR	CLEAR	TURBID	CLEAR	CLEAR	TURBID, HIGH
104027	CLEAR	CLEAR	CLEAR	CLEAR	CLEAR	CLEAR	HIGH+VERY TURBID
104028	CLEAR	CLEAR	CLEAR	CLEAR	CLEAR	CLEAR	TURBID, HIGH
104029	CLEAR	CLEAR	HIGH/SLIGHTLY CLEAR	CLEAR	CLEAR	CLEAR	TURBID, HIGH
104037	CLEAR	CLEAR	HIGH/SLIGHTLY CLEAR	CLEAR	CLEAR	CLEAR	TURBID, HIGH
107002	CLEAR	CLEAR	CLEAR	TURBID SLIGHTLY	CLEAR	CLEAR	TURBID, HIGH
CC005	CLEAR	CLEAR	CLEAR	CLEAR	CLEAR	CLEAR	TURBID, HIGH
DM 6.0	CLEAR	CLEAR	CLEAR	TURBID SLIGHTLY	CLEAR	TURBID SLIGHTLY	CLEAR
DN008WM	CLEAR	CLEAR	CLEAR	CLEAR	TURBID	TURBID, HIGH	CLEAR
FB003WM	CLEAR	CLEAR	TURBID SLIGHTLY	CLEAR	TURBID, HIGH	CLEAR	TURBID, HIGH
HU010WM	CLEAR	CLEAR	CLEAR	CLEAR	TURBID SLIGHTLY	TURBID, HIGH	TURBID, HIGH
HU1RWMP	CLEAR	CLEAR	TURBID SLIGHTLY	TURBID	CLEAR	TURBID SLIGHTLY	CLEAR
Little Etob CK	CLEAR	CLEAR	CLEAR	CLEAR	CLEAR	TURBID	CLEAR
Lower Etob US	CLEAR	CLEAR	CLEAR	CLEAR	TURBID, HIGH	CLEAR	TURBID, HIGH
Mayfield	CLEAR	CLEAR	CLEAR	CLEAR	CLEAR	CLEAR	TURBID, HIGH
MM003WM	CLEAR	TURBID	CLEAR	CLEAR	TURBID, HIGH	CLEAR	TURBID, HIGH
PT001WM	CLEAR	CLEAR	CLEAR	CLEAR	TURBID, HIGH	CLEAR, HIGH SLIGHTLY	TURBID, HIGH
Spring Creek	CLEAR	CLEAR	CLEAR	CLEAR	TURBID, HIGH	CLEAR	TURBID, HIGH
Tributary 3	CLEAR	CLEAR	CLEAR	CLEAR	TURBID, HIGH	CLEAR	TURBID, HIGH
Tributary 4	CLEAR	CLEAR/HIGH	CLEAR	CLEAR	CLEAR	CLEAR	CLEAR, HIGH SLIGHTLY

6.2 Appendix B. Stations sampled in 2019 and associated weather

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	# wet samples	# dry samples
80006	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	2	10
80007	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	1	11
82003	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	2	10
83002	Wet	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	3	9
83004	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	1	11
83009	Wet	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	2	10
83012	Wet	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	2	10
83018	Wet	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	2	10
83019	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	0	12
83020	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	1	11
83103	Wet	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	2	10
83104	Wet	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	2	10
85003	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	2	10
85004	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	2	10
85014	Dry	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	1	11
94002	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	1	11
97003	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	1	11
97007	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	1	11
97011	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	1	11
97013	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	1	11
97018	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	0	12
97777	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	0	12
97999	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	0	12
104001	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	0	12
104008	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	0	12
104023	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	0	12
104025	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	0	12
104026	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	0	12
104027	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	0	12
104028	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	0	12
104029	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	0	12
104037	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	0	12
107002	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	0	12
CC005	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	0	12
DM 6.0	Dry	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	1	11
DN008WM	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	2	10
FB003WM	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	1	11
HU010WM	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	2	10
HU1RWMP	Dry	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	1	11
Little Etob CK	Wet	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	3	9
Lower Etob US	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	1	11
Mayfield	Wet	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	3	9
MM003WM	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	1	11
PT001WM	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	1	11
Spring Creek	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	1	11
Tributary 3	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	1	11
Tributary 4	Wet	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry	Dry	3	9

6.3 Appendix C. Descriptive statistics for 2019 water quality data

		AVERAGE															
		Aluminium (ug/L)	Arsenic (ug/L)	Chloride (mg/L)	Copper (ug/L)	E. coli (CFU/100mL)	Iron (ug/L)	Lead (ug/L)	Nickel (ug/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	Ammonia (ug/L)	pH	Total phosphorus (mg/L)	TSS (mg/L)	Zinc (ug/L)
Etobicoke Creek	Mayfield	497	1.57	154	2.25	120	362	0.27	0.62	2.13	0.019	1.352	126	8.06	0.087	6.8	10.00
	80007	571	1.16	434	5.37	499	344	1.51	0.79	1.81	0.024	1.683	116	8.30	0.096	31.4	13.42
	Spring Creek	291	1.64	605	4.39	370	252	0.70	1.02	0.67	0.025	1.023	78	8.21	0.043	12.6	18.46
	Tributary 3	402	1.79	1098	4.48	388	320	0.78	1.65	0.45	0.046	1.152	91	8.11	0.066	18.6	21.96
	Lower Etob US	558	1.55	556	5.51	308	328	1.15	1.06	1.02	0.027	1.304	99	8.17	0.073	23.5	20.02
	Tributary 4	85	1.20	467	2.88	1344	208	0.26	1.00	1.41	0.027	0.974	107	8.15	0.086	3.6	12.22
	Little Etob CK	55	1.80	952	4.62	1018	136	0.34	1.13	1.14	0.049	0.803	85	8.20	0.026	2.4	12.80
	80006	192		988	9.37	578	463			1.19	0.032		74	8.25	0.061	22.0	54.54
Mimico Creek	MM003WM	373	1.89	1046	5.55	536	397	1.09	1.59	0.67	0.054	1.489	313	8.05	0.060	16.5	25.65
	82003	240		1155	10.36	504	560			0.79	0.035		102	8.29	0.068	27.4	46.50
Humber River	83104	172	0.73	73	1.42	48	300	0.43	0.42	0.42	0.007	1.243	71	8.23	0.053	11.3	4.76
	83018	109	0.57	77	1.46	44	266	0.19	0.40	0.53	0.007	0.767	55	8.30	0.108	10.9	4.93
	83009	169	0.48	43	1.55	96	408	0.31	0.46	0.32	0.008	0.965	97	8.27	0.058	15.5	5.11
	83020	1202	0.82	87	1.51	121	406	0.58	0.41	0.66	0.007	1.005	77	8.22	0.088	65.9	10.00
	83004	793	0.72	174	1.74	350	329	0.53	0.58	0.39	0.012	0.948	73	8.22	0.065	38.7	10.00
	83103	293	0.99	292	2.76	278	304	0.35	0.67	0.98	0.015	1.430	95	8.27	0.056	16.3	6.62
	HU1RWMP	254	1.50	1140	4.77	956	395	0.68	1.38	0.49	0.061	2.197	236	8.01	0.183	12.9	20.64
	83002	896	1.43	313	2.44	233	444	0.61	0.90	0.82	0.016	1.367	128	8.14	0.087	22.5	11.75
	HU010WM	639	1.06	210	1.75	437	314	0.46	0.48	0.62	0.014	0.809	415	8.30	0.051	27.5	10.17
	83012	366	1.27	989	5.70	3218	479	1.45	1.64	1.24	0.076	1.953	475	8.13	0.098	18.8	20.93
	83019	220		423	4.38	1096	475			0.70	0.019		75	8.33	0.069	41.1	14.30
Don River	85004	243	1.56	955	3.26	392	370	0.67	1.09	0.77	0.050	1.059	128	8.15	0.053	7.3	13.45
	85003	411	1.14	394	2.41	520	326	0.64	0.71	0.80	0.023	0.937	118	8.23	0.087	20.9	12.07
	DN008WM	122	1.40	548	2.40	530	437	0.31	0.70	0.70	0.032	0.855	126	8.17	0.047	8.4	10.75
	DM 6.0	198	1.05	580	4.34	2360	313	0.89	1.04	1.75	0.062	1.835	625	8.15	0.185	8.3	14.11
	85014	159		641	6.23	14011	485			1.65	0.095		814	8.20	0.159	23.8	20.43
Highland Creek	94002	241	0.87	485	3.49	1310	304	0.65	3.39	1.00	0.032	1.044	136	8.13	0.068	13.3	14.02
Rouge River	97018	187	0.45	89	1.30	134	294	0.38	0.22	0.95	0.009	1.690	109	8.27	0.050	11.8	4.29
	97999	862	0.76	137	1.46	221	333	0.69	0.53	1.11	0.013	1.249	95	8.18	0.086	55.9	10.48
	97777	483	0.92	503	2.22	336	313	0.62	0.64	0.52	0.025	1.554	238	8.08	0.066	22.2	11.19
	97003	509	0.86	380	2.50	438	340	0.73	0.65	0.72	0.024	1.375	155	8.15	0.083	36.9	11.00
	97007	558	0.71	160	1.28	92	227	0.37	0.45	1.01	0.013	1.104	95	8.26	0.064	26.5	10.00
	97013	821	0.70	154	1.49	72	265	0.39	0.56	0.88	0.013	1.112	95	8.26	0.077	46.8	10.00
	97011	194		391	3.92	350	372			0.72	0.019		105	8.29	0.065	26.7	11.91
Petticoat Creek	PT001WM	265	0.63	300	2.29	495	202	0.39	0.64	1.60	0.016	1.036	69	8.19	0.052	15.3	11.41
Frenchmans Bay	FB003WM	245	0.84	388	3.13	1219	311	0.40	0.64	1.32	0.023	0.970	115	8.11	0.052	15.9	12.92
Duffins Creek	104037	208	0.59	137	1.13	291	208	0.27	0.34	0.82	0.011	0.992	100	8.22	0.045	8.8	10.00
	104008	202	0.27	57	1.16	92	267	0.52	0.23	0.23	0.004	1.237	50	8.30	0.037	12.3	44.80
	104029	318	0.33	51	0.94	61	214	0.28	0.25	0.40	0.004	0.745	77	8.27	0.039	14.3	10.00
	104028	235	0.46	155	0.98	51	254	0.26	0.33	0.69	0.011	0.773	78	8.20	0.043	10.8	10.00
	104027	513	0.42	50	1.02	47	297	0.44	0.29	0.42	0.011	0.781	105	8.28	0.059	27.5	10.00
	104026	593	0.59	161	1.23	156	349	0.49	0.46	0.27	0.011	1.044	76	8.25	0.062	27.7	10.00
	104023	392	0.47	96	1.03	33	248	0.33	0.29	0.32	0.005	0.658	55	8.25	0.039	20.1	10.03
	104025	836	0.51	61	1.25	76	321	0.54	0.48	0.83	0.009	0.925	98	8.31	0.088	65.6	10.00
	104001	232		108	2.26	183	472			0.65	0.018		66	8.30	0.057	38.6	6.50
Carruthers Creek	CC005	221	0.52	109	1.03	150	293	0.23	0.57	0.66	0.007	0.967	71	8.16	0.038	20.4	10.00
	107002	267	0.65	238	1.30	182	239	0.28	0.64	0.67	0.015	0.987	94	8.16	0.038	8.5	10.00

		MEDIAN															
		Aluminium (ug/L)	Arsenic (ug/L)	Chloride (mg/L)	Copper (ug/L)	E. coli (CFU/100mL)	Iron (ug/L)	Lead (ug/L)	Nickel (ug/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	Ammonia (ug/L)	pH	Total phosphorus (mg/L)	TSS (mg/L)	Zinc (ug/L)
Etobicoke Creek	Mayfield	217	1.32	142	1.82	100	293	0.19	0.58	1.10	0.019	1.19	60	8.10	0.069	8.0	10.0
	80007	192	1.24	309	4.04	180	245	0.51	0.78	1.37	0.023	1.01	57	8.32	0.059	5.1	8.3
	Spring Creek	165	1.17	418	3.55	290	222	0.40	0.82	0.72	0.022	1.05	50	8.30	0.033	5.0	10.0
	Tributary 3	125	1.52	655	4.20	280	252	0.42	1.48	0.34	0.055	1.14	50	8.20	0.050	3.0	16.8
	Lower Etob US	151	1.15	320	3.85	80	279	0.36	0.91	0.99	0.024	1.00	60	8.20	0.051	6.0	10.0
	Tributary 4	80	1.27	357	2.74	1450	217	0.24	1.02	1.66	0.022	0.83	80	8.20	0.068	2.0	10.0
	Little Etob CK	61	1.44	754	4.10	760	132	0.37	0.96	1.13	0.055	0.75	50	8.20	0.025	2.0	10.0
	80006	105		477	4.80	350	203			0.95	0.026		57	8.31	0.045	7.1	14.3
Mimico Creek	MM003WM	187	1.42	629	4.79	280	300	0.61	1.46	0.67	0.055	1.27	170	8.10	0.043	6.0	16.5
	82003	108		613	6.40	320	275			0.72	0.031		59	8.30	0.048	11.6	22.7
Humber River	83104	97	0.69	72	1.07	21	275.5	0.42	0.24	0.39	0.006	1.27	53	8.30	0.045	11.8	2.3
	83018	54	0.49	63	1.17	25	198	0.21	0.20	0.44	0.006	0.74	40	8.32	0.031	8.0	3.5
	83009	83	0.38	37	1.10	65	347	0.22	0.33	0.28	0.007	0.81	44	8.30	0.044	12.8	2.0
	83020	749	0.63	69	1.27	100	329	0.51	0.39	0.65	0.007	0.95	50	8.20	0.062	33.0	10.0
	83004	516	0.67	134	1.82	170	359	0.50	0.55	0.41	0.011	0.89	50	8.20	0.066	10.0	10.0
	83103	248	0.94	215	2.66	120	329	0.29	0.62	0.81	0.0135	1.39	52	8.35	0.050	12.4	6.2
	HU1RWMP	175	1.40	893	4.01	430	306	0.50	1.25	0.48	0.055	1.19	190	8.00	0.079	8.0	11.9
	83002	788	1.16	237	2.34	120	498	0.62	0.90	0.65	0.011	1.23	90	8.20	0.079	22.0	10.0
	HU010WM	212	0.81	128	1.66	90	231	0.30	0.45	0.39	0.011	0.79	50	8.30	0.032	7.0	10.0
	83012	224	1.17	609	4.34	1500	416	0.45	1.66	1.24	0.056	1.45	330	8.10	0.061	8.0	17.1
	83019	192		206	3.09	375	358			0.60	0.0165		59	8.40	0.048	14.2	6.0
Don River	85004	171	1.24	459	2.54	240	318	0.53	0.90	0.79	0.055	0.99	60	8.20	0.051	8.0	10.0
	85003	139	0.76	291	1.59	340	242	0.25	0.50	0.75	0.019	0.92	60	8.25	0.059	5.0	10.0
	DN008WM	99	0.99	343	2.22	350	451	0.24	0.74	0.74	0.025	0.80	90	8.20	0.044	5.0	10.0
	DM 6.0	101	1.01	524	3.54	1455	295	0.50	1.08	1.89	0.05	1.17	160	8.20	0.144	4.0	10.0
	85014	86		381	4.92	1330	319			1.67	0.07		467	8.23	0.123	10.5	11.9
Highland Creek	94002	146	0.80	415	3.62	730	292	0.48	0.85	1.12	0.027	0.85	90	8.10	0.053	3.0	10.4
Rouge River	97018	55	0.46	93	1.20	65	237.5	0.29	0.20	0.94	0.009	1.57	57	8.28	0.039	6.9	1.7
	97999	511	0.68	109	1.20	100	293	0.55	0.47	1.18	0.011	1.05	60	8.20	0.057	10.0	10.0
	97777	231	0.87	385	1.73	370	229	0.32	0.62	0.57	0.022	0.90	70	8.10	0.042	10.0	10.0
	97003	344	0.82	236	2.08	80	286	0.49	0.59	0.87	0.022	1.17	80	8.20	0.063	12.0	10.0
	97007	222	0.65	134	1.20	30	177	0.22	0.45	1.13	0.011	1.00	50	8.30	0.043	8.0	10.0
	97013	369	0.67	123	1.25	40	198	0.24	0.51	0.90	0.011	0.96	50	8.30	0.043	14.0	10.0
	97011	151		235	3.81	135	290			0.72	0.017		42	8.30	0.045	12.5	7.5
Petticoat Creek	PT001WM	107	0.66	303	1.88	210	125	0.13	0.78	1.15	0.014	0.91	50	8.30	0.032	5.0	10.0
Frenchmans Bay	FB003WM	118	0.77	308	1.71	480	278	0.24	0.67	1.02	0.016	0.87	100	8.20	0.037	6.0	10.0
Duffins Creek	104037	101	0.60	101	0.92	120	213	0.19	0.30	0.74	0.011	0.93	50	8.20	0.046	6.0	10.0
	104008	72	0.23	53	0.98	75	234.5	0.44	0.20	0.21	0.0035	0.88	25	8.32	0.029	8.2	2.8
	104029	153	0.30	43	0.80	20	166	0.12	0.20	0.31	0.003	0.53	50	8.30	0.029	8.0	10.0
	104028	160	0.44	152	0.80	40	201	0.23	0.31	0.68	0.011	0.71	50	8.20	0.034	5.0	10.0
	104027	526	0.38	50	0.97	50	276	0.44	0.29	0.38	0.005	0.66	50	8.30	0.051	10.0	10.0
	104026	346	0.49	154	1.05	60	271	0.31	0.47	0.14	0.011	0.93	50	8.30	0.051	13.0	10.0
	104023	166	0.45	94	0.80	10	175	0.08	0.20	0.27	0.004	0.51	50	8.30	0.017	7.0	10.0
	104025	472	0.49	56	0.99	60	213	0.26	0.45	0.66	0.008	0.73	70	8.30	0.043	18.0	10.0
	104001	157		90	1.79	85	293			0.61	0.0095		46	8.29	0.053	20.4	2.8
Carruthers Creek	CC005	87	0.49	114	0.88	60	281	0.08	0.48	0.66	0.005	0.86	50	8.10	0.022	2.0	10.0
	107002	205	0.57	207	1.27	70	225	0.26	0.69	0.70	0.013	0.99	60	8.20	0.032	4.0	10.0

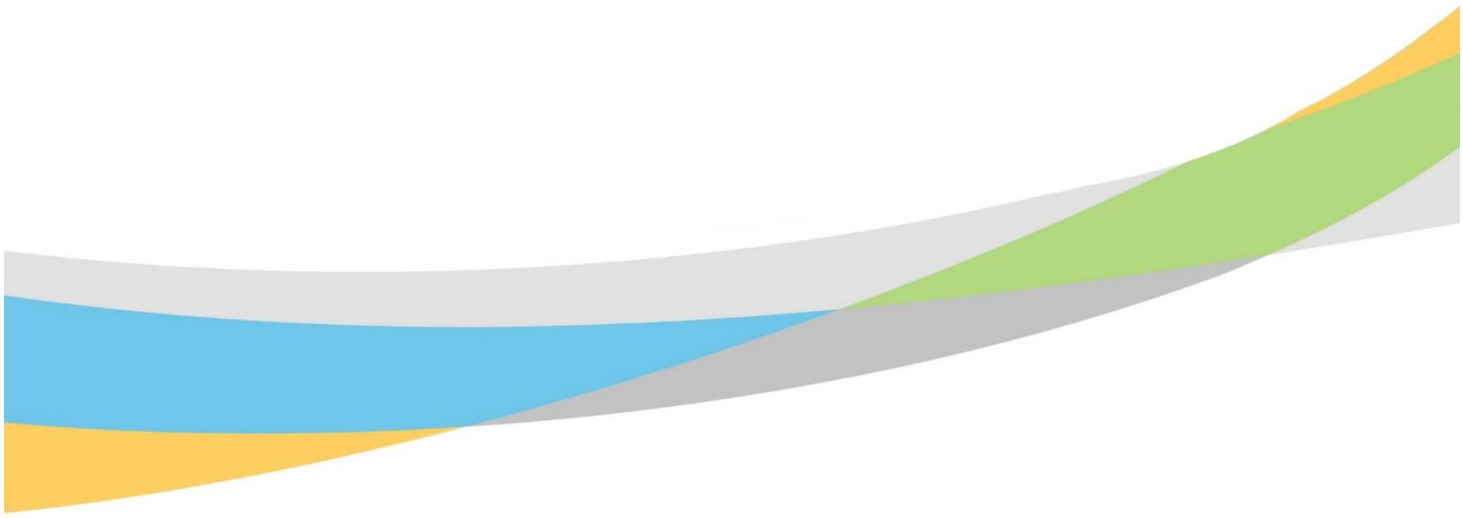
		MINIMUM															
		Aluminium (ug/L)	Arsenic (ug/L)	Chloride (mg/L)	Copper (ug/L)	E. coli (CFU/100mL)	Iron (ug/L)	Lead (ug/L)	Nickel (ug/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	Ammonia (ug/L)	pH	Total phosphorus (mg/L)	TSS (mg/L)	Zinc (ug/L)
Etobicoke Creek	Mayfield	44	0.67	74	1.05	0	126	0.07	0.39	0.06	0.011	0.77	50	7.90	0.029	2	10.00
	80007	28	0.80	130	2.36	30	72	0.11	0.41	0.31	0.006	0.67	28	8.02	0.0281	2	2.76
	Spring Creek	44	0.81	74	2.08	10	79	0.12	0.59	0.11	0.011	0.68	50	7.60	0.0135	2	10.00
	Tributary 3	69	0.81	142	2.88	0	152	0.25	1.01	0.28	0.018	0.79	50	7.50	0.0341	2	10.00
	Lower Etob US	28	0.79	147	2.33	0	85	0.11	0.68	0.11	0.017	0.74	50	7.70	0.0105	2	10.00
	Tributary 4	39	0.80	121	2.22	100	86	0.13	0.51	0.30	0.022	0.73	50	8.00	0.0156	2	10.00
	Little Etob CK	25	0.76	245	3.61	220	61	0.13	0.83	0.54	0.011	0.54	50	8.10	0.0174	2	10.00
	80006	2		188	0.50	150	94			0.29	0.006		17	7.96	0.0261	1.9	4.56
Mimico Creek	MM003WM	32	0.74	130	3.31	20	242	0.29	0.97	0.28	0.022	0.77	50	7.50	0.0244	2	10.00
	82003	29		173	4.58	70	80			0.39	0.004		16	8.05	0.023	2.2	6.18
Humber River	83104	15	0.51	56	0.79	0	106	0.21	0.20	0.06	0.003	0.77	15	7.90	0.0159	2.1	0.72
	83018	16	0.39	50	0.80	0	141	0.07	0.20	0.25	0.003	0.54	14	8.10	0.0211	4.7	0.50
	83009	22	0.27	14	0.73	0	205	0.16	0.20	0.09	0.004	0.49	9	7.90	0.0202	1.8	0.43
	83020	88	0.50	57	0.80	0	185	0.14	0.20	0.32	0.004	0.62	50	8.00	0.0124	7	10.00
	83004	28	0.49	114	0.85	60	118	0.07	0.35	0.11	0.011	0.54	50	8.10	0.0117	2	10.00
	83103	108	0.70	117	1.77	20	129	0.24	0.53	0.08	0.005	1.21	19	8.00	0.0204	3.4	0.94
	HU1RWMP	50	0.64	296	3.16	50	240	0.17	0.74	0.28	0.055	0.74	50	7.70	0.0358	2	10.00
	83002	248	0.71	111	1.23	10	186	0.30	0.75	0.06	0.011	0.88	50	7.80	0.0275	7	10.00
	HU010WM	110	0.54	96	1.12	20	171	0.14	0.26	0.30	0.011	0.56	50	8.20	0.0154	4	10.00
	83012	76	0.75	232	3.63	460	299	0.33	1.08	0.76	0.055	0.98	140	7.80	0.0409	4	10.00
	83019	37		151	2.35	90	119			0.19	0.009		15	7.85	0.0154	1.5	2.59
Don River	85004	49	0.65	206	1.48	90	206	0.20	0.79	0.29	0.011	0.72	50	8.00	0.0274	2	10.00
	85003	52	0.53	185	1.17	80	228	0.16	0.23	0.38	0.011	0.50	50	8.10	0.0223	2	10.00
	DN008WM	39	0.62	135	1.46	0	304	0.12	0.35	0.28	0.017	0.53	50	8.10	0.0236	2	10.00
	DM 6.0	34	0.77	262	2.40	270	211	0.37	0.56	0.96	0.022	0.61	60	7.70	0.0922	2	10.00
	85014	7		179	0.50	220	3			1.14	0.04		127	7.84	0.0716	2.4	7.12
Highland Creek	94002	25	0.52	66	1.73	90	138	0.08	0.68	0.43	0.022	0.63	50	7.90	0.0156	2	10.00
Rouge River	97018	24	0.39	52	0.60	0	174	0.10	0.20	0.34	0.003	0.67	22	8.10	0.0193	4.4	0.72
	97999	87	0.47	0	0.80	10	146	0.08	0.29	0.31	0.007	0.63	50	8.10	0.0309	4	10.00
	97777	66	0.58	234	1.21	50	150	0.10	0.45	0.11	0.011	0.74	50	7.90	0.0197	5	10.00
	97003	82	0.58	125	1.16	0	155	0.20	0.22	0.16	0.011	0.86	50	7.90	0.0305	3	10.00
	97007	42	0.44	86	0.80	0	95	0.09	0.33	0.06	0.006	0.55	50	8.10	0.0113	2	10.00
	97013	60	0.42	0	0.85	0	87	0.07	0.39	0.06	0.011	0.66	50	8.10	0.01	2	10.00
	97011	23		109	1.70	10	73			0.06	0.002		8	8.11	0.0151	2.2	1.59
Petticoat Creek	PT001WM	27	0.43	121	1.06	110	98	0.06	0.24	0.55	0.011	0.61	50	7.80	0.0206	2	10.00
Frenchmans Bay	FB003WM	56	0.55	97	1.20	330	154	0.09	0.20	0.43	0.011	0.48	50	7.70	0.0167	2	10.00
Duffins Creek	104037	28	0.37	75	0.80	10	117	0.05	0.20	0.48	0.004	0.53	50	8.10	0.0184	2	10.00
	104008	22	0.22	17	0.57	0	119	0.25	0.20	0.02	0.002	0.41	5	8.10	0.0129	2	0.29
	104029	44	0.20	18	0.80	0	91	0.05	0.20	0.17	0.002	0.31	50	8.20	0.01	2	10.00
	104028	32	0.30	99	0.80	10	160	0.05	0.20	0.44	0.005	0.44	50	8.10	0.017	2	10.00
	104027	72	0.29	0	0.80	0	124	0.09	0.20	0.15	0.003	0.30	50	8.20	0.0197	4	10.00
	104026	83	0.31	76	0.80	0	178	0.10	0.25	0.06	0.007	0.62	50	8.10	0.0172	2	10.00
	104023	30	0.30	60	0.80	0	104	0.05	0.20	0.03	0.004	0.41	50	8.00	0.011	2	10.00
	104025	44	0.34	0	0.80	0	117	0.05	0.32	0.41	0.004	0.43	50	8.20	0.01	2	10.00
	104001	33		53	0.73	0	108			0.29	0.005		10	8.12	0.0172	3.1	1.69
Carruthers Creek	CC005	26	0.31	68	0.80	0	98	0.05	0.25	0.02	0.004	0.61	50	8.10	0.0126	2	10.00
	107002	64	0.41	119	0.94	0	150	0.10	0.29	0.06	0.011	0.73	50	8.00	0.0232	2	10.00

		MAXIMUM															
		Aluminium (ug/L)	Arsenic (ug/L)	Chloride (mg/L)	Copper (ug/L)	E. coli (CFU/100mL)	Iron (ug/L)	Lead (ug/L)	Nickel (ug/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	Ammonia (ug/L)	pH	Total phosphorus (mg/L)	TSS (mg/L)	Zinc (ug/L)
Etobicoke Creek	Mayfield	1830	4.6	340	3.84	430	919	0.64	1.03	8.19	0.029	2.07	600	8.2	0.203	14	10
	80007	4460	1.37	1130	12.4	2100	1070	4.90	1.20	4.829	0.057	3.37	780	8.58	0.419	254	55.3
	Spring Creek	1440	5.13	1980	10.1	1400	807	3.48	2.49	1.42	0.055	1.49	320	8.5	0.131	64	57.8
	Tributary 3	1850	5.49	2990	8	1500	690	2.82	4.02	0.74	0.055	1.62	220	8.4	0.187	83	53.3
	Lower Etob US	2610	4.41	1960	11.5	1190	810	5.18	2.14	2.51	0.055	2.26	390	8.4	0.237	132	64.3
	Tributary 4	136	1.7	1100	4	3430	330	0.37	1.32	2.39	0.043	1.66	390	8.3	0.226	6	25.9
	Little Etob CK	104	6.26	2740	8	3600	322	0.51	2.50	1.73	0.063	1.19	280	8.4	0.0357	4	26.6
	80006	740		4720	47.2	1420	1980			4.049	0.079		236	8.41	0.146	83.2	387
Mimico Creek	MM003WM	1590	6.37	3750	10.4	2470	835	4.11	3.25	1.23	0.11	3.25	1500	8.3	0.177	85	64.1
	82003	1140		4550	42.3	1200	2090			1.356	0.075		420	8.47	0.206	106	216
Humber River	83104	587	1.02	110	4	160	535	0.69	1.00	0.87	0.014	1.67	160	8.4	0.102	20.1	10
	83018	375	0.935	264	4	170	686	0.27	1.00	1.05	0.018	1.02	130	8.42	0.944	25.9	10
	83009	728	0.906	106	4	210	928	0.65	1.00	0.85	0.013	1.76	280	8.4	0.201	39.5	17.3
	83020	3380	2.04	175	2.45	320	752	1.17	0.86	1.18	0.018	1.52	260	8.3	0.199	172	10
	83004	2440	1.68	337	2.64	1500	550	1.20	0.87	0.77	0.02	1.65	250	8.4	0.174	136	10
	83103	678	1.36	983	4.37	1540	454	0.57	0.91	3.16	0.024	1.73	320	8.44	0.0978	51	12.4
	HU1RWMP	703	2.85	3310	8.24	2990	1040	1.88	2.89	0.92	0.078	8.64	680	8.2	0.695	36	45.3
	83002	2130	2.64	966	4.36	910	641	1.04	1.15	3.19	0.032	2	510	8.3	0.163	45	20.5
	HU010WM	2930	2.74	662	2.72	3700	695	1.20	0.79	1.42	0.021	0.97	3900	8.4	0.157	137	11.9
	83012	2080	2.4	2940	11.8	11700	986	7.33	2.21	1.75	0.128	3.88	1400	8.3	0.256	108	52.5
	83019	611		1810	9.26	5800	1200			1.511	0.046		193	8.61	0.198	215	60.6
Don River	85004	1030	3.91	3220	8	1920	642	2.08	2.34	1.27	0.055	1.84	420	8.3	0.115	15	25.5
	85003	2660	4.28	1180	8	1930	894	3.76	2.65	1.78	0.055	1.56	410	8.3	0.402	118	28.8
	DN008WM	283	4.69	2230	4	1710	736	0.83	1.00	1.25	0.055	1.33	250	8.3	0.107	31	18.3
	DM 6.0	1090	1.37	1260	9.05	10970	490	3.50	1.28	2.47	0.102	7.67	4400	8.3	0.541	42	35.3
	85014	808		2400	20.6	120000	2330			2.289	0.177		3760	8.35	0.377	162	105
Highland Creek	94002	956	1.42	1320	7.72	4500	743	2.39	29.00	1.51	0.055	1.83	390	8.3	0.242	76	30
Rouge River	97018	1080	0.51	120	2.75	490	747	0.84	0.27	1.648	0.018	2.83	580	8.39	0.112	60.8	10
	97999	4870	1.23	443	3.97	910	1150	3.44	1.01	2.03	0.028	2.63	340	8.3	0.395	467	14.8
	97777	2670	1.27	1300	4.96	780	1030	2.99	0.86	0.86	0.055	6.6	1600	8.2	0.281	142	19
	97003	1740	1.4	1060	5.02	2600	782	2.19	1.02	1.4	0.04	3.6	780	8.3	0.18	167	15.3
	97007	3510	1.22	418	2.62	460	663	1.56	0.59	2.43	0.025	2.65	350	8.4	0.275	187	10
	97013	5550	1.17	452	3.63	260	869	1.66	0.81	2.14	0.023	2.63	360	8.4	0.444	362	10
	97011	541		1100	7.59	1420	991			1.415	0.036		619	8.49	0.202	95.7	31.8
Petticoat Creek	PT001WM	903	0.826	499	5.79	2130	376	1.18	0.96	3.67	0.037	1.9	130	8.3	0.12	52	21.1
Frenchmans Bay	FB003WM	1120	1.37	791	10.5	4700	713	1.87	1.11	2.96	0.077	1.66	320	8.3	0.223	82	42.1
Duffins Creek	104037	742	0.905	388	2	1100	364	0.80	0.64	1.37	0.026	1.81	430	8.3	0.086	35	10
	104008	747	0.383	138	2.54	330	565	0.96	0.34	0.62	0.014	2.42	270	8.46	0.0864	39	487
	104029	1130	0.675	128	1.56	260	507	0.87	0.40	0.84	0.014	1.93	300	8.4	0.0869	47	10
	104028	759	0.826	225	1.45	160	541	0.73	0.61	1.19	0.018	1.33	210	8.3	0.11	36	10
	104027	1880	0.951	124	1.8	80	823	1.43	0.42	0.67	0.044	1.63	250	8.4	0.185	137	10
	104026	3080	1.01	324	3.13	650	853	2.07	0.62	0.73	0.015	2.06	230	8.4	0.261	175	10
	104023	1720	0.845	157	2	110	783	1.58	0.73	1.08	0.012	1.48	90	8.4	0.12	88	10.3
	104025	4720	0.942	154	3.74	280	1330	2.94	0.86	1.71	0.018	2.23	230	8.4	0.412	452	10
	104001	753		238	5.76	730	1340			1.207	0.068		148	8.43	0.143	170	21.7
Carruthers Creek	CC005	1340	0.921	138	2.15	460	705	1.26	0.92	2.45	0.013	1.37	200	8.3	0.142	151	10
	107002	663	1.02	558	1.82	830	380	0.60	0.95	1.86	0.026	1.37	320	8.3	0.0614	29	10

		STANDARD DEVIATION															
		Aluminium (ug/L)	Arsenic (ug/L)	Chloride (mg/L)	Copper (ug/L)	E. coli (CFU/100mL)	Iron (ug/L)	Lead (ug/L)	Nickel (ug/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	Ammonia (ug/L)	pH	Total phosphorus (mg/L)	TSS (mg/L)	Zinc (ug/L)
Etobicoke Creek	Mayfield	660	1.14	70	0.90	116	249	0.21	0.17	2.59	0.007	0.41	162.2	0.10	0.052	4.3776	0.00
	80007	1235	0.25	356	3.37	639	270	2.28	0.36	1.57	0.014	1.47	209.7	0.19	0.109	71.338	15.01
	Spring Creek	402	1.22	529	2.58	426	205	0.96	0.61	0.43	0.011	0.23	80.6	0.25	0.031	18.489	16.02
	Tributary 3	599	1.30	1032	1.63	441	171	0.78	0.83	0.18	0.016	0.24	57.2	0.25	0.044	27.296	13.58
	Lower Etob US	822	1.03	564	3.26	386	244	1.74	0.51	0.85	0.010	0.51	100.5	0.21	0.063	42.821	19.35
	Tributary 4	41	0.26	309	0.50	988	72	0.08	0.23	0.77	0.007	0.30	99.5	0.10	0.060	1.9633	5.21
	Little Etob CK	26	1.55	733	1.34	978	69	0.12	0.48	0.36	0.017	0.22	69.3	0.11	0.006	0.809	5.07
	80006	218		1354	12.41	464	559			1.05	0.022		63.0	0.14	0.042	30.048	107.68
Mimico Creek	MM003WM	497	1.64	1090	2.06	735	202	1.21	0.60	0.27	0.025	0.71	434.9	0.23	0.045	26.857	18.31
	82003	329		1302	10.61	426	635			0.30	0.023		117.2	0.14	0.052	37.406	60.38
Humber River	83104	188	0.22	16	0.92	53	146	0.23	0.39	0.23	0.003	0.45	53.4	0.15	0.025	6.1035	4.02
	83018	102	0.25	59	0.93	59	169	0.09	0.40	0.24	0.004	0.24	36.9	0.10	0.264	6.8397	3.91
	83009	195	0.29	32	1.00	79	196	0.23	0.37	0.22	0.002	0.56	97.2	0.14	0.047	11.833	5.35
	83020	1218	0.44	40	0.67	103	203	0.43	0.21	0.27	0.004	0.34	62.1	0.10	0.069	65.488	0.00
	83004	816	0.33	71	0.69	445	153	0.41	0.17	0.23	0.003	0.37	59.7	0.10	0.052	44.356	0.00
	83103	176	0.32	246	0.75	430	98	0.15	0.18	0.94	0.007	0.23	102.2	0.15	0.024	14.357	3.63
	HU1RWMP	194	0.65	908	1.81	987	227	0.53	0.58	0.20	0.008	2.28	224.9	0.15	0.221	11.683	13.92
	83002	586	0.65	236	0.79	263	158	0.25	0.12	0.97	0.008	0.43	130.7	0.13	0.042	13.545	3.50
	HU010WM	854	0.69	177	0.56	1086	174	0.34	0.16	0.38	0.004	0.13	1156.3	0.08	0.044	41.331	0.57
	83012	577	0.48	934	2.91	3799	201	2.05	0.36	0.36	0.031	1.09	383.2	0.13	0.066	30.076	13.37
	83019	181		488	2.62	1705	373			0.42	0.011		58.3	0.24	0.054	60.763	17.80
Don River	85004	272	0.96	1013	1.97	517	138	0.52	0.44	0.34	0.013	0.33	115.3	0.10	0.024	3.8234	5.93
	85003	759	1.07	282	2.01	542	195	1.06	0.67	0.40	0.014	0.30	108.0	0.08	0.107	34.509	5.68
	DN008WM	88	1.20	599	0.86	557	124	0.21	0.18	0.31	0.013	0.22	85.4	0.07	0.023	8.5822	2.50
	DM 6.0	306	0.20	333	1.95	3126	89	0.95	0.23	0.47	0.027	1.99	1263.6	0.17	0.131	11.723	7.70
	85014	216		644	5.01	34943	601			0.39	0.054		1025.3	0.13	0.100	43.887	27.11
Highland Creek	94002	282	0.26	376	1.79	1407	165	0.69	8.50	0.37	0.011	0.43	108.9	0.14	0.063	22.473	6.34
Rouge River	97018	302	0.05	18	0.53	163	158	0.32	0.03	0.48	0.005	1.08	160.4	0.09	0.030	15.701	4.23
	97999	1368	0.27	110	0.89	267	288	0.95	0.18	0.64	0.006	0.59	85.7	0.08	0.105	136.9	1.44
	97777	751	0.24	323	1.26	236	244	0.83	0.14	0.27	0.011	1.73	455.5	0.10	0.075	39.962	2.87
	97003	472	0.24	293	1.26	773	203	0.63	0.22	0.40	0.009	0.78	212.6	0.14	0.056	50.366	1.95
	97007	1010	0.26	98	0.55	142	164	0.42	0.08	0.77	0.006	0.58	90.6	0.11	0.074	54.335	0.00
	97013	1593	0.25	116	0.79	82	218	0.45	0.12	0.72	0.004	0.59	94.7	0.10	0.124	105.42	0.00
	97011	178		309	1.82	471	296			0.46	0.010		167.9	0.15	0.056	30.648	10.58
Petticoat Creek	PT001WM	309	0.14	133	1.34	622	124	0.44	0.27	0.95	0.008	0.44	31.4	0.16	0.039	17.59	3.38
Frenchmans Bay	FB003WM	315	0.23	204	3.03	1421	141	0.51	0.30	0.75	0.020	0.36	79.4	0.18	0.058	23.62	9.68
Duffins Creek	104037	216	0.19	91	0.41	401	66	0.22	0.13	0.29	0.006	0.32	114.4	0.06	0.022	10.216	0.00
	104008	245	0.08	36	0.53	96	140	0.33	0.07	0.19	0.003	1.05	72.6	0.11	0.022	12.55	139.32
	104029	341	0.13	36	0.29	79	142	0.29	0.08	0.24	0.003	0.51	74.8	0.06	0.029	15.563	0.00
	104028	231	0.14	36	0.25	48	115	0.24	0.11	0.22	0.004	0.28	50.4	0.06	0.029	11.277	0.00
	104027	521	0.18	31	0.30	31	205	0.40	0.08	0.18	0.013	0.42	75.9	0.08	0.048	39.208	0.00
	104026	861	0.20	64	0.68	225	192	0.56	0.12	0.25	0.002	0.41	55.9	0.08	0.069	49.609	0.00
	104023	598	0.16	25	0.43	38	222	0.50	0.16	0.32	0.002	0.33	12.9	0.10	0.036	32.12	0.09
	104025	1351	0.18	38	0.86	94	356	0.84	0.15	0.43	0.004	0.54	66.3	0.07	0.118	131.34	0.00
	104001	219		59	1.38	229	405			0.29	0.019		49.5	0.10	0.038	48.124	7.24
Carruthers Creek	CC005	389	0.20	27	0.40	183	169	0.36	0.22	0.70	0.003	0.27	47.6	0.08	0.037	44.085	0.00
	107002	189	0.20	123	0.30	253	71	0.15	0.21	0.54	0.006	0.18	79.4	0.10	0.014	8.722	0.00

6.4 Appendix D. Mean monthly parameter values for 2019

	Mean Monthly Analyte Values															
	Aluminium (ug/L)	Arsenic (ug/L)	Chloride (mg/L)	Copper (ug/L)	E. coli (CFU/100mL)	Iron (ug/L)	Lead (ug/L)	Nickel (ug/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	Ammonia (ug/L)	pH	Total phosphorus (mg/L)	TSS (mg/L)	Zinc (ug/L)
January	333	1.75	834	5.53	1303	521	0.70	0.99	1.28	0.021	1.081	289.5	8.08	0.074	24.37	29.93
February	358	1.07	885	3.40	3268	332	0.60	0.70	1.01	0.034	1.840	471.9	8.16	0.079	16.65	15.92
March	382	0.83	744	2.48	272	335	0.45	0.65	0.86	0.026	0.950	132.4	8.18	0.063	19.46	14.92
April	496	1.35	261	3.09	194	351	0.46	0.61	1.30	0.022	1.067	75.8	8.23	0.060	26.68	10.13
May	340	0.62	212	2.44	278	268	0.36	0.72	0.90	0.020	1.294	144.6	8.26	0.084	13.63	9.25
June	112	0.91	283	1.98	661	221	0.25	0.83	0.66	0.029	0.953	121.3	8.30	0.048	5.49	19.04
July	248	0.99	192	2.25	686	258	0.43	0.78	0.46	0.026	0.886	71.9	8.26	0.061	16.54	8.43
August	174	0.91	191	2.00	599	211	0.31	0.66	0.39	0.021	0.852	77.6	8.27	0.057	8.62	8.51
September	143	0.89	240	2.35	797	233	0.35	0.75	0.40	0.026	1.053	87.3	8.28	0.057	7.48	9.58
October	318	0.61	138	3.17	623	305	0.82	1.62	0.41	0.017	0.989	75.8	8.12	0.063	19.85	15.07
November	197		248	4.53	425	453			1.32	0.022		58.5	8.37	0.063	22.20	18.44
December	1287	0.80	428	3.89	490	585	1.19	0.57	1.57	0.023	1.525	135.9	8.08	0.137	84.40	17.10



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