


2011 Surface Water Quality Summary
Regional Watershed Monitoring Program

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Watershed Monitoring and Reporting Section
Ecology Division

TORONTO AND REGION Conservation
for The Living City

Acknowledgments

Aaron Todd (Coordinator, Stream Water Quality Monitoring, Environmental Monitoring and Reporting Branch Ontario Ministry of the Environment)

Renu Joshie (Superintendent, York-Durham Regional Environmental Laboratory)

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Report prepared by: Nelson Amaral, Environmental Technologist
Reviewed by: Scott Jarvie, Manager, Watershed Monitoring and Reporting Section, Angela Wallace, Biomonitoring Analyst, Watershed Monitoring and Reporting Section

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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 of the greater 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 Ontario Ministry of the Environment (OMOE). The data collected is shared with partner municipalities and other agencies, and is 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 the 2011 laboratory results for the surface water quality sampling conducted in support of the Provincial Water Quality Monitoring Network (PWQMN), RWMP and special projects. It provides a general overview and description of the range of water quality conditions across the TRCA jurisdiction during the 2011 sample year. 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. However, results should be interpreted with caution, since sampling events were not targeted to capture specific stream flow conditions (e.g. wet weather events) and this report only presents one year of data which may not represent normal conditions.

2. Methods

In 2011, surface water quality samples were collected at 44 stations (Figure 1) throughout the TRCA's jurisdiction. Sample collection and laboratory analysis were carried out through several partnerships. These partnerships are outlined below:

- 13 stations were sampled by TRCA under the OMOE's PWQMN;
- 28 stations were sampled by TRCA for the RWMP;
- 3 special project sites (104028, 104026 and 104023) were established in October 2010 as part of the Seaton/Duffins Heights Development Monitoring Project;
- 3 special project sites (Glen Haffy 1, Heart Lake 1 and Bruce's Mill) were established in February 2011 as part of the TRCA's Parks and Culture Department initiative to assess the water quality within TRCA parks.

Sample collection was undertaken monthly using in-stream "grab" techniques following the 0MOE PWQMN protocol (OMOE 2003). Sampling also included in-situ measurements (e.g. water temperature, conductivity, and dissolved oxygen) collected using a hand-held YSI meter (Model 600QS). Sampling occurred year-round, typically the third week of each month, and was independent of precipitation. Samples were submitted to the OMOE Rexdale Laboratory and the York-Durham Regional Environmental Laboratory for analysis. Samples for months not covered by the PWQMN partnership were submitted to the York-Durham Laboratory for January, February, March and December in order to augment water quality data from these sites and to maintain a year-round dataset.

Stream conditions were noted 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) along with 2011 precipitation records from Pearson International Airport (Figures 3 and 4) are included in this report to provide context to assist with interpretation of results.

The water quality parameters assessed are listed in Table 1 and include a standard suite of nutrients, metals and conventional water quality parameters used by the PWQMN. Microbiological samples were collected by TRCA at all 44 stations in 2011 and submitted to the York-Durham Regional Environmental Laboratory or the OMOE Rexdale Laboratory for analysis.

Laboratory results were compared to the Provincial Water Quality Objectives (PWQO) where applicable. The PWQOs are a set of numerical and narrative ambient surface water quality criteria that represent a desirable level of water quality that will 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 were not available, other objectives such as 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 2005) were used. 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 is stored in “Water”, a relational SQL database that is part of the TRCA’s corporate database EnviroBase. The Water database includes laboratory results and metadata such as laboratory analysis methods and sampling equipment.

Table 1. Standard suite of water quality parameters analyzed[1]

General Chemistry	Nutrients	Metals	Microbiological
Alkalinity	Ammonia	Aluminum	*Escherichia coli*
Biochemical Oxygen Demand	*Nitrate/Nitrite	Barium	Background Colonies
Calcium	Nitrogen, Total Kjeldahl	Beryllium	
*Chloride	Phosphate	Cadmium	
Conductivity	*Total Phosphorus	Chromium	
Dissolved Oxygen		Cobalt	
Hardness		*Copper	
Magnesium		Iron	
pH		*Lead	
Potassium		Manganese	
Sodium		Molybdenum	
Total Dissolved Solids		Nickel	
*Total Suspended Solids		Strontium	
Turbidity		Vanadium	
Water Temperature		*Zinc	

Note: [1]Additional parameters may be analyzed on a site/project specific basis
*PWQMN recommended indicator parameters

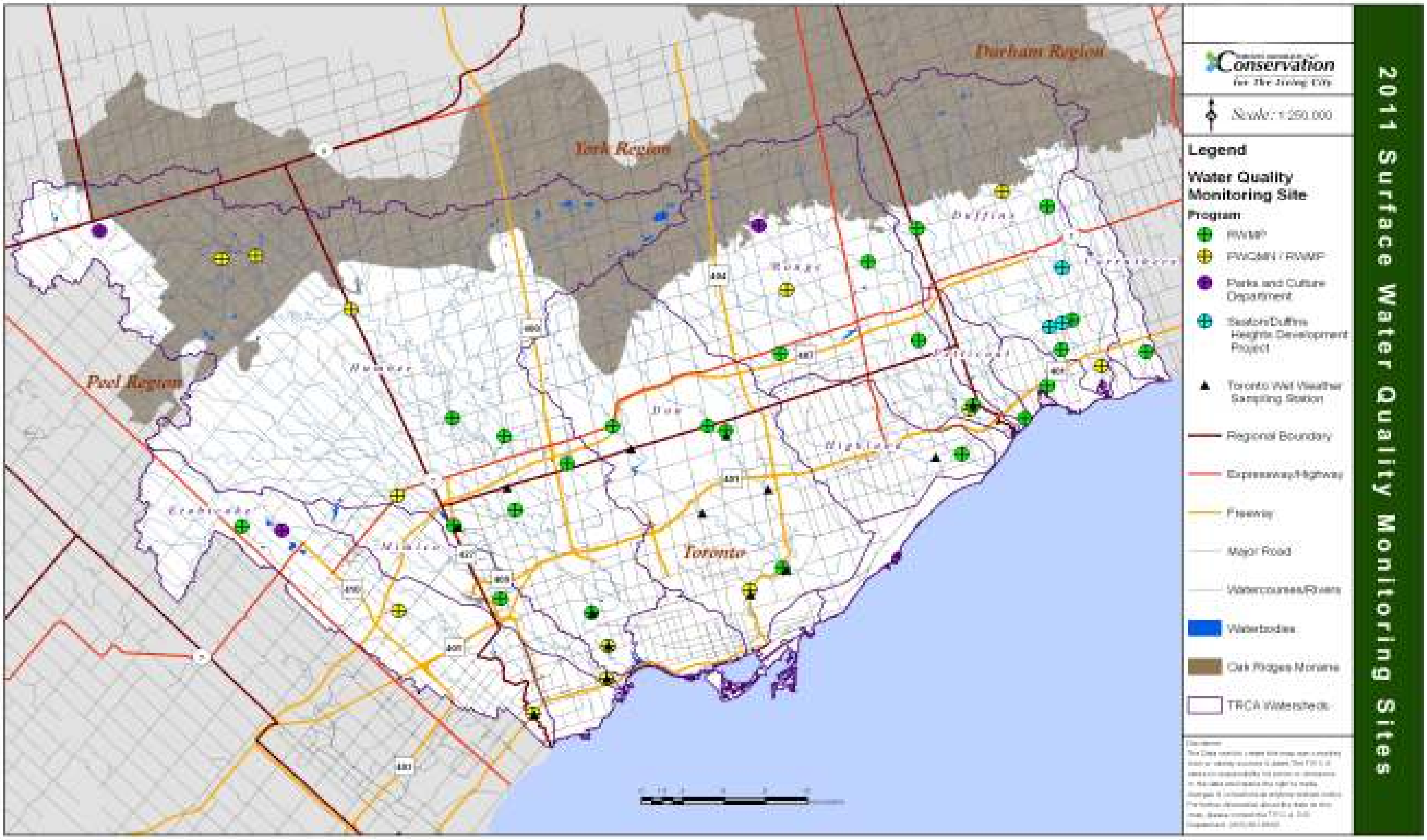

Figure 1. **2011 surface water quality monitoring sites**

Table 2. 2011 RWMP surface water quality sites and associated laboratories

Station	Watershed	UTM Coordinates		Laboratory		
		Northing	Easting	Jan-Mar	Apr-Oct	Nov-Dec
Mayfield	Etobicoke	4843488	595028	Y	Y	Y
80007	Etobicoke	4836746	606933	Y	M	Y
80006	Etobicoke	4829016	616234	M	M	M
MM003WM	Mimico	4837916	613849	Y	Y	Y
82003	Mimico	4831713	621585	M	M	M
83104	Humber	4864112	593560	Y	M	Y
83018	Humber	4864329	595961	Y	M	Y
83009	Humber	4860243	602980	Y	M	Y
83020	Humber	4851861	610386	Y	Y	Y
83004	Humber	4850423	614148	Y	Y	Y
HU010WM	Humber	4844744	615027	Y	Y	Y
83103	Humber	4845870	606385	Y	M	Y
83002	Humber	4843562	610459	Y	Y	Y
HU1RWMP	Humber	4848311	618678	Y	Y	Y
83012	Humber	4836845	620488	Y	M	Y
83019	Humber	4834265	621663	M	M	M
85004	Don	4851207	622014	Y	Y	Y
85003	Don	4851256	628954	Y	Y	Y
DN008WM	Don	4850889	630236	Y	Y	Y
DM 6.0	Don	4840251	634378	Y	Y	Y
85014	Don	4838576	632000	M	M	M
94002	Highland	4849056	647429	Y	M	Y
97018	Rouge	4861770	634680	Y	M	Y
97999	Rouge	4863887	640589	Y	Y	Y

Station	Watershed	UTM Coordinates		Laboratory		
		Northing	Easting	Jan-Mar	Apr-Oct	Nov-Dec
97777	Rouge	4856823	634214	Y	Y	Y
97003	Rouge	4857669	641985	Y	Y	Y
97007	Rouge	4857816	644300	Y	Y	Y
97013	Rouge	4852830	648243	Y	Y	Y
97011	Rouge	4852511	648007	M	M	M
FB003WM	Pine Creek	4854151	653659	Y	Y	Y
PT001WM	Petticoat	4851804	652005	Y	Y	Y
104008	Duffins	4869299	650372	Y	M	Y
104037	Duffins	4866462	644191	Y	Y	Y
104029	Duffins	4868158	653641	Y	Y	Y
104028	Duffins	4863433	654742	Y	Y	Y
104023	Duffins	4858867	653796	Y	Y	Y
104026	Duffins	4859199	654730	Y	Y	Y
104027	Duffins	4859419	655458	Y	Y	Y
104025	Duffins	4857115	654656	Y	Y	Y
104001	Duffins	4855880	657579	M	M	M
107002	Carruthers	4856972	660850	Y	Y	Y
Heart Lake 1[a]	Etobicoke	4843199	597954	Y[b]	-	-
Glen Haffy 1[a]	Humber	4866262	584678	Y	Y	Y
Bruces Mill 1[a]	Rouge	4866672	632670	Y	Y	Y

M:OMOE Laboratory; Y: York-Durham

[a] Sampling started in February 2011

[b] sampled once in Febraury 2011

3. Results & Discussion

Sampling results are presented in box plots (e.g. Figure 2) which summarize the distribution of results for each parameter over the course of the year. Box plots display the range of data that falls within 1.5 times the upper and lower quartiles and excludes extreme values. The use of box plots allows the reader to view the range of results with the majority (50%) of results being located within the box section. The ends of the boxes represent the 25th and 75th quartiles. The difference between the quartiles is the interquartile range. The line across the middle of the box identifies the median sample value. The "whiskers" represent the calculated value of plus or minus 1.5 times the interquartile range.

Sample stations are arranged in each graph from upstream to downstream (left to right) and watersheds are arranged from west to east along the x-axis of each graph.

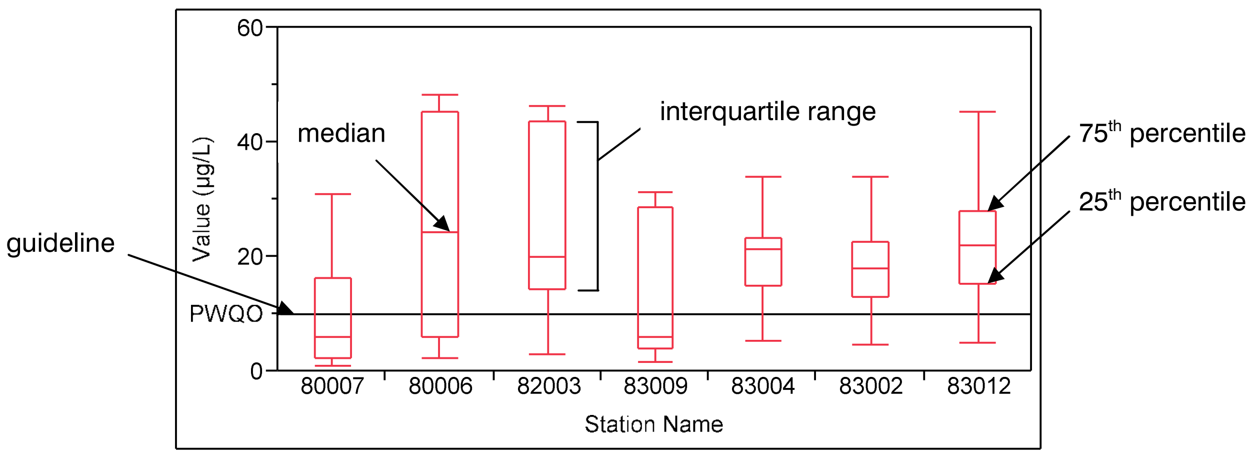

Figure 2. Box plot graphic example

For more informative interpretation of results the OMOE recommends a minimum sample size of 30 (or 5 years of data) because this sample size will help reduce the influence of unusual conditions such as spills, extreme runoff events and drought. Due to the low annual sample size (n=12) for each site, only a limited number of high results (e.g. wet weather flow) are required to skew the median results upwards. In addition, station Heart Lake 1 data was omitted from this report because it was only sampled once in 2011.

This report is intended to provide a general characterization of the surface water quality conditions. TRCA has also analyzed larger datasets in order to examine spatial and temporal trends in the data. These reports are available at www.trca.on.ca.

3.1 Precipitation

The total amount of precipitation recorded in 2011 at the Lester B. Pearson International Airport measured 937 mm. This is 142 mm above the 10 year average of 794 mm (Figure 3). Seasonal precipitation values for 2011 are displayed in Figure 4. Precipitation quantity peaked in May of 2011 (Figure 4) and may have contributed to the elevated concentrations of pollutants found at some sites.

Sampling occurred year round and was independent of precipitation, however, 44% of samples collected in 2011 were taken during and/or immediately after precipitation events (Appendix A).

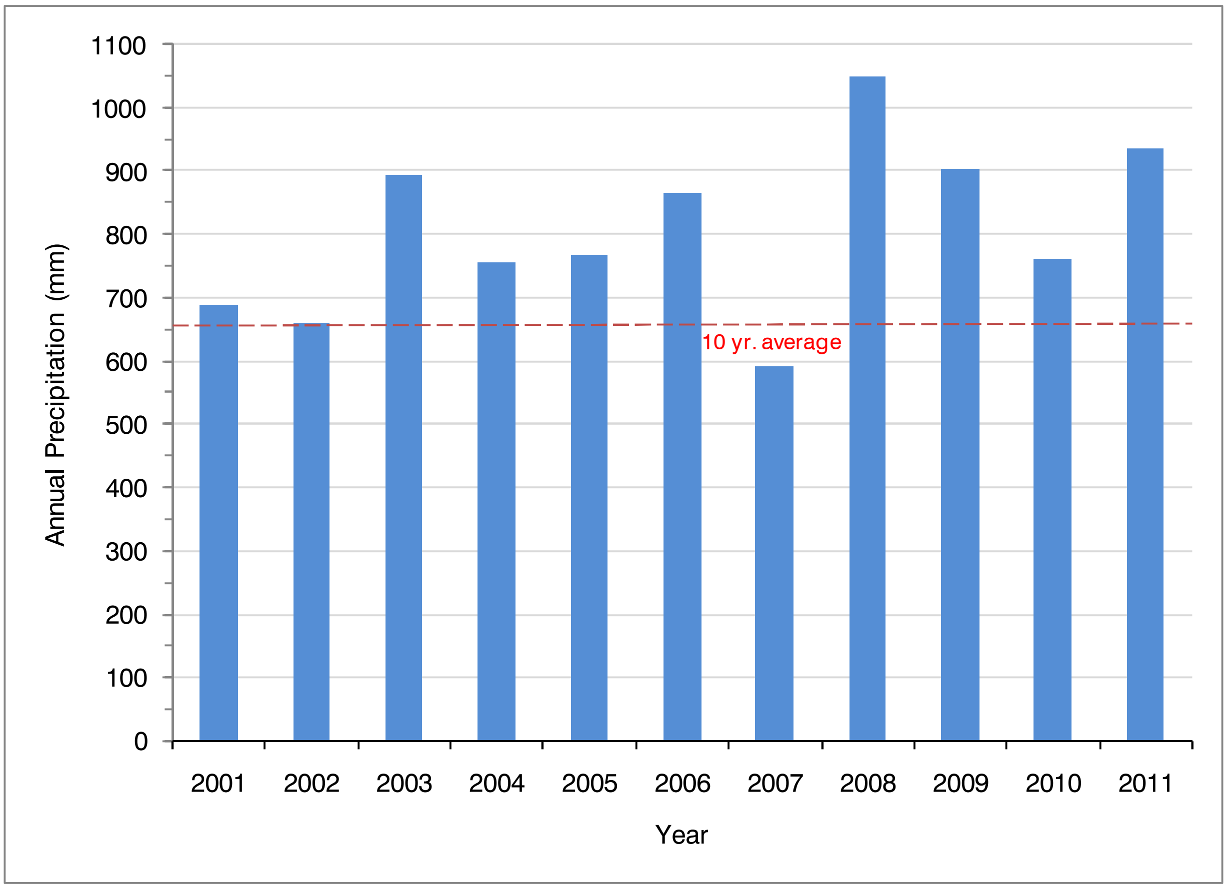

Figure 3. Annual precipitation at Lester B. Pearson International Airport (2001-2011)

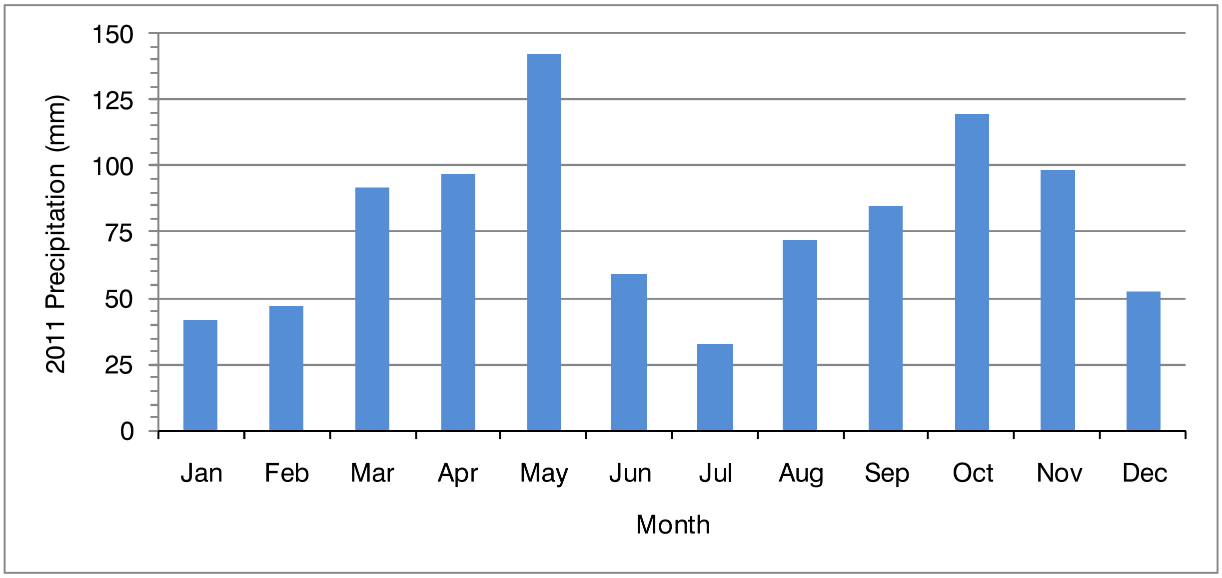

Figure 4. **Monthly precipitation at Lester B. Pearson International Airport (2011)**

3.2 General Chemistry Parameters

The general chemistry parameters included in this report are chloride, specific conductivity, total suspended solids and pH. Conductivity is a measure of how well a solution conducts electricity. Water with no impurities conducts electricity very poorly. Therefore, higher levels of conductivity provide an estimate of the degree of impurity. Electrical current in water is carried almost entirely by dissolved ions. Chloride is a highly soluble, negatively charged ion. Specific conductivity and chloride have a positive/significant relationship, meaning, as chloride concentrations increase, so too will specific conductivity values. Chloride 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).

Total suspended solids is a measure of suspended sediment, which is important for fish and benthos health and aesthetics. Suspended particles may cause abrasion on fish gills, and reduce as well as impair spawning habitat. Toxic organics and metals often adhere to suspended solids and may become available to benthic fauna when the solids settle (CCME, 2007).

pH fluctuations can affect fish communities directly and indirectly by facilitating the release of organic and metal contaminants bonded to sediments. Nutrient cycling, the discharge of industrial effluent and spills can result in pH fluctuations. The pH of water also effects the toxicity of ammonia.

Chloride and Specific Conductivity

Chloride (Figure 5) and specific conductivity (Figure 6) data displayed virtually identical patterns across all watersheds, with higher levels documented in urban areas. Approximately half of the samples (20/43) had a median value which surpassed the CWQG chloride guideline of 120 mg/L for chronic exposure.

Elevated median chloride values at these 20 stations have been documented consistently since 2009. In addition, station HU1RWMP has consistently produced the highest chloride median values over the past three years. The high levels, both range and median, of chloride at these 20 stations is likely a result of the surrounding land-use (i.e. urban, industrial, commercial, residential, etc.) which results in greater road density. Road salting is directly linked to urbanization and increased chloride and specific conductivity levels. Etobicoke Creek, Humber River and the Rouge River display a distinct increase in median chloride values in conjunction with an increase in road density. Mimico Creek, Don River, Highland Creek, Frenchman's Bay, Petticoat Creek and Carruthers Creek all display elevated median values, which surpass the CWQG of 120 mg/L.

In 2011, the only station to record a median value that exceeded the short-term (acute) CWQG chloride guideline of 640 mg/L was station HU1RWMP on Black Creek in the Humber River watershed. HU1RWMP is located in an area of high road density as well as one kilometre downstream of highway 407. Stations that displayed elevated chloride levels in previous years continued to produce 75th percentile values that surpassed 640 mg/L. In 2011, the 75th percentile of nine stations exceeded the short-term chloride guideline, which was only one station less than in 2010.

Station 83009 located in the mid Humber River watershed recorded the lowest median concentration of chloride in 2011, which is likely a result of low road density. On a watershed scale, Duffins Creek, which is the least urbanized watershed, exhibited the lowest overall range of chloride as well as median values, which did not exceed the either CWQG.

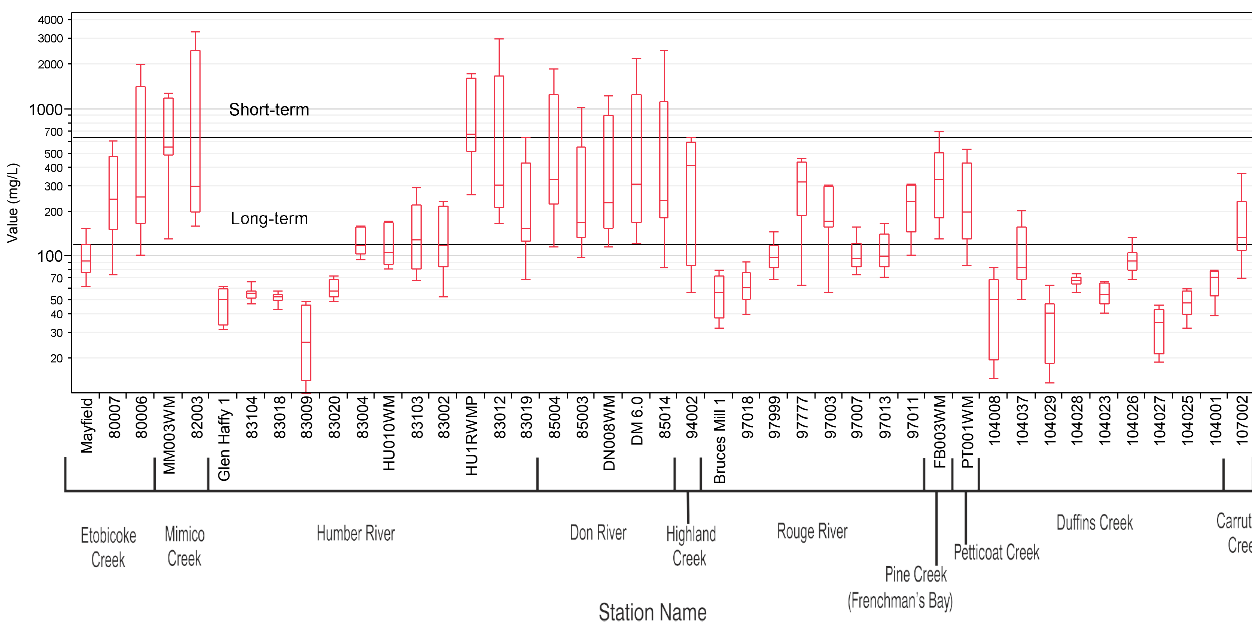

Figure 5. Chloride concentrations (mg/L) at 43 sites within TRCA jurisdiction (CWQG: 120 mg/L (chronic) and 640 mg/L (acute); CCME 2011)

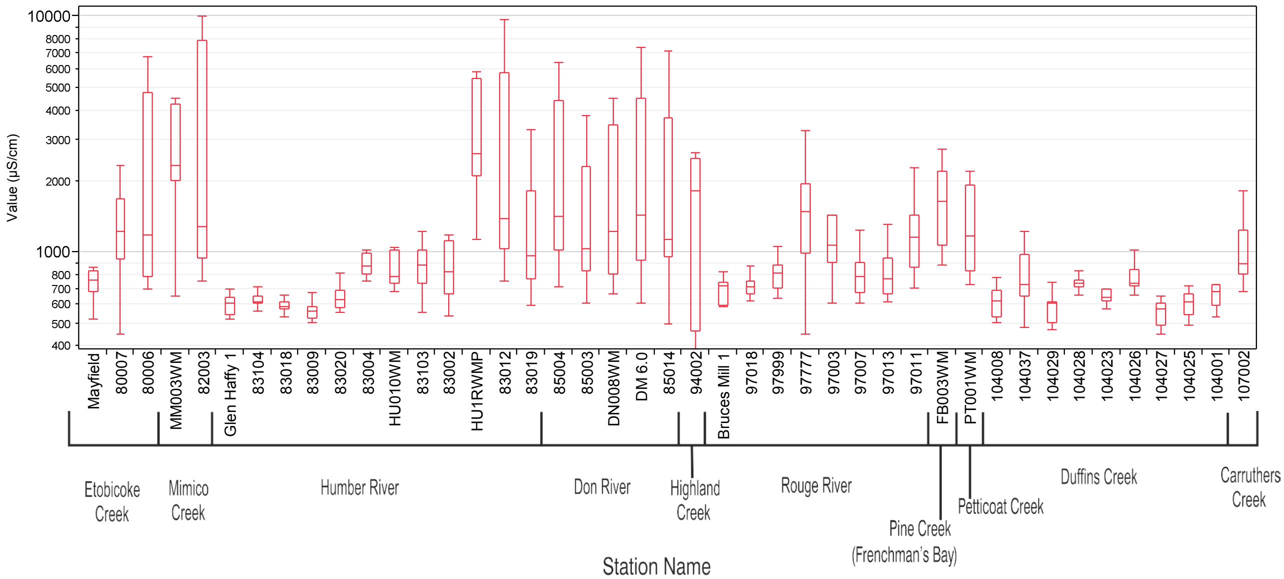

Figure 6. Specific conductivity (µS/cm) at 43 sites within TRCA jurisdiction

Total Suspended Solids

Median values for total suspended solids remained below the derived CWQG of 30 mg/L for all stations (Figure 7). However, the 75th percentile values at 18 of the 43 stations exceeded the CWQG, which is an increase of 12 stations compared to 2010. This may be a result of 44% of samples being collected during wet events compared to 27% in 2010, which would produce greater turbidity. Station 83019, 82003 and 85004 located in the lower Humber River, lower Mimico Creek, and mid Don River watersheds displayed the largest ranges of TSS values which differentiated them from all other stations sampled.

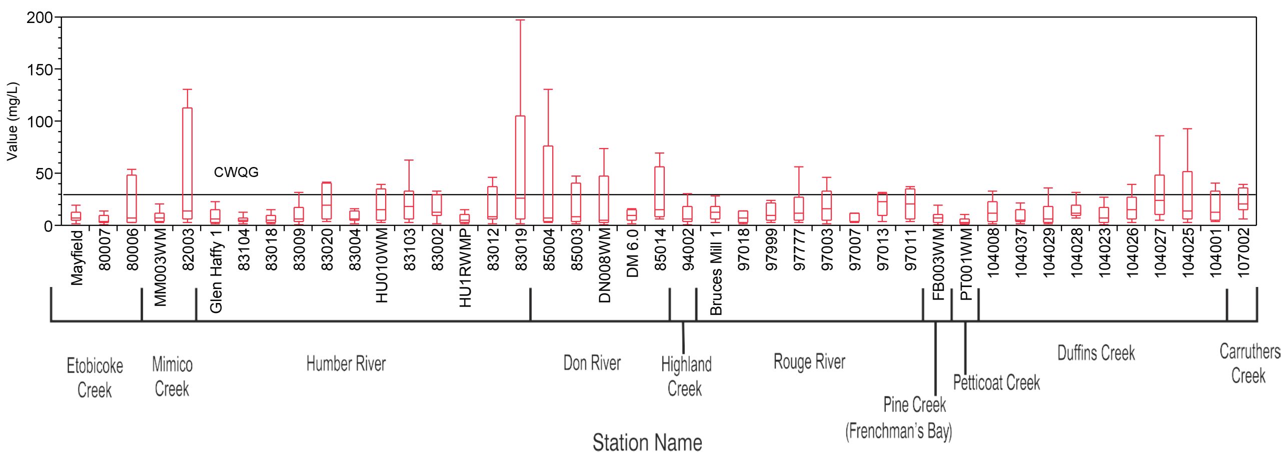

Figure 7. Total suspended solids (TSS) concentrations (mg/L) at 43 sites within TRCA jurisdiction (CWQG: 30 mg/L)

pH

Median pH values were within PWQO range of 6.5 to 8.5 for all stations (Figure 8), although 11 stations displayed 75th percentile values above 8.5.

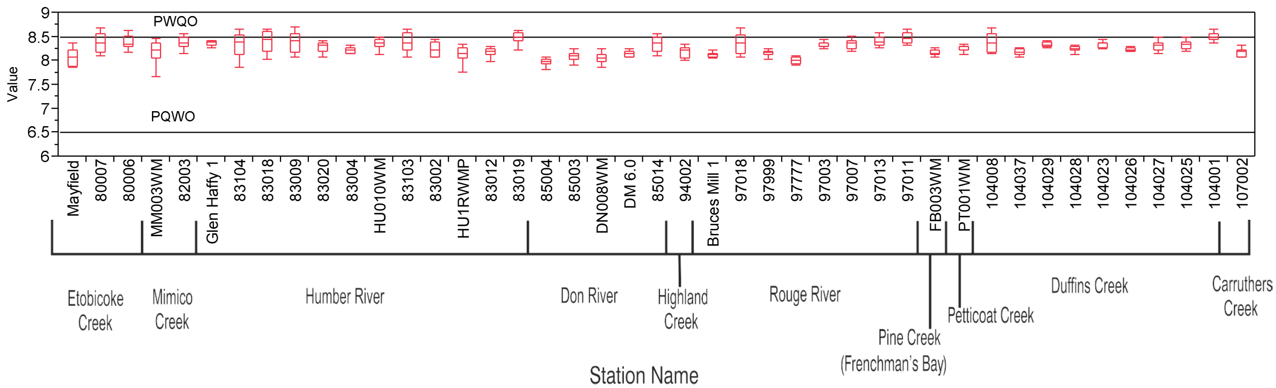

Figure 8. pH values at 43 sites within TRCA jurisdiction (PWQO: 6.5-8.5 pH)

3.3

3.4 Metals

Metals occur naturally in the environment, but human activities such as industrial processes and urban runoff can dramatically alter their distribution and increase their occurrence. When metals are released into the environment in higher than natural concentrations, they can be toxic, cause disruptions to aquatic ecosystems and decrease a waterbody's suitability for supporting aquatic life and domestic uses.

Aluminum

Currently, there is no PWQO, CWQG or CESI guidelines which define the amount of allowable total aluminum for the protection of aquatic life. Relatively higher levels were found at sites located in urban areas within all the watersheds (Figure 9). Station 82003, located in the lower Mimico Creek watershed, displayed the highest levels of aluminum of all stations sampled. This station experienced an increase in its median value from 56 μg/L in 2010 to 213 μg/L in 2011. In addition, the 75th percentile rose from 237 μg/L to 1178 μg/L, which is more than double almost all other stations. The Mimico Creek watershed is heavily developed and provides drainage for the Lester B. Pearson International Airport as well as many industrial/commercial properties, which may be the source of elevated aluminum concentrations.

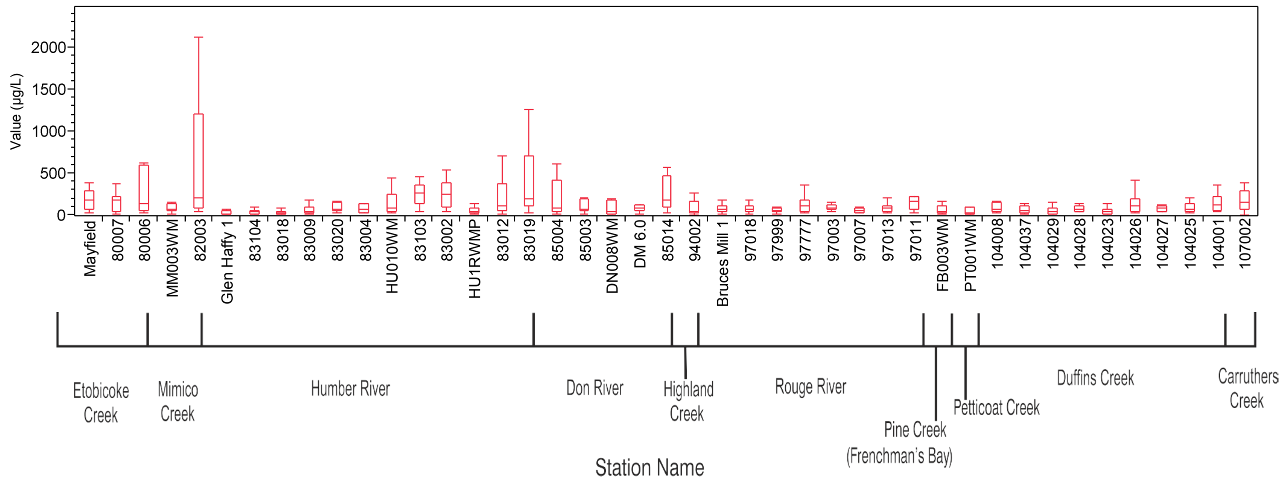

Figure 9. Total aluminum concentrations (µg/L) at 43 sites within TRCA jurisdiction

Arsenic

Arsenic data presented in this report is based on a limited dataset (30 stations) since not all stations were analyzed regularly for this parameter. Only samples submitted to the York-Durham Environmental laboratory year round were analyzed for arsenic since this parameter is not analyzed by OMOE under the PWQMN (See Table 1). Arsenic levels at the stations that were sampled in 2011 (Figure 10) were well below the PWQO of 5 µg/L.

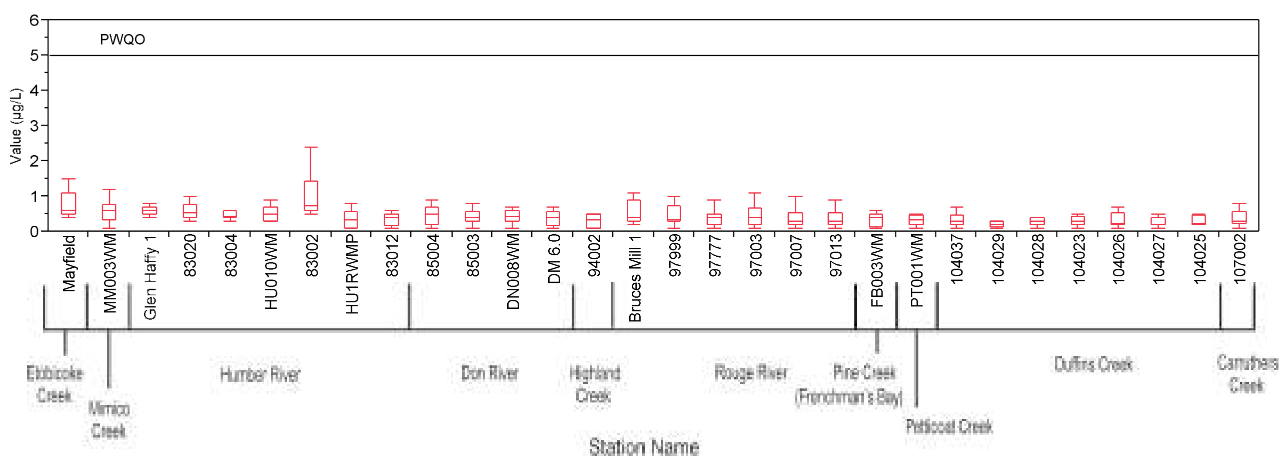

Figure 10. Arsenic concentrations (µg/L) at 30 sites within TRCA jurisdiction (PWQO: 5 µg/L)

Copper

Copper data exhibited the same spatial tendencies as in 2010. Stations located closest to the mouths of Etobicoke Creek, Mimico Creek and the Don River and one station in the Humber River displayed elevated median levels (80006, 82003, 83012 and 85014) which exceeded the PWQO of 5 µg/L (Figure 11).

Concentrations in Etobicoke Creek and the Humber River were lowest at the most northern (upstream) stations (Mayfield and Glen Haffy 1) and generally increased further south (downstream) in the watersheds.

Copper is a trace metal associated with urbanization. Typically, copper binds readily 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).

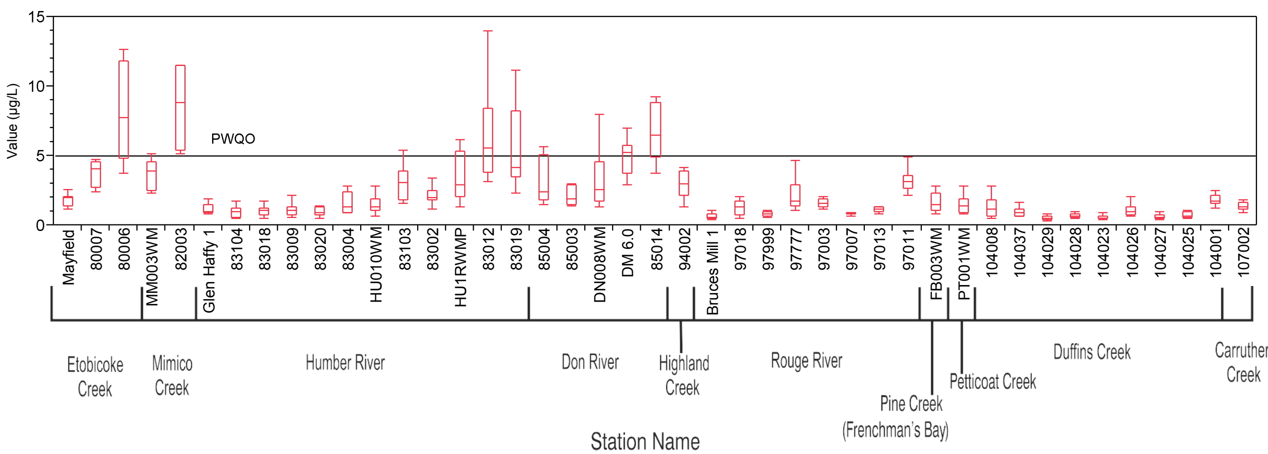

Figure 11. Copper concentrations (µg/L) at 43 sites within TRCA jurisdiction (PWQO: 5 µg/L)

Iron

In 2011, 24 stations median values exceeded the PWQO of 300 µg/L (Figure 12). This includes 13 stations that exceeded the PWQO in 2010 that are predominantly located in urbanized areas in the mid-lower Humber River, the Don River, Pine Creek (Frenchman's Bay) and Carruthers Creek watersheds. Stations located in the lower reaches of the Etobicoke Creek and Mimico Creek watersheds (80006 and 82003) displayed the highest median values. Station 80006 is located within two kilometres of an industrial warehouse complex that may be a source of iron contamination in Etobicoke Creek. Stations 80006 and 82003 are situated downstream of the Lester B. Pearson International Airport and in a heavily developed area. Urban surface runoff is likely the cause of elevated iron concentrations in the surface water of Etobicoke and Mimico Creek watersheds.

Bruces Mill 1 and 104008, which are located in the upper portions of the Rouge River and Duffins Creek watersheds in areas of mixed land use (agricultural/recreational/natural/residential), also exceeded the PWQO for iron concentrations. Bruces Mill 1 is located downstream of two golf courses and a small subdivision while 104008 is situated downstream of the small town of Claremont.

Increased median iron concentrations in 2011 may have been a result of 44% of samples being collected during wet weather events, compared to 27% in 2010. The increase in samples taken during turbid conditions would likely result in increased iron concentrations given the fact that iron has an affinity to bind to sediment particles. Natural sources of iron may also have been the cause of elevated levels at stations 104008 and Bruces Mill 1.

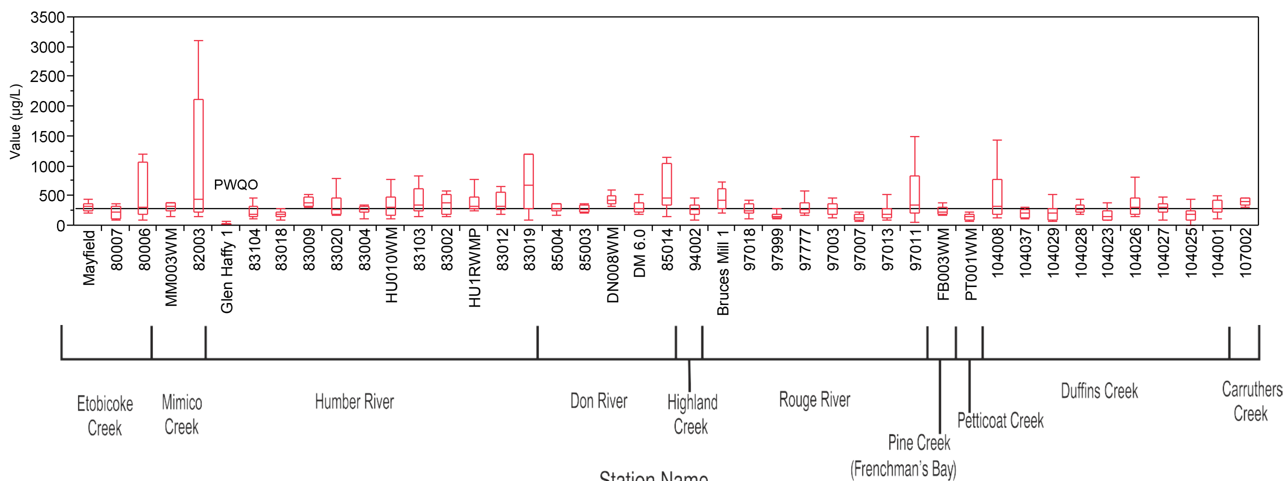

Figure 12. Iron concentrations (µg/L) at 43 sites within TRCA jurisdiction (PWQO: 300 µg/L)

Lead

The OMOE laboratory lead values were omitted because the OMOE reporting detection limit was 11 µg/L, which is well above the PWQO of 5 µg/L. Therefore, the OMOE lead dataset is not comparable due to higher variability at low concentrations. All supplemental sample data for PWQMN stations were excluded due to low samples numbers (n=4). As a result the lead results presented only include TRCA stations sampled 1for 2 months in 2011. Median levels of lead were below the PWQO for all 30 stations (Figure 13).

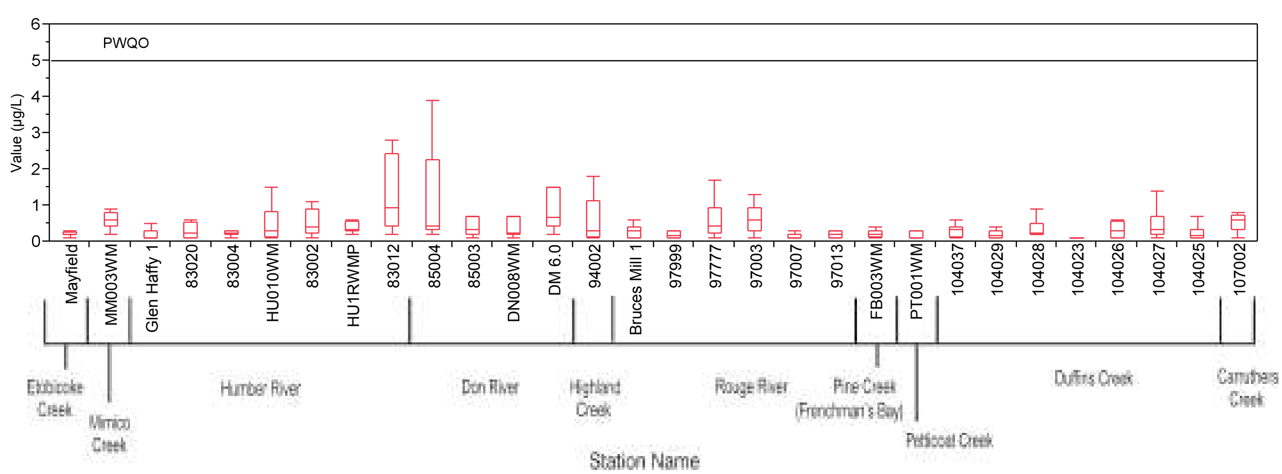

Figure 13. Lead concentrations (µg/L) at 30 sites within TRCA jurisdiction (PWQO: 5 µg/L)

Nickel

Nickel results (Figure 14) were all well below the PWQO of 25 µg/L. Outlet stations located in Etobicoke Creek, Mimico Creek, Humber River, Don River, Rouge River and Duffins Creek displayed slightly higher levels of nickel relative to the other stations within each watershed.

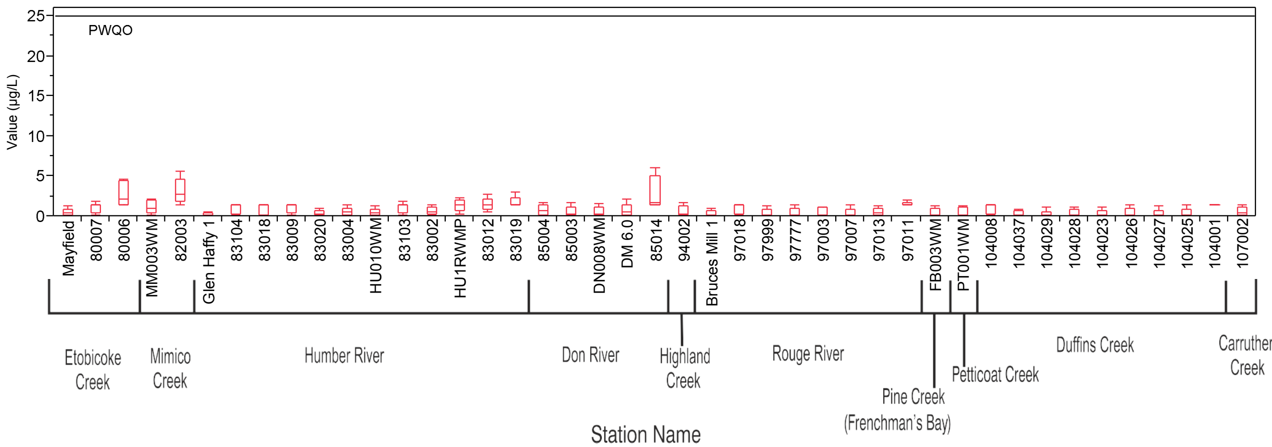

Figure 14. Nickel concentrations (µg/L) at 43 sites within TRCA jurisdiction (PWQO: 25 µg/L)

Zinc

Median zinc concentrations (Figure 15) exceeded the PWQO at two watershed outlet stations (80006 and 82003) in Etobicoke Creek and Mimico Creek. The magnitude of zinc concentrations found easily differentiated these stations for all others which may be a potential concern in the future. Stations 80006 and 82003 are situated downstream of the Lester B. Pearson International Airport and in a heavily developed area. Urban surface runoff is likely the cause of elevated zinc concentrations in the surface water of Etobicoke and Mimico Creek watersheds. Although median values did not exceed the PWQO in the lower Humber River and all Don River, several stations showed elevated zinc levels and 75th percentiles that surpassed the PWQO.

Zinc is made readily available through the natural process of weathering. Other sources include municipal wastewater, wood combustion, iron and steel production and waste incineration (OMOEE, 2003.

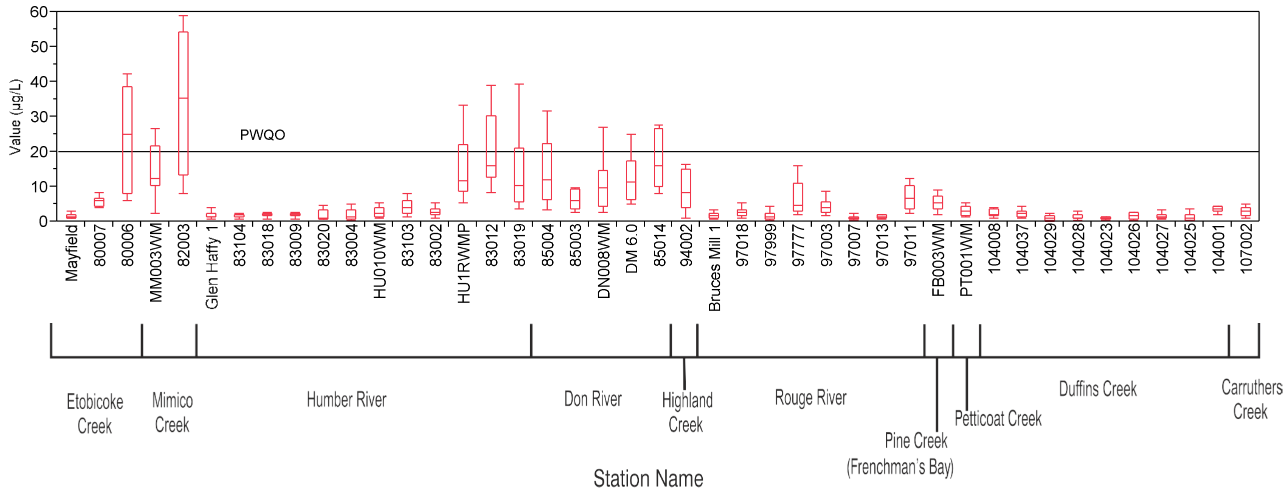

Figure 15. **Zinc concentrations (µg/L) at 43 sites within TRCA jurisdiction (PWQO: 20 µg/L)**

3.5 Bacteria

Microorganisms such as bacteria are found throughout our environment but elevated levels can impact human health and the recreational uses of a waterbody. High *E. coli* levels are indications of raw sewage (human and/or animal) loading. Human activities such as inadequately designed sanitary and stormwater systems as well as illegal connections between storm and sanitary sewers typically result in elevated bacteria concentrations in urbanized areas (CCME, 2003).

Median *Escherichia coli* (*E. coli)* counts met or exceeded the PWQO of 100 colony forming units (CFU)/100 mL at 31 of 43 stations in 2011 (Figure 16). The median values for 9 stations were above 1000 CFU/100 mL and 4 of those were above 2000 CFU/100 mL (83012, DM 6.0, 85014 and 94002). Areas of concern include Etobicoke Creek, Mimico Creek, mid to lower Humber River, the Don River, Highland Creek, and a mid-section as well as the lower Rouge River. Highest median concentrations were recorded at two stations in the Don River watershed (85014 and DM 6.0), one station on a tributary of the lower Humber River (83012), and in Highland Creek (94002). Station DM 6.0 is located on a heavily urbanized tributary (Taylor Massey Creek) of the Don River that is serviced by combined sewers. Also, illegal sewage cross connections to stormwater sewers contribute elevated levels. Station 85014 is located downstream of DM 6.0 as well as approximately 1.5 km downstream of the North Toronto Wastewater Treatment Plant which may contribute to elevated *E. coli* concentrations in the lower Don River. Station 83012 is also located on a heavily urbanized tributary which is located in the Humber River watershed that is serviced by combined sewers with large portions of the channel hardened with concrete banks. These conditions appear to result in an influx of contaminants from the upstream urban areas, which then travel downstream with little opportunity to be filtered or absorbed by the riparian zone. The elevated *E. coli* median value documented at station 94002 is likely a result of the watershed being completely urbanized.

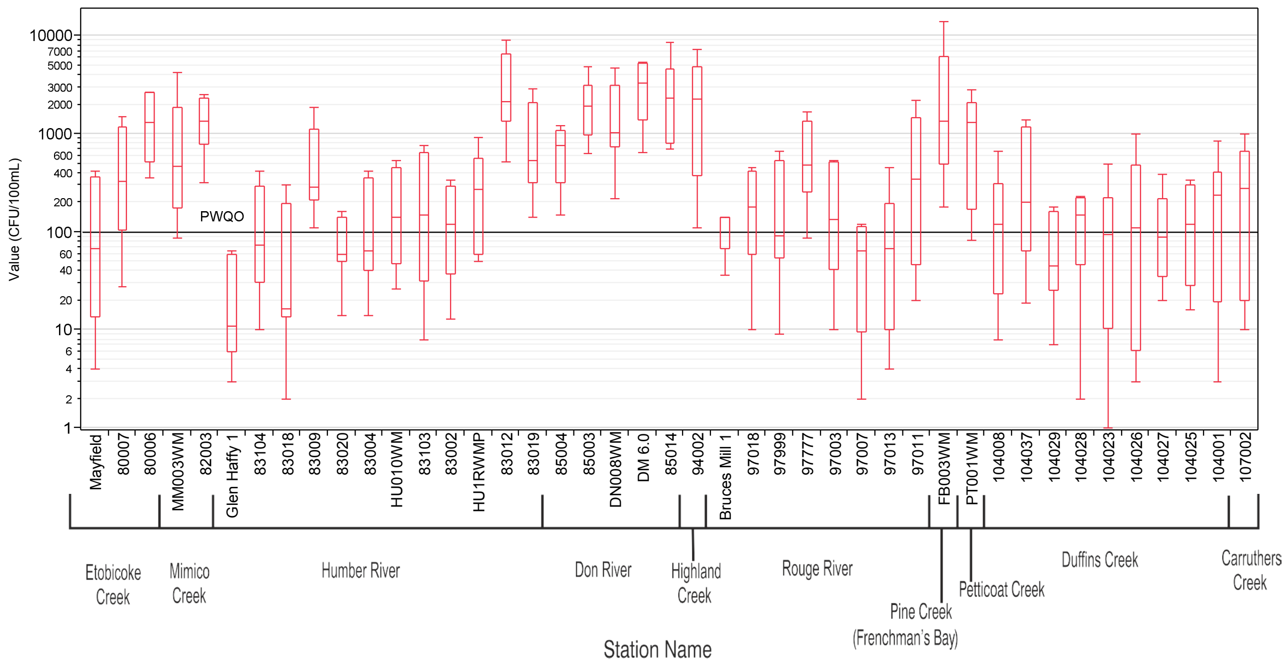

Figure 16. ***Escherichia coli*** **concentrations (CFU/100mL) at 43 sites within TRCA jurisdiction (PWQO: 100 CFU/100 mL)**

3.6 Nutrients

Nitrogen and phosphorous are nutrients that found in agricultural fertilizer, animal wastes and municipal sewage which promote plant and algae growth in aquatic environments. Excessive growth of aquatic plants can cause dissolved oxygen concentrations in streams to decrease during the night to levels that may not sustain certain species of aquatic organisms.

Ammonia

Currently, there is no PWQO, CWQG or CESI guidelines which define the amount of allowable total ammonia for the protection of aquatic life. The highest median total ammonia value (Figure 17) was recorded at station 85014 in the Don River (1075 μg/L). Total ammonia levels at this station can be attributed to combined sewer systems and 85014 being located 1.5 km downstream of the North Toronto Wastewater Treatment Plant which discharges effluent into the lower Don River. In addition, the portion of the Don River is subjected to illegal cross connections that discharge effluent directly into stormwater sewers and into the Don River.

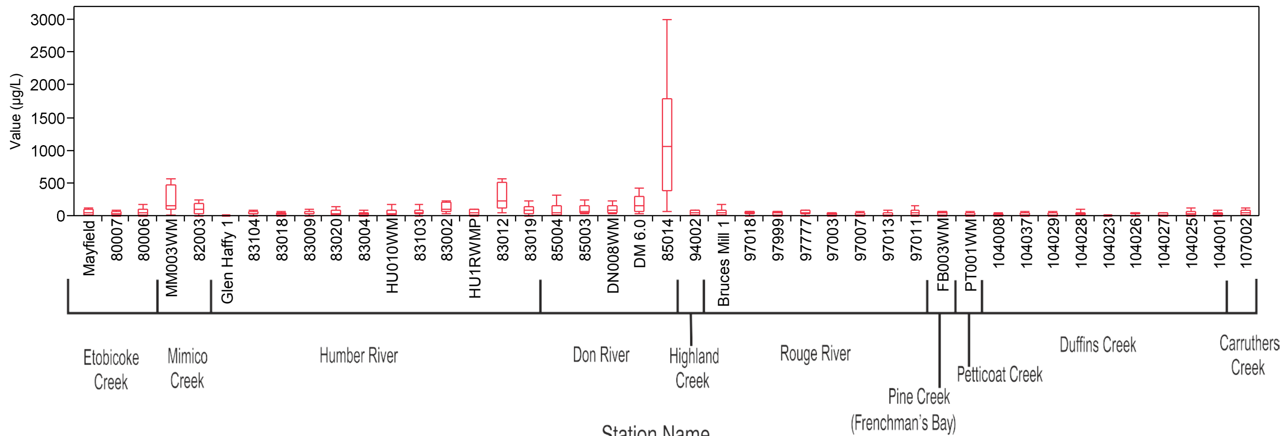

Figure 17. Total ammonia concentrations (µg /L) at 43 sites within TRCA jurisdiction

Phosphorus

Median phosphorus levels exceeded the PWQO of 0.03 mg/L at 28 out of 43 stations in 2011 (Figure 18), which is 3 more than in 2010. The majority of these stations were located in Etobicoke Creek, Mimico Creek, lower Humber River, Don River, Rouge River and Carruthers Creek. All stations located in Etobicoke Creek, Mimco Creek and the Don River exceeded the PWQO. Stations Mayfield (Etobicoke Creek) and 85014 (Don River) displayed the highest elevated levels of phosphorus which may have been caused by 6 of 12 samples (Mayfield) and 8 of 12 samples (85014) being collected during wet weather events. Phosphorus readily binds to sediment particles and increases in phosphorus concentrations are typically associated with storm events and elevated levels of turbidity.

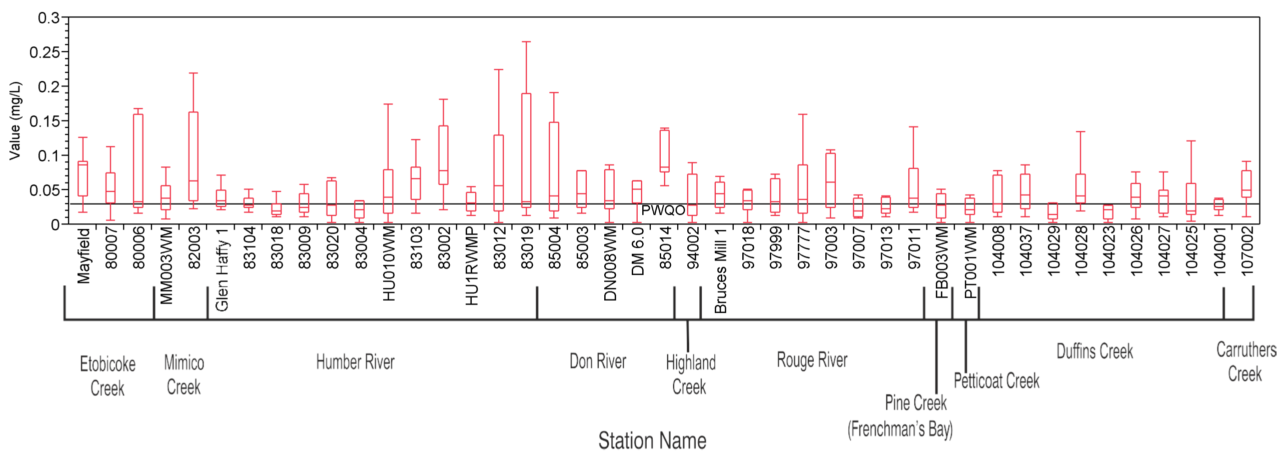

Figure 18. Total phosphorus concentrations (mg/L) at 43 sites within TRCA jurisdiction (PWQO: 0.03 mg/L)

Nitrogen

In contrast to phosphorus, only 1 of the 43 stations exceeded the water quality objectives for nitrite (0.06 mg/L), while no stations exceeded the objectives for nitrate (Figures 19 and 20). Station 83014 had a median nitrite concentration above the CESI of 0.06 mg/L. Nitrite interquartile ranges were greater at stations MM003WM, 82003, HU1RWMP, 83012, DM 6.0, and 85014 relative to the other stations. Median nitrate values appeared elevated at stations MM003WM, 82003, DM 6.0 and 85014. In general, nitrate concentrations increased with urbanization. Total Kjehldahl Nitrogen (TKN) median values were elevated in the Etobicoke Creek, Mimico Creek, portions of the Humber River and the Don River with stations 83002 and 85014 having the highest median values (Figure 21). TKN is the total concentration of organic nitrogen and ammonia.

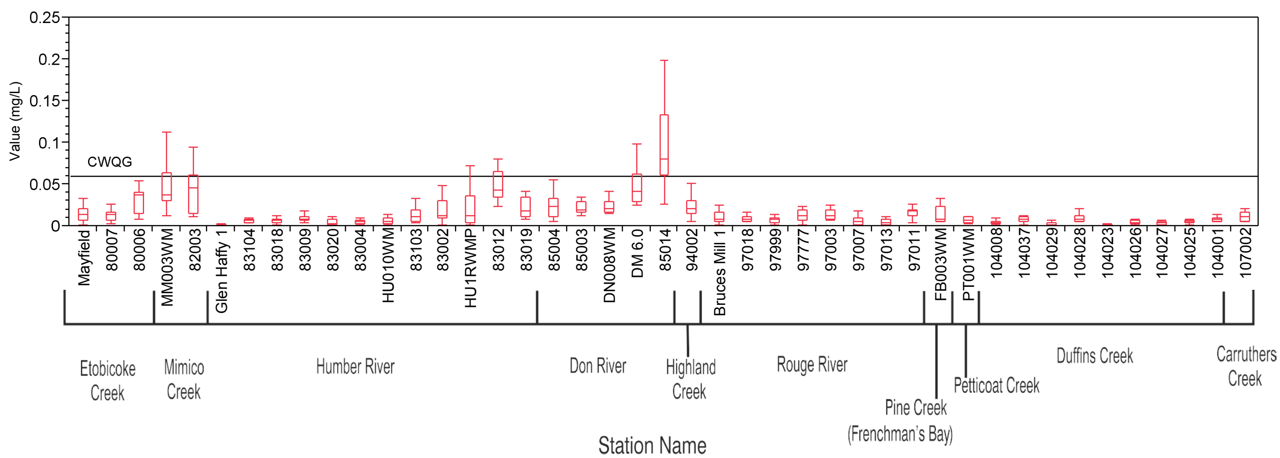

Figure 19. Nitrite concentrations (mg/L) at 43 sites within TRCA jurisdiction (CWQG: 0.06 mg/L)

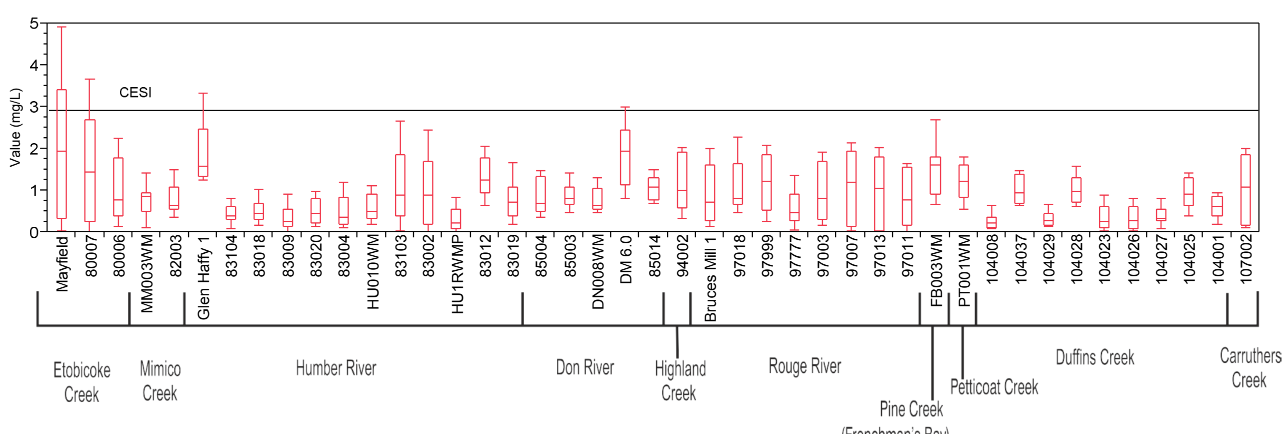

Figure 20. Nitrate concentrations (mg/L) at 43 sites within TRCA jurisdiction (EC: 2.93 mg/L)

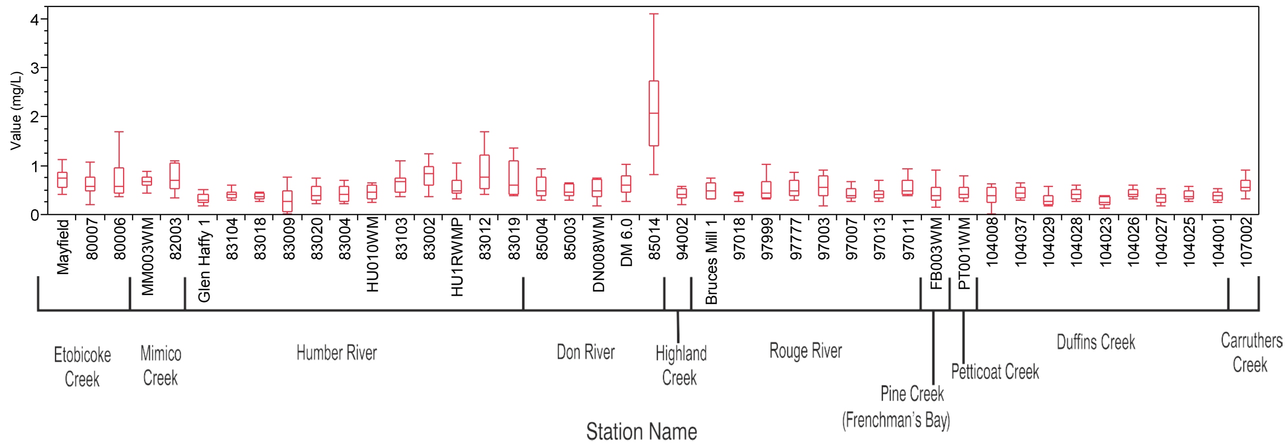

Figure 21. Total kjeldahl nitrogen (TKN) concentrations (mg/L) at 43 sites within TRCA jurisdiction

4. Summary

The results in this report represent a limited assessment/characterization of the water quality conditions found in 2011 since samples were collected irrespective of precipitation and flows. It is expected that levels of many of the parameters presented in this report would be higher when mobilized by storm events. Areas of concern identified in 2008, 2009 and 2010 continue to display elevated levels of contaminants. In 2011, the water quality in the lower portions of Etobicoke Creek and Mimico Creek were characterized by median values above guidelines/objectives for chloride, copper, iron, zinc, *E.coli* and phosphorus. Stations in the lower Humber River experienced the same exceedences with the exception of zinc, although zinc levels were elevated relative to other stations that were not of concern. The lower Don River displayed the greatest levels of degradation within the TRCA jurisdiction. Chloride, copper iron, *E. coli*, total ammonia, phosphorus nitrite and TKN were all a concern in the lower Don River. Frenchman's Bay and Petticoat Creek watershed, which are areas that are developed but drain significantly smaller areas, experienced contaminant levels above the designated the guidelines/objectives for only chloride and *E. coli*.

Watersheds located in less developed areas did not incur the same level of water quality degradation as the developed portions of Etobicoke Creek, Mimico Creek, Humber River and the Don River. Although, the Rouge River did experience elevated levels of chloride, iron, *E. coli* and phosphorus that exceeded the guidelines/objectives utilized in this report. Duffins creek exhibited the least water quality degradation of all watersheds, but *E. coli* and phosphorus are still a concern throughout the watershed. This can be attributed to the extensive use of land for agricultural purposes.

Non-point source pollution (e.g. stormwater runoff) continues to influence water quality within the Greater Toronto Area. As water flows through each watershed towards Lake Ontario, water quality becomes degraded as it passes through agricultural and urban areas. Point sources of pollution also contribute to the degradation of Toronto's water quality.

5. References

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Appendix A – Water quality stream conditions from field notes

Site	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Wet (# samples)	Dry (# samples)
80006	Frozen partly, clear	Frozen partly, turbid slightly	Turbid, high	Turbid, high	Turbid, high	Turbid	Low water	Low water	Clear	Turbid, high	Turbid slightly, high slightly	Clear	7	5
80007	Frozen	Turbid, high	Turbid, high	Turbid slightly, high	Turbid, high	Low water	Low water	Clear	Clear	Clear	Clear	Clear	4	8
82003	Frozen partly, clear	Frozen partly, turbid slightly	Turbid slightly, high	Turbid, high	Turbid, high	Turbid	Low water	Low water	Clear	Turbid, high	Turbid slightly, high slightly	Turbid extremely	8	4
83002	Frozen	Turbid slightly	Turbid, high	Turbid, high	Turbid, high	Clear	Low water, very	Turbid, high	Low water	Turbid, high	Clear	Clear	6	6
83004	Frozen	Turbid slightly, high	Turbid, high	Turbid, high	Turbid, high	Clear	Low water	Clear	Clear	Clear	Clear	High slightly	4	8
83009	Frozen partly, clear	Turbid, high	Turbid, high	Turbid slightly, high	Turbid slightly	Clear	Clear	Clear	Clear	Clear	Clear	Clear	4	8
83012	Turbid slightly	Turbid slightly	Turbid, high	Turbid, high	Turbid, high	Turbid, extremely high	Low water	Low water	Clear	Turbid, high	Clear	Clear	7	5
83018	Frozen	Frozen	Turbid, high	Clear	Turbid slightly	Clear	Clear	Clear	Clear	Clear	Clear	Clear	2	10
83019	Frozen	Frozen, high	Turbid, high	Turbid, high	Turbid, high	Turbid	Low water	Low water	Clear	Turbid, high	High slightly	Clear	6	6
83020	Frozen partly, clear	Turbid, high, site flooded	Turbid, high	Turbid, high	Turbid, high	Clear	Turbid slightly	Clear	Clear	Turbid, high	Clear	High slightly	7	5

Site	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Wet (# samples)	Dry (# samples)
83103	Frozen	Turbid slightly, high	Turbid, high	Turbid, high	Turbid, high	Clear	Low water	Turbid , high	Low	Clear	Clear	Clear	5	7
83104	Frozen	Frozen	Turbid slightly, high	Clear, high	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	2	10
85003	Frozen	Clear	Turbid slightly	Turbid, high	Turbid, high	Turbid, high	Low water	Low water	Clear	Turbid, high	Clear	Clear	5	7
85004	Frozen	Frozen partly, clear	Turbid slightly	Turbid, high	Turbid, high	Turbid	Low water	Low water	Turbid slightly	Turbid, high	Turbid slightly	Clear	7	5
85014	Turbid slightly	Turbid slightly	Turbid slightly	Turbid, high	Turbid	Turbid, high	Low water	Clear	Clear	Turbid slightly, high slightly	Turbid slightly	Clear	8	4
94002	Frozen partly, clear	Turbid slightly	Turbid slightly	Turbid slightly	Turbid, high	Clear	Low water	Clear	Turbid, high slightly	Turbid, high	Turbid, high	Clear	7	5
97003	Frozen	Frozen partly, turbid	Turbid, high	Turbid, high slightly	Turbid slightly	Clear	Low water	Clear	Turbid, high	Turbid, high	Turbid slightly	Clear	7	5
97007	Frozen	Frozen partly, clear	Turbid, high	Clear	Turbid slightly, high	Clear	Low water	Clear	Turbid slightly	Turbid, high	Clear	Clear	4	8
97011	Frozen	Frozen, high	Turbid, high	Turbid slightly	Turbid, high	Clear	Clear	Clear	Turbid, high slightly	Turbid, high	Turbid slightly, high slightly	Clear	6	6
97013	Frozen	Frozen partly, clear	Turbid, high	Turbid slightly	Turbid, high	Clear	Low water	Clear	Clear	Turbid, high	Clear	Clear	4	8
97018	Frozen	Frozen partly, clear	Turbid, high	Clear	Turbid slightly	Clear	Clear	Clear	Turbid slightly	Turbid, high	Clear	Clear	4	8
97777	Frozen partly, clear	Frozen partly, clear	Turbid, high	Turbid, high	Turbid slightly	Clear	Clear	Clear	Turbid, high	Turbid, high	Turbid, high slightly	Low	6	6

Site	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Wet (# samples)	Dry (# samples)
97999	Frozen	Frozen	Turbid, high	Clear	Turbid slightly	Clear	Clear	Clear	Turbid slightly	Turbid, high	Turbid slightly, high slightly	Clear	5	7
104001	Frozen	Turbid slightly	Turbid, high	Turbid	Turbid slightly, high	Clear	Clear	Clear	Turbid slightly, high slightly	Turbid, high	Turbid slightly, high slightly	Clear	7	5
104008	Frozen partly, clear	Frozen	Turbid slightly, high	Clear	Turbid, high	Clear	Low water	Clear	Turbid slightly	Turbid slightly, high	Turbid slightly, high slightly	Clear	5	7
104023	Frozen	Frozen partly, clear	Turbid slightly, high	Clear	Clear	Clear	Clear	Clear	Clear	Turbid, high	Turbid slightly	Clear	3	9
104025	Frozen	Frozen, high	Turbid, high	Turbid, high	Turbid, high	Clear	Low water	Clear	Turbid, high	Turbid, high	Turbid slightly	Clear	6	6
104026	Frozen	Frozen, high	Turbid slightly, high	Turbid slightly	Turbid slightly	Clear	Clear	Turbid slightl y	Turbid slightly	Turbid, high	Turbid slightly, high slightly	Clear	7	5
104027	Frozen	Frozen, high	Turbid, high	Turbid, high	Turbid slightly	Clear	Clear	Clear	Turbid, high	Turbid, high	Turbid slightly, high slightly	Clear	6	6
104028	Frozen partly, clear	Frozen	Turbid slightly, high	Turbid slightly, high slightly	Turbid	Clear	Clear	Clear	Clear	Turbid, high	Turbid slightly, high slightly	Clear	5	7
104029	Frozen	Frozen, high	Turbid slightly, high	Clear	Turbid, high	Clear	Low water	Clear	Turbid slightly	Turbid slightly, high	Turbid slightly, high slightly	Clear	5	7
104037	Frozen	Frozen	Turbid, high	Clear	Clear	Clear	Low water	Clear	Turbid slightly	Turbid slightly, high	Clear	Clear	3	9

Site	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Wet (# samples)	Dry (# samples)
107002	Frozen	Frozen	Turbid, high	Turbid, high	Turbid, high	Turbid slightly	Clear	Turbid	Clear	Turbid, high	Turbid, high	Clear	7	5
DM 6.0	Frozen partly, clear	Clear	Turbid slightly	Turbid, high	Turbid slightly	Turbid, high	Clear	Clear	Clear	Turbid slightly, high slightly	Clear	Clear	5	7
DN008WM	Frozen partly, clear	Clear	Turbid slightly	Turbid, high	Turbid slightly	Turbid	Low water	Clear	Clear	Turbid, high	Clear	Clear	5	7
FB003WM	Frozen	Frozen	Turbid slightly	Clear	Turbid slightly	Clear	Low water	Clear	Turbid slightly	Turbid, high	Turbid slightly, high slightly	Clear	5	7
HU010WM	Frozen partly, clear	Turbid, high	Turbid, high	Turbid, high	Turbid, high	Clear	Clear	Turbid , high	Clear	Turbid slightly, high	Clear	High slightly	7	5
HU1RWMP	Frozen	Frozen, turbid slightly	Turbid slightly, high	Turbid slightly, high	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	3	9
Mayfield	Frozen	Frozen, turbid and high	Turbid, high	Turbid, high	Turbid, high	Clear	Low water	Turbid slightly, high	Clear	Turbid slightly, high slightly	Clear	Clear	6	6
MM003WM	Frozen	Clear	Turbid, high	Turbid slightly, high	Turbid slightly	Clear	Low water	Turbid	Low water	Turbid slightly, high	Clear	Clear	5	7
PT001WM	Frozen	Frozen, high, site flooded	Turbid slightly, high	Turbid slightly, high	Turbid slightly, high	Clear	Low water	Low water	Turbid, high slightly	Turbid, high	Turbid, high	Clear	6	6
Glen Haffy 1	Frozen	High	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	1	11

Site	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Wet (# samples)	Dry (# samples)
Heart Lake 1	Frozen	High	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	1	11
Bruce's Mill 1	Frozen partly, turbid slightly	Turbid, high	High	Turbid slightly	Clear	Clear	Clear	Turbid slightly	Turbid, high	Turbid, high	Clear	Clear	7	5
													230	298