Centre for Alternative Wastewater Treatment

# CFS Alert Wetland Report 2016

Gordon Balch, Marcus Sheppard, Heather Broadbent,
Jennifer Paul and Brent Wootton

March 2017

Fleming College

Contact Information:

**Jeremy Kraemer, Ph.D., P.Eng.**
Director,
Centre for Alternative Wastewater Treatment
**t:** 705-324-9144 x 3226
**f:** 705-824-8805
**e:** jeremy.kraemer@flemingcollege.ca

**Mary Lou McLean**
Manager of Applied Research,
Fleming College
**t:** 705-324-9144 x 3080
**f:** 705-324-8805
**e:** mary_lou.mclean@flemingcollege.ca

**Jennifer Paul**
Manager, Projects and Partners
Fleming College
**t:** 705-324-9144 x 3068
**f:** 705-324-8805
**e:** jenn.paul@flemingcollege.ca

**Fleming College**
200 Albert St. S., PO Box 8000
Lindsay, ON K9V 5E6

**cawt.ca**

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# EXECUTIVE SUMMARY

The performance of the terraced wetland located at the Canadian Forces Station (CFS) in Alert, Nunavut was monitored over the summer months (July to September) in 2016 by the Centre for Alternative Wastewater Treatment (CAWT), a research facility of Fleming College in Lindsay, Ontario. This wetland is used to treat the sanitary waste and greywater generated at the CFS. The wetland in its present location was commissioned in the summer of 2010. CFS Alert produces on average approximately 100 $m^3$ of wastewater per day that is directed to the terraced wetland for treatment. The current water licence (No. 3BC-ALT1015) issued in August 2010 to the Department of National Defence by the Nunavut Water Board stipulates that treated wastewater effluent from the station should be equal to or less than:

- 80 mg $L^{-1}$ five day biochemical oxygen demand ($BOD_5$);
- 70 mg $L^{-1}$ total suspended solids (TSS);
- 5 mg $L^{-1}$ oil and grease;
- and have a pH between 6 and 9.

The four compliance parameters of the water licence mentioned above, along with an additional 19 water quality parameters and 35 trace elements within the wastewater, were monitored to assess the performance and treatment efficiency of the terraced wetland. The assessment period began later in the season than normal, spanning from July 27 to September 6, 2016. Due to the late start, samples were not collected during the spring freshet when flow conditions are expected to be the highest and treatment performance the lowest because of shorter wastewater retention times. Samples were collected from a defined set of 14 locations strategically placed throughout the wetland to ensure adequate monitoring at all major regions within the wetland and one location at a reference stream to assess natural background levels for the region.

The averaged summer concentration of the treated effluent exiting the wetland indicates that $BOD_5$ was reduced to a final concentration of 13 mg $BOD_5$ per L, which is well below the compliance value of 80 mg $BOD_5$ per L. The summer average of TSS exiting the wetland was 48 mg $L^{-1}$, a concentration well below the compliance value of 70 mg TSS per L. The summer average of oil and grease in the wetland effluent was 9.4 mg $L^{-1}$, which is above the compliance criteria of 5 mg $L^{-1}$. The pH level was within compliance with an average of approximately 8.4. An unusually high strength of wastewater effluent was observed on August 24; the elevated concentration appeared to drop back to near normal conditions in subsequent weeks and appeared to have little impact on the overall performance of the wetland and the quality of effluent draining into Parr Inlet.

This was the sixth season the wetland was monitored by the CAWT. Significant

maintenance work to fix breaches in the berms occurred late in the 2015 season. Significant improvement to 2016 flow detention and flow direction, together with the lack of breaches to berms, indicated that the work occurring at the end of the 2015 field season greatly improved the overall performance of the wetland.

Assessing the performance of the wetland from one year to the next can be difficult since operating parameters of the wetland (e.g. breaching of berms) often change and the overall strength of the wastewater entering the wetland is variable from year to year. Because of this variability, it became meaningless to attempt to generate an overall quantification of treatment performance occuring over the six years of assessment. Table E.1 illustrates the irregularity in the overall strength (based on concentration) of BOD, VSS, Fats/Oils/Grease (FOG) within the wastewater entering the wetland, which was lower in 2013 and 2014 compared to 2012, higher in 2015, and once again lower in 2016.

**Table E.1. Overview of individual wastewater constituents of the influent entering the wetland. All values represent summer averages expressed as percent change from the summer averages of the previous field season.**

| Parameter | | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|
| | | % Change in Conc. of Influent from 2011 | % Change in Conc. of Influent from 2012 | % Change in Conc. of Influent from 2013 | % Change in Conc. of Influent from 2014 | % Change in Conc. of Influent from 2015 |
| $BOD_5$ | mg $L^{-1}$ | 56 | -82 | 14 | 172 | -31 |
| $cBOD_5$ | mg $L^{-1}$ | 48 | -62 | 60 | 9 | 9 |
| TSS | mg $L^{-1}$ | 588 | -66 | 61 | 62 | -9 |
| VSS | mg $L^{-1}$ | 758 | -68 | 39 | 98 | -15 |
| FOG | mg $L^{-1}$ | 1315 | -13 | 6 | 55 | 9 |
| COD | mg $L^{-1}$ | 115 | -48 | 44 | 133 | -24 |
| TN | mg $L^{-1}$ | | -7 | -12 | 188 | 26 |
| TKN | mg $L^{-1}$ | 36 | -8 | -11 | 188 | -55 |
| TAN | mg $L^{-1}$ | -9 | -23 | -10 | 68 | -46 |
| TP | mg $L^{-1}$ | 233 | -26 | -37 | 292 | -55 |
| $PO_4$ | mg $L^{-1}$ | 1567 | -43 | -48 | 318 | -59 |
| TC | cfu/100mL | 16567 | -68 | -65 | 2116 | 58 |
| EC | cfu/100mL | 8991 | -66 | -50 | 1392 | -10 |

The treatment performance of the wetland, expressed as a percent change between influent to effluent (negative values represent a reduction in the concentration of a parameter), is tabulated for years 2012 to 2016 in Table E.2. Although year-to-year results are variable, the overall magnitude of change for individual parameters is similar, suggesting that for the most part (with the exception of $BOD_5$ and FOG in 2015 and TSS in 2013, 2014 and 2015), the treatment performance of the wetland remains comparable among the six years of monitoring.

**Table E.2. Treatment efficiency expressed as a percent change in the concentration between influent entering the wetland and effluent leaving the wetland for each of the six years of assessment.**

| Parameter | | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|
| | | % Treatment | % Treatment | % Treatment | % Treatment | % Treatment | % Treatment |
| $BOD_5$ | mg $L^{-1}$ | -97 | -85 | -71 | -50 | -2 | -96 |
| $cBOD_5$ | mg $L^{-1}$ | -91 | -76 | -85 | -74 | -63 | -91 |
| TSS | mg $L^{-1}$ | 392 | -63 | 418 | 340 | 196 | -82 |
| VSS | mg $L^{-1}$ | 8 | -83 | -52 | -58 | -42 | -89 |
| FOG | mg $L^{-1}$ | -10 | -36 | -73 | -57 | 59 | -89 |
| COD | mg $L^{-1}$ | -67 | -45 | -52 | -47 | -34 | -85 |
| TN | mg $L^{-1}$ | | -46 | -39 | -28 | -51 | -46 |
| TKN | mg $L^{-1}$ | -54 | -46 | -38 | -29 | -52 | -68 |
| TP | mg $L^{-1}$ | -47 | -63 | -62 | -24 | -62 | -81 |
| $PO_4$ | mg $L^{-1}$ | -100 | -90 | -74 | -91 | -87 | -88 |

# 1.0 INTRODUCTION

This document provides a review of the terraced wetland located at the Canadian Forces Station (CFS) Alert, Nunavut and its performance in the treatment of domestic wastewater generated at the CFS in the summer of 2016. The report summarizes the data collected at specified sampling points within the wetland between the dates of July 27 and September 6, 2016. The performance of the wetland was assessed by monitoring the changes in water quality and biological parameters of the wastewater as it traversed the wetland. Treated wastewater exiting the wetland was then compared to the compliance parameters stipulated in CFS Alert's water licence issued by the Nunavut Water Board (see below). Additional water quality parameters were also analyzed to provide greater insight into performance of the treatment wetland. Results from similar studies in 2012, 2013, 2014, and 2015 were compared with these current data to assess yearly differences. This report also provides a list of recommendations intended to enhance the overall performance in future years.

## 1.1 Nunavut Water Board Licenced Water Quality Parameters

The Nunavut Water Board licence (No. 3BC-ALT1015) issued in August 2010 to the Department of National Defence stipulates that treated wastewater effluent from the station should meet the following criteria:

| Parameter | Maximum Concentration of Any Grab Sample |
|---|---|
| $BOD_5$ | 80 mg $L^{-1}$ |
| total suspended solids | 70 mg $L^{-1}$ |
| oil and grease | 5 mg $L^{-1}$ and no visible sheen |
| pH | between 6 and 9 |

## 1.2 Background

This study was undertaken by the Centre for Alternative Wastewater Treatment (CAWT) at the request of the Canadian Department of National Defence (DND). The CAWT is an applied research facility of Fleming College in Lindsay, Ontario, Canada and has extensive expertise in the monitoring and assessment of treatment wetlands located in Canada's Far North. Of note was a research grant from the Canadian government through the International Polar Year program (IPY award: 2007 – 2011) to investigate the efficacy of northern treatment wetlands and to document efficiencies in the treatment of municipal sewage received from six hamlets in the Kivalliq region

of Nunavut. Subsequently, Environment Canada (Aquatic Ecosystem Management Research Division) contracted the CAWT to investigate the performance of seven additional wetlands because of the CAWT's prior IPY experience and its demonstrated capacity to conduct this type of research.

In December of 2008, DND contacted FSC Architects and Engineers (now Stantec) to investigate options that could be implemented for the treatment of the domestic wastewater generated at CFS Alert. It was decided that the wastewater could be treated by an overland flow system that utilized terraces to trap and delay the wastewater prior to entering Parr Inlet of the Arctic Ocean bounding CFS Alert. It was assumed that water quality of the wastewater would be improved through the physical removal of suspended material and by biological mechanisms as the wastewater flowed over biofilms that had developed on the substrate of this site. For the purposes of this document, the treatment area is referred to as a terraced wetland.

In 2010, the Nunavut Water Board (NWB), on behalf of the Nunavut Territorial government, issued DND a water licence (No. 3BC-ALT1015) establishing the water quality compliance criteria that must be met by DND in the management of the terraced wetland. The water quality parameters stipulated in the licence include the five day biochemical oxygen demand ($BOD_5$), total suspended solids (TSS), oil and grease (referred to as FOG which stands for fats/oils/grease) and pH. In preparation for this licence, DND expressed difficulty in having $BOD_5$ analyzed within the short timeframe required by this test, since these samples must be shipped to larger centres in the south for analysis. The CAWT therefore proposed to provide services at the Alert station in the determination of additional $BOD_5$ samples to provide an additional check to determine if and how sample quality changed over time in the samples shipped to a certified southern laboratory for analysis. DND also expressed interest in determining if a consistent relationship exists between $BOD_5$ and the chemical oxygen demand (COD) of the wastewater. If a consistent relationship was found, then DND would like to present this evidence to the NWB with the hope that the more easily analyzed COD may be used as a surrogate for the more commonly used $BOD_5$ water quality parameter. Data from the 2011, 2012, 2013, 2014, and 2015 field seasons failed to show any consistent relationship between $cBOD_5$ and COD. This comparison was examined once again in 2016 to determine if the findings are consistent with the data from 2012 to 2015.

The terraced wetland was established in the summer of 2010 and has operated since. The daily volume of wastewater can range from approximately 70 $m^3$/day during winter months to a high of approximately 120 $m^3$/day in the summer, which is reflective of the fluctuation in the number of personnel stationed at the base. Clean water (bleed water) is allowed to constantly bleed through the collection and distribution systems

to prevent freezing; therefore wastewater is always flowing to the terraced wetland. This wastewater is a combination of bleed water, garburated food wastes, along with greywater and sanitary sewer waste. This means that the consistency of the wastewater can be quite variable and range in strength from very dilute to moderately strong, depending on the time of day or the type of activities occurring at the station.

Late in the summer of 2010, the CAWT spent a week at the newly constructed terraced wetland mapping the site, establishing sample collection sites, and performing a limited number of analyses on the wastewater. In 2011 the CAWT visited the terraced wetland for approximately one month to monitor its performance in the treatment of the wastewater. The field seasons of 2012, 2013, 2014, and 2015 were extended to slightly more than three months in duration. In 2016 the CAWT once again visited the wetland for approximately two months to monitor wetland performance. Portions of the terraces (also called berms in this report) typically erode during the spring freshet and are often not repaired until late in August. Fortuitously, the berms modified last in the 2015 field season remained relatively intact for the 2016 field season and overall functioned better than in previous years.

## 1.3 Overview of Treatment Processes Operative in Wetlands

Many of the processes (biological, chemical, physical) operating in the treatment of municipal sewage / effluents are common to both wastewater treatment plants and to treatment wetlands. In brief, the treatment of municipal sewage and effluents can be summarized as: i) oxidizing organic and chemical constituents to harmless products, ii) the removal of viable pathogens, and iii) removal of suspended solids along with inorganic and or organic contaminants associated with the solids. Performance standards for wastewater effluents are currently in transition within Canada as the federal government is developing national performance standards (NPS) for municipal wastewater effluent. In 2009 the Canadian Council of Ministers of the Environment (CCME) released the final draft of the Canada-wide Strategy for the Management of Municipal Wastewater Effluent that details regulatory changes to be implemented through the Canadian Fisheries Act. The intent of the strategy is to ensure there are no deleterious effects to the water bodies receiving the treated effluent, particularly with regard to fish health and or fish habitat. This strategy has identified specific national performance standards for effluent of Canadian wastewater treatment facilities at 25 mg $L^{-1}$ for the parameters of carbonaceous biochemical oxygen demand ($cBOD_5$) and total suspended solids (TSS), 1.25 mg $L^{-1}$ for un-ionized ammonia expressed as $NH_3$-N @ 15°C±1°C and a standard of 0.02 mg $L^{-1}$ of total residual chlorine (TRC) (Canadian Council of Ministers of the Environment, 2009). The Federal Government

recognizes that conditions in portions of Canada's Far North (Nunavut, Northwest Territories, and regions located north of the 54th parallel in Quebec and Newfoundland and Labrador) are unique and as such national performance standards have not yet been determined for these areas. A five-year research period was initiated in 2009 to determine what NPS (treated effluent concentration levels) would be appropriate in the Canadian North (Canadian Council of Ministers of the Environment, 2009). At the end of the five year period, federal and territorial governments determined that more work was needed and there is now a movement to work towards developing a risk level approach where risk level criteria may be implemented at specific sites rather than a single national performance standard applied to all locations (CCME 2014).

$BOD_5$ refers to the amount of oxygen that is consumed during the microbial degradation of organic matter within sewage or effluent, within five days. The underlying concern is related to the potential for significant oxygen depletion to occur in receiving waters when sewage or effluent is poorly treated before its release to the environment, where it has the potential to significantly reduce oxygen levels as microbial degradation continues. If the oxygen depletion in the receiving environment is significant and occurs for an extended period of time, then there is the potential to negatively affect the biota of that region. The ability of the wetland to mediate this process before effluents are released to the environment can be influenced by several factors including mechanical filtration (removal) of organic matter readily oxidized by microorganisms, temperature, and contact time. Microbial action is known to be influenced by temperature. In addition, BOD is also influenced by the contact time between the microorganisms and the effluent's organic constituents. If the contact time is too short or too long, this treatment process can be impeded. The rate that effluent flows through the Alert terraced wetland is linked to the hydraulic retention time (HRT) of the wetland and it is a function of both the flow rate of wastewater and the water holding capacity of the wetland. The HRT provides an estimate of the volume of water that the wetland can hold at any one time and how quickly that defined volume of water changes over. HRT is therefore an indirect measure of how long the microbial population is in contact with a unit of wastewater. To date, little is known about the rate that effluent flows through the Alert terraced wetland because no flow tracer studies designed to measure the HRT have been undertaken.

It is generally known that municipal sewage and effluent have the potential to contain pathogens in significant quantity and virulence to cause harm to humans if released to the environment. Several indicator organisms are used to provide an indication if human pathogens potentially exist within municipal effluents, with *Escherichia coli* (*E. coli*) generally being the organism most often used for surveillance purposes, along with the surveillance of fecal coliforms, which is an indicator of fecal contamination

(animal or human). In conventional municipal wastewater treatment plants (but not in wetlands), strong oxidants such as chlorine (or its various forms) are used as a disinfection technique designed to significantly reduce the number of harmful organisms. Wetlands can often approach disinfection levels that are similar to what is achieved in treatment plants that use chlorination or other chemical means. The mechanisms of action are, however, more through the entrapment of harmful organisms on biofilms within the wetland, or through the filtration of suspended particles which the pathogens have attached themselves. Once trapped, these microorganisms are often eliminated through a variety of mechanisms such as bacteriophages or consumption by nematodes or natural death. Many of the pathogen elimination processes operative in treatment wetlands are often influenced by temperature, HRT and other biological/chemical/physical processes that can be both unique to the site and easily influenced by natural and human events. Human waterborne enteric pathogens such as *E. coli* are likely not directly harmful to the marine biota of the receiving waters and because of this, NWB has not listed them as compliance parameters. The CAWT has however, chosen to monitor these microbial indicators, believing that they provide additional information that can be used to assess wetland performance.

Wetlands can be effective in the removal of suspended solids contained within municipal effluents. The removal process is usually one of entrapment within the matrices of the wetlands substrate or attachment to biofilms, together with the force of gravitational pull causing solids to fall out of solution (i.e. settling). Some of the prime factors affecting a wetland's effectiveness in reducing the concentration of total suspended solids (TSS) are water velocity, HRT, and the size and volume of the interstitial spaces through which the effluent flows. The release of high concentrations of suspended solids to the receiving environment can have deleterious effects on natural habitats or biota through the burial of vital habitat areas or through the co-transport of other harmful contaminants or pathogens. The potential for wetlands to reduce TSS provides a surrogate measure for the removal of other potentially harmful contaminants attached to suspended solids, such as trace elements, pathogens, nutrients like phosphorus, and other chemicals. Thus, removal of the suspended solids often correlates to a reduction in the concentration of these particulate-associated contaminants within the treated effluent.

Nitrogen constituents are often monitored during the treatment process since some nitrogenous forms like un-ionized ammonia ($NH_3$-N) can be toxic to certain aquatic or marine biota, while other nitrogen forms can also consume oxygen during transformation of nitrogen species. As with the other water quality parameters, treatment efficiencies are often influenced by many factors intrinsic to the individual

wetland.

## 1.4 Study Location

CFS Alert is a weather / military station located on the northeastern tip of Ellesmere Island in Nunavut (82°30'05"N 62°20'20"W), approximately 817 km from the geographic North Pole (Figure 1.1). The topography is characterized by rocky hills and valleys composed of shale and slate. The station is bounded to the east and south


**Figure 1.1.** **CFS Alert located on northern tip of Ellesmere Island.**

east by the Arctic Ocean. The mean daily temperature is -33°C in January and 3°C in July; pack ice is present year round.

The terraced wetland is located to the south east of the main buildings on a rocky hill side with a moderate slope to the ocean. The landscape has been altered by the placement of six berms to create a terraced area where wastewater is diverted in a zigzag fashion as it travels downslope to Parr Inlet of the Arctic Ocean. The berms were created from the local gravel/rock overburden and are intended to retard the velocity of the wastewater as it is forced to travel a winding path between the berms. The purpose

of this pattern is to enhance the settling of larger particles in the wastewater and to also function as a mechanical sieve, as a portion of wastewater permeates through the detention berms. The wastewater is delivered from the main building of the station to

**Figure 1.2. The discharge pipe delivering wastewater to the wetland**

the wetland via a heated pipe (utilidor) where the wastewater is allowed to discharge into a collection depression, lined with larger rocks (Figure 1.2).

A series of sampling stations have been geo-referenced to the site. These stations follow the primary flow path of the wastewater. Additional ephemeral flow paths have developed at different times in response to increased volumes during the spring freshet and in erosional areas where berms have been breached. Additional sampling stations have been added to some of these ephemeral flow paths, however the number of times they were sampled depended on whether there was sufficient flow to sample. The down slope portion of the wetland flattens out in the shore zone of the inlet where silt

fences have been installed to intercept residual silt. Station 16SH-2 was positioned to capture the major flow of treated effluent originating from Berm 6 and for the purpose of this study is considered to be the primary site for sampling of the treated effluent prior to its release into Parr Inlet. Stations 16SH-1and 16SH-3 sampled additional flow paths of lesser volumes that originated from the ice sheet of winter-accumulated wastewater that was released during spring melt. Flow paths were changeable over the course of the field season due to changing conditions of the ice sheet.

## 1.5 Purpose

The purpose of this report is to:

- Assess the performance of the terraced wetland during the summer of 2016 in reference to the NWB licence compliance values for $BOD_5$, TSS, oil and grease, and pH.
- Compare the performance of the terraced wetland in the summer of 2016 with the performance in 2015, 2014, 2013, 2012, and 2011.
- Review the data to determine if there is a consistent relationship between COD and $BOD_5$ which would allow COD to be used as a surrogate for $BOD_5$.
- Provide recommendations on how the wetland could be modified or operated to enhance overall treatment.

# 2.0 METHODOLOGY

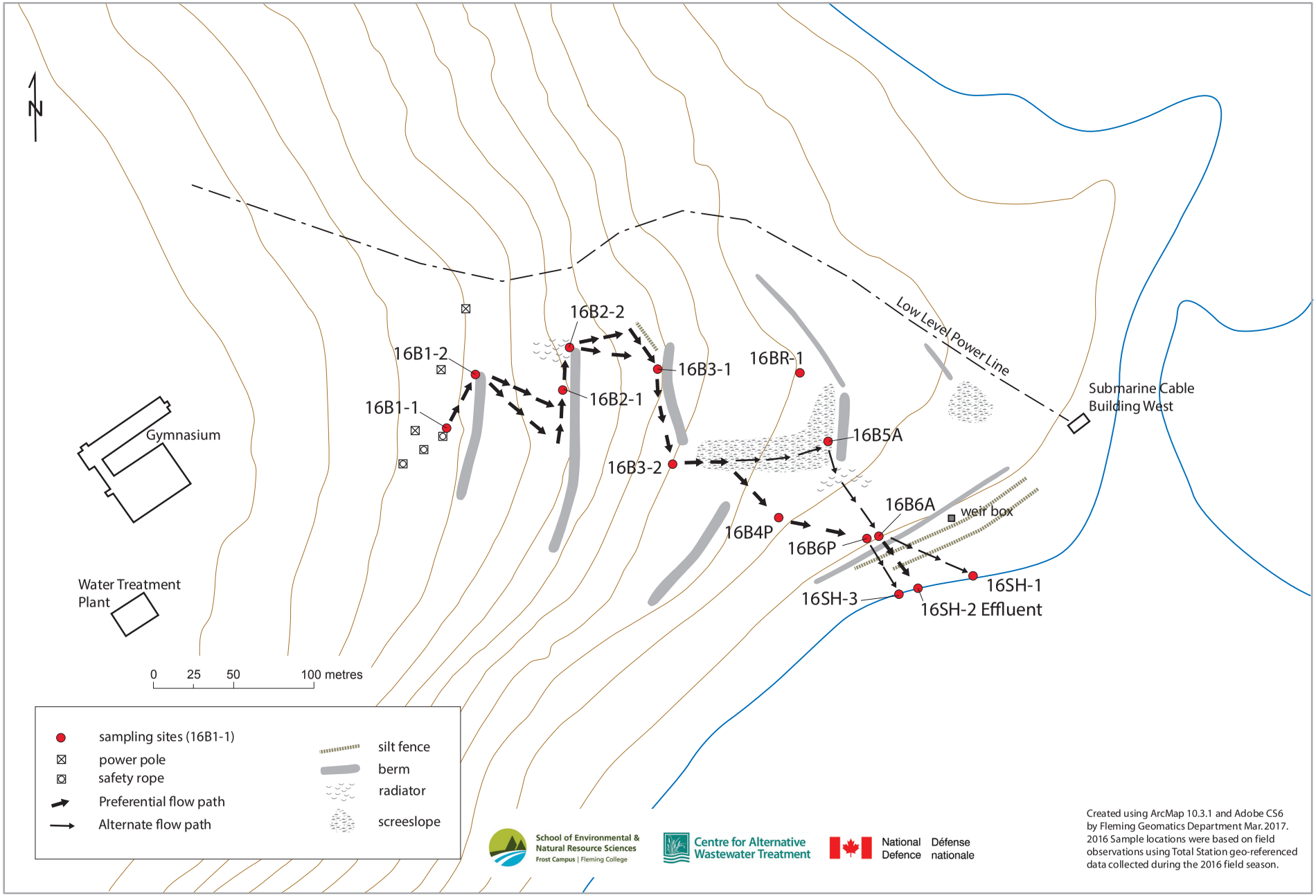
## 2.1 Site Reconnaissance

The start of the CAWT field season at the Alert terraced wetland began late in July 2016. By the start of the 2016 field season, most of the winter's wastewater that had accumulated as ice over the previous winter, had melted. At the start of the season, the wetland was walked by foot to observe and record how the wetland had changed from the previous year. The team also located the sampling sites that were used in the 2011, 2012, 2013, 2014, and 2015 field seasons and found that many of these sites could still be used as the primary sampling sites for the 2016 period, thus allowing greater sampling consistency between the six years. Additional sampling sites were established on an as-needed-basis to capture preferential flows that were more ephemeral by nature and often disappeared later in the season as the wetland became drier. These additional sampling sites are identified in the site map (Figure 1.3) and site photo (Figure 1.4), both of which also identify the primary sampling sites that followed the dominant flow path of the wastewater.

**Figure 1.3 (Overleaf) Location of sampling sites at the Alert terraced wetland during the 2016 field season**

# TREATMENT WETLAND PERFORMANCE AND PHYSICAL CHARACTERIZATION
# ALERT, NUNAVUT

2016 FIELD SEASON




Created using ArcMap 10.3.1 and Adobe CS6 by Fleming Geomatics Department Mar. 2017. 2016 Sample locations were based on field observations using Total Station geo-referenced data collected during the 2016 field season.

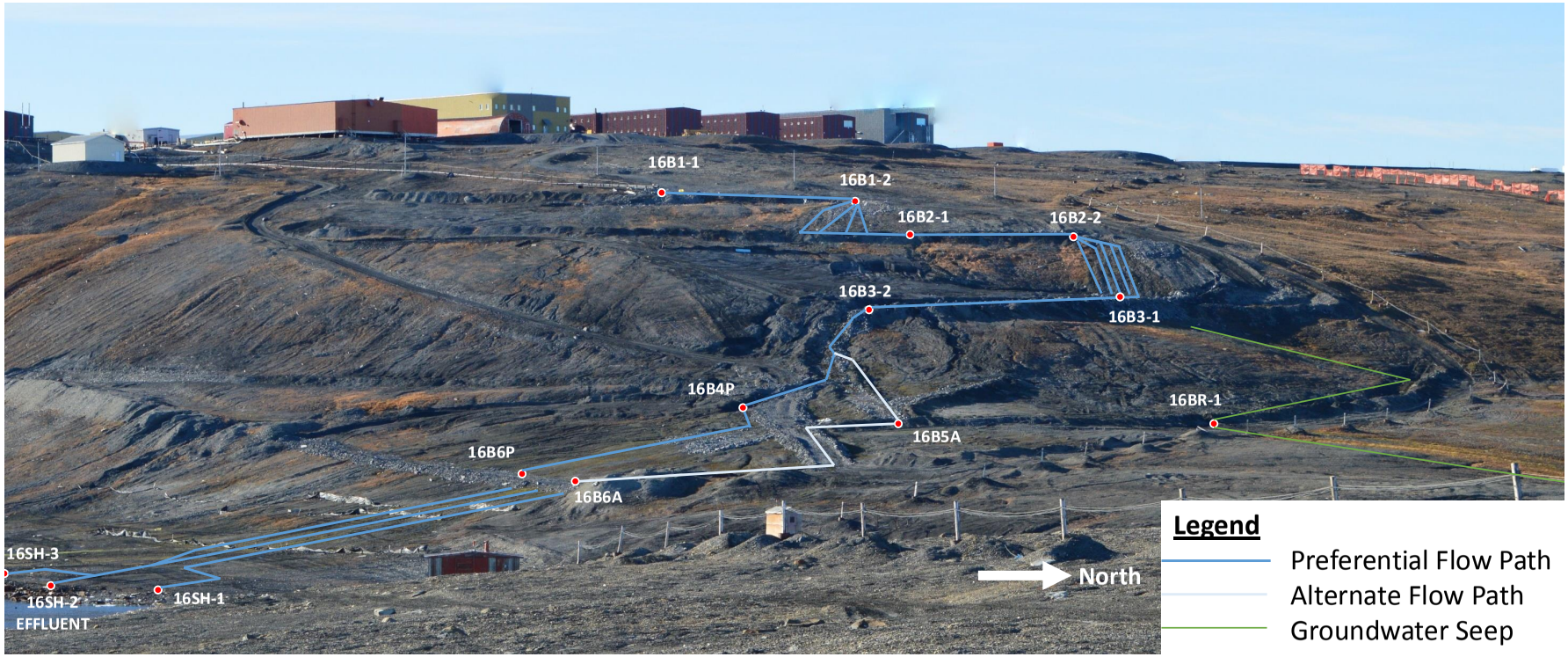



**Figure 1.4** A panoramic photo of the sampling sites at the Alert terraced wetland during the 2016 field season

## 2.2 Primary Flow Path

The primary flow path throughout the summer was directed to Parr Inlet. All observations used to assess the functioning of the terraced wetland utilized the following collection sites in the sequential order presented below:

Berm 1:
- 16B1-1 (Influent) – Note: all samples were grab samples, not 24 hour composite samples
- 16B1-2

Berm 2:
- 16B2-1
- 16B2-2

Berm 3:
- 16B3-1
- 16B3-3

Berm 4:
- 16B4P (primary flow)

Berm 5:
- 16B5A (alternative minor flow)

Berm 6:
- 16B6P (primary flow)
- 16B6A (alternative minor flow)

Ground Water Seep:
- 16BR-1

Shoreline:
- 16SH-1 (minor and or ephemeral flows)
- 16SH-3 (minor and or ephemeral flows)
- 16SH-2 (Effluent) and primary exit to Parr Inlet

Reference site:
- Stream directly east of the Global Atmospheric Watch Lab

The primary flow path was designed (engineered) to flow north along Berm 1 and spill onto Berm 2 where it would once again flow north and spill onto Berm 3, then travel south along Berm 3 and spill east down the steep grade of the screeslope to Berm 4, then south until it intersected and crossed Berm 6 to continue on a southeast path on to the gentle slope of the shore zone (SH) as it traveled to Parr Inlet. The dominant and most consistent flow exited into Parr Inlet at sample site 16SH-2 with

minor intermittent flows spilling into the Inlet at 16SH-3 and 16SH-1. A minor flow path was intermittently observed half way down along the screeslope between stations 16B3-2 and 16B4P, that took a divergent path to 16B5A (Berm 5) and onto 16B6A (Berm 6) where it once again joined the main flow path. A minor groundwater seep was also observed early in the season exiting downslope of station 16B3-1, which was sampled at 16BR-1 to determine if the seep was composed primarily of wastewater or ice melt. Sample station identification codes ending in "P" identify the preferential or dominant flow path. When the flow path split into two streams between Berm 3 and 4, the lesser flow path was identified with the suffix "A" to designate the alternative flow path. Identification codes ending in "BR" represent the breach but is better characterized as the ground water seep occurring below Berm 3.

## 2.3 Surface Water Sampling

The surface water samples were collected from surface flow identified as preferential flow or alternative flow locations. Surface samples were often collected into the sample bottle by submerging the sampling container below the water surface; however, in cases where water depth was shallow, syringes were used. The use of syringes minimized the disturbance of sediment that could have been collected inadvertently into the sample bottle, which could potentially influence final water quality values.

The chemical and biochemical water quality parameters analyzed in surface waters are summarized in Table 1.1. Physical and ionic parameters of surface water samples are summarized in Table 1.2 with the trace elemental parameters identified in Table 1.3. In addition, surface water temperature was recorded during the field season with the placement of a HOBO® tidbit data logger into the surface water of the wetland in one location. Air temperature was also logged during this time by the suspension of one HOBO® tidbit data logger at one location in the wetland.

**Table 1.1. Chemical, biochemical and microbial water quality parameters surveyed in surface waters collected from the CFS Alert wetland (2016).**

| | |
|---|---|
| Ammonia ($NH_3$-N) | Phosphate ($PO_4$) |
| Nitrite ($NO_2$-N) | Dissolved Organic Carbon (DOC) |
| Nitrate ($NO_3$-N) | Dissolved Oxygen (DO) |
| Total Kjeldahl Nitrogen (TKN-N) | Chemical Oxygen Demand (COD) |
| Total Coliforms (TC) | 5 Day Biochemical Oxygen Demand ($BOD_5$) |
| *Escherichia coli* (EC) | 5 Day Carbonaceous Biochemical Oxygen Demand ($cBOD_5$) |
| Total Phosphorus (TP) | Fat, Oil and Grease (FOG) |

**Table 1.2. Physical chemistry and ionic parameters surveyed in surface water samples collected from the CFS Alert wetland (2016).**

| | |
|---|---|
| Temperature | Total Suspended Solids (TSS) |
| Conductivity | Volatile Suspended Solids (VSS) |
| pH | |

**Table 1.2. Trace elements surveyed in surface water samples collected from the CFS Alert wetland (2016).**

| | | |
|---|---|---|
| Aluminum (Al) | Copper (Cu) | Selenium (Se) |
| Antimony (Sb) | Iron (Fe) | Silver (Ag) |
| Arsenic (As) | Lead (Pb) | Sodium (Na) |
| Barium (Ba) | Lithium(Li) | Strontium (Sr) |
| Beryllium (Be) | Magnesium (Mg) | Thallium (Tl) |
| Boron (B) | Manganese (Mn) | Tin (Sn) |
| Cadmium (Cd) | Mercury (Hg) | Titanium (Ti) |
| Calcium (Ca) | Molybdenum (Mo) | Uranium (U) |
| Chromium (Cr) | Nickel (Ni) | Vanadium (V) |
| Cobalt (Co) | Potassium (K) | Zinc (Zn) |

## 2.4 Quality Assurance / Quality Control

HDPE bottles were used for the collection of all water samples. Each sample bottle was labeled with the sample location and "Fleming College" and packed with ice packs in appropriate coolers, together with a chain of custody form identifying each bottle and the analyses required. Samples were then shipped to the appropriate lab for analysis. On average, the shipment of samples took approximately 24 to 48 hours. Temperature data loggers were also placed into the shipment coolers to monitor temperature during shipment.

A series of measures, such as the use of field blank sample collection protocols, were adopted to ensure that all water samples collected in the wetland had not been contaminated by poor handling and that bottles were not contaminated prior to sample collection.

Nutrient parameters were also preserved with acid at the site of collection prior to being shipped for analysis.

## 2.5 Statistical Analysis

Water quality parameters were analysed using an unpaired t-test (one tailed) designed for unequal sample sizes and unequal variances ($p < 0.05$) using the statistical functions provided by MathPortal, an online statistical package (http://www.mathportal.org/calculators/statistics-calculator/t-test-calculator.php) accessed March 2, 2017). Comparisons were made between only the influent flowing into the wetland (e.g. site 16B1-1 grab sample) and the effluent leaving the wetland (e.g. site 16SH-2).

## 2.6 Analytical Laboratories Utilized

The City of Peterborough Environmental Protection Laboratory (EPL) was contracted to analyze the influent and effluent of the CFS Alert wetland for $BOD_5$, $cBOD_5$, oil and grease, TC, EC and all wastewater samples for TSS, VSS, COD, dissolved organic carbon (DOC), TKN, $NH_3$, $NO_2$, $NO_3$, TP, $PO_4$, and trace elements. The EPL is ISO 17025 certified, has been accredited with the Canadian Association for Laboratory Accreditation (CALA) since 2004, and is licenced by the Ontario Ministry of the Environment for drinking water testing.

The CAWT performed additional testing at the Alert site for QA/QC purposes, and to increase the number of samples tested to enhance the understanding of the wetland's performance. Tests conducted by the CAWT at the CFS Alert site included dissolved oxygen, conductivity, pH, $BOD_5$, $cBOD_5$, TC, and EC.

# 3.0 RESULTS

## 3.1 NWB Licences Parameters

The water licence issued to CFS Alert by the Nunavut Water Board stipulates that the maximum concentration of any grab sample of the effluent exiting the treatment wetland should not exceed the following concentrations: $BOD_5$ = 80 mg $L^{-1}$; TSS = 70 mg $L^{-1}$; oil and grease = 5 mg $L^{-1}$ with no visible sheen, and pH in the range of 6 to 9. The results presented in this report represent mean values, believing that collectively they provide an overall better assessment of the treatment performance and associated variability around those means. Of the four criteria, the summer mean values for $BOD_5$, TSS, and pH were within the range stipulated by the NWB waster licence and were therefore compliant. The oil and grease (i.e. FOG) was the only parameter that was non-compliant with a summertime mean of 9 mg $L^{-1}$, which was slightly elevated above the licence value of 5 mg $L^{-1}$. The summertime averages of the four licensed parameters generated by both the ISO certified laboratory (City of Peterborough Environmental Protection Laboratory – EPL) and the CAWT on-site field laboratory located at CFS Alert, are summarized in Table 3.1 below. All pH measurements were determined at CFS Alert and were not determined from samples sent to southern laboratories, in order to avoid changes in pH that may have occurred during sample shipment.

It should be noted that all other summary values in sections of the report beyond this point reflect the values generated from the averaging of the data analyzed by both the EPL laboratory and the CAWT. The amalgamation of the two data sets enhanced the ability to display how treatment changed over time and space (sample location) by producing larger data sets. Parameter values changed little between those analyzed on site by the CAWT or those sent to the EPL laboratory in Peterborough. BOD samples were the only parameter to change slightly between the CFS Alert location and Peterborough location. In general, BOD concentrations analyzed on site at CFS Alert were slightly greater than those analyzed by EPL, since some of the organic components of the sample were consumed (oxidized) during sample shipment. The differences between the two laboratories were minor and the analytical results from the two laboratories were in general agreement with each other.

**Table 3.1.** **A summary of summertime means for the four NWB licenced parameters showing results analyzed by the ISO contract laboratory and those analyzed at CFS Alert by the CAWT. Note: station 16B1-1 was the location where the effluent entered the wetland and station 16SH-2 was the major effluent sampling point, while the other two sampling sites were minor flows to Parr Inlet.**

| Parameter | Analytical Laboratory | NWB Licenced Value mg $L^{-1}$ | 16B1-1 Mean ± S.D. (n) mg $L^{-1}$ | 16SH-2 Mean ± S.D. (n) mg $L^{-1}$ |
|---|---|---|---|---|
| $BOD_5$ | Alert, CAWT | 80 | 309±334 (3) | 13±5 (3) |
| $BOD_5$ | Peterborough | 80 | 123 (1) | 5.6 (1) |
| Total Suspended Solids | Peterborough | 70 | 269±403 (7) | 48±34 (6) |
| Oil and Grease | Peterborough | 5 | 81±155 (7) | 9±4 (6) |
| pH | Alert, CAWT | 6 to 9 | 7.7±0.5 (7) | 8.4±0.2 (6) |

| Parameter | Analytical Laboratory | NWB Licenced Value mg $L^{-1}$ | 16SH-3 Mean ± S.D. (n) mg $L^{-1}$ | 16SH-1 Mean ± S.D. (n) mg $L^{-1}$ |
|---|---|---|---|---|
| $BOD_5$ | Alert, CAWT | 80 | 24±23 (3) | 18±10 (3) |
| $BOD_5$ | Peterborough | 80 | -- | -- |
| Total Suspended Solids | Peterborough | 70 | 138±223 (6) | 66±105 (6) |
| Oil and Grease | Peterborough | 5 | -- | -- |
| pH | Alert, CAWT | 6 to 9 | 8.5±0.2 (6) | 8.7±0.2 (6) |

### 3.1.1 Biochemical Oxygen Demand (5 day)

The concentration of $BOD_5$ entering the wetland (influent) moderated modestly over the course of the summer with the exception of on August 24, when a sharp increase in both $BOD_5$ and $cBOD_5$ were exhibited. It should be noted that all collections from the influent site (16B1-1) were grab samples and not 24 hour composite samples. Grab samples by nature can be variable since the composition of the influent is a constantly changing mixture of bleed water, garburator wastewater, greywater, and sanitary wastewater, which is reflective of the wastewater activities of the station just prior to the time of collection. Sample variability can be high and may be influenced by heterogeneity of the sample at the time of collection. Despite the inherent variability of grab samples, the August 24 sample does appear to be unusually high in both $BOD_5$ (>695 mg $L^{-1}$) and $cBOD_5$ (1220 mg $L^{-1}$), suggesting that strength of the wastewater generated on or around the date of August 24 was unusually high. The strength of

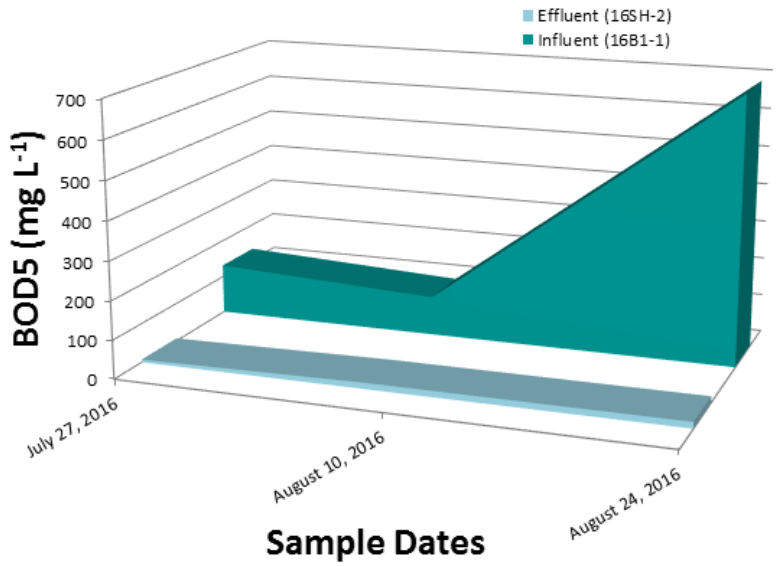



**Figure 3.1.** Weekly concentrations of the 5-day biochemical oxygen demand ($BOD_5$) within the influent and effluent sampled during the 2016 study period.

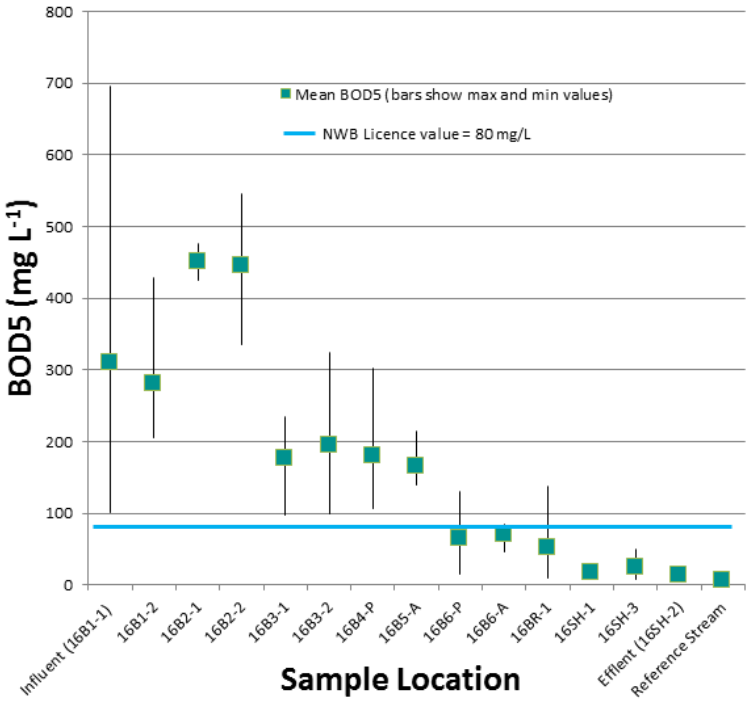



**Figure 3.2.** Mean concentrations of the 5-day biochemical oxygen demand ($BOD_5$) within wastewaters taken from sample sites within the Alert wetland during the 2016 study period. The blue horizontal line indicates the NWB compliance value of 80 mg $BOD_5$ per litre.

the wastewater effluent exiting the wetland on either August 24 ($BOD_5$ = 17 mg $L^{-1}$) or a week later on August 31 ($cBOD_5$ = < 4 mg $L^{-1}$) suggests that despite periodically high BOD influent concentrations, the wetland was not overwhelmed and remained effective in the treatment of $BOD_5$.

Although $BOD_5$ was sampled on only three dates, Figure 3.1 suggests that $BOD_5$ concentrations exiting the wetland remained low, even when influent concentrations were elevated one to two orders of magnitude higher. Figure 3.2 summarizes the summer averages calculated for each of the sample locations and illustrates a consistent reduction in $BOD_5$ as the wastewater moves towards Parr Inlet where the final discharge concentration is below compliance levels.

The overall reduction in the concentration of $BOD_5$ is best illustrated in Figure 3.2. The data points in Figure 3.2 represent the averaged (arithmetic mean) $BOD_5$ concentration measured during the field season (means include data from both the Peterborough laboratory and the data analyzed on site by the CAWT). The vertical bars bracketing the data points represent the maximum and minimum $BOD_5$ concentrations recorded during this time period. As shown in this figure, a consistent reduction in $BOD_5$ was observed as the wastewater moves towards Parr Inlet where the final discharge concentration is below compliance values. All three flows (16SH-2; 16SH-1 and 16SH-3) exiting into Parr Inlet were below the regulatory standard of 80 mg $L^{-1}$ $BOD_5$.

### 3.1.2 Total Suspended Solids

The summertime averages of TSS in the treated effluent exiting the wetland are low and generally below the NWB licensed value of 70 mg $L^{-1}$ (as shown in Figure 3.3) despite the fact that the average TSS concentration of the influent at 16B1-1 was 269 mg $L^{-1}$. This trend is more clearly depicted in Figure 3.4 where averages for all sample locations are illustrated. Once again, there was an unusually high spike in TSS influent concentration (1170 mg TSS $L^{-1}$) on August 24 which corresponds to the same date for elevated $BOD_5$ in the influent. Of particular interest is the ratio of volatile suspended solids (organic fraction) in comparison to the inorganic fraction of the TSS in the influent. The organic portion of the TSS of the influent was approximately six times greater than the inorganic faction, while the volatile and inorganic fraction of the effluent were similar.

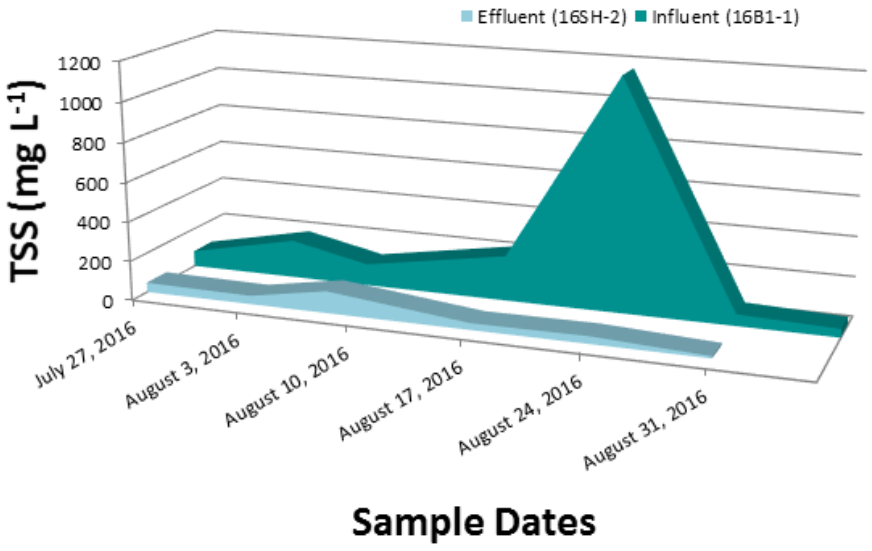



**Figure 3.3.** **Weekly concentrations of total suspended solids (TSS) within the influent and effluent sampled during the 2016 study period.**

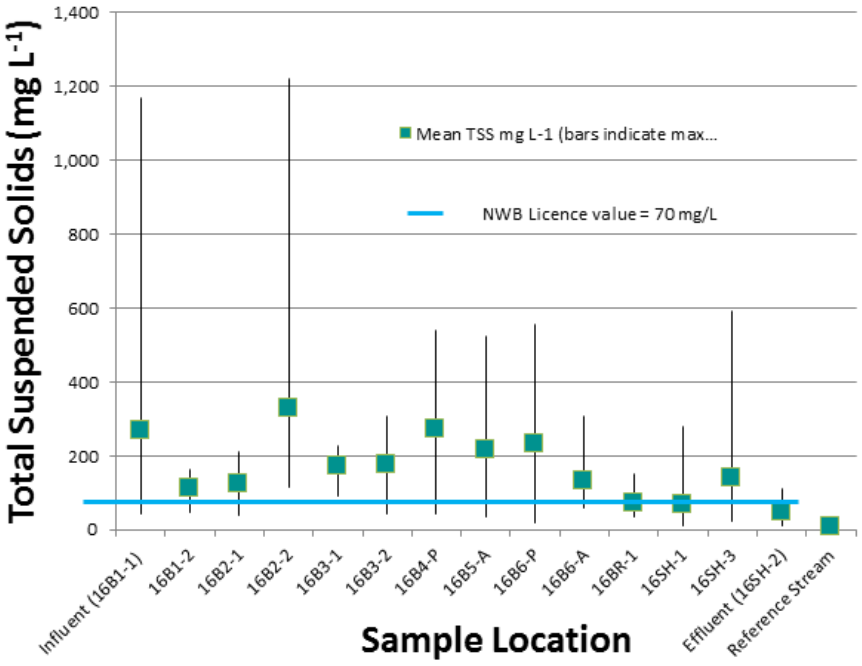



**Figure 3.4.** **Mean concentrations of total suspended solids (TSS) within wastewaters taken from sample sites within the Alert wetland during the 2016 study period. The blue horizontal line represents the NWB compliance value of 70 mg TSS per litre.**

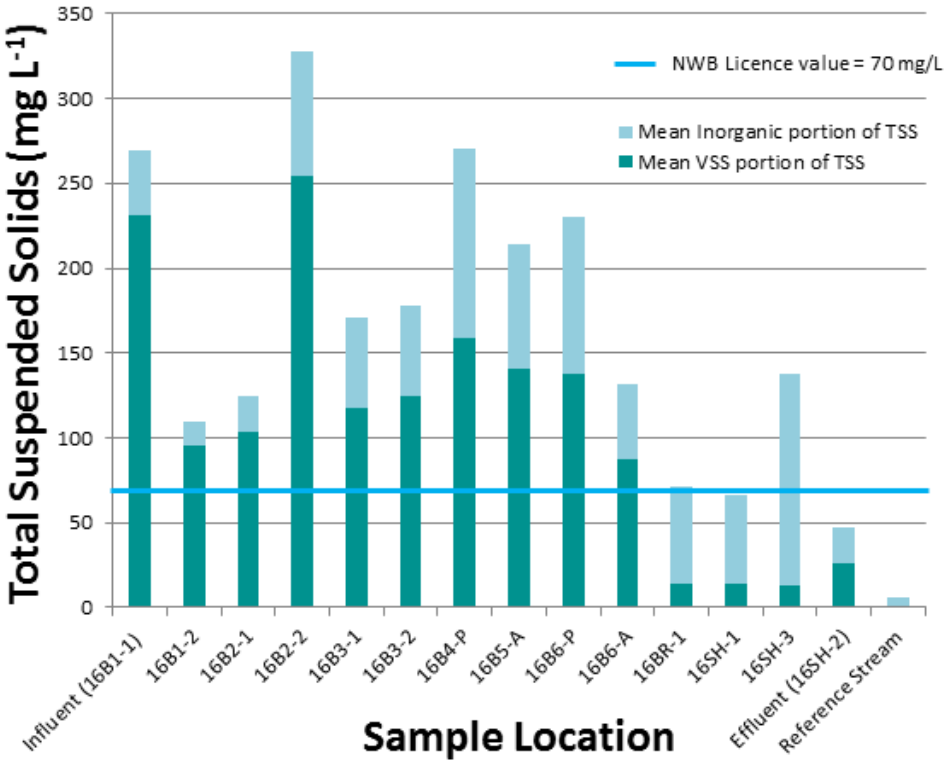



**Figure 3.5. The proportion of total suspended solids composed of volatile suspended solids (VSS) and inorganic suspended solids within wastewater collected from sites within the Alert wetland during the 2016 study period. The blue horizontal line represents the NWB compliance value of 70 mg TSS per litre.**

### 3.1.3 Oil and Grease

The influent (16B1-1-grab) entering the wetland and the effluent (16SH-2) exiting the wetland were monitored weekly for fats, oil and grease (FOG). Once again the August 24 sample heavily influenced the mean concentration of FOG for the influent sample site 16B1-1. The August 24 value at this location was 439 mg $L^{-1}$, while the concentrations on all other sampling dates were approximately 50 mg $L^{-1}$ or less (Figure 3.6).

The concentrations of FOG (Figure 3.7) leaving the wetland exhibited a mean value of approximately 9 mg $L^{-1}$, which is above the NWB compliance value of 5 mg $L^{-1}$. These data suggest a relatively good removal rate of FOG (approximately 89%), much better than observed in previous years.

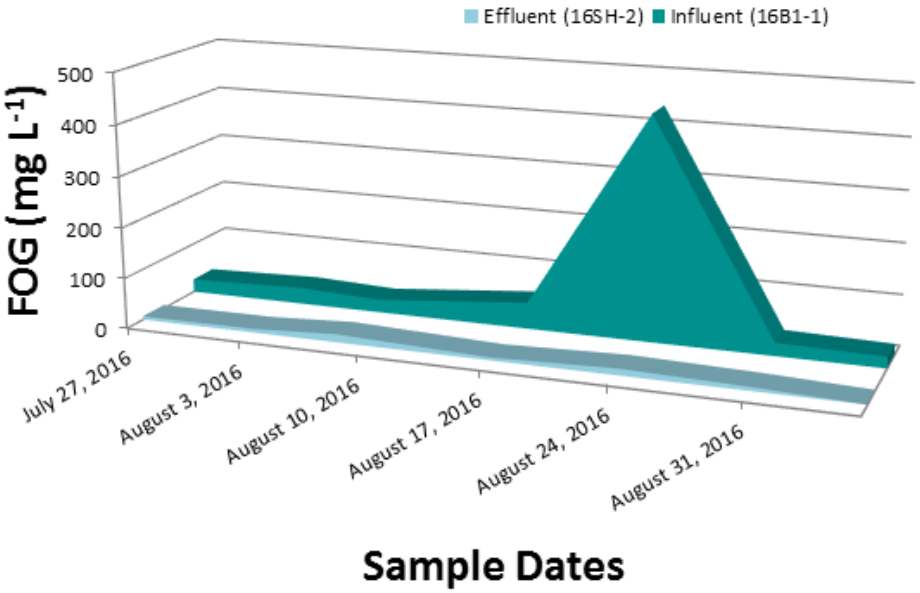



**Figure 3.6.** Weekly concentrations of fats, oils and grease (FOG) within the influent and effluent sampled during the 2016 study period.

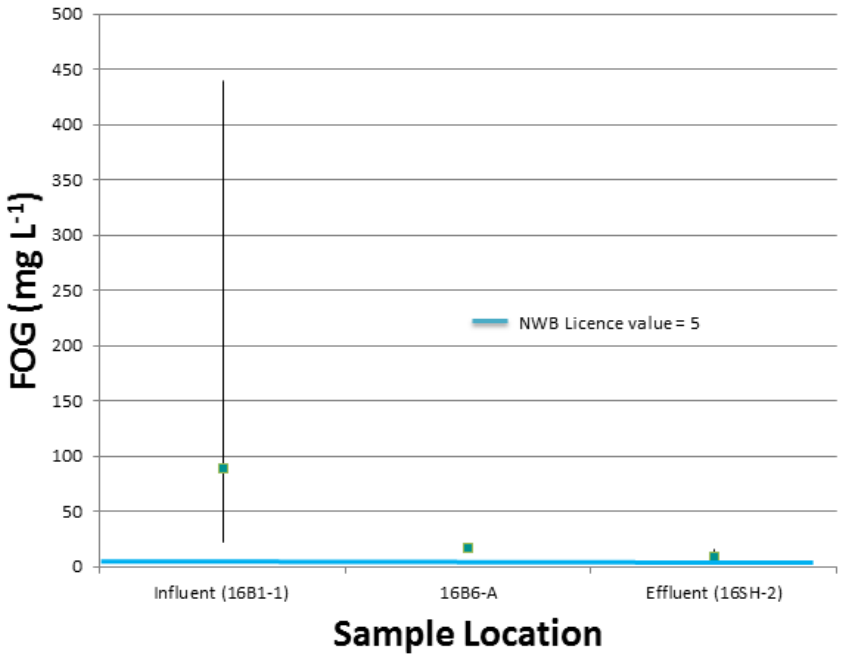



**Figure 3.7.** Mean concentrations of fats, oils and grease (FOG) within wastewaters taken from sample sites within the Alert wetland during the 2016 study period. The blue horizontal line represents the NWB compliance value of 5 mg FOG per litre.

### 3.1.4 pH

The pH of the wastewater entering the wetland (16B1-1-grab) varied moderately (range: 7.2 – 8.7) with a mean value of 7.7. The pH of the wastewater exiting the wetland (16SH-2) was somewhat less variable with a mean value of 8.4, which was well within the NBW compliance range of 6 to 9 for pH (Figure 3.8).

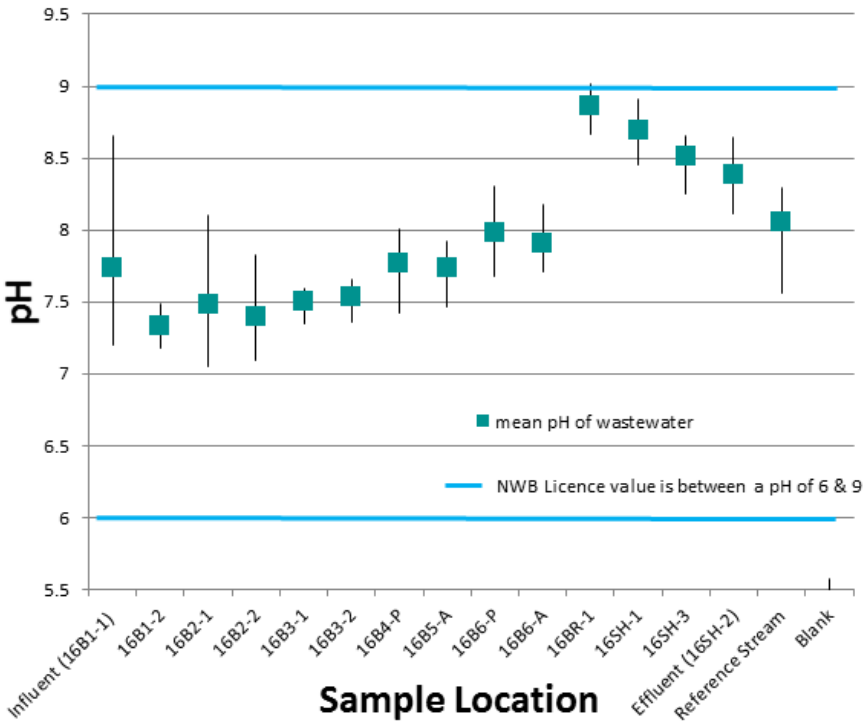



**Figure 3.8. Mean pH values within wastewaters taken from sample sites within the Alert wetland during the 2016 study period. The two blue horizontal lines represent the NWB compliance value for pH, which should be between 6 and 9.**

## 3.2 Additional Water Quality Parameters Measured for Interpretive Purposes

The following water quality parameters were not required by the NWB for compliance purposes. These parameters were monitored by the CAWT to provide additional information concerning the functioning and performance of the terraced wetland. Therefore, there is no treatment requirement stipulated by the NWB that must be achieved. The list of additional water quality parameters monitored during this study period includes:

Nitrogen Compounds

- Total Kjeldahl nitrogen (TKN)
- Total ammonia nitrogen ($NH_3$-N)
- Total nitrogen (the sum of organic nitrogen + $NH_3$-N + oxidized nitrogen ($NO_2$ and $NO_3$))

Phosphorus

- Total phosphorus (TP) [non-filtered]
- Ortho-phosphate ($PO_4$-P) [0.45 µm filtered]

Chemical oxygen demand and carbonaceous biochemical oxygen demand

- Chemical oxygen demand (COD)
- 5-Day carbonaceous biochemical oxygen demand ($cBOD_5$)

Microbial indicator organisms

- Total coliform (TC)
- *Escherichia coli* (*E. coli*)

Dissolved trace elements

- Al, Sb, As, Ba, Be, B, Cd, Ca, Cr, Co, Cu, Fe, Pb, Li, Mg, Mn, Hg, Mo, Ni, K, Se, Ag, Na, Sr, Tl, Ti, Sn, U, V, Zn

### 3.2.1 Total Kjeldahl Nitrogen

The weekly concentration of TKN (the sum of the total ammonia nitrogen and organic nitrogen) entering the wetland (16B1-1-grab) fluctuated over the summer with a peak concentration observed on August 24. The weekly concentrations exiting the wetland (16SH-2) were generally a third to one half the concentration of the influent (Figure 3.9). The change in the mean TKN concentration as the wastewater traveled through the wetland is best illustrated in Figure 3.10, which shows that the concentration of TKN decreased by approximately two thirds by the time the wastewater emptied into Parr Inlet. The reduction in TKN from influent to effluent was statistically significant ($p<0.05$).

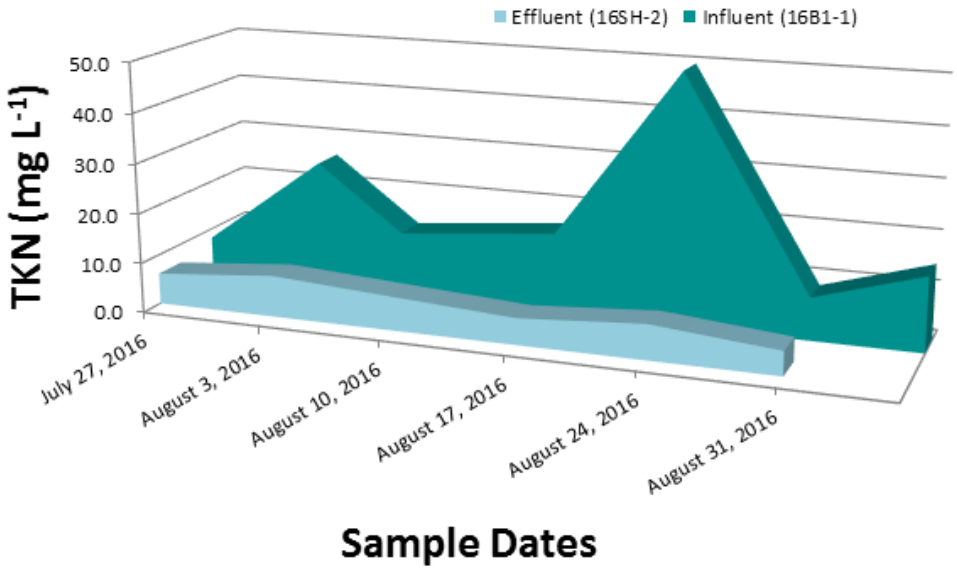



**Figure 3.9.** Weekly concentrations of total Kjeldahl nitrogen (TKN) within the influent and effluent, sampled during the 2016 study period.

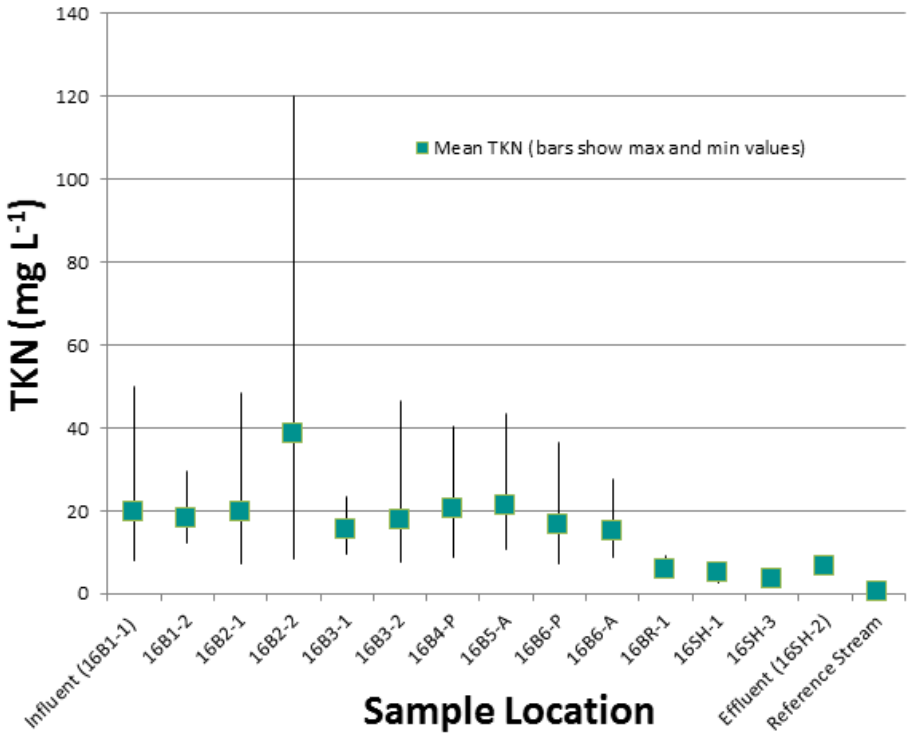



**Figure 3.10.** Mean concentration of total Kjeldahl nitrogen (TKN) within wastewaters taken from sample sites within the Alert wetland during the 2016 study period.

### 3.2.2 Total Ammonia Nitrogen ($NH_3$-N)

Ammonia can exist in both an un-ionized form ($NH_3$) and an ionized form (ammonium $NH_4^+$). The proportion of these two forms is both pH and temperature dependant, with higher percentages of $NH_3$ favoured with higher pH values. The un-ionized from ($NH_3$) is toxic to aquatic life forms and as such, CCME has set a national performance standard (NPS) for the concentration: $NH_3$ (measured as N) at 1.25 mg $L^{-1}$ for southern treatment plants. A NPS guideline for northern communities is currently under review.

The ammonia concentrations expressed in this report are recorded as the concentration of total ammonia nitrogen, expressed as $NH_3$-N. However, the nitrogen measured from the $NH_3$-N form does not accurately represent the toxic form of $NH_3$ found in the original environmental sample. The effluent sample in its natural state would contain a fraction of both the un-ionized form ($NH_3$ ) and the ionized form ($NH_4^+$). The effluent sample is analyzed under a basic environment that forces all of the $NH_4^+$ into the $NH_3$ form. Thus, what is expressed in the value $NH_3$ -N is actually the nitrogen from both the un-ionized and ionized forms. A better expression of this value is a term called "total ammonia nitrogen" or TAN for short. In order to approach the NPS of 1.25 mg $L^{-1}$ of the toxic un-ionized form ($NH_3$ ), "total nitrogen ammonia" (TAN) concentration would need to approach 100 mg $L^{-1}$ in an environment with a pH of 8 and a temperature of 5°C. Thus the proportion of the TAN in the toxic un-ionized form of Alert wetland samples is expected to be well below the CCME standard of 1.25 mg $L^{-1}$.

The weekly TAN values for the influent (16B1-1-grab) are variable and the concentration of TAN leaving the wetland (16SH-2) is generally less variable and lower in concentration (Figure 3.11). In general, the loss of TAN as the wastewater traverses the wetland is similar to what was observed for TKN, which shows that mean values become less variable and the overall decrease at 16SH-2 was approximately forty percent (Figure 3.12). The net loss of TAN, however, was not statistically significant ($p<0.05$).

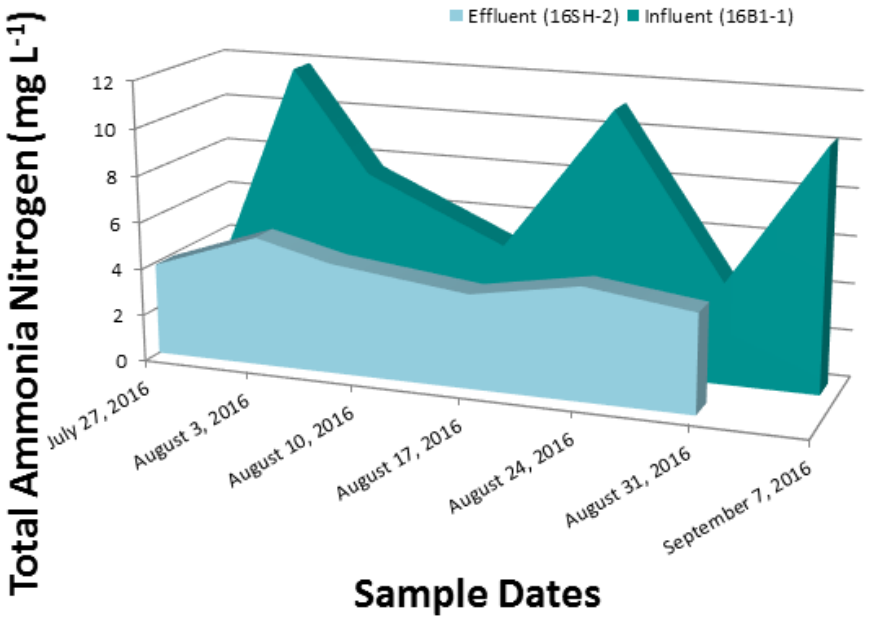



**Figure 3.11.** Weekly concentrations of total ammonia nitrogen ($NH_3$-N) within the influent and effluent sampled during the 2016 study period.

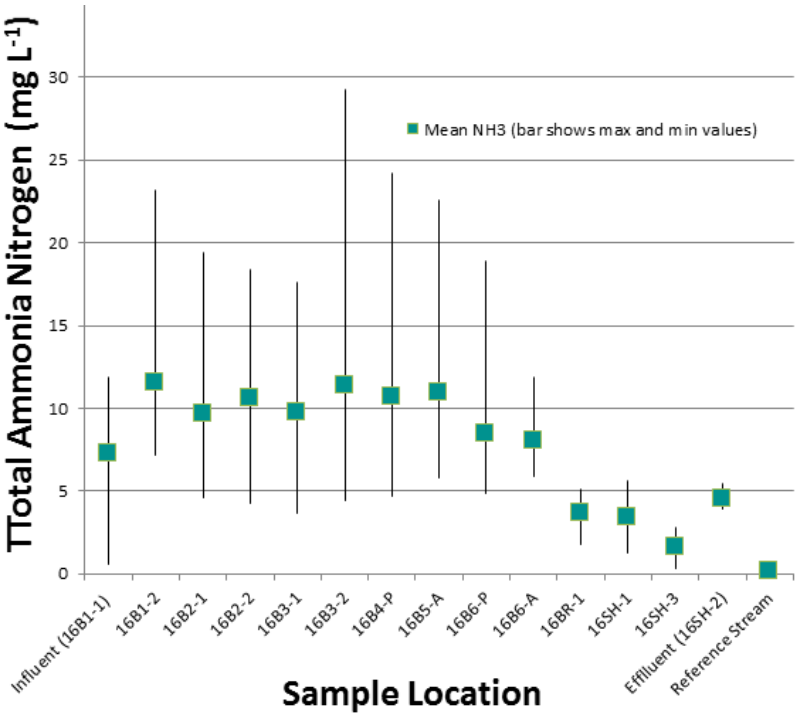



**Figure 3.12.** Mean concentrations of total ammonia nitrogen ($NH_3$-N) within wastewater collected at sample sites within the Alert wetland during the 2016 study period.

### 3.2.3 Total Nitrogen

Total nitrogen (TN) is the sum of organic nitrogen, ammonia (i.e. TAN) and oxidized nitrogen (e.g. $NO_2$-N + $NO_3$-N). Organic nitrogen was derived by subtracting $NH_3$-N from TKN. The averaged concentrations of total nitrogen at each sampling location are presented in Figure 3.13. As shown in this figure, the overall decrease in total nitrogen as the wastewater travels through the wetland approximates fifty percent or less. A closer look at the changing composition of the total nitrogen values suggests approximately a third of the TN fraction in the effluent at 16SH-2 is oxidized to $NO_2$/$NO_3$.

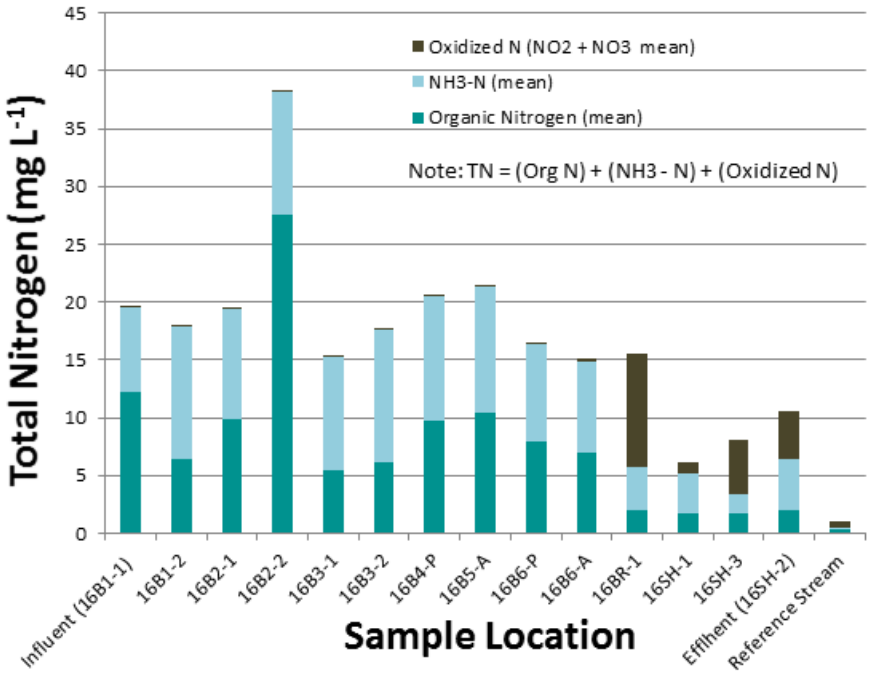



**Figure 3.13. The mean concentrations of total nitrogen within wastewaters collected at sampling sites within the Alert wetland showing the proportion of organic nitrogen, ammonia nitrogen, and oxidized nitrogen that contribute to the total nitrogen concentration during the 2016 study period.**

### 3.2.4 Phosphorus

The weekly changes in the concentration of total phosphorus (TP) are illustrated in Figure 3.14. As evident in this figure, the overall concentration of total phosphorus entering the wetland (16B1-1-grab) is variable, with once again the August 24 sampling date exhibiting the highest concentration. The TP concentration exiting the wetland (16SH-2) is less variable, with values often close to an order of magnitude lower, demonstrating reasonably good phosphorus removal has occurred by the time the effluent reaches the shore zone area (as seen in Figure 3.15). The difference between the TP entering and exiting the wetland was statistically significant ($p<0.05$).

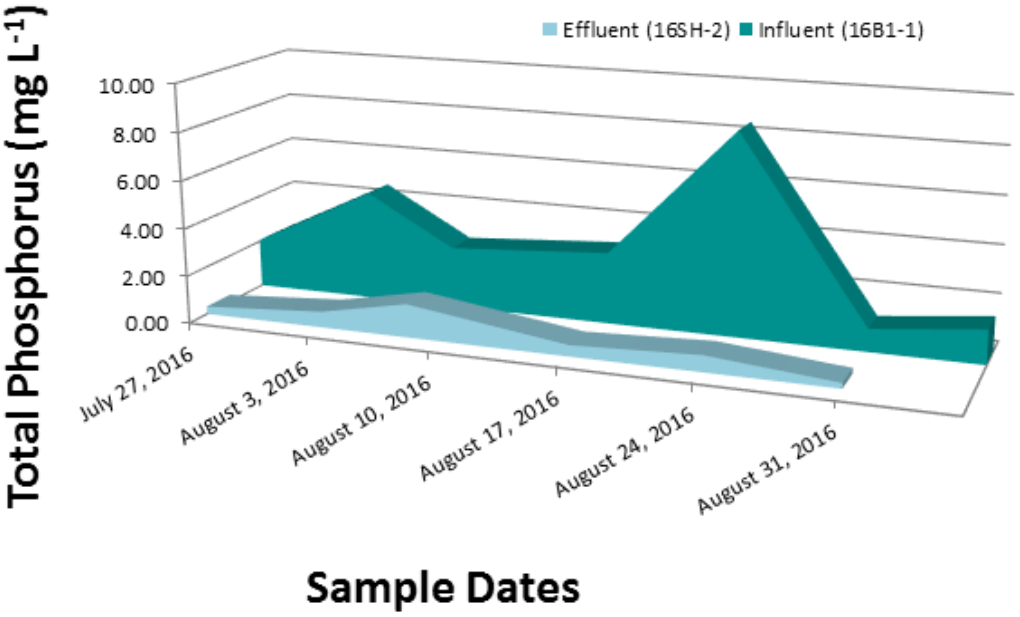



**Figure 3.14. Weekly concentrations of total phosphorus (TP) within the influent and effluent sampled during the 2016 study period.**

Total phosphorus includes both particle-bound and dissolved forms. While there are several dissolved forms of phosphorus, the greatest portion of dissolved phosphorus is often in the form of ortho-phosphate ($PO_4$-P). Figure 3.16 illustrates the proportion of total phosphorus load that was measured in the dissolved form of $PO_4$-P and the non ortho-phosphate form, which is most likely phosphorus that is particle-bound or incorporated into particulate matter. As seen in Figure 3.16, the non-dissolved, non-$PO_4$-P (e.g. particulate P), is the dominate fraction of the total phosphorus

concentration at most sampling stations. It is assumed, but not confirmed, that the removal mechanisms for the particulate fraction are likely influenced from physical removal processes, while the dissolved fraction is likely removed through adsorption processes onto metal oxides naturally found within the wetland matrix. The loss of the non-ortho P fraction (e.g. particulate fraction) in the shore zone area corresponds to the loss of TSS in this region; once again suggesting that a good portion of phosphorus removal is via physical retention. The difference between the mean $PO_4$-P of the effluent was statistically different ($p<0.05$) than the mean influent.

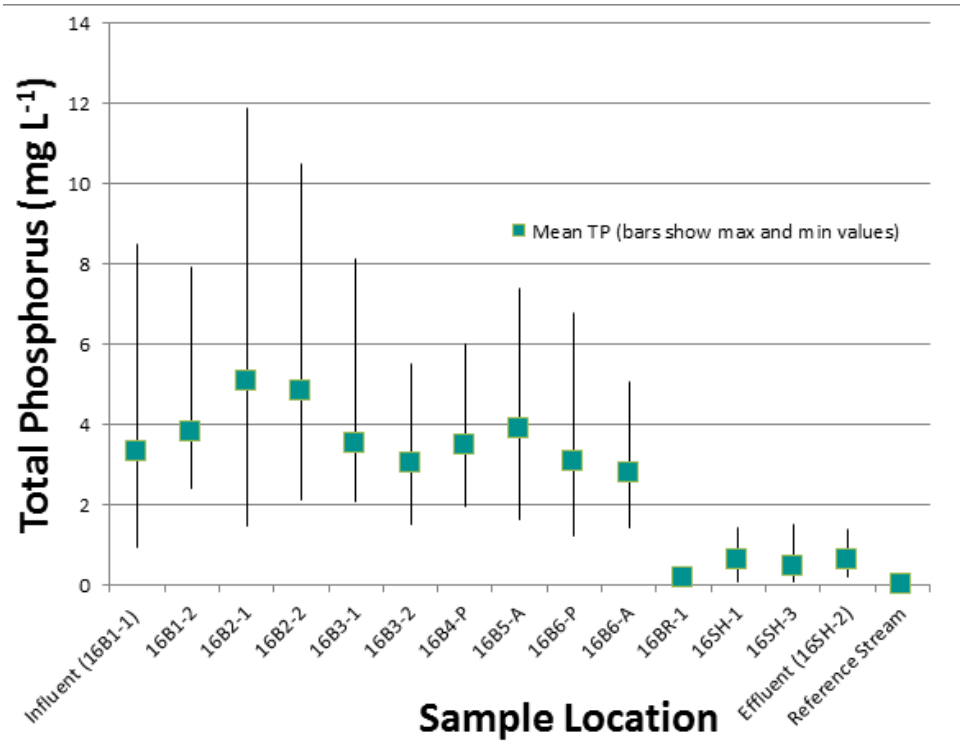



**Figure 3.15. Mean concentrations of total phosphorus (TP) within wastewaters collected at sample sites within the Alert wetland during the 2016 study period.**

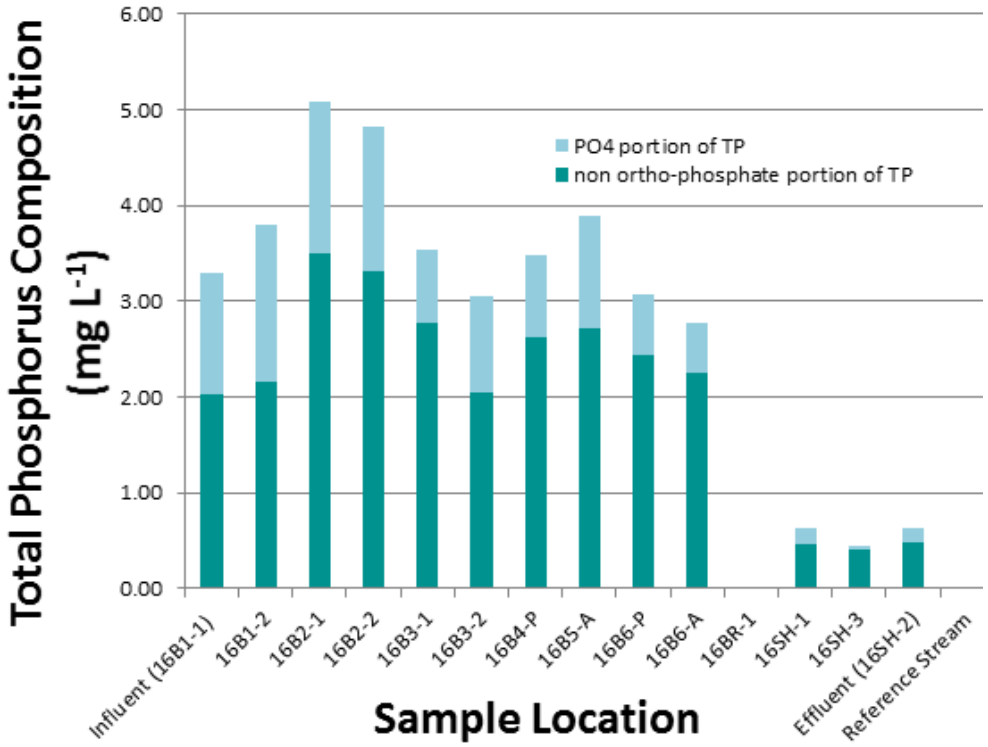



**Figure 3.16.** **The mean concentrations of total phosphorus in wastewater at sampling sites within the Alert wetland showing the proportion of ortho-phosphate ($PO_4$-P) and non ortho-phosphate (e.g. particulate bound) that contribute to the total phosphorus concentration during the 2016 study period.**

### 3.2.5 Chemical Oxygen Demand and Carbonaceous Biochemical Oxygen Demand

The analysis of the carbonaceous biochemical oxygen demand is a five-day test. Water samples collected for $cBOD_5$ must be analyzed within 24 hours after collection. Laboratories certified for the analysis of $cBOD_5$ or $BOD_5$ do not exist in Nunavut and therefore samples must be flown south to larger centres such as Calgary, Winnipeg, or Ottawa, where shipment times may exceed 24 hours. The biochemical oxygen demand is a measure of the microbially mediated oxidation of carbonaceous and nitrogenous compounds. In most cases, oxygen consumption from the oxidation of carbonaceous compounds exceeds the consumption from the oxidation of nitrogenous material. Measuring the oxygen demand associated with only the carbonaceous compounds can be achieved through the analysis of $cBOD_5$, which in essence is a $BOD_5$ test with the addition of a chemical additive that suppresses the oxidation of nitrogenous compounds present in the sample.

The chemical oxygen demand is also a measure of the oxidizable compounds within the wastewater. In this test, however, oxidation is accomplished through the addition of a strong chemical oxidant and does not involve microbial oxidation. This test can be used to provide a more complete understanding of all oxidizable compounds within the wastewater, including those that are not readily oxidized microbially. Since this test does not involve microbially mediated processes, it can be accomplished within minutes, rather than days, and does not require the use of an incubator as do the $BOD_5$ and $cBOD_5$ tests and thus can be routinely performed in lesser equipped laboratories.

In this study, the relationship between COD and $cBOD_5$ was evaluated to determine if COD could be used as a surrogate for the biochemical oxygen demand test. Finding a consistent relationship may provide an indirect measure of BOD. If a relationship existed, then this might help with compliance testing at the Alert site and mitigate the challenges associated with finding a suitable location for the analysis of BOD. The NWB licence stipulates that $BOD_5$ be one of the treatment performance measurements, as do most other regulatory bodies.

A comparison of the COD results with the $cBOD_5$ values (Figure 3.17) generated from the same wastewater samples illustrates that there is a general lack of relationship between COD and $cBOD_5$, indicating that at the Alert wetland, COD would not be a reliable surrogate for the measurement of $BOD_5$.

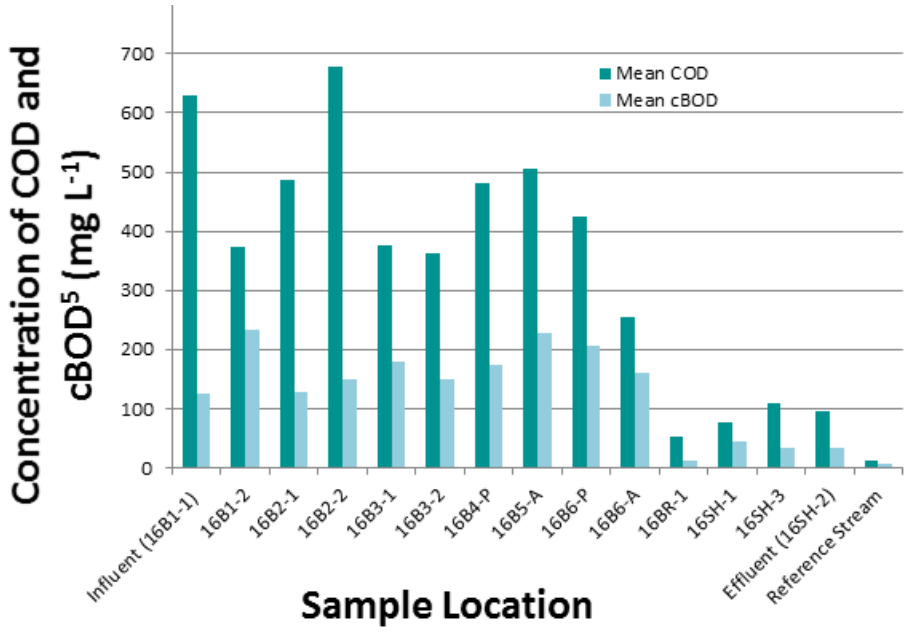



**Figure 3.17. The concentration of COD compared to the concentration of $cBOD_5$, from wastewater collected at sites within the Alert wetland during the 2016 study period, illustrating that the relationship is variable and not consistent.**

Table 3.1 summarizes the mean yearly ratio of COD to $cBOD_5$ for the years 2013 through to 2016. Each of the seasonal means, along with associated standard deviations, were calculated by dividing the COD concentration by the $cBOD_5$ concentrations observed at all sample stations, and generating a seasonal mean. As shown in Table 3.1, not only do the seasonal means of this ratio (COD to $cBOD_5$) vary, so do the standard deviations, meaning that this relationship varies widely amongst sample stations and years. Therefore, there is no consistent relationship between COD and $cBOD_5$ that would allow COD to be used confidently as a surrogate for $cBOD_5$ at the Alert station.

The mean concentrations of $cBOD_5$ are illustrated in Figure 3.18. The mean $cBOD_5$ of the effluent was statistically ($p<0.05$) lower than the mean $cBOD_5$ of the influent.

**Table 3.1. The concentration of COD divided by $cBOD_5$ expressed as a yearly (seasonal) mean generated by averaging all sampling station values for each year.**

| Year | Mean (COD/$cBOD_5$) | SD (COD/$cBOD_5$) |
|---|---|---|
| 2013 | 3.81 | 1.74 |
| 2014 | 3.74 | 4.42 |
| 2015 | 2.31 | 1.48 |
| 2016 | 2.86 | 1.12 |

SD = standard deviation

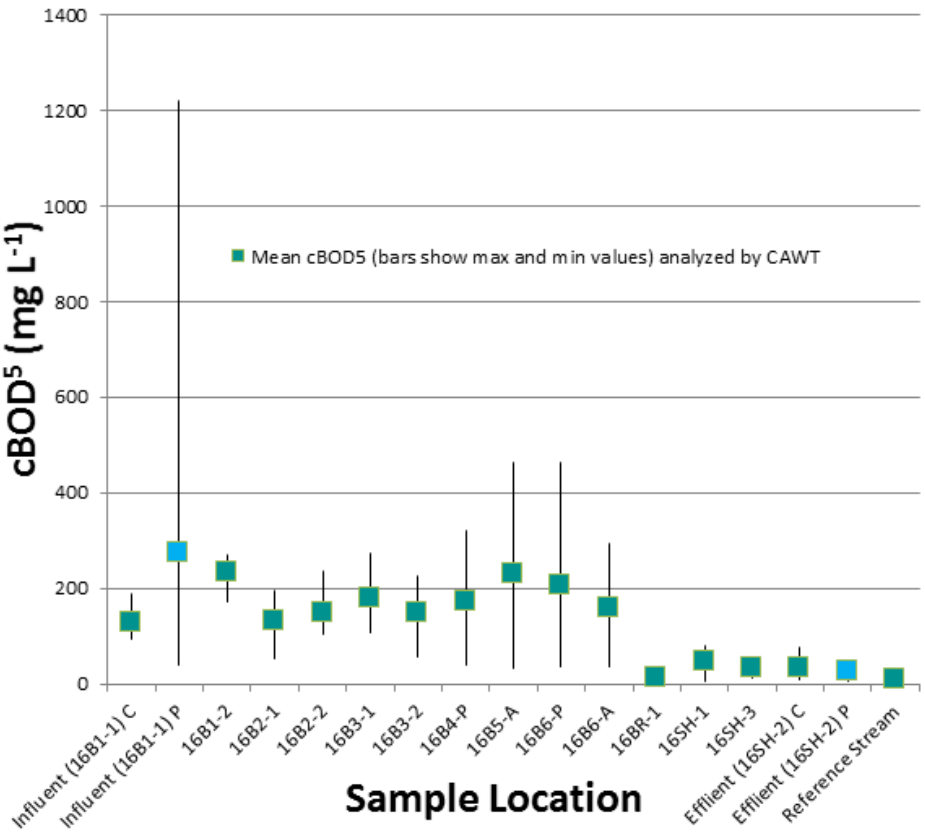



**Figure 3.18. Mean concentrations of the carbonaceous 5-day biochemical oxygen demand ($cBOD_5$) within wastewaters taken from sample sites within the Alert wetland during the 2016 study period.**

### 3.2.6 Microbial Indicators

The density of microbial indicator organisms, expressed as the number of colony forming units per 100 mL of sample (cfu/100 mL), was monitored at the collection sites for both total coliforms and *E. coli*. Total coliforms (TC) are often used as an indicator of fecal contamination and although this indicator group can also contain genera that do not originate from fecal contamination, it has been used in this study as a general indicator of microbial contamination originating from the discharge of wastewater to the wetland. *E. coli* (EC) does originate from fecal contamination and it has been used as an indicator for the possible presence of human pathogens. In both cases, these microbial groups are used primarily to monitor the change in the density of microbial organisms within the wastewater as it travels through the wetland.

Figures 3.19 and 3.20 illustrate the changing densities of total coliforms and *E.*

*coli*, respectively. Total coliform densities were typically ten times greater than the densities of *E. coli*. In both cases the densities at the sample locations vary widely throughout the study period. Microbial population densities entering the wetland were approximately $2.2x10^7$ for TC and $1.8x10^6$ for EC. These densities declined over distance, but generally one to two log units. Final densities exiting the wetland were approximately $1.3x10^6$ for TC and $2.3x10^5$ for EC. The decline in cfu / 100 mL was statistically significant ($p<0.05$) for TC but not statistically significant ($p>0.05$) for EC.

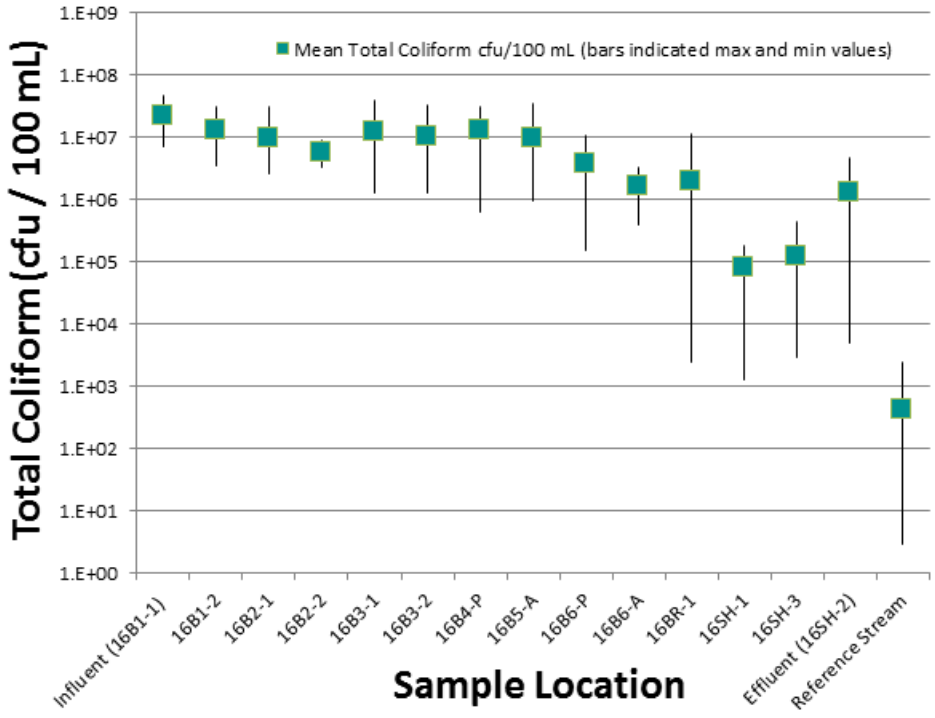



**Figure 3.19. The mean concentration of total coliforms (expressed as colony forming units per 100 mL of wastewater) at sample sites within the Alert wetland during the 2016 study period.**

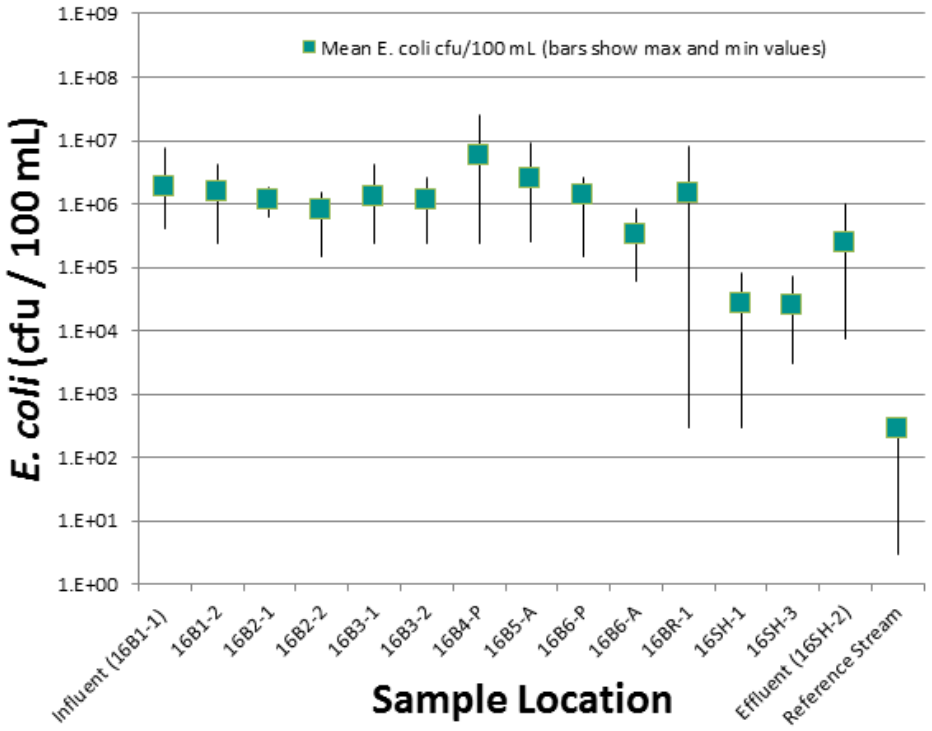



**Figure 3.20. The mean concentrations of *Escherichia coli* (expressed as colony forming units per 100 mL of wastewater) at sample sites within the Alert wetland during the 2016 study period.**

### 3.2.7 Dissolved Trace Elements

Calcium (Ca), magnesium (Mg), potassium (K), sodium (Na), aluminum (Al) and iron (Fe) were all found in low mg $L^{-1}$ (ppm) concentrations with all other elements in the range of µg $L^{-1}$ (ppb). Of the six elements in the ppm range, Al and Fe are of greatest interest in terms of their potential impact upon biota, since the remaining four elements (Ca, Mg, K, and Na) are more easily tolerated by organisms. Copper and lead were found in the low ppb range but have been highlighted since the concentrations of these elements exceed the Environment Canada water quality guidelines for the protection of aquatic health.

Both the concentration of Al and Fe increase slightly as the wastewater travels through the wetland. As shown in Figure 3.21, the concentration of Al entering the wetland was approximately 0.68 mg $L^{-1}$ (675 µg $L^{-1}$) with a peak concentration of 2.6 mg $L^{-1}$ (2558 µg $L^{-1}$) at site 16B3-1 and then declining to 0.39 mg $L^{-1}$ (385 µg $L^{-1}$) as it exited into Parr Inlet at 16SH-2. Environment Canada does not provide a water

quality guideline for the protection of marine health but does indicate that within freshwater environments the water quality guideline for Al is set at 0.10 mg $L^{-1}$.

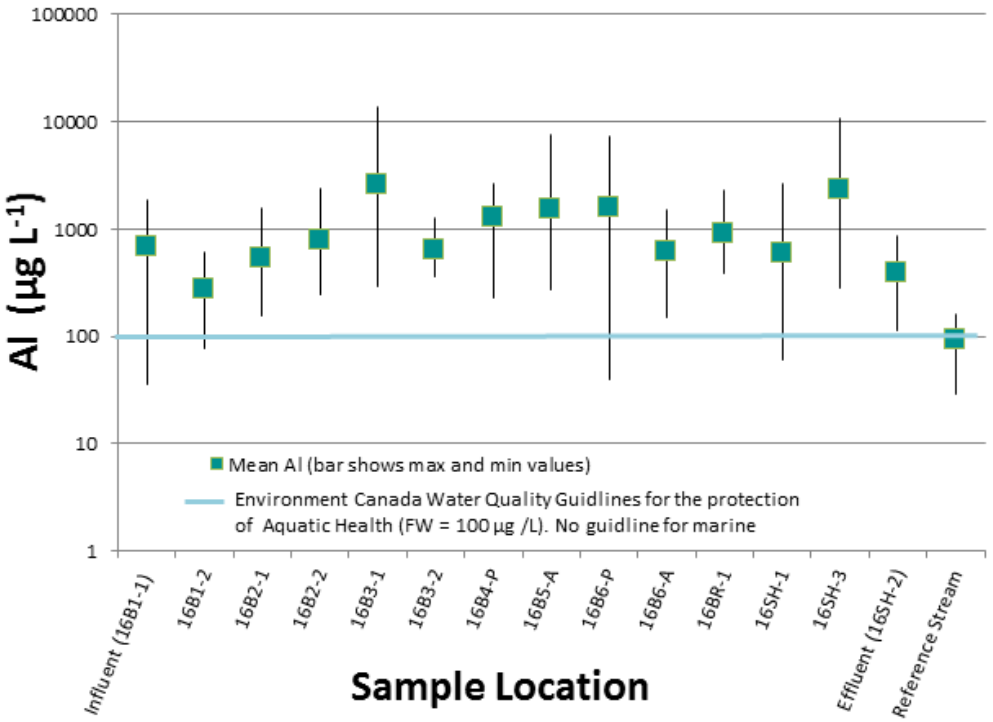



**Figure 3.21. Mean concentrations (µg L-1) of aluminum (Al) observed in wastewater collected at sample sites within the Alert wetland during the 2016 study period.**

The trend is similar for Fe (Figure 3.22) in that the average concentration of Fe entering the wetland was 1.2 mg $L^{-1}$ and peaks at station 16B3-1 at a concentration of 6.1 mg $L^{-1}$, while exiting the wetland with a mean value of 1.5 mg $L^{-1}$ at site 16SH-2. The increase in Al and Fe between the inflow and outflow of the wetland was not significantly different for Al ($p<0.05$) or Fe ($p<0.05$). Note, for the ease of graphing, the results shown in Figures 3.21 and 3.22 are expressed in units of µg $L^{-1}$ or ppb. Likewise, there is no Environment Canada guideline for Fe within a marine environment; however, the value set for aquatic environments is 0.30 mg $L^{-1}$.

The mean concentrations of copper generally decline modestly as the effluent passes through the wetland, but did remain approximately one order of magnitude higher than recorded in the water collected from the reference site (Figure 3.23). The decline was statistically significant ($p<0.05$).

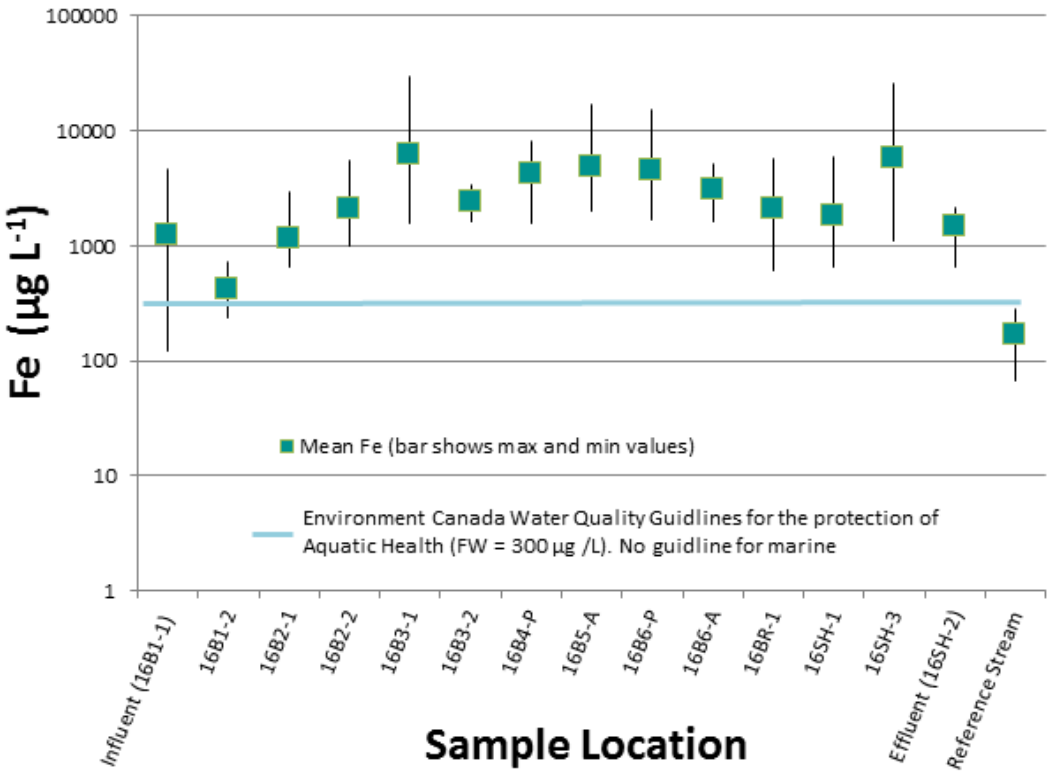



**Figure 3.22. Mean concentrations (µg $L^{-1}$) of iron (Fe) observed in wastewater collected at sample sites within the Alert wetland during the 2016 study period.**

The mean concentration of lead in wastewaters passing through the wetland exhibit a trend similar to that observed for copper (not statistically significant at $p<0.05$). Once again, lead values remain somewhat elevated above the mean concentration observed in the water sampled from the reference stream (Figure 3.24).

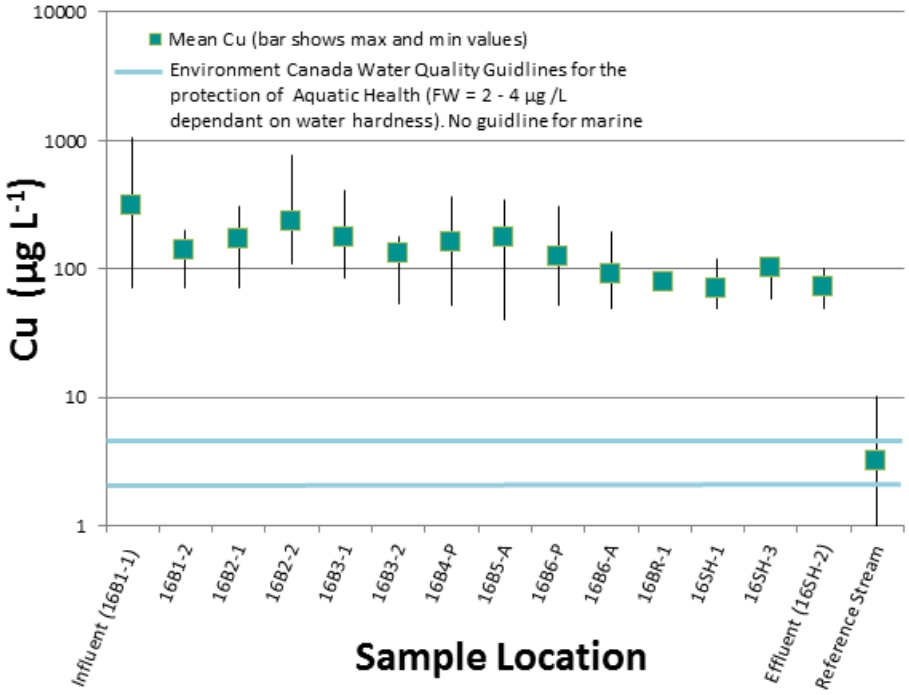



**Figure 3.23.** Mean concentrations (µg $L^{-1}$) of copper (Cu) observed in wastewater collected at sample sites within the Alert wetland during the 2016 study period.

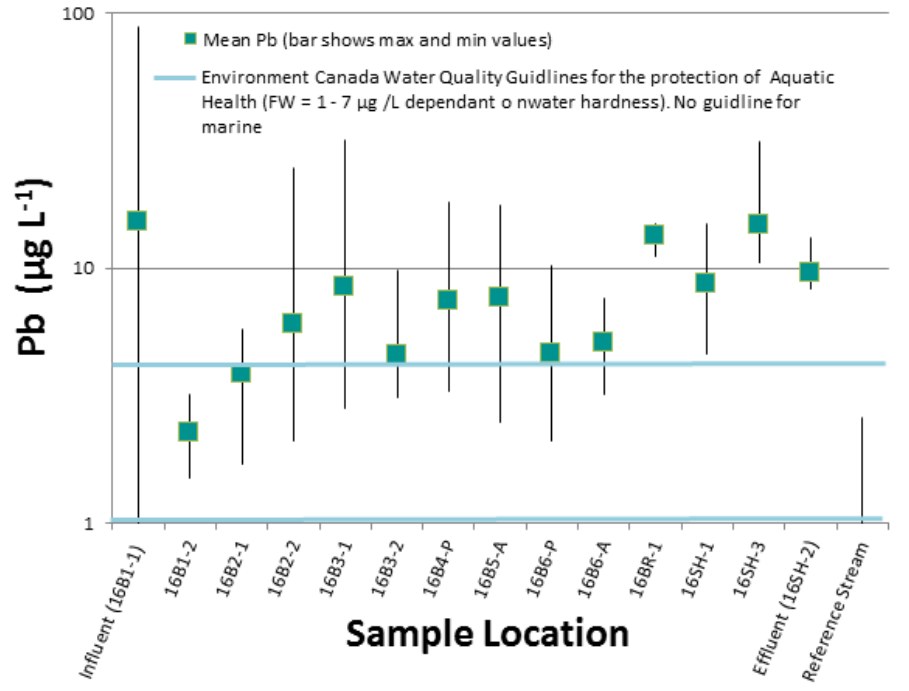



**Figure 3.24.** Mean concentrations (µg $L^{-1}$) of lead (Pb) observed in wastewater collected at sample sites within the Alert wetland during the 2016 study period.

# 4.0 DISCUSSION

## 4.1 General Overview

In many ways, the treatment performance of the terraced wetland in the 2016 field season accomplished some of the best removal rates since its construction in 2010 (Table 4.1). Of the four licenced compliance parameters, only oil and grease (i.e. FOG) was out of compliance, while the remaining three were within stipulated ranges. The efficiency of the treatment performance is hypothesized to be due primarily to the overwinter stability of the berms that were modified at the end of the 2015 field season. Historically, one or more berms would become breached sometime over the course of the winter and/or during the following spring freshet, where the intended zigzag flow path would become short circuited. Erosional waters would carry suspended solids rapidly to the ocean, leaving little contact time for microbial action and likely, decreasing the wetland's ability to physical removal solids via sedimentation and filtration. In general the wastewater flow was maintained to the desired flow path confined by the engineered berms with the exceptions of the alternative flow path sampled at stations 16B5A and 16B6A, and the seep monitored at station 16BR-1.

**Table 4.1 Water quality of the treated wastewater exiting the Alert wetland in the 2011, 2012, 2013, 2014, 2015, and 2016 site visits for the licenced compliance parameters stipulated by the Nunavut Water Board. Licensed compliance concentrations for $BOD_5$ = 80 mg $L^{-1}$; TSS = 70 mg $L^{-1}$; oil and grease = 5 mg $L^{-1}$ and pH = range of 6 to 9.**

| | 2011 mg $L^{-1}$ (range) | 2012 mg $L^{-1}$ (range) | 2013 mg $L^{-1}$ (range) | 2014 mg $L^{-1}$ (range) | 2015 mg $L^{-1}$ (range) | 2016 mg $L^{-1}$ (range) |
|---|---|---|---|---|---|---|
| $BOD_5$ | 15 (10 to 23) | 112 (64 to 190) | 39 (12 to 86) | 76 (19 to 138) | 401 (17 to 1780) | 13 (<7 to 17) |
| TSS | 241 (12 to 742) | 124 (2 to 490) | 590 (38 to 1860) | 805 (58 to 3980) | 880 (29 to 5660) | 48 (11 to 111) |
| Oil and Grease | 3.7 (<1 to 7.4) | 36 (13 to 72) | 13 (<1 to 41) | 23 (<10 to 57) | 130 (<5 to 836) | 9.4 (5.7 to 16) |
| pH | 8.2 (8.0 to 8.2) | 7.5 (6.0 to 7.9) | 7.5 (6.8 to 7.8) | 7.8 (7.5 to 8.0) | 8.0 (7.6 to 8.8) | 8.4 (8.1 to 8.6) |

Table 4.2 shows that although the wastewater strength was similar between 2015 and 2016, in particular for parameters such as TSS and FOG, the overall performance of the wetland varies greatly with much better performance observed in 2016, which is attributed primarily to the integrity of the detention berms. An increased retention of solids and possibly wastewater detention (e.g. increase in microbial contact time) were likely the two greatest contributors to better performance in 2016.

**Table 4.2.** Water quality parameters measured in the influent (B1-1) for the years 2011 to 2016.

| Parameter | | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|
| $BOD_5$ | mg $L^{-1}$ | 471 | 734 | 133 | 159 | 449 | 309 |
| $cBOD_5$ | mg $L^{-1}$ | 251 | 371 | 142 | 258 | 252 | 275 |
| TSS | mg $L^{-1}$ | 49 | 337 | 114 | 183 | 297 | 269 |
| VSS | mg $L^{-1}$ | 36 | 309 | 99 | 138 | 273 | 231 |
| pH | | 7.0 | 7.0 | 7.2 | 7.8 | 7.8 | 7.4 |
| FOG | mg $L^{-1}$ | 4.0 | 58 | 50 | 53 | 82 | 89 |
| COD | mg $L^{-1}$ | 223 | 479 | 248 | 358 | 833 | 630 |
| TN | mg $L^{-1}$ | -- | 19 | 18 | 16 | 16 | 20 |
| TKN | mg $L^{-1}$ | 14.0 | 19.1 | 17.5 | 15.6 | 44.9 | 20.0 |
| TAN | mg $L^{-1}$ | 12.7 | 11.5 | 8.9 | 8.0 | 13.4 | 7.3 |
| TP | mg $L^{-1}$ | 1.2 | 4.0 | 3.0 | 1.9 | 7.3 | 3.3 |
| $PO_4$ | mg $L^{-1}$ | 0.15 | 2.50 | 1.42 | 0.74 | 3.09 | 1.28 |
| TC | cfu/100mL | 2.40E+05 | 4.00E+07 | 1.28E+07 | 2.86E+06 | 1.43E+07 | 2.25E+07 |
| EC | cfu/100mL | 3.30E+04 | 3.00E+06 | 1.02E+06 | 3.93E+05 | 2.00E+06 | 1.80E+06 |

The hydraulic retention time (HRT) of the wetland is generally considered to be one of the more important aspects of treatment since it influences the settling of materials and contact time with microbial organisms. The slower the wastewater travels through the wetland the greater the potential for solids to settle and microbial degradation to occur. HRT is a difficult measurement to determine at the Alert wetland. The rocky nature of the wetland, the changing preferential flow paths, together with a changing porosity due to freezing of the substrate, makes it difficult to estimate the water holding capacity of the wetland (and in turn complicates the determination of HRT). Permafrost likely inhibits the subsurface flow from penetrating much more than a few centimetres. Adding to this issue is the fact that much of the wastewater is retained in the upper portions of the wetland as ice during the winter months. Most of this frozen wastewater is typically released over a period of 4 to 6 weeks, resulting in an increased flow rate greater than the typical 100 $m^3$ per day generated by the facility, resulting in flow rates that would be much faster than the normal rate at which wastewater is generated.

It should be noted that the start of the 2016 field season began approximately one month later than previous years and because of this, the mean concentrations calculated do not include the early portions of the field season where flows would be expected to be much higher and retention times much shorter because of the melting of ice sheets.

Therefore, in some regards part of the enhanced treatment performance may appear somewhat artificially better because the sampling season did not include the early melt period when treatment performance is generally poorest within the field season. This melt of frozen wastewater in the early summer would inevitably lower the HRT within a wetland that, in all likelihood, already has a short HRT. Although not known, it is anticipated that the HRT is likely no more than a few days, given all the conditions outlined above. Wetland performance would likely be improved if the HRT could be increased.

Aluminum and iron were the trace elements that were elevated to mg $L^{-1}$ concentrations in the wastewater, however; the peak concentrations in the 2016 field season (Al = 2.6 mg $L^{-1}$; Fe = 6.1 mg $L^{-1}$) were lower than observed in 2015 (Al = 10.9 mg $L^{-1}$; Fe = 24.5 mg $L^{-1}$), which is likely due to the fact that the wastewater flows did not traverse the old landfill site as they did in 2015 (e.g. 15SL-2 located at a breach in Berm 4). In both cases, Al and Fe leaving the wetland were elevated above the Environment Canada water quality guidelines for the protection of aquatic health. Guidelines for marine environments such as those at Alert wetland site have not been determined and are not available.

## 4.2 Comparison of Wetland's Performance in 2016 with Previous Years

Table 4.3 summarizes the mean summer water quality parameters of the wastewater entering (influent) and exiting the wetland (effluent) during the summers of 2012, 2013, 2014, 2015 and 2016. The effluent leaving the wetland in 2016 suggests treatment was slightly improved in comparison to other years.

A comparison of the water quality parameters of the raw wastewater flowing into the wetland (influent) reveals that strength of the 2016 influent was slightly weaker than the strength of the 2015 field season, particularly in terms of $BOD_5$, $cBOD_5$, COD, TN, TKN, TAN TP and $PO_4$. At this stage it is difficult to determine if the apparent difference in wastewater strength is real or not, or if it is just an artifact of sampling and more indicative of the non-homogenous nature of raw wastewater. Part of the yearly differences may also be related to how the influent was sampled; either as a grab sample or as a composite sample. In 2012 and 2015, the influent sample (B1-1) was a 24 hour composite sample that utilized an automated composite sampler to collect a subsample once every hour over a 24 hour period. Thus, the influent samples collected during 2012 and 2015 may better represent an "averaged" daily concentration, whereas the 2013, 2014 and 2016 influent samples represented one grab sample within a 24 hour period. In addition, the intake hose for the composite sampler in 2012 was positioned within a pool of the slash pad. If organic matter concentrated in this pool, then the

2012 influent samples may be expected to be somewhat elevated in comparison to grab samples.

**Table 4.3 Comparison of influent and effluent values for 2012, 2013, 2014, 2015, and 2016 field seasons**

| Parameter | | 2012 | | 2013 | | 2014 | | 2015 | | 2016 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | influent | effluent | influent | effluent | influent | effluent | influent | effluent | influent | effluent |
| $BOD_5$ | mg $L^{-1}$ | 734 | 111 | 133 | 39 | 151 | 76 | 410 | 401 | 309 | 13 |
| $cBOD_5$ | mg $L^{-1}$ | 371 | 88 | 142 | 22 | 227 | 58 | 339 | 212 | 274 | 25 |
| TSS | mg $L^{-1}$ | 337 | 124 | 114 | 590 | 183 | 805 | 297 | 880 | 269 | 48 |
| VSS | mg $L^{-1}$ | 309 | 52 | 99 | 48 | 138 | 58 | 273 | 157 | 231 | 26 |
| pH | | 7.0 | 7.5 | 7.2 | 7.5 | 7.8 | 7.8 | 7.8 | 8.0 | 7.7 | 8.4 |
| FOG | mg $L^{-1}$ | 58 | 37 | 50 | 14 | 53 | 23 | 82 | 130 | 89 | 9 |
| COD | mg $L^{-1}$ | 479 | 262 | 248 | 120 | 358 | 191 | 833 | 546 | 630 | 97 |
| TN | mg $L^{-1}$ | 19.1 | 10.4 | 17.8 | 10.9 | 15.6 | 11.2 | 44.9 | 21.9 | 19.6 | 10.6 |
| TKN | mg $L^{-1}$ | 19.1 | 10.4 | 17.5 | 10.8 | 15.6 | 11.1 | 44.9 | 21.5 | 20.0 | 6.5 |
| TAN | mg $L^{-1}$ | 11.5 | 7.4 | 8.9 | 9.4 | 8.0 | 7.7 | 13.4 | 8.5 | 7.3 | 4.5 |
| $NO_2$ | mg $L^{-1}$ | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 0.09 | <0.05 | 0.12 |
| $NO_3$ | mg $L^{-1}$ | 0.10 | 0.50 | <0.05 | 0.17 | <0.05 | 0.09 | <0.05 | 0.38 | 0.05 | 1.13 |
| TP | mg $L^{-1}$ | 4.00 | 1.50 | 2.97 | 1.12 | 1.87 | 1.43 | 7.33 | 2.77 | 3.00 | 0.63 |
| $PO_4$ | mg $L^{-1}$ | 4.20 | 0.26 | 1.42 | 0.37 | 0.74 | 0.07 | 3.09 | 0.39 | 1.29 | 0.15 |
| TC | cfu/100mL | 4.00E+07 | 3.90E+06 | 1.28E+07 | 4.61E+05 | 4.44E+06 | 1.18E+06 | 9.83E+07 | 4.11E+06 | 2.25E+07 | 1.28E+06 |
| EC | cfu/100mL | 3.00E+06 | 2.90E+05 | 1.02E+06 | 3.48E+04 | 5.08E+05 | 1.11E+05 | 7.57E+06 | 5.00E+05 | 1.76E+06 | 2.34E+05 |

## 4.3 Recommendations

A major hindrance to performance of the Alert wetland throughout the years of research appear to be related to ice damage to the berms that facilitates erosion and unintentional redirection of flow paths. These erosional forces can lead to increased suspended solids and reduced contact time with microbial organisms involved in treatment. Stabilization of erosion and confinement of wastewater to engineered flow paths appears to be pivotal to obtaining a reasonable level of treatment performance within the wetland.

Ice damage and erosional forces associated with the spring freshet will likely mean that yearly maintenance to the berms will be required. Strengthening of the berms to minimize ice damage will be challenging but is something that should be considered. In addition, extra discussion should occur with all parties to consider ways to better

direct flow away from areas that historically breach. The redirection of flow should be approached with caution to ensure that new problems are not created that could further hinder performance. If possible, one goal should be to slow the rate of flow through the wetland. A slower flow rate should facilitate the settling of suspended solids and increase contact time between wastewater constituents and microbial organisms involved in treatment.

Determining the best way to strengthen berms, redirect flows, and slow flow rates at the Alert site will likely require a team approach that involves civil engineers from the firm overseeing wetland maintenance and some representation from DND. Possible solutions may include the use of geotextile or rubberized pond liner in areas particularly prone to erosional forces. Other possibilities may involve a greater use of the smaller detention barriers within the six larger berms to create a greater abundance of shallow pools to help facilitate settling of solids while slowing flow rates.

Discussions should take place sometime in the spring or early summer of the upcoming field season so that plans can be finalized in time for the yearly maintenance work that typically occurs each August. These talks should also address costs for this work and how this work is financed if projected costs are greater than what is normally expensed for yearly maintenance.

The recommendations are as follows:

1. Establish a working group to determine the best approach to strengthen the berms, eliminate erosion, and ensure wastewater flow is confined to engineered flow paths. Investigate ways to slow the flow rate of wastewater through the wetland.
2. Monitor the performance of the wetland in the summer of 2017 in order to better understand the natural variability inherent in the wetland and to monitor performance and assess how modifications to flow paths impact overall treatment.
3. Conduct a tracer study early in the season and again late in the season to better determine the rate at which the wastewater is travelling through the wetland. This will help to better assess the ability of the wetland to detain the wastewater and provide insight into seasonal variability of flow rates. A tracer test can be accomplished with the input of a known mass of potassium bromide and a composite sampler that collects samples hourly at the end of the wetland (this would require battery power). An alternative but less expensive and less accurate method would be to use a coloured dye that can be detected visually to monitor the major flow paths as the wastewater flows towards the ocean.The dye chosen should be one that will not be harmful to the environment.

# 5.0 SUMMARY

The Alert terraced wetland provided treatment of the wastewater generated by CFS Alert. The 2016 field season exhibited one of the highest treatment performances since the establishment of the wetland in 2010. The efficiency of the 2016 season appears to be primarily related to the integrity of the berms that were successful in both detaining and directing the wastewater along an engineered flow path. It was also recognized, however, that the late start to field sampling missed the spring freshet, when treatment performance was likely poorer. Even though berms withstood the erosional forces of ice and water from the 2015/16 winter, they should be monitored each field season and reinforced when needed.

# 6.0 REFERENCES

Canadian Council of Ministers of the Environment. 2009. *Canada-wide strategy for the management of municipal wastewater effluent.* Endorsed by CCME Council of Ministers, February 17, 2009, Whitehorse. 22 pp.

Canadian Council of Ministers of the Environment. 2014. *Canada-wide strategy for the management of municipal wastewater effluent – 2014 progress report.* ISBN: 978-1-77202-005-2 PDF. Winnipeg, Manitoba, Ontario. 18 pp.

# 7.0 APPENDICES

**Temperature (º C)**

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 7.5 | 7.1 | 6.9 | 7.0 | 7.4 | 7.0 | 8.4 | 8.0 |
| August 3, 2016 | 15.3 | 12.7 | 11.2 | 11.3 | 10.1 | 9.3 | 8.8 | 9.7 |
| August 8, 2016 | | | | | | | | |
| August 17, 2016 | 21.0 | 17.0 | 10.0 | 9.0 | 8.0 | 8.0 | 7.0 | 7.0 |
| August 24, 2016 | 20.0 | 16.0 | 10.0 | 8.0 | 7.0 | 7.0 | 5.0 | 6.0 |
| August 31, 2016 | 20.0 | 17.0 | 11.0 | 10.0 | 7.0 | 6.0 | 3.0 | 4.0 |
| September 6, 2016 | 15.0 | 10.0 | 5.0 | 4.0 | 1.0 | 0.0 | 0.0 | 0.0 |
| Average | 16.5 | 13.3 | 9.0 | 8.2 | 6.8 | 6.2 | 5.4 | 5.8 |
| Min | 7.5 | 7.1 | 5.0 | 4.0 | 1.0 | 0.0 | 0.0 | 0.0 |
| Max | 21.0 | 17.0 | 11.2 | 11.3 | 10.1 | 9.3 | 8.8 | 9.7 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream |
|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | |
| July 27, 2016 | 6.9 | 7.2 | 6.2 | 6.9 | 7.9 | 7.5 | 7.1 |
| August 3, 2016 | 10.7 | 9.3 | 9.0 | 9.7 | 9.8 | 9.2 | 9.6 |
| August 8, 2016 | | | | | | | |
| August 17, 2016 | 8.0 | 7.0 | 8.0 | 8.0 | 7.0 | 7.0 | 6.0 |
| August 24, 2016 | 6.0 | 6.0 | 5.0 | 6.0 | 5.0 | 5.0 | 4.0 |
| August 31, 2016 | 3.0 | 2.0 | 5.0 | 0.0 | 0.0 | 0.0 | 1.0 |
| September 6, 2016 | | 0.0 | | | | | |
| Average | 6.9 | 5.3 | 6.6 | 6.1 | 5.9 | 5.7 | 5.5 |
| Min | 3.0 | 0.0 | 5.0 | 0.0 | 0.0 | 0.0 | 1.0 |
| Max | 10.7 | 9.3 | 9.0 | 9.7 | 9.8 | 9.2 | 9.6 |

## Dissolved Oxygen (mg/L)

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 6.9 | 6.8 | 0.3 | 5.0 | 4.0 | 2.7 | 6.6 | 6.6 |
| August 3, 2016 | 6.1 | 5.9 | 7.5 | 6.0 | 8.2 | 7.8 | 10.2 | 8.7 |
| August 8, 2016 | 6.5 | 5.7 | 6.6 | 6.1 | 8.3 | 7.0 | 8.9 | 6.5 |
| August 17, 2016 | 5.3 | 4.9 | 5.6 | 5.9 | 7.3 | 6.9 | 5.2 | 5.8 |
| August 24, 2016 | 3.7 | 5.6 | 7.0 | 6.0 | 8.1 | 7.7 | 9.4 | 8.8 |
| August 31, 2016 | 7.4 | 5.6 | 6.4 | 6.6 | 8.5 | 8.2 | 10.3 | 9.4 |
| September 6, 2016 | 8.4 | 7.6 | 9.1 | 9.7 | 11.0 | 11.5 | 12.3 | 11.6 |
| Average | 6.3 | 6.0 | 6.1 | 6.5 | 7.9 | 7.4 | 9.0 | 8.2 |
| Min | 3.7 | 4.9 | 0.3 | 5.0 | 4.0 | 2.7 | 5.2 | 5.8 |
| Max | 8.4 | 7.6 | 9.1 | 9.7 | 11.0 | 11.5 | 12.3 | 11.6 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream |
|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | |
| July 27, 2016 | 8.0 | 9.2 | 8.7 | 11.6 | 11.5 | 11.5 | 10.8 |
| August 3, 2016 | 10.1 | 9.5 | 13.4 | 12.0 | 11.8 | 9.9 | 11.9 |
| August 8, 2016 | 8.3 | 8.2 | 14.3 | 11.9 | 11.4 | 9.7 | 12.2 |
| August 17, 2016 | 6.9 | 6.4 | 13.0 | 12.2 | 11.9 | 11.0 | 11.9 |
| August 24, 2016 | 10.2 | 9.8 | 15.2 | 12.6 | 13.1 | 12.7 | 13.0 |
| August 31, 2016 | 10.9 | 10.0 | 16.6 | 14.0 | 14.3 | 15.2 | 14.2 |
| September 6, 2016 | | 10.7 | | | | | |
| Average | 9.1 | 9.1 | 13.5 | 12.4 | 12.3 | 11.7 | 12.3 |
| Min | 6.9 | 6.4 | 8.7 | 11.6 | 11.4 | 9.7 | 10.8 |
| Max | 10.9 | 10.7 | 16.6 | 14.0 | 14.3 | 15.2 | 14.2 |

## Conductivity (µS)

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 403 | 476 | 656 | 585 | 698 | 737 | 722 | 785 |
| August 3, 2016 | 405 | 414 | 406 | 488 | 627 | 664 | 689 | 738 |
| August 8, 2016 | 324 | 353 | 540 | 816 | 521 | 598 | 635 | 603 |
| August 17, 2016 | 426 | 480 | 468 | 531 | 768 | 701 | 618 | 643 |
| August 24, 2016 | 889 | 379 | 407 | 521 | 490 | 460 | 586 | 533 |
| August 31, 2016 | 275 | 439 | 336 | 333 | 428 | 453 | 468 | 498 |
| September 6, 2016 | 299 | 348 | 601 | 435 | 558 | 480 | 404 | 413 |
| Average | 431.6 | 412.7 | 487.7 | 529.9 | 584.3 | 584.7 | 588.9 | 601.9 |
| Min | 275.0 | 348.0 | 336.0 | 333.0 | 428.0 | 453.0 | 404.0 | 413.0 |
| Max | 889.0 | 480.0 | 656.0 | 816.0 | 768.0 | 737.0 | 722.0 | 785.0 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 763 | 913 | 2510 | 1583 | 244 | 2640 | 1431 | |
| August 3, 2016 | 738 | 851 | 3250 | 2300 | 2500 | 1035 | 291 | |
| August 8, 2016 | 552 | 822 | 2710 | 2144 | 2470 | 842 | 335 | 26 |
| August 17, 2016 | 558 | 856 | 2830 | 807 | 2820 | 1260 | 356 | 23 |
| August 24, 2016 | 491 | 651 | 2064 | 551 | 2196 | 984 | 367 | 20.7 |
| August 31, 2016 | 388 | 558 | 1642 | 727 | 1961 | 894 | 361 | 42.8 |
| September 6, 2016 | | 670 | | | | | | 14.1 |
| Average | 582 | 760 | 2501 | 1352 | 2032 | 1276 | 524 | 25 |
| Min | 388 | 558 | 1642 | 551 | 244 | 842 | 291 | 14 |
| Max | 763 | 913 | 3250 | 2300 | 2820 | 2640 | 1431 | 43 |

**pH**

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 7.62 | 7.33 | 7.05 | 7.32 | 7.35 | 7.60 | 7.80 | 7.92 |
| August 3, 2016 | 8.65 | 7.49 | 8.10 | 7.83 | 7.59 | 7.59 | 8.01 | 7.84 |
| August 8, 2016 | 7.69 | 7.33 | 7.43 | 7.39 | 7.52 | 7.45 | 7.74 | 7.61 |
| August 17, 2016 | 7.41 | 7.18 | 7.39 | 7.34 | 7.43 | 7.36 | 7.42 | 7.47 |
| August 24, 2016 | 7.20 | 7.24 | 7.38 | 7.09 | 7.52 | 7.53 | 7.71 | 7.77 |
| August 31, 2016 | 7.86 | 7.36 | 7.48 | 7.41 | 7.55 | 7.56 | 7.91 | 7.79 |
| September 6, 2016 | 7.76 | 7.42 | 7.57 | 7.42 | 7.55 | 7.66 | 7.79 | 7.72 |
| Average | 7.74 | 7.34 | 7.49 | 7.40 | 7.50 | 7.54 | 7.77 | 7.73 |
| Min | 7.20 | 7.18 | 7.05 | 7.09 | 7.35 | 7.36 | 7.42 | 7.47 |
| Max | 8.65 | 7.49 | 8.10 | 7.83 | 7.59 | 7.66 | 8.01 | 7.92 |
| SD | 0.46 | | | | | | | |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 8.04 | 8.04 | 8.67 | 8.91 | 8.25 | 8.55 | 8.29 | |
| August 3, 2016 | 8.30 | 8.18 | 8.94 | 8.80 | 8.55 | 8.11 | 8.07 | |
| August 8, 2016 | 7.87 | 7.88 | 8.80 | 8.84 | 8.45 | 8.14 | 8.09 | 5.34 |
| August 17, 2016 | 7.68 | 7.71 | 8.92 | 8.61 | 8.60 | 8.25 | 8.15 | 4.84 |
| August 24, 2016 | 8.04 | 7.94 | 8.83 | 8.45 | 8.66 | 8.64 | 8.18 | 5.57 |
| August 31, 2016 | 7.94 | 7.86 | 9.02 | 8.53 | 8.58 | 8.61 | 7.56 | 5.45 |
| September 6, 2016 | | 7.74 | | | | | | 5.47 |
| Average | 7.98 | 7.91 | 8.86 | 8.69 | 8.52 | 8.38 | 8.06 | 5.33 |
| Min | 7.68 | 7.71 | 8.67 | 8.45 | 8.25 | 8.11 | 7.56 | 4.84 |
| Max | 8.30 | 8.18 | 9.02 | 8.91 | 8.66 | 8.64 | 8.29 | 5.57 |

## Dissolved Organic Carbon (mg/L)

**City of Peterborough Detection Limits:** **1.0** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 36.1 | | | | | 44.8 | 41.7 | 34.7 |
| August 3, 2016 | 35.1 | 135 | 16.4 | 24.5 | 22.4 | 21.3 | 16.8 | 18.5 |
| August 8, 2016 | 28.0 | 51.5 | 274 | 242 | 39.4 | 33.1 | 48.3 | 38.6 |
| August 17, 2016 | 21.1 | 71.4 | 62.4 | 78.4 | 85.1 | 78.3 | 112 | 204 |
| August 24, 2016 | 255 | 76.1 | 67.5 | 71.4 | 58.6 | 63.7 | 81.9 | 56.5 |
| August 31, 2016 | 8.30 | 47.6 | 21.7 | 16.0 | 20.6 | 25.2 | 26.1 | 36.4 |
| September 6, 2016 | 4.90 | 10.9 | 19.4 | 17.0 | 18.2 | 10.9 | 11.9 | 12.4 |
| Average | 55.5 | 65.4 | 76.9 | 74.9 | 40.7 | 39.6 | 48.4 | 57.3 |
| Min | 4.9 | 10.9 | 16.4 | 16.0 | 18.2 | 10.9 | 11.9 | 12.4 |
| Max | 255 | 135 | 274 | 242 | 85.1 | 78.3 | 112 | 204 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 49.8 | 41.1 | 10.0 | 10.4 | 6.2 | 9.4 | 1.0 | |
| August 3, 2016 | 19.1 | 22.9 | 6.4 | 11.5 | 9.3 | 20.8 | 1.2 | 1.0 |
| August 8, 2016 | 43.1 | 24.9 | 6.7 | 8.1 | 7.7 | 13.6 | 1.3 | 1.0 |
| August 17, 2016 | 170 | 54.0 | 15.8 | 51.9 | 29.9 | 48.7 | 1.2 | 1.0 |
| August 24, 2016 | 24.8 | 17.5 | 13.6 | 14.4 | 7.8 | 1.50 | 1.3 | 1.6 |
| August 31, 2016 | 17.6 | 33.1 | 10.4 | 7.2 | 5.8 | 13.6 | 1.0 | 1.0 |
| September 6, 2016 | | 9.8 | | | | | | |
| Average | 54.1 | 29.0 | 10.5 | 17.3 | 11.1 | 17.9 | 1.2 | 1.1 |
| Min | 17.6 | 9.8 | 6.4 | 7.2 | 5.8 | 1.5 | 1.0 | 1.0 |
| Max | 170 | 54.0 | 15.8 | 51.9 | 29.9 | 48.7 | 1.3 | 1.6 |

## Chemical Oxygen Demand (mg/L)

**City of Peterborough Detection Limits:** **10.0** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 220 | | | | | 460 | 340 | 260 |
| August 3, 2016 | 360 | 570 | 140 | 260 | 230 | 130 | 130 | 130 |
| August 8, 2016 | 250 | 380 | 1130 | 920 | 220 | 220 | 320 | 260 |
| August 17, 2016 | 380 | 420 | 580 | 480 | 490 | 490 | 1260 | 1510 |
| August 24, 2016 | 2920 | 310 | 370 | 1590 | 440 | 570 | 550 | 370 |
| August 31, 2016 | 150 | 400 | 400 | 380 | 460 | 430 | 360 | 360 |
| September 6, 2016 | 130 | 160 | 300 | 440 | 410 | 230 | 410 | 650 |
| Average | 630 | 373 | 487 | 678 | 375 | 361 | 481 | 506 |
| Min | 130 | 160 | 140 | 260 | 220 | 130 | 130 | 130 |
| Max | 2920 | 570 | 1130 | 1590 | 490 | 570 | 1260 | 1510 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 340 | 200 | 40 | 70 | 50 | 30 | 10 | |
| August 3, 2016 | 120 | 130 | 70 | 40 | 70 | 130 | 10 | 10 |
| August 8, 2016 | 380 | 210 | 40 | 20 | 40 | 140 | 10 | 10 |
| August 17, 2016 | 1310 | 520 | 50 | 180 | 100 | 170 | 10 | 10 |
| August 24, 2016 | 100 | 100 | 50 | 60 | 290 | 90 | 20 | 10 |
| August 31, 2016 | 300 | 520 | 70 | 90 | <10 | 20 | 10 | 10 |
| September 6, 2016 | | 100 | | | | | | |
| Average | 425 | 254 | 53 | 77 | 110 | 97 | 12 | 10 |
| Min | 100 | 100 | 40 | 20 | 40 | 20 | 10 | 10 |
| Max | 1310 | 520 | 70 | 180 | 290 | 170 | 20 | 10 |

## Carbonaceous Biochemical Oxygen Demand (mg/L)

**CAWT Detection Limits:** **4.0** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue, values above range are highlighted in red***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | | | | | | | | |
| August 3, 2016 | 94 | 271 | 52 | 103 | 108 | 57 | 39 | 32 |
| August 8, 2016 | | | | | | | | |
| August 17, 2016 | 189 | 257 | 196 | 237 | 272 | 225 | 321 | 462 |
| August 24, 2016 | | | | | | | | |
| August 31, 2016 | 96 | 173 | 138 | 107 | 159 | 164 | 158 | 192 |
| September 6, 2016 | | | | | | | | |
| Average | 127 | 234 | 129 | 149 | 180 | 148 | 173 | 229 |
| Min | 94 | 173 | 52 | 103 | 108 | 57 | 39 | 32 |
| Max | 189 | 271 | 196 | 237 | 272 | 225 | 321 | 462 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | | | | | | | | |
| August 3, 2016 | 35 | 36 | 9 | 6 | 39 | 13 | 7 | |
| August 8, 2016 | | | | | | | | |
| August 17, 2016 | 464 | 150 | 22 | 79 | 47 | 77 | 7 | |
| August 24, 2016 | | | | | | | | |
| August 31, 2016 | 122 | 292 | 8 | 51 | 13 | 9 | 7 | |
| September 6, 2016 | | | | | | | | |
| Average | 207 | 159 | 13 | 46 | 33 | 33 | 7 | |
| Min | 35 | 36 | 8 | 6 | 13 | 9 | 7 | |
| Max | 464 | 292 | 22 | 79 | 47 | 77 | 7 | |

## Carbonaceous Biochemical Oxygen Demand (mg/L)

**Peterborough Detection Limits:** **4.0** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue, values above range are highlighted in red***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | | | | | | | | |
| August 3, 2016 | 105 | | | | | | | |
| August 8, 2016 | 82 | | | | | | | |
| August 17, 2016 | 134 | | | | | | | |
| August 24, 2016 | 1220 | | | | | | | |
| August 31, 2016 | 40 | | | | | | | |
| September 6, 2016 | 68 | | | | | | | |
| Average | 275 | | | | | | | |
| Min | 40 | | | | | | | |
| Max | 1220 | | | | | | | |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | | | | | | | | |
| August 3, 2016 | | | | | | 32 | | |
| August 8, 2016 | | | | | | 29 | | |
| August 17, 2016 | | | | | | 51 | | |
| August 24, 2016 | | | | | | 8.0 | | |
| August 31, 2016 | | | | | | 4.0 | | |
| September 6, 2016 | | | | | | | | |
| Average | | | | | | 24.6 | | |
| Min | | | | | | 4.0 | | |
| Max | | | | | | 50.8 | | |

## Biochemical Oxygen Demand (mg/L)

**CAWT Detection Limits:** **3.0** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue, values above range are highlighted in red***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 131 | 429 | 475 | 335 | 235 | 157 | 106 | 143 |
| August 3, 2016 | | | | | | | | |
| August 8, 2016 | 102 | 205 | 450 | 452 | 97 | 99 | 131 | 139 |
| August 17, 2016 | | | | | | | | |
| August 24, 2016 | 695 | 207 | 424 | 545 | 194 | 324 | 302 | 215 |
| August 31, 2016 | | | | | | | | |
| September 6, 2016 | | | | | | | | |
| Average | 309 | 280 | 450 | 444 | 176 | 194 | 180 | 166 |
| Min | 102 | 205 | 424 | 335 | 97 | 99 | 106 | 139 |
| Max | 695 | 429 | 475 | 545 | 235 | 324 | 302 | 215 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 14 | 85 | 137 | 21 | 7 | 7 | 3 | |
| August 3, 2016 | | | | | | | | |
| August 8, 2016 | 130 | 77 | 9 | 7 | 50 | 16 | 7 | |
| August 17, 2016 | | | | | | | | |
| August 24, 2016 | 47 | 47 | 10 | 25 | 15 | 17 | 7 | |
| August 31, 2016 | | | | | | | | |
| September 6, 2016 | | | | | | | | |
| Average | 64 | 69 | 52 | 18 | 24 | 13.2 | 5.7 | |
| Min | 14 | 47 | 9 | 7 | 7 | 7 | 3.0 | |
| Max | 130 | 85 | 137 | 25 | 50 | 17 | 7.0 | |

## Biochemical Oxygen Demand (mg/L)

**Peterborough Detection Limits:** **2.3** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue, values above range are highlighted in red***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 123 | | | | | | | |
| August 3, 2016 | | | | | | | | |
| August 8, 2016 | | | | | | | | |
| August 17, 2016 | | | | | | | | |
| August 24, 2016 | | | | | | | | |
| August 31, 2016 | | | | | | | | |
| September 6, 2016 | | | | | | | | |
| Average | 123 | | | | | | | |
| Min | 123 | | | | | | | |
| Max | 123 | | | | | | | |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | | | | | | 5.6 | | |
| August 3, 2016 | | | | | | | | |
| August 8, 2016 | | | | | | | | |
| August 17, 2016 | | | | | | | | |
| August 24, 2016 | | | | | | | | |
| August 31, 2016 | | | | | | | | |
| September 6, 2016 | | | | | | | | |
| Average | | | | | | 5.6 | | |
| Min | | | | | | 5.6 | | |
| Max | | | | | | 5.6 | | |

## Total Coliforms (cfu/100mls)

**CAWT Detection Limits:** **3** **cfu/100mls**

***Values below detection limit are listed as the detection limit and highlighted in blue, values above range are highlighted in red***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 7400000 | 15350000 | 8300000 | 3600000 | 39700000 | 32700000 | 27950000 | 11300000 |
| August 3, 2016 | 44720000 | 15520000 | 3800000 | 3250000 | 4720000 | 2000000 | 3680000 | 1800000 |
| August 8, 2016 | 10160000 | 3600000 | 8050000 | 4700000 | 1280000 | 1280000 | 640000 | 950000 |
| August 17, 2016 | 16000000 | 32240000 | 30950000 | 3680000 | 7840000 | 15520000 | 30950000 | 34700000 |
| August 24, 2016 | 46960000 | 5760000 | 2640000 | 8800000 | 7520000 | 4400000 | 4160000 | 2400000 |
| August 31, 2016 | 9520000 | 5100000 | 5200000 | 9120000 | 10880000 | 6640000 | 9120000 | 6640000 |
| September 6, 2016 | | | | | | | | |
| Average | 22460000 | 12928333 | 9823333 | 5525000 | 11990000 | 10423333 | 12750000 | 9631667 |
| Min | 7400000 | 3600000 | 2640000 | 3250000 | 1280000 | 1280000 | 640000 | 950000 |
| Max | 46960000 | 32240000 | 30950000 | 9120000 | 39700000 | 32700000 | 30950000 | 34700000 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 150000 | 3250000 | 11300000 | 30000 | 30000 | 5000 | 3 | |
| August 3, 2016 | 2640000 | 950000 | 150000 | 1300 | 242400 | 4690000 | 3 | |
| August 8, 2016 | 1520000 | 400000 | 30000 | 19000 | 451000 | 2595000 | 3 | 3 |
| August 17, 2016 | 10650000 | 1120000 | 8000 | 98000 | 7500 | 235000 | 13 | 3 |
| August 24, 2016 | 2600000 | 1180000 | 2500 | 135500 | 3000 | 90000 | 33 | 3 |
| August 31, 2016 | 5100000 | 2720000 | 2500 | 188000 | 16100 | 47000 | 2424 | 3 |
| September 6, 2016 | | | | | | | | |
| Average | 3776667 | 1603333 | 1915500 | 78633 | 125000 | 1277000 | 413 | 3 |
| Min | 150000 | 400000 | 2500 | 1300 | 3000 | 5000 | 3 | 3 |
| Max | 10650000 | 3250000 | 11300000 | 188000 | 451000 | 4690000 | 2424 | 3 |

## Total Coliforms (cfu/100mls)

**Peterborough Detection Limits:** **0** **cfu/100mls**

***Values below detection limit are listed as the detection limit and highlighted in blue, values above range are highlighted in red***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 13500000 | | | | | | | |
| August 3, 2016 | 30000000 | | | | | | | |
| August 8, 2016 | 1200000 | | | | | | | |
| August 17, 2016 | 12500000 | | | | | | | |
| August 24, 2016 | 12800000 | | | | | | | |
| August 31, 2016 | NDOGT | | | | | | | |
| September 6, 2016 | 1800000 | | | | | | | |
| Average | 11966667 | | | | | | | |
| Min | 1200000 | | | | | | | |
| Max | 30000000 | | | | | | | |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | | | | | | 22500 | | |
| August 3, 2016 | | | | | | 75000 | | |
| August 8, 2016 | | | | | | 300000 | | |
| August 17, 2016 | | | | | | 90000 | | |
| August 24, 2016 | | | | | | 55000 | | |
| August 31, 2016 | | | | | | 15000 | | |
| September 6, 2016 | | | | | | | | |
| Average | | | | | | 92917 | | |
| Min | | | | | | 15000 | | |
| Max | | | | | | 300000 | | |

## E.coli (cfu/100mls)

**CAWT Detection Limits:** **3** **cfu/100mls**

***Values below detection limit are listed as the detection limit and highlighted in blue, values above range are highlighted in red***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 550000 | 2150000 | 1100000 | 550000 | 400000 | 2600000 | 25500000 | 9100000 |
| August 3, 2016 | 640000 | 1280000 | 1800000 | 150000 | 1040000 | 880000 | 2000000 | 800000 |
| August 8, 2016 | 640000 | 400000 | 950000 | 1400000 | 240000 | 240000 | 240000 | 250000 |
| August 17, 2016 | 400000 | 880000 | 1500000 | 240000 | 1520000 | 640000 | 1950000 | 1650000 |
| August 24, 2016 | 1040000 | 240000 | 640000 | 880000 | 240000 | 240000 | 240000 | 640000 |
| August 31, 2016 | 7520000 | 4150000 | 640000 | 1520000 | 4160000 | 2240000 | 3920000 | 2000000 |
| September 6, 2016 | | | | | | | | |
| Average | 1798333 | 1516667 | 1105000 | 790000 | 1266667 | 1140000 | 5641667 | 2406667 |
| Min | 400000 | 240000 | 640000 | 150000 | 240000 | 240000 | 240000 | 250000 |
| Max | 7520000 | 4150000 | 1800000 | 1520000 | 4160000 | 2600000 | 25500000 | 9100000 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 150000 | 150000 | 8300000 | 30000 | 30000 | 33000 | 3 | |
| August 3, 2016 | 1520000 | 550000 | 150000 | 300 | 18200 | 980000 | 3 | |
| August 8, 2016 | 880000 | 150000 | 30000 | 5000 | 72000 | 340000 | 3 | 3 |
| August 17, 2016 | 650000 | 120000 | 3000 | 25000 | 7500 | 20000 | 3 | 3 |
| August 24, 2016 | 2150000 | 60000 | 1500 | 14000 | 3000 | 7500 | 3 | 3 |
| August 31, 2016 | 2600000 | 860000 | 300 | 83000 | 13600 | 23000 | 1696 | 3 |
| September 6, 2016 | | | | | | | | |
| Average | 1325000 | 315000 | 1414133 | 26217 | 24050 | 233917 | 285 | 3 |
| Min | 150000 | 60000 | 300 | 300 | 3000 | 7500 | 3 | 3 |
| Max | 2600000 | 860000 | 8300000 | 83000 | 72000 | 980000 | 1696 | 3 |

## E.coli(cfu/100mls)

***Peterborough Detection Limits:*** **0** ***cfu/100mls***

***Values below detection limit are listed as the detection limit and highlighted in blue, values above range are highlighted in red***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0 | | | | | | | |
| August 3, 2016 | 30000000 | | | | | | | |
| August 8, 2016 | 100000 | | | | | | | |
| August 17, 2016 | 2800000 | | | | | | | |
| August 24, 2016 | 400000 | | | | | | | |
| August 31, 2016 | NDOGT | | | | | | | |
| September 6, 2016 | 500000 | | | | | | | |
| Average | 5633333 | | | | | | | |
| Min | 0 | | | | | | | |
| Max | 30000000 | | | | | | | |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | | | | | | 2000 | | |
| August 3, 2016 | | | | | | 75000 | | |
| August 8, 2016 | | | | | | NDOGT | | |
| August 17, 2016 | | | | | | 10000 | | |
| August 24, 2016 | | | | | | 5000 | | |
| August 31, 2016 | | | | | | 0 | | |
| September 6, 2016 | | | | | | | | |
| Average | | | | | | 18400 | | |
| Min | | | | | | 0 | | |
| Max | | | | | | 75000 | | |

## Ammonia (mg/L-N)

**City of Peterborough Detection Limits:** **0.1** **mg/L-N**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.6 | | | | | 29.3 | 24.2 | 22.6 |
| August 3, 2016 | 11.9 | 7.2 | 8 | 14.2 | 13 | 9.1 | 11.4 | 9.3 |
| August 8, 2016 | 7.6 | 8.8 | 13.8 | 18.4 | 9.4 | 9.4 | 8.6 | 6.7 |
| August 17, 2016 | 5 | 10.6 | 19.4 | 10.7 | 17.6 | 12.1 | 11.4 | 12.7 |
| August 24, 2016 | 11.1 | 11.3 | 5 | 9.4 | 5.1 | 4.4 | 4.7 | 7.1 |
| August 31, 2016 | 4.3 | 23.2 | 7.1 | 6.7 | 9.9 | 10 | 9.3 | 12.2 |
| September 6, 2016 | 10.3 | 7.9 | 4.6 | 4.3 | 3.7 | 5.3 | 5.3 | 5.8 |
| Average | 7.3 | 11.5 | 9.7 | 10.6 | 9.8 | 11.4 | 10.7 | 10.9 |
| Min | 0.6 | 7.2 | 4.6 | 4.3 | 3.7 | 4.4 | 4.7 | 5.8 |
| Max | 11.9 | 23.2 | 19.4 | 18.4 | 17.6 | 29.3 | 24.2 | 22.6 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 18.9 | 11.9 | 2.6 | 2.8 | 2.1 | 3.9 | <0.1 | |
| August 3, 2016 | 7.3 | 8.4 | 1.8 | 1.3 | 0.3 | 5.5 | 0.3 | 0.1 |
| August 8, 2016 | 5.1 | 6.2 | 5.1 | 1.6 | 2.8 | 4.7 | <0.1 | <0.1 |
| August 17, 2016 | 9.6 | 8.6 | 4.2 | 3.8 | 1.5 | 4 | <0.1 | 0.1 |
| August 24, 2016 | 4.9 | 5.9 | 4.7 | 5.2 | 1.2 | 4.8 | <0.1 | 0.1 |
| August 31, 2016 | 5 | 7.9 | 3.8 | 5.6 | 1.8 | 4.2 | <0.1 | 0.2 |
| September 6, 2016 | | 7 | | | | | | |
| Average | 8.5 | 8.0 | 3.7 | 3.4 | 1.6 | 4.5 | 0.3 | 0.1 |
| Min | 4.9 | 5.9 | 1.8 | 1.3 | 0.3 | 3.9 | 0.3 | 0.1 |
| Max | 18.9 | 11.9 | 5.1 | 5.6 | 2.8 | 5.5 | 0.3 | 0.2 |

## Nitrate (mg/L-N)

**City of Peterborough Detection Limits:** **0.1** **mg/L-N**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.05 | | | | | 0.05 | 0.05 | 0.05 |
| August 3, 2016 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| August 8, 2016 | 0.06 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| August 17, 2016 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| August 24, 2016 | 0.05 | 0.05 | 0.05 | 0.05 | 0.08 | 0.05 | 0.05 | 0.05 |
| August 31, 2016 | 0.05 | 0.05 | 0.05 | 0.05 | 0.18 | 0.10 | 0.05 | 0.10 |
| September 6, 2016 | 0.05 | 0.05 | 0.05 | 0.05 | 0.56 | 0.36 | 0.05 | 0.12 |
| Average | 0.05 | 0.05 | 0.05 | 0.05 | 0.16 | 0.10 | 0.05 | 0.07 |
| Min | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| Max | 0.06 | 0.05 | 0.05 | 0.05 | 0.56 | 0.36 | 0.05 | 0.12 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.05 | 0.13 | 9.54 | 0.96 | 4.61 | 3.98 | 0.56 | |
| August 3, 2016 | 0.13 | 0.82 | 19.2 | 2.15 | 6.86 | 1.12 | 0.90 | 0.05 |
| August 8, 2016 | 0.05 | 0.05 | 12.0 | 3.04 | 6.68 | 0.24 | 2.01 | 0.05 |
| August 17, 2016 | 0.05 | 0.05 | 9.58 | 0.05 | 6.07 | 0.21 | 2.76 | 0.05 |
| August 24, 2016 | 0.05 | 0.38 | 10.1 | 0.23 | 4.00 | 0.42 | 2.56 | 0.05 |
| August 31, 2016 | 0.05 | 0.06 | 1.35 | 0.28 | 2.80 | 0.80 | 2.33 | 0.05 |
| September 6, 2016 | | 2.18 | | | | | | |
| Average | 0.06 | 0.52 | 10.3 | 1.12 | 5.17 | 1.13 | 1.85 | 0.05 |
| Min | 0.05 | 0.05 | 1.35 | 0.05 | 2.80 | 0.21 | 0.56 | 0.05 |
| Max | 0.13 | 2.18 | 19.2 | 3.04 | 6.86 | 3.98 | 2.76 | 0.05 |

## Nitrite (mg/L-N)

**City of Peterborough Detection Limits:** **0.1** **mg/L-N**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.05 | | | | | 0.05 | 0.05 | 0.05 |
| August 3, 2016 | 0.12 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| August 8, 2016 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| August 17, 2016 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| August 24, 2016 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| August 31, 2016 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| September 6, 2016 | 0.05 | 0.05 | 0.05 | 0.05 | 0.10 | 0.19 | 0.14 | 0.05 |
| Average | 0.06 | 0.05 | 0.05 | 0.05 | 0.06 | 0.07 | 0.06 | 0.05 |
| Min | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| Max | 0.12 | 0.05 | 0.05 | 0.05 | 0.10 | 0.19 | 0.14 | 0.05 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.05 | 0.05 | 0.22 | 0.10 | 0.06 | 0.13 | 0.05 | |
| August 3, 2016 | 0.06 | 0.19 | 0.62 | 0.11 | 0.05 | 0.14 | 0.05 | 0.05 |
| August 8, 2016 | 0.05 | 0.05 | 0.19 | 0.13 | 0.07 | 0.05 | 0.05 | 0.05 |
| August 17, 2016 | 0.05 | 0.05 | 0.20 | 0.05 | 0.18 | 0.13 | 0.05 | 0.05 |
| August 24, 2016 | 0.05 | 0.07 | 0.27 | 0.06 | 0.10 | 0.13 | 0.05 | 0.05 |
| August 31, 2016 | 0.05 | 0.05 | 0.10 | 0.05 | 0.05 | 0.14 | 0.05 | 0.05 |
| September 6, 2016 | | 0.23 | | | | | | |
| Average | 0.05 | 0.10 | 0.27 | 0.08 | 0.09 | 0.12 | 0.05 | 0.05 |
| Min | 0.05 | 0.05 | 0.10 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| Max | 0.06 | 0.23 | 0.62 | 0.13 | 0.18 | 0.14 | 0.05 | 0.05 |

## Total Kjeldahl Nitrogen (mg/L-N)

**City of Peterborough Detection Limits:** **0.1** **mg/L-N**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 8.1 | | | | | 47 | 34 | 30 |
| August 3, 2016 | 26 | 12 | 11 | 17 | 20 | 11 | 15 | 13 |
| August 8, 2016 | 13 | 15 | 48 | 46 | 15 | 13 | 13 | 11 |
| August 17, 2016 | 16 | 16 | 32 | 20 | 24 | 21 | 41 | 43 |
| August 24, 2016 | 50 | 22 | 7.2 | 120 | 9.4 | 7.5 | 8.9 | 13 |
| August 31, 2016 | 8.5 | 30 | 9.4 | 18 | 13 | 15 | 14 | 18 |
| September 6, 2016 | 15 | 13 | 9.4 | 8.3 | 9.9 | 9.4 | 18 | 21 |
| Average | 20 | 18 | 19 | 38 | 15 | 18 | 21 | 21 |
| Min | 8.1 | 12 | 7.2 | 8.3 | 9.4 | 7.5 | 8.9 | 11 |
| Max | 50 | 30 | 48 | 120 | 24 | 47 | 41 | 43 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 28 | 19 | 5.6 | 6.8 | 5.3 | 6.2 | 2.0 | |
| August 3, 2016 | 10 | 13 | 3.6 | 2.5 | 4.1 | 8.3 | 0.1 | 0.1 |
| August 8, 2016 | 8.8 | 12 | 5.4 | 2.7 | 4.4 | 7.2 | 0.1 | 0.1 |
| August 17, 2016 | 36 | 28 | 5.5 | 7.1 | 2.0 | 5.3 | 0.1 | 0.1 |
| August 24, 2016 | 7.5 | 8.7 | 5.1 | 5.4 | 1.9 | 7.0 | 0.1 | 0.1 |
| August 31, 2016 | 7.4 | 13 | 9.0 | 6.2 | 2.4 | 4.8 | 0.1 | 0.1 |
| September 6, 2016 | | 12 | | | | | | |
| Average | 16 | 15 | 5.7 | 5.1 | 3.4 | 6.5 | 0.4 | 0.1 |
| Min | 7.4 | 8.7 | 3.6 | 2.5 | 1.9 | 4.8 | 0.1 | 0.1 |
| Max | 36 | 28 | 9.0 | 7.1 | 5.3 | 8.3 | 2.0 | 0.1 |

## Total Phosphorus (mg/L-P)

**City of Peterborough Detection Limits:** **0.02** **mg/L-P**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 2.06 | 7.92 | 11.9 | 7.08 | 8.13 | 5.53 | 3.89 | 3.17 |
| August 3, 2016 | 4.61 | 4.50 | 1.82 | 2.11 | 2.08 | 1.52 | 1.95 | 1.63 |
| August 8, 2016 | 2.56 | 2.54 | 11.2 | 10.5 | 2.30 | 2.78 | 3.24 | 3.33 |
| August 17, 2016 | 3.00 | 2.82 | 4.41 | 3.02 | 3.62 | 3.51 | 6.02 | 7.39 |
| August 24, 2016 | 8.49 | 2.40 | 1.96 | 6.52 | 2.79 | 3.12 | 3.46 | 3.68 |
| August 31, 2016 | 0.95 | 3.53 | 2.82 | 2.16 | 2.90 | 3.06 | 2.88 | 3.30 |
| September 6, 2016 | 1.44 | 2.93 | 1.48 | 2.33 | 2.87 | 1.82 | 2.89 | 4.67 |
| Average | 3.30 | 3.81 | 5.08 | 4.82 | 3.53 | 3.05 | 3.48 | 3.88 |
| Min | 0.95 | 2.40 | 1.48 | 2.11 | 2.08 | 1.52 | 1.95 | 1.63 |
| Max | 8.49 | 7.92 | 11.9 | 10.5 | 8.13 | 5.53 | 6.02 | 7.39 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 2.58 | 1.67 | 0.23 | 0.44 | 0.18 | 0.32 | 0.04 | |
| August 3, 2016 | 1.68 | 1.69 | 0.16 | 0.11 | 0.26 | 0.67 | 0.02 | 0.02 |
| August 8, 2016 | 3.62 | 3.18 | 0.11 | 0.10 | 0.43 | 1.40 | 0.02 | 0.02 |
| August 17, 2016 | 6.78 | 5.08 | 0.25 | 0.65 | 0.20 | 0.47 | 0.02 | 0.02 |
| August 24, 2016 | 1.22 | 1.90 | 0.11 | 1.07 | 1.50 | 0.69 | 0.03 | 0.02 |
| August 31, 2016 | 2.55 | 4.49 | 0.27 | 1.43 | 0.09 | 0.23 | 0.02 | 0.02 |
| September 6, 2016 | | 1.43 | | | | | | |
| Average | 3.07 | 2.78 | 0.19 | 0.63 | 0.44 | 0.63 | 0.03 | 0.02 |
| Min | 1.22 | 1.43 | 0.11 | 0.10 | 0.09 | 0.23 | 0.02 | 0.02 |
| Max | 6.78 | 5.08 | 0.27 | 1.43 | 1.50 | 1.40 | 0.04 | 0.02 |

## Dissolved Phosphate as Phosphorus (mg/L-P)

**City of Peterborough Detection Limits:** **0.02** **mg/L-P**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.21 | | | | | 2.66 | 1.49 | 0.72 |
| August 3, 2016 | 1.17 | 2.53 | 0.42 | 0.29 | 0.38 | 0.29 | 0.57 | 0.35 |
| August 8, 2016 | 1.43 | 1.14 | 5.40 | 4.06 | 0.46 | 0.64 | 0.10 | 0.77 |
| August 17, 2016 | 0.65 | 0.91 | 1.65 | 0.84 | 0.98 | 0.83 | 1.63 | 1.88 |
| August 24, 2016 | 3.96 | 0.81 | 0.15 | 1.89 | 0.71 | 1.22 | 1.04 | 2.51 |
| August 31, 2016 | 0.51 | 2.29 | 1.15 | 0.87 | 0.88 | 1.14 | 0.83 | 1.53 |
| September 6, 2016 | 1.01 | 2.16 | 0.74 | 1.10 | 1.08 | 0.20 | 0.33 | 0.44 |
| Average | 1.28 | 1.64 | 1.59 | 1.51 | 0.75 | 1.00 | 0.86 | 1.17 |
| Min | 0.21 | 0.81 | 0.15 | 0.29 | 0.38 | 0.20 | 0.10 | 0.35 |
| Max | 3.96 | 2.53 | 5.40 | 4.06 | 1.08 | 2.66 | 1.63 | 2.51 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.23 | 0.10 | 0.02 | 0.04 | 0.02 | 0.05 | 0.02 | 0.02 |
| August 3, 2016 | 0.60 | 0.40 | 0.02 | 0.03 | 0.04 | 0.27 | 0.02 | 0.02 |
| August 8, 2016 | 0.84 | 0.52 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |
| August 17, 2016 | 1.27 | 0.89 | 0.02 | 0.02 | 0.02 | 0.04 | 0.02 | 0.02 |
| August 24, 2016 | 0.63 | 0.64 | 0.02 | 0.55 | 0.04 | 0.38 | 0.02 | 0.02 |
| August 31, 2016 | 0.26 | 0.99 | 0.02 | 0.33 | 0.05 | 0.13 | 0.02 | 0.02 |
| September 6, 2016 | | 0.15 | | | | | | |
| Average | 0.64 | 0.53 | 0.02 | 0.17 | 0.03 | 0.15 | 0.02 | 0.02 |
| Min | 0.23 | 0.10 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |
| Max | 1.27 | 0.99 | 0.02 | 0.55 | 0.05 | 0.38 | 0.02 | 0.02 |

## Total Suspended Solids (mg/L)

**City of Peterborough Detection Limits:** **2** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 81 | | | | | 186 | 358 | 93 |
| August 3, 2016 | 194 | 163 | 56 | 141 | 174 | 44 | 44 | 36 |
| August 8, 2016 | 110 | 114 | 146 | 114 | 93 | 101 | 176 | 108 |
| August 17, 2016 | 228 | 128 | 212 | 138 | 144 | 168 | 540 | 524 |
| August 24, 2016 | 1170 | 98 | 135 | 1220 | 171 | 308 | 204 | 130 |
| August 31, 2016 | 59 | 108 | 161 | 172 | 226 | 189 | 134 | 145 |
| September 6, 2016 | 43 | 47 | 39 | 182 | 215 | 247 | 438 | 465 |
| Average | 269 | 110 | 125 | 328 | 171 | 178 | 271 | 214 |
| Min | 43 | 47 | 39 | 114 | 93 | 44 | 44 | 36 |
| Max | 1170 | 163 | 212 | 1220 | 226 | 308 | 540 | 524 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 95 | 59 | 34 | 280 | 94 | 49 | 9 | |
| August 3, 2016 | 33 | 74 | 39 | 12 | 32 | 43 | 7 | 2 |
| August 8, 2016 | 556 | 95 | 38 | 16 | 25 | 111 | 3 | 2 |
| August 17, 2016 | 508 | 260 | 97 | 30 | 37 | 34 | 5 | 2 |
| August 24, 2016 | 20 | 68 | 68 | 16 | 591 | 38 | 6 | 2 |
| August 31, 2016 | 168 | 306 | 151 | 42 | 48 | 11 | 2 | 2 |
| September 6, 2016 | | 62 | | | | | | |
| Average | 230 | 132 | 71 | 66 | 138 | 48 | 5 | 2 |
| Min | 20 | 59 | 34 | 12 | 25 | 11 | 2 | 2 |
| Max | 556 | 306 | 151 | 280 | 591 | 111 | 9 | 2 |

## Volatile Suspended Solids (mg/L)

**City of Peterborough Detection Limits:** **10** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 51 | | | | | 126 | 95 | 65 |
| August 3, 2016 | 130 | 136 | 38 | 108 | 82 | 30 | 28 | 25 |
| August 8, 2016 | 90 | 98 | 127 | 103 | 60 | 73 | 86 | 81 |
| August 17, 2016 | 210 | 122 | 192 | 124 | 116 | 146 | 456 | 450 |
| August 24, 2016 | 1050 | 86 | 117 | 936 | 143 | 242 | 158 | 109 |
| August 31, 2016 | 49 | 91 | 118 | 138 | 184 | 148 | 111 | 105 |
| September 6, 2016 | 37 | 39 | 30 | 119 | 122 | 104 | 181 | 147 |
| Average | 231 | 95 | 104 | 255 | 118 | 124 | 159 | 140 |
| Min | 37 | 39 | 30 | 103 | 60 | 30 | 28 | 25 |
| Max | 1050 | 136 | 192 | 936 | 184 | 242 | 456 | 450 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 72 | 34 | 10 | 10 | 10 | 10 | 10 | |
| August 3, 2016 | 24 | 30 | 13 | 10 | 10 | 23 | 10 | 10 |
| August 8, 2016 | 122 | 74 | 17 | 10 | 10 | 80 | 10 | 10 |
| August 17, 2016 | 460 | 204 | 22 | 26 | 10 | 18 | 10 | 10 |
| August 24, 2016 | 18 | 35 | 10 | 12 | 25 | 17 | 10 | 10 |
| August 31, 2016 | 130 | 190 | 11 | 18 | 10 | 10 | 10 | 10 |
| September 6, 2016 | | 44 | | | | | | |
| Average | 138 | 87 | 14 | 14 | 13 | 26 | 10 | 10 |
| Min | 18 | 30 | 10 | 10 | 10 | 10 | 10 | 10 |
| Max | 460 | 204 | 22 | 26 | 25 | 80 | 10 | 10 |

## Fats, Oils and Grease (mg/L)

**City of Peterborough Detection Limits:** **5.0** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 26.1 | | | | | | | |
| August 3, 2016 | 32.6 | | | | | | | |
| August 8, 2016 | 25.9 | | | | | | | |
| August 17, 2016 | 51.7 | | | | | | | |
| August 24, 2016 | 439 | | | | | | | |
| August 31, 2016 | 26.2 | | | | | | | |
| September 6, 2016 | 22.1 | | | | | | | |
| Average | 89.1 | | | | | | | |
| Min | 22.1 | | | | | | | |
| Max | 439.0 | | | | | | | |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | | | | | | 6.5 | | |
| August 3, 2016 | | | | | | 7.4 | | |
| August 8, 2016 | | | | | | 15.9 | | |
| August 17, 2016 | | | | | | 5.7 | | |
| August 24, 2016 | | | | | | 13.0 | | |
| August 31, 2016 | | | | | | 7.6 | | |
| September 6, 2016 | | 16.8 | | | | | | |
| Average | | 16.8 | | | | 9.4 | | |
| Min | | 16.8 | | | | 5.7 | | |
| Max | | 16.8 | | | | 15.9 | | |

## Aluminum (mg/L)

**City of Peterborough Detection Limits:** **0.025** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.680 | 0.450 | 1.550 | 0.920 | 14.00 | 0.800 | 1.950 | 0.360 |
| August 3, 2016 | 1.860 | 0.610 | 0.560 | 0.880 | 1.210 | 0.380 | 0.470 | 0.270 |
| August 8, 2016 | 0.440 | 0.290 | 0.440 | 0.300 | 0.710 | 0.470 | 1.680 | 0.600 |
| August 17, 2016 | 0.266 | 0.107 | 0.332 | 0.249 | 0.295 | 0.354 | 1.150 | 1.210 |
| August 24, 2016 | 1.360 | 0.185 | 0.210 | 2.400 | 0.435 | 0.710 | 0.701 | 0.278 |
| August 31, 2016 | 0.086 | 0.182 | 0.424 | 0.271 | 0.397 | 0.370 | 0.227 | 0.343 |
| September 6, 2016 | 0.036 | 0.076 | 0.153 | 0.477 | 0.860 | 1.280 | 2.670 | 7.650 |
| Average | 0.675 | 0.271 | 0.524 | 0.785 | 2.558 | 0.623 | 1.264 | 1.530 |
| Min | 0.036 | 0.076 | 0.153 | 0.249 | 0.295 | 0.354 | 0.227 | 0.270 |
| Max | 1.860 | 0.610 | 1.550 | 2.400 | 14.00 | 1.280 | 2.670 | 7.650 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.270 | 0.380 | 0.460 | 2.700 | 1.210 | 0.540 | 0.160 | |
| August 3, 2016 | 0.340 | 0.810 | 0.380 | 0.160 | 0.440 | 0.220 | 0.120 | 0.025 |
| August 8, 2016 | 7.430 | 0.410 | 0.440 | 0.230 | 0.280 | 0.870 | 0.070 | 0.025 |
| August 17, 2016 | 0.744 | 0.533 | 1.140 | 0.066 | 0.597 | 0.248 | 0.081 | 0.025 |
| August 24, 2016 | 0.039 | 0.395 | 0.549 | 0.061 | 10.900 | 0.317 | 0.092 | 0.025 |
| August 31, 2016 | 0.492 | 1.530 | 2.330 | 0.323 | 0.401 | 0.114 | 0.029 | 0.025 |
| September 6, 2016 | | 0.152 | | | | | | |
| Average | 1.553 | 0.601 | 0.883 | 0.590 | 2.305 | 0.385 | 0.092 | 0.025 |
| Min | 0.039 | 0.152 | 0.380 | 0.061 | 0.280 | 0.114 | 0.029 | 0.025 |
| Max | 7.430 | 1.530 | 2.330 | 2.700 | 10.90 | 0.870 | 0.160 | 0.025 |

## Antimony (mg/L)

**City of Peterborough Detection Limits:** **0.001** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0005 | 0.0011 | 0.0014 | 0.0011 | 0.0015 | 0.0005 | 0.0005 | 0.0005 |
| August 3, 2016 | 0.0016 | 0.001 | 0.001 | 0.001 | 0.0011 | 0.0012 | 0.001 | 0.0011 |
| August 8, 2016 | 0.0011 | 0.001 | 0.0009 | 0.0009 | 0.0011 | 0.0012 | 0.0012 | 0.0011 |
| August 17, 2016 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| August 24, 2016 | 0.0095 | 0.0035 | 0.0037 | 0.0049 | 0.0036 | 0.0041 | 0.0035 | 0.003 |
| August 31, 2016 | 0.0028 | 0.003 | 0.0036 | 0.0027 | 0.003 | 0.0039 | 0.0033 | 0.003 |
| September 6, 2016 | 0.0037 | 0.0024 | 0.0034 | 0.0029 | 0.004 | 0.0038 | 0.0039 | 0.004 |
| Average | 0.0028 | 0.0018 | 0.0021 | 0.0020 | 0.0021 | 0.0022 | 0.0020 | 0.0019 |
| Min | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| Max | 0.0095 | 0.0035 | 0.0037 | 0.0049 | 0.0040 | 0.0041 | 0.0039 | 0.0040 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0005 | 0.0005 | 0.0006 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | |
| August 3, 2016 | 0.0009 | 0.0012 | 0.0012 | 0.0005 | 0.0005 | 0.0009 | 0.0005 | 0.0005 |
| August 8, 2016 | 0.0014 | 0.0012 | 0.0006 | 0.0005 | 0.0005 | 0.0014 | 0.0005 | 0.0005 |
| August 17, 2016 | 0.0005 | 0.0005 | 0.0007 | 0.0007 | 0.0006 | 0.0009 | 0.0005 | 0.0005 |
| August 24, 2016 | 0.0005 | 0.0034 | 0.0005 | 0.0005 | 0.0041 | 0.0005 | 0.0005 | 0.0005 |
| August 31, 2016 | 0.0039 | 0.0036 | 0.0036 | 0.0035 | 0.0032 | 0.0031 | 0.0005 | 0.0005 |
| September 6, 2016 | | 0.0033 | | | | | | |
| Average | 0.0013 | 0.0020 | 0.0012 | 0.0010 | 0.0016 | 0.0012 | 0.0005 | 0.0005 |
| Min | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| Max | 0.0039 | 0.0036 | 0.0036 | 0.0035 | 0.0041 | 0.0031 | 0.0005 | 0.0005 |

## Arsenic (mg/L)

**City of Peterborough Detection Limits:** **0.0005** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0007 | 0.0005 | 0.0026 | 0.0022 | 0.0171 | 0.0046 | 0.0072 | 0.0062 |
| August 3, 2016 | 0.0013 | 0.0017 | 0.0013 | 0.0020 | 0.0043 | 0.0045 | 0.0046 | 0.0051 |
| August 8, 2016 | 0.0007 | 0.0005 | 0.0011 | 0.0019 | 0.0032 | 0.0035 | 0.0052 | 0.0050 |
| August 17, 2016 | 0.0005 | 0.0005 | 0.0010 | 0.0016 | 0.0024 | 0.0023 | 0.0031 | 0.0040 |
| August 24, 2016 | 0.0019 | 0.0005 | 0.0010 | 0.0047 | 0.0025 | 0.0028 | 0.0031 | 0.0030 |
| August 31, 2016 | 0.0005 | 0.0005 | 0.0009 | 0.0013 | 0.0019 | 0.0019 | 0.0020 | 0.0024 |
| September 6, 2016 | 0.0005 | 0.0005 | 0.0014 | 0.0035 | 0.0051 | 0.0053 | 0.0071 | 0.0113 |
| Average | 0.0009 | 0.0007 | 0.0013 | 0.0025 | 0.0052 | 0.0036 | 0.0046 | 0.0053 |
| Min | 0.0005 | 0.0005 | 0.0009 | 0.0013 | 0.0019 | 0.0019 | 0.0020 | 0.0024 |
| Max | 0.0019 | 0.0017 | 0.0026 | 0.0047 | 0.0171 | 0.0053 | 0.0072 | 0.0113 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0056 | 0.0103 | 0.0034 | 0.0105 | 0.0039 | 0.0051 | 0.0005 | |
| August 3, 2016 | 0.0049 | 0.0101 | 0.0031 | 0.0082 | 0.0041 | 0.0057 | 0.0005 | 0.0005 |
| August 8, 2016 | 0.0093 | 0.0097 | 0.0028 | 0.0069 | 0.0035 | 0.0052 | 0.0005 | 0.0005 |
| August 17, 2016 | 0.0041 | 0.0094 | 0.0046 | 0.0098 | 0.0039 | 0.0050 | 0.0005 | 0.0005 |
| August 24, 2016 | 0.0031 | 0.0108 | 0.0035 | 0.0102 | 0.0165 | 0.0054 | 0.0005 | 0.0005 |
| August 31, 2016 | 0.0029 | 0.0073 | 0.0048 | 0.0082 | 0.0037 | 0.0036 | 0.0005 | 0.0005 |
| September 6, 2016 | | 0.0114 | | | | | | |
| Average | 0.0050 | 0.0099 | 0.0037 | 0.0090 | 0.0059 | 0.0050 | 0.0005 | 0.0005 |
| Min | 0.0029 | 0.0073 | 0.0028 | 0.0069 | 0.0035 | 0.0036 | 0.0005 | 0.0005 |
| Max | 0.0093 | 0.0114 | 0.0048 | 0.0105 | 0.0165 | 0.0057 | 0.0005 | 0.0005 |

## Barium (mg/L)

**City of Peterborough Detection Limits:** **0.001** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.005 | 0.062 | 0.096 | 0.060 | 0.107 | 0.016 | 0.018 | 0.017 |
| August 3, 2016 | 0.069 | 0.058 | 0.067 | 0.054 | 0.056 | 0.063 | 0.065 | 0.078 |
| August 8, 2016 | 0.057 | 0.080 | 0.051 | 0.046 | 0.073 | 0.069 | 0.068 | 0.057 |
| August 17, 2016 | 0.014 | 0.006 | 0.010 | 0.010 | 0.014 | 0.015 | 0.021 | 0.022 |
| August 24, 2016 | 0.106 | 0.006 | 0.007 | 0.026 | 0.011 | 0.014 | 0.013 | 0.010 |
| August 31, 2016 | 0.006 | 0.013 | 0.007 | 0.007 | 0.012 | 0.011 | 0.009 | 0.010 |
| September 6, 2016 | 0.004 | 0.004 | 0.006 | 0.009 | 0.013 | 0.012 | 0.016 | 0.028 |
| Average | 0.037 | 0.033 | 0.035 | 0.030 | 0.041 | 0.029 | 0.030 | 0.032 |
| Min | 0.004 | 0.004 | 0.006 | 0.007 | 0.011 | 0.011 | 0.009 | 0.010 |
| Max | 0.106 | 0.080 | 0.096 | 0.060 | 0.107 | 0.069 | 0.068 | 0.078 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.015 | 0.019 | 0.024 | 0.037 | 0.024 | 0.031 | 0.003 | |
| August 3, 2016 | 0.057 | 0.065 | 0.062 | 0.034 | 0.028 | 0.069 | 0.004 | 0.001 |
| August 8, 2016 | 0.083 | 0.083 | 0.022 | 0.044 | 0.031 | 0.089 | 0.006 | 0.001 |
| August 17, 2016 | 0.017 | 0.032 | 0.020 | 0.028 | 0.034 | 0.041 | 0.005 | 0.001 |
| August 24, 2016 | 0.006 | 0.016 | 0.014 | 0.019 | 0.044 | 0.038 | 0.005 | 0.001 |
| August 31, 2016 | 0.009 | 0.021 | 0.014 | 0.021 | 0.019 | 0.040 | 0.004 | 0.001 |
| September 6, 2016 | | 0.015 | | | | | | |
| Average | 0.031 | 0.036 | 0.026 | 0.031 | 0.030 | 0.051 | 0.005 | 0.001 |
| Min | 0.006 | 0.015 | 0.014 | 0.019 | 0.019 | 0.031 | 0.003 | 0.001 |
| Max | 0.083 | 0.083 | 0.062 | 0.044 | 0.044 | 0.089 | 0.006 | 0.001 |

## Beryllium (mg/L)

**City of Peterborough Detection Limits:** **0.0001** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0005 | 0.0001 | 0.0001 | 0.0001 |
| August 3, 2016 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| August 8, 2016 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| August 17, 2016 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| August 24, 2016 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| August 31, 2016 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| September 6, 2016 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0003 |
| Average | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0002 | 0.0001 | 0.0001 | 0.0001 |
| Min | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| Max | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0005 | 0.0001 | 0.0001 | 0.0003 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | |
| August 3, 2016 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| August 8, 2016 | 0.0002 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| August 17, 2016 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| August 24, 2016 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0004 | 0.0001 | 0.0001 | 0.0001 |
| August 31, 2016 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| September 6, 2016 | | 0.0001 | | | | | | |
| Average | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0002 | 0.0001 | 0.0001 | 0.0001 |
| Min | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| Max | 0.0002 | 0.0001 | 0.0001 | 0.0001 | 0.0004 | 0.0001 | 0.0001 | 0.0001 |

## Bismuth (mg/L)

**City of Peterborough Detection Limits:** **0.0005** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0009 | 0.0005 | 0.0005 | 0.0005 |
| August 3, 2016 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| August 8, 2016 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| August 17, 2016 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0010 | 0.0007 |
| August 24, 2016 | 0.0006 | 0.0005 | 0.0005 | 0.0020 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| August 31, 2016 | 0.0005 | 0.0009 | 0.0017 | 0.0014 | 0.0021 | 0.0016 | 0.0015 | 0.0018 |
| September 6, 2016 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0006 | 0.0013 |
| Average | 0.0005 | 0.0006 | 0.0007 | 0.0008 | 0.0008 | 0.0007 | 0.0007 | 0.0008 |
| Min | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| Max | 0.0006 | 0.0009 | 0.0017 | 0.0020 | 0.0021 | 0.0016 | 0.0015 | 0.0018 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | |
| August 3, 2016 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| August 8, 2016 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| August 17, 2016 | 0.0006 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| August 24, 2016 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| August 31, 2016 | 0.0007 | 0.0019 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| September 6, 2016 | | 0.0005 | | | | | | |
| Average | 0.0006 | 0.0007 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| Min | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| Max | 0.0007 | 0.0019 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |

## Boron (mg/L)

**City of Peterborough Detection Limits:** **0.0005** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0198 | 0.0734 | 0.0696 | 0.0582 | 0.1700 | 0.0752 | 0.0773 | 0.1050 |
| August 3, 2016 | 0.0554 | 0.0427 | 0.0460 | 0.0847 | 0.1150 | 0.1900 | 0.1500 | 0.1900 |
| August 8, 2016 | 0.0481 | 0.0533 | 0.0699 | 0.0815 | 0.0938 | 0.1490 | 0.1200 | 0.1250 |
| August 17, 2016 | 0.0159 | 0.0167 | 0.0222 | 0.0358 | 0.0705 | 0.0678 | 0.0668 | 0.0787 |
| August 24, 2016 | 0.0534 | 0.0169 | 0.0195 | 0.0340 | 0.0550 | 0.0537 | 0.0573 | 0.0597 |
| August 31, 2016 | 0.0107 | 0.0151 | 0.0143 | 0.0206 | 0.0414 | 0.0430 | 0.0419 | 0.0438 |
| September 6, 2016 | 0.0142 | 0.0142 | 0.0155 | 0.0308 | 0.0455 | 0.0388 | 0.0316 | 0.0325 |
| Average | 0.0311 | 0.0332 | 0.0367 | 0.0494 | 0.0845 | 0.0882 | 0.0778 | 0.0907 |
| Min | 0.0107 | 0.0142 | 0.0143 | 0.0206 | 0.0414 | 0.0388 | 0.0316 | 0.0325 |
| Max | 0.0554 | 0.0734 | 0.0699 | 0.0847 | 0.1700 | 0.1900 | 0.1500 | 0.1900 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0786 | 0.1340 | 0.5710 | 0.3260 | 0.5200 | 0.3400 | 0.0025 | |
| August 3, 2016 | 0.1280 | 0.3000 | 0.9400 | 0.5400 | 0.6600 | 0.3000 | 0.0005 | 0.0011 |
| August 8, 2016 | 0.1170 | 0.2250 | 0.8920 | 0.5730 | 0.6730 | 0.2400 | 0.0019 | 0.0020 |
| August 17, 2016 | 0.0820 | 0.1970 | 0.9290 | 0.2660 | 0.6850 | 0.4000 | 0.0018 | 0.0045 |
| August 24, 2016 | 0.0559 | 0.1040 | 0.6440 | 0.1190 | 0.5390 | 0.2860 | 0.0013 | 0.0048 |
| August 31, 2016 | 0.0318 | 0.0699 | 0.6200 | 0.1080 | 0.4600 | 0.3400 | 0.0010 | 0.0069 |
| September 6, 2016 | | 0.0874 | | | | | | |
| Average | 0.0822 | 0.1596 | 0.7660 | 0.3220 | 0.5895 | 0.3177 | 0.0015 | 0.0039 |
| Min | 0.0318 | 0.0699 | 0.5710 | 0.1080 | 0.4600 | 0.2400 | 0.0005 | 0.0011 |
| Max | 0.1280 | 0.3000 | 0.9400 | 0.5730 | 0.6850 | 0.4000 | 0.0025 | 0.0069 |

## Cadmium (mg/L)

**City of Peterborough Detection Limits:** **0.0001** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0001 | 0.0001 | 0.0002 | 0.0002 | 0.0006 | 0.0001 | 0.0001 | 0.0001 |
| August 3, 2016 | 0.0002 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| August 8, 2016 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| August 17, 2016 | 0.0002 | 0.0003 | 0.0002 | 0.0003 | 0.0001 | 0.0001 | 0.0004 | 0.0003 |
| August 24, 2016 | 0.0044 | 0.0004 | 0.0003 | 0.0011 | 0.0005 | 0.0006 | 0.0002 | 0.0002 |
| August 31, 2016 | 0.0001 | 0.0001 | 0.0002 | 0.0001 | 0.0002 | 0.0001 | 0.0001 | 0.0001 |
| September 6, 2016 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0002 | 0.0002 | 0.0002 | 0.0003 |
| Average | 0.0007 | 0.0002 | 0.0002 | 0.0003 | 0.0003 | 0.0002 | 0.0002 | 0.0002 |
| Min | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| Max | 0.0044 | 0.0004 | 0.0003 | 0.0011 | 0.0006 | 0.0006 | 0.0004 | 0.0003 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0001 | 0.0001 | 0.0002 | 0.0001 | 0.0003 | 0.0002 | 0.0001 | |
| August 3, 2016 | 0.0001 | 0.0002 | 0.0002 | 0.0001 | 0.0003 | 0.0003 | 0.0001 | 0.0001 |
| August 8, 2016 | 0.0002 | 0.0001 | 0.0002 | 0.0002 | 0.0003 | 0.0002 | 0.0001 | 0.0001 |
| August 17, 2016 | 0.0002 | 0.0002 | 0.0002 | 0.0001 | 0.0002 | 0.0001 | 0.0001 | 0.0001 |
| August 24, 2016 | 0.0001 | 0.0002 | 0.0002 | 0.0002 | 0.0004 | 0.0001 | 0.0001 | 0.0001 |
| August 31, 2016 | 0.0001 | 0.0002 | 0.0001 | 0.0001 | 0.0002 | 0.0001 | 0.0001 | 0.0001 |
| September 6, 2016 | | 0.0002 | | | | | | |
| Average | 0.0001 | 0.0002 | 0.0002 | 0.0001 | 0.0003 | 0.0002 | 0.0001 | 0.0001 |
| Min | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0002 | 0.0001 | 0.0001 | 0.0001 |
| Max | 0.0002 | 0.0002 | 0.0002 | 0.0002 | 0.0004 | 0.0003 | 0.0001 | 0.0001 |

## Calcium (mg/L)

**City of Peterborough Detection Limits:** **0.2** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 38.6 | 40.4 | 52.1 | 47.2 | 220 | 51.5 | 70.1 | 54.5 |
| August 3, 2016 | 68.6 | 52.9 | 49.5 | 51.0 | 59.2 | 58.5 | 57.9 | 55.4 |
| August 8, 2016 | 35.7 | 36.3 | 49.5 | 55.8 | 49.6 | 50.0 | 60.5 | 54.1 |
| August 17, 2016 | 35.5 | 35.7 | 41.4 | 42.3 | 46.6 | 48.3 | 52.6 | 57.5 |
| August 24, 2016 | 52.9 | 39.2 | 41.4 | 64.0 | 53.7 | 53.0 | 56.2 | 49.6 |
| August 31, 2016 | 32.8 | 36.8 | 39.7 | 38.0 | 44.8 | 45.2 | 44.8 | 46.8 |
| September 6, 2016 | 35.5 | 36.7 | 40.1 | 45.6 | 57.5 | 60.0 | 71.2 | 121 |
| Average | 42.8 | 39.7 | 44.8 | 49.1 | 75.9 | 52.4 | 59.0 | 62.7 |
| Min | 32.8 | 35.7 | 39.7 | 38.0 | 44.8 | 45.2 | 44.8 | 46.8 |
| Max | 68.6 | 52.9 | 52.1 | 64.0 | 220 | 60.0 | 71.2 | 121 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 54.5 | 58.6 | 84.6 | 79.8 | 72.0 | 57.9 | 35.6 | |
| August 3, 2016 | 53.1 | 59.8 | 79.7 | 44.4 | 65.1 | 48.2 | 46.7 | 0.2 |
| August 8, 2016 | 82.2 | 54.6 | 79.8 | 41.3 | 66.4 | 49.7 | 53.7 | 0.2 |
| August 17, 2016 | 53.4 | 62.1 | 76.5 | 35.7 | 87.9 | 55.5 | 56.9 | 0.2 |
| August 24, 2016 | 43.9 | 56.1 | 58.8 | 42.0 | 215 | 51.5 | 59.6 | 0.6 |
| August 31, 2016 | 43.4 | 61.7 | 61.2 | 43.7 | 48.9 | 43.4 | 57.6 | 1.3 |
| September 6, 2016 | | 68.1 | | | | | | |
| Average | 55.1 | 60.1 | 73.4 | 47.8 | 92.6 | 51.0 | 51.7 | 0.5 |
| Min | 43.4 | 54.6 | 58.8 | 35.7 | 48.9 | 43.4 | 35.6 | 0.2 |
| Max | 82.2 | 68.1 | 84.6 | 79.8 | 215 | 57.9 | 59.6 | 1.3 |

## Chromium (mg/L)

**City of Peterborough Detection Limits:** **0.0005** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0020 | 0.0012 | 0.0027 | 0.0016 | 0.0218 | 0.0024 | 0.0035 | 0.0008 |
| August 3, 2016 | 0.0028 | 0.0012 | 0.0012 | 0.0014 | 0.0021 | 0.0008 | 0.0028 | 0.0007 |
| August 8, 2016 | 0.0012 | 0.0008 | 0.0011 | 0.0008 | 0.0015 | 0.0012 | 0.0032 | 0.0151 |
| August 17, 2016 | 0.0016 | 0.0015 | 0.0014 | 0.0011 | 0.0019 | 0.0013 | 0.0032 | 0.0034 |
| August 24, 2016 | 0.0106 | 0.0006 | 0.0009 | 0.0072 | 0.0012 | 0.0019 | 0.0017 | 0.0008 |
| August 31, 2016 | 0.0005 | 0.0006 | 0.0012 | 0.0010 | 0.0013 | 0.0011 | 0.0009 | 0.0010 |
| September 6, 2016 | 0.0005 | 0.0005 | 0.0011 | 0.0012 | 0.0018 | 0.0028 | 0.0054 | 0.0124 |
| Average | 0.0027 | 0.0009 | 0.0014 | 0.0020 | 0.0045 | 0.0016 | 0.0030 | 0.0049 |
| Min | 0.0005 | 0.0005 | 0.0009 | 0.0008 | 0.0012 | 0.0008 | 0.0009 | 0.0007 |
| Max | 0.0106 | 0.0015 | 0.0027 | 0.0072 | 0.0218 | 0.0028 | 0.0054 | 0.0151 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0007 | 0.0008 | 0.0008 | 0.0046 | 0.0022 | 0.0010 | 0.0009 | |
| August 3, 2016 | 0.0006 | 0.0013 | 0.0008 | 0.0005 | 0.0010 | 0.0005 | 0.0013 | 0.0005 |
| August 8, 2016 | 0.0136 | 0.0010 | 0.0007 | 0.0005 | 0.0067 | 0.0124 | 0.0005 | 0.0005 |
| August 17, 2016 | 0.0022 | 0.0015 | 0.0024 | 0.0005 | 0.0013 | 0.0007 | 0.0005 | 0.0005 |
| August 24, 2016 | 0.0005 | 0.0019 | 0.0012 | 0.0007 | 0.0213 | 0.0007 | 0.0005 | 0.0005 |
| August 31, 2016 | 0.0012 | 0.0028 | 0.0039 | 0.0008 | 0.0011 | 0.0005 | 0.0005 | 0.0005 |
| September 6, 2016 | | 0.0005 | | | | | | |
| Average | 0.0031 | 0.0014 | 0.0016 | 0.0013 | 0.0056 | 0.0026 | 0.0007 | 0.0005 |
| Min | 0.0005 | 0.0005 | 0.0007 | 0.0005 | 0.0010 | 0.0005 | 0.0005 | 0.0005 |
| Max | 0.0136 | 0.0028 | 0.0039 | 0.0046 | 0.0213 | 0.0124 | 0.0013 | 0.0005 |

## Cobalt (mg/L)

**City of Peterborough Detection Limits:** **0.0001** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0006 | 0.0003 | 0.0032 | 0.0028 | 0.0284 | 0.0168 | 0.0209 | 0.0262 |
| August 3, 2016 | 0.0012 | 0.0006 | 0.0008 | 0.0027 | 0.0140 | 0.0186 | 0.0184 | 0.0249 |
| August 8, 2016 | 0.0016 | 0.0013 | 0.0008 | 0.0024 | 0.0084 | 0.0124 | 0.0141 | 0.0172 |
| August 17, 2016 | 0.0005 | 0.0005 | 0.0010 | 0.0022 | 0.0086 | 0.0084 | 0.0080 | 0.0116 |
| August 24, 2016 | 0.0036 | 0.0006 | 0.0011 | 0.0051 | 0.0101 | 0.0098 | 0.0111 | 0.0118 |
| August 31, 2016 | 0.0008 | 0.0019 | 0.0025 | 0.0024 | 0.0082 | 0.0079 | 0.0080 | 0.0096 |
| September 6, 2016 | 0.0004 | 0.0004 | 0.0010 | 0.0072 | 0.0132 | 0.0117 | 0.0105 | 0.0151 |
| Average | 0.0012 | 0.0008 | 0.0015 | 0.0035 | 0.0130 | 0.0122 | 0.0130 | 0.0166 |
| Min | 0.0004 | 0.0003 | 0.0008 | 0.0022 | 0.0082 | 0.0079 | 0.0080 | 0.0096 |
| Max | 0.0036 | 0.0019 | 0.0032 | 0.0072 | 0.0284 | 0.0186 | 0.0209 | 0.0262 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0204 | 0.0343 | 0.0427 | 0.0478 | 0.0242 | 0.0337 | 0.0002 | |
| August 3, 2016 | 0.0192 | 0.0303 | 0.0382 | 0.0398 | 0.0249 | 0.0265 | 0.0001 | 0.0001 |
| August 8, 2016 | 0.0153 | 0.0208 | 0.0437 | 0.0389 | 0.0238 | 0.0205 | 0.0001 | 0.0001 |
| August 17, 2016 | 0.0110 | 0.0232 | 0.0512 | 0.0233 | 0.0363 | 0.0577 | 0.0001 | 0.0001 |
| August 24, 2016 | 0.0122 | 0.0222 | 0.0472 | 0.0321 | 0.0626 | 0.0680 | 0.0002 | 0.0001 |
| August 31, 2016 | 0.0054 | 0.0143 | 0.0471 | 0.0200 | 0.0395 | 0.0758 | 0.0001 | 0.0001 |
| September 6, 2016 | | 0.0179 | | | | | | |
| Average | 0.0139 | 0.0233 | 0.0450 | 0.0337 | 0.0352 | 0.0470 | 0.0001 | 0.0001 |
| Min | 0.0054 | 0.0143 | 0.0382 | 0.0200 | 0.0238 | 0.0205 | 0.0001 | 0.0001 |
| Max | 0.0204 | 0.0343 | 0.0512 | 0.0478 | 0.0626 | 0.0758 | 0.0002 | 0.0001 |

## Copper (mg/L)

**City of Peterborough Detection Limits:** **0.0005** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.1950 | 0.1790 | 0.3050 | 0.1660 | 0.4140 | 0.1560 | 0.1070 | 0.0975 |
| August 3, 2016 | 0.3360 | 0.1140 | 0.1000 | 0.1110 | 0.0862 | 0.0534 | 0.0524 | 0.0399 |
| August 8, 2016 | 0.1500 | 0.1270 | 0.2000 | 0.2090 | 0.1180 | 0.1130 | 0.1080 | 0.0963 |
| August 17, 2016 | 0.2500 | 0.1290 | 0.2110 | 0.1350 | 0.1490 | 0.1460 | 0.3630 | 0.3500 |
| August 24, 2016 | 1.0600 | 0.2000 | 0.1260 | 0.7730 | 0.1510 | 0.1770 | 0.1980 | 0.1990 |
| August 31, 2016 | 0.0886 | 0.1520 | 0.1680 | 0.1280 | 0.1630 | 0.1390 | 0.1250 | 0.1360 |
| September 6, 2016 | 0.0710 | 0.0725 | 0.0708 | 0.1120 | 0.1380 | 0.1290 | 0.1650 | 0.3090 |
| Average | 0.3072 | 0.1391 | 0.1687 | 0.2334 | 0.1742 | 0.1305 | 0.1598 | 0.1754 |
| Min | 0.0710 | 0.0725 | 0.0708 | 0.1110 | 0.0862 | 0.0534 | 0.0524 | 0.0399 |
| Max | 1.0600 | 0.2000 | 0.3050 | 0.7730 | 0.4140 | 0.1770 | 0.3630 | 0.3500 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0912 | 0.0496 | 0.0913 | 0.0495 | 0.1020 | 0.0866 | 0.0015 | |
| August 3, 2016 | 0.0522 | 0.0517 | 0.0777 | 0.0640 | 0.1050 | 0.0796 | 0.0010 | 0.0008 |
| August 8, 2016 | 0.1160 | 0.0732 | 0.0815 | 0.1210 | 0.1250 | 0.1020 | 0.0103 | 0.0017 |
| August 17, 2016 | 0.3090 | 0.1490 | 0.0735 | 0.0681 | 0.0951 | 0.0618 | 0.0019 | 0.0009 |
| August 24, 2016 | 0.0521 | 0.0615 | 0.0758 | 0.0604 | 0.1230 | 0.0493 | 0.0034 | 0.0009 |
| August 31, 2016 | 0.1160 | 0.1930 | 0.0676 | 0.0552 | 0.0580 | 0.0520 | 0.0008 | 0.0006 |
| September 6, 2016 | | 0.0594 | | | | | | |
| Average | 0.1228 | 0.0911 | 0.0779 | 0.0697 | 0.1014 | 0.0719 | 0.0032 | 0.0010 |
| Min | 0.0521 | 0.0496 | 0.0676 | 0.0495 | 0.0580 | 0.0493 | 0.0008 | 0.0006 |
| Max | 0.3090 | 0.1930 | 0.0913 | 0.1210 | 0.1250 | 0.1020 | 0.0103 | 0.0017 |

## Iron (mg/L)

**City of Peterborough Detection Limits:** **0.001** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.986 | 0.414 | 2.990 | 2.200 | 29.400 | 3.150 | 5.960 | 3.220 |
| August 3, 2016 | 1.650 | 0.738 | 0.789 | 1.400 | 3.200 | 2.250 | 2.540 | 2.780 |
| August 8, 2016 | 0.453 | 0.278 | 0.778 | 0.995 | 1.790 | 1.750 | 4.930 | 2.620 |
| August 17, 2016 | 0.461 | 0.285 | 0.926 | 1.120 | 1.710 | 1.880 | 3.070 | 3.870 |
| August 24, 2016 | 4.680 | 0.435 | 0.917 | 5.470 | 2.140 | 2.630 | 2.840 | 2.070 |
| August 31, 2016 | 0.184 | 0.474 | 1.060 | 1.060 | 1.550 | 1.640 | 1.580 | 2.010 |
| September 6, 2016 | 0.121 | 0.233 | 0.658 | 2.050 | 2.670 | 3.410 | 8.040 | 17.30 |
| Average | 1.219 | 0.408 | 1.160 | 2.042 | 6.066 | 2.387 | 4.137 | 4.839 |
| Min | 0.121 | 0.233 | 0.658 | 0.995 | 1.550 | 1.640 | 1.580 | 2.010 |
| Max | 4.680 | 0.738 | 2.990 | 5.470 | 29.400 | 3.410 | 8.040 | 17.30 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 2.430 | 3.000 | 1.280 | 5.880 | 2.900 | 1.800 | 0.279 | |
| August 3, 2016 | 2.370 | 3.450 | 0.604 | 0.775 | 1.580 | 1.520 | 0.180 | 0.003 |
| August 8, 2016 | 15.50 | 1.890 | 0.604 | 0.647 | 1.130 | 2.180 | 0.088 | 0.001 |
| August 17, 2016 | 2.650 | 3.160 | 2.830 | 0.791 | 1.950 | 1.170 | 0.167 | 0.002 |
| August 24, 2016 | 1.660 | 2.820 | 1.370 | 1.050 | 26.30 | 1.510 | 0.206 | 0.002 |
| August 31, 2016 | 1.890 | 5.170 | 5.710 | 1.530 | 1.100 | 0.649 | 0.066 | 0.002 |
| September 6, 2016 | | 1.640 | | | | | | |
| Average | 4.417 | 3.019 | 2.066 | 1.779 | 5.827 | 1.472 | 0.164 | 0.002 |
| Min | 1.660 | 1.640 | 0.604 | 0.647 | 1.100 | 0.649 | 0.066 | 0.001 |
| Max | 15.50 | 5.170 | 5.710 | 5.880 | 26.30 | 2.180 | 0.279 | 0.003 |

## Lead (mg/L)

**City of Peterborough Detection Limits:** **0.0005** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0024 | 0.0025 | 0.0058 | 0.0036 | 0.0321 | 0.0034 | 0.0041 | 0.0025 |
| August 3, 2016 | 0.0040 | 0.0026 | 0.0017 | 0.0023 | 0.0040 | 0.0032 | 0.0033 | 0.0028 |
| August 8, 2016 | 0.0027 | 0.0015 | 0.0023 | 0.0021 | 0.0028 | 0.0031 | 0.0044 | 0.0036 |
| August 17, 2016 | 0.0063 | 0.0020 | 0.0039 | 0.0031 | 0.0031 | 0.0031 | 0.0094 | 0.0083 |
| August 24, 2016 | 0.0888 | 0.0032 | 0.0034 | 0.0248 | 0.0076 | 0.0098 | 0.0182 | 0.0124 |
| August 31, 2016 | 0.0017 | 0.0024 | 0.0042 | 0.0032 | 0.0046 | 0.0043 | 0.0044 | 0.0061 |
| September 6, 2016 | 0.0007 | 0.0015 | 0.0054 | 0.0030 | 0.0048 | 0.0051 | 0.0081 | 0.0178 |
| Average | 0.0152 | 0.0022 | 0.0038 | 0.0060 | 0.0084 | 0.0046 | 0.0074 | 0.0076 |
| Min | 0.0007 | 0.0015 | 0.0017 | 0.0021 | 0.0028 | 0.0031 | 0.0033 | 0.0025 |
| Max | 0.0888 | 0.0032 | 0.0058 | 0.0248 | 0.0321 | 0.0098 | 0.0182 | 0.0178 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0021 | 0.0032 | 0.0122 | 0.0121 | 0.0106 | 0.0089 | 0.0005 | |
| August 3, 2016 | 0.0032 | 0.0048 | 0.0112 | 0.0095 | 0.0119 | 0.0084 | 0.0005 | 0.0005 |
| August 8, 2016 | 0.0103 | 0.0047 | 0.0145 | 0.0149 | 0.0128 | 0.0086 | 0.0026 | 0.0005 |
| August 17, 2016 | 0.0061 | 0.0054 | 0.0128 | 0.0046 | 0.0107 | 0.0083 | 0.0005 | 0.0005 |
| August 24, 2016 | 0.0028 | 0.0060 | 0.0146 | 0.0059 | 0.0313 | 0.0098 | 0.0005 | 0.0005 |
| August 31, 2016 | 0.0030 | 0.0076 | 0.0150 | 0.0046 | 0.0108 | 0.0132 | 0.0005 | 0.0005 |
| September 6, 2016 | | 0.0038 | | | | | | |
| Average | 0.0046 | 0.0051 | 0.0134 | 0.0086 | 0.0147 | 0.0095 | 0.0009 | 0.0005 |
| Min | 0.0021 | 0.0032 | 0.0112 | 0.0046 | 0.0106 | 0.0083 | 0.0005 | 0.0005 |
| Max | 0.0103 | 0.0076 | 0.0150 | 0.0149 | 0.0313 | 0.0132 | 0.0026 | 0.0005 |

## Lithium (mg/L)

**City of Peterborough Detection Limits:** **0.0002** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0018 | 0.0017 | 0.0026 | 0.0026 | 0.0204 | 0.0029 | 0.0050 | 0.0031 |
| August 3, 2016 | 0.0035 | 0.0023 | 0.0025 | 0.0030 | 0.0044 | 0.0042 | 0.0038 | 0.0032 |
| August 8, 2016 | 0.0031 | 0.0038 | 0.0032 | 0.0032 | 0.0050 | 0.0035 | 0.0064 | 0.0038 |
| August 17, 2016 | 0.0013 | 0.0015 | 0.0018 | 0.0022 | 0.0027 | 0.0024 | 0.0038 | 0.0039 |
| August 24, 2016 | 0.0036 | 0.0014 | 0.0016 | 0.0050 | 0.0023 | 0.0027 | 0.0029 | 0.0020 |
| August 31, 2016 | 0.0009 | 0.0011 | 0.0015 | 0.0014 | 0.0022 | 0.0024 | 0.0020 | 0.0021 |
| September 6, 2016 | 0.0010 | 0.0011 | 0.0016 | 0.0021 | 0.0029 | 0.0034 | 0.0058 | 0.0122 |
| Average | 0.0022 | 0.0018 | 0.0021 | 0.0028 | 0.0057 | 0.0031 | 0.0042 | 0.0043 |
| Min | 0.0009 | 0.0011 | 0.0015 | 0.0014 | 0.0022 | 0.0024 | 0.0020 | 0.0020 |
| Max | 0.0036 | 0.0038 | 0.0032 | 0.0050 | 0.0204 | 0.0042 | 0.0064 | 0.0122 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0026 | 0.0038 | 0.0171 | 0.0122 | 0.0135 | 0.0078 | 0.0008 | |
| August 3, 2016 | 0.0031 | 0.0052 | 0.0225 | 0.0111 | 0.0123 | 0.0049 | 0.0008 | 0.0003 |
| August 8, 2016 | 0.0155 | 0.0047 | 0.0198 | 0.0131 | 0.0145 | 0.0073 | 0.0008 | 0.0003 |
| August 17, 2016 | 0.0031 | 0.0049 | 0.0219 | 0.0053 | 0.0164 | 0.0080 | 0.0008 | 0.0004 |
| August 24, 2016 | 0.0016 | 0.0032 | 0.0143 | 0.0028 | 0.0301 | 0.0060 | 0.0006 | 0.0009 |
| August 31, 2016 | 0.0022 | 0.0043 | 0.0151 | 0.0038 | 0.0091 | 0.0061 | 0.0006 | 0.0021 |
| September 6, 2016 | | 0.0026 | | | | | | |
| Average | 0.0047 | 0.0041 | 0.0185 | 0.0081 | 0.0160 | 0.0067 | 0.0007 | 0.0008 |
| Min | 0.0016 | 0.0026 | 0.0143 | 0.0028 | 0.0091 | 0.0049 | 0.0006 | 0.0003 |
| Max | 0.0155 | 0.0052 | 0.0225 | 0.0131 | 0.0301 | 0.0080 | 0.0008 | 0.0021 |

## Magnesium (Mg) (mg/L)

**City of Peterborough Detection Limits:** **0.05** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 6.13 | 7.09 | 9.41 | 8.11 | 35.1 | 9.66 | 11.9 | 12.9 |
| August 3, 2016 | 9.08 | 6.75 | 6.40 | 7.00 | 11.1 | 11.3 | 11.2 | 13.3 |
| August 8, 2016 | 5.83 | 5.82 | 7.50 | 8.76 | 9.50 | 10.30 | 12.7 | 12.1 |
| August 17, 2016 | 6.11 | 6.17 | 6.82 | 7.26 | 8.88 | 9.25 | 10.1 | 11.7 |
| August 24, 2016 | 8.00 | 5.60 | 5.71 | 9.79 | 7.94 | 8.20 | 8.93 | 8.24 |
| August 31, 2016 | 5.41 | 6.30 | 6.54 | 6.69 | 8.60 | 8.67 | 8.23 | 9.02 |
| September 6, 2016 | 5.49 | 5.89 | 6.57 | 8.16 | 10.50 | 10.5 | 13.2 | 21.0 |
| Average | 6.58 | 6.23 | 6.99 | 7.97 | 13.1 | 9.70 | 10.89 | 12.61 |
| Min | 5.41 | 5.60 | 5.71 | 6.69 | 7.94 | 8.20 | 8.23 | 8.24 |
| Max | 9.08 | 7.09 | 9.41 | 9.79 | 35.1 | 11.3 | 13.2 | 21.0 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 10.4 | 15.6 | 82.0 | 39.7 | 48.9 | 28.6 | 5.33 | |
| August 3, 2016 | 12.8 | 17.8 | 107 | 54.7 | 54.5 | 21.2 | 7.84 | 0.06 |
| August 8, 2016 | 18.9 | 16.5 | 82.8 | 47.4 | 53.6 | 18.4 | 9.15 | 0.05 |
| August 17, 2016 | 10.9 | 23.7 | 93.4 | 21.8 | 70.7 | 32.3 | 10.2 | 0.05 |
| August 24, 2016 | 7.03 | 13.6 | 50.9 | 12.0 | 60.9 | 22.6 | 9.28 | 0.16 |
| August 31, 2016 | 8.09 | 14.0 | 58.6 | 17.6 | 54.9 | 27.6 | 10.5 | 0.48 |
| September 6, 2016 | | 15.5 | | | | | | |
| Average | 11.4 | 16.7 | 79.1 | 32.2 | 57.3 | 25.1 | 8.72 | 0.16 |
| Min | 7.03 | 13.6 | 50.9 | 12.0 | 48.9 | 18.4 | 5.33 | 0.05 |
| Max | 18.9 | 23.7 | 107 | 54.7 | 70.7 | 32.3 | 10.5 | 0.48 |

## Manganese (mg/L)

**City of Peterborough Detection Limits:** **0.0005** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0281 | 0.0246 | 0.1040 | 0.0868 | 1.0300 | 0.3810 | 0.4750 | 0.5040 |
| August 3, 2016 | 0.0605 | 0.0274 | 0.0272 | 0.0566 | 0.2390 | 0.2880 | 0.3020 | 0.3810 |
| August 8, 2016 | 0.0166 | 0.0140 | 0.0403 | 0.0663 | 0.1530 | 0.2140 | 0.2810 | 0.3040 |
| August 17, 2016 | 0.0189 | 0.0143 | 0.0365 | 0.0556 | 0.1600 | 0.1680 | 0.1860 | 0.2420 |
| August 24, 2016 | 0.0692 | 0.0175 | 0.0418 | 0.1230 | 0.1240 | 0.1090 | 0.1350 | 0.1390 |
| August 31, 2016 | 0.0058 | 0.0164 | 0.0321 | 0.0409 | 0.0768 | 0.0813 | 0.1010 | 0.1220 |
| September 6, 2016 | 0.0046 | 0.0106 | 0.0306 | 0.0941 | 0.1490 | 0.1640 | 0.2010 | 0.4550 |
| Average | 0.0291 | 0.0178 | 0.0446 | 0.0748 | 0.2760 | 0.2008 | 0.2401 | 0.3067 |
| Min | 0.0046 | 0.0106 | 0.0272 | 0.0409 | 0.0768 | 0.0813 | 0.1010 | 0.1220 |
| Max | 0.0692 | 0.0274 | 0.1040 | 0.1230 | 1.0300 | 0.3810 | 0.4750 | 0.5040 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.4340 | 0.5590 | 0.0817 | 0.3360 | 0.1340 | 0.2510 | 0.0068 | |
| August 3, 2016 | 0.3840 | 0.4290 | 0.0528 | 0.1360 | 0.2020 | 0.3920 | 0.0044 | 0.0005 |
| August 8, 2016 | 0.4410 | 0.2910 | 0.0606 | 0.1180 | 0.1540 | 0.2840 | 0.0032 | 0.0005 |
| August 17, 2016 | 0.2530 | 0.3920 | 0.0904 | 0.2200 | 0.4700 | 1.2300 | 0.0052 | 0.0005 |
| August 24, 2016 | 0.2690 | 0.3000 | 0.0488 | 0.3470 | 1.2900 | 1.2300 | 0.0078 | 0.0005 |
| August 31, 2016 | 0.1340 | 0.2010 | 0.0995 | 0.2840 | 0.2420 | 1.4900 | 0.0028 | 0.0005 |
| September 6, 2016 | | 0.2010 | | | | | | |
| Average | 0.3192 | 0.3390 | 0.0723 | 0.2402 | 0.4153 | 0.8128 | 0.0050 | 0.0005 |
| Min | 0.1340 | 0.2010 | 0.0488 | 0.1180 | 0.1340 | 0.2510 | 0.0028 | 0.0005 |
| Max | 0.4410 | 0.5590 | 0.0995 | 0.3470 | 1.2900 | 1.4900 | 0.0078 | 0.0005 |

## Mercury (mg/L)

**City of Peterborough Detection Limits:** **0.1** **ug/L**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| August 3, 2016 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| August 8, 2016 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| August 17, 2016 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| August 24, 2016 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| August 31, 2016 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| September 6, 2016 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Average | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Min | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Max | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | |
| August 3, 2016 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| August 8, 2016 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| August 17, 2016 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| August 24, 2016 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| August 31, 2016 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| September 6, 2016 | | 0.1 | | | | | | |
| Average | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Min | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Max | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |

## Molybdenum (mg/L)

**City of Peterborough Detection Limits:** **0.0005** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0005 | 0.0006 | 0.0010 | 0.0007 | 0.0015 | 0.0012 | 0.0010 | 0.0012 |
| August 3, 2016 | 0.0014 | 0.0005 | 0.0013 | 0.0014 | 0.0011 | 0.0010 | 0.0012 | 0.0018 |
| August 8, 2016 | 0.0007 | 0.0006 | 0.0008 | 0.0016 | 0.0009 | 0.0012 | 0.0009 | 0.0010 |
| August 17, 2016 | 0.0009 | 0.0009 | 0.0008 | 0.0009 | 0.0012 | 0.0012 | 0.0019 | 0.0015 |
| August 24, 2016 | 0.0033 | 0.0006 | 0.0006 | 0.0020 | 0.0010 | 0.0011 | 0.0017 | 0.0009 |
| August 31, 2016 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0008 | 0.0008 | 0.0015 | 0.0010 |
| September 6, 2016 | 0.0007 | 0.0009 | 0.0032 | 0.0022 | 0.0031 | 0.0020 | 0.0023 | 0.0029 |
| Average | 0.0011 | 0.0007 | 0.0012 | 0.0013 | 0.0014 | 0.0012 | 0.0015 | 0.0015 |
| Min | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0008 | 0.0008 | 0.0009 | 0.0009 |
| Max | 0.0033 | 0.0009 | 0.0032 | 0.0022 | 0.0031 | 0.0020 | 0.0023 | 0.0029 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0009 | 0.0016 | 0.0027 | 0.0035 | 0.0048 | 0.0030 | 0.0024 | |
| August 3, 2016 | 0.0012 | 0.0022 | 0.0032 | 0.0038 | 0.0039 | 0.0024 | 0.0006 | 0.0024 |
| August 8, 2016 | 0.0010 | 0.0015 | 0.0033 | 0.0043 | 0.0033 | 0.0022 | 0.0007 | 0.0059 |
| August 17, 2016 | 0.0018 | 0.0030 | 0.0031 | 0.0042 | 0.0057 | 0.0085 | 0.0006 | 0.0044 |
| August 24, 2016 | 0.0011 | 0.0034 | 0.0030 | 0.0037 | 0.0060 | 0.0076 | 0.0008 | 0.0059 |
| August 31, 2016 | 0.0020 | 0.0027 | 0.0027 | 0.0025 | 0.0040 | 0.0056 | 0.0005 | 0.0005 |
| September 6, 2016 | | 0.0015 | | | | | | |
| Average | 0.0013 | 0.0023 | 0.0030 | 0.0037 | 0.0046 | 0.0049 | 0.0009 | 0.0038 |
| Min | 0.0009 | 0.0015 | 0.0027 | 0.0025 | 0.0033 | 0.0022 | 0.0005 | 0.0005 |
| Max | 0.0020 | 0.0034 | 0.0033 | 0.0043 | 0.0060 | 0.0085 | 0.0024 | 0.0059 |

## Nickel (Ni) (mg/L)

**City of Peterborough Detection Limits:** **0.002** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.003 | 0.004 | 0.008 | 0.006 | 0.059 | 0.020 | 0.027 | 0.027 |
| August 3, 2016 | 0.006 | 0.003 | 0.002 | 0.005 | 0.019 | 0.023 | 0.023 | 0.026 |
| August 8, 2016 | 0.002 | 0.002 | 0.003 | 0.005 | 0.013 | 0.018 | 0.022 | 0.021 |
| August 17, 2016 | 0.002 | 0.002 | 0.003 | 0.004 | 0.012 | 0.012 | 0.014 | 0.019 |
| August 24, 2016 | 0.013 | 0.002 | 0.002 | 0.013 | 0.013 | 0.014 | 0.017 | 0.018 |
| August 31, 2016 | 0.002 | 0.002 | 0.003 | 0.003 | 0.011 | 0.011 | 0.011 | 0.012 |
| September 6, 2016 | 0.002 | 0.002 | 0.002 | 0.007 | 0.018 | 0.017 | 0.020 | 0.036 |
| Average | 0.004 | 0.002 | 0.003 | 0.006 | 0.021 | 0.016 | 0.019 | 0.023 |
| Min | 0.002 | 0.002 | 0.002 | 0.003 | 0.011 | 0.011 | 0.011 | 0.012 |
| Max | 0.013 | 0.004 | 0.008 | 0.013 | 0.059 | 0.023 | 0.027 | 0.036 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.023 | 0.042 | 0.088 | 0.066 | 0.045 | 0.052 | 0.002 | |
| August 3, 2016 | 0.025 | 0.040 | 0.073 | 0.052 | 0.040 | 0.039 | 0.002 | 0.002 |
| August 8, 2016 | 0.035 | 0.026 | 0.064 | 0.054 | 0.037 | 0.032 | 0.002 | 0.002 |
| August 17, 2016 | 0.016 | 0.031 | 0.070 | 0.036 | 0.046 | 0.063 | 0.002 | 0.002 |
| August 24, 2016 | 0.014 | 0.028 | 0.053 | 0.037 | 0.088 | 0.067 | 0.002 | 0.002 |
| August 31, 2016 | 0.009 | 0.023 | 0.049 | 0.026 | 0.043 | 0.068 | 0.002 | 0.002 |
| September 6, 2016 | | 0.029 | | | | | | |
| Average | 0.020 | 0.031 | 0.066 | 0.045 | 0.050 | 0.054 | 0.002 | 0.002 |
| Min | 0.009 | 0.023 | 0.049 | 0.026 | 0.037 | 0.032 | 0.002 | 0.002 |
| Max | 0.035 | 0.042 | 0.088 | 0.066 | 0.088 | 0.068 | 0.002 | 0.002 |

## Potassium (mg/L)

**City of Peterborough Detection Limits:** **0.50** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 4.00 | 10.0 | 14.4 | 10.7 | 12.9 | 13.6 | 12.9 | 12.7 |
| August 3, 2016 | 12.3 | 9.00 | 6.30 | 9.80 | 10.3 | 10.7 | 12.2 | 11.4 |
| August 8, 2016 | 9.20 | 9.60 | 24.7 | 23.1 | 10.8 | 10.5 | 12.0 | 11.4 |
| August 17, 2016 | 5.30 | 8.40 | 11.0 | 10.4 | 13.4 | 12.1 | 14.1 | 21.1 |
| August 24, 2016 | 21.5 | 9.90 | 5.90 | 8.80 | 9.40 | 9.70 | 14.2 | 13.7 |
| August 31, 2016 | 3.30 | 13.0 | 6.50 | 5.70 | 9.50 | 11.1 | 9.60 | 10.4 |
| September 6, 2016 | 6.90 | 7.70 | 6.80 | 9.50 | 13.0 | 7.50 | 7.60 | 8.60 |
| Average | 8.93 | 9.66 | 10.8 | 11.1 | 11.3 | 10.7 | 11.8 | 12.8 |
| Min | 3.30 | 7.70 | 5.90 | 5.70 | 9.40 | 7.50 | 7.60 | 8.60 |
| Max | 21.5 | 13.0 | 24.7 | 23.1 | 13.4 | 13.6 | 14.2 | 21.1 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 11.1 | 11.6 | 31.7 | 23.6 | 30.1 | 20.7 | 0.50 | |
| August 3, 2016 | 13.5 | 13.7 | 38.8 | 30.8 | 30.9 | 16.4 | 0.50 | 0.50 |
| August 8, 2016 | 9.60 | 13.2 | 35.4 | 28.5 | 29.4 | 15.8 | 0.50 | 0.50 |
| August 17, 2016 | 18.6 | 17.8 | 34.5 | 17.8 | 30.3 | 20.4 | 0.50 | 0.50 |
| August 24, 2016 | 8.40 | 10.8 | 28.1 | 12.6 | 30.7 | 19.2 | 0.50 | 0.50 |
| August 31, 2016 | 7.70 | 12.3 | 24.1 | 13.3 | 24.1 | 19.3 | 0.50 | 0.50 |
| September 6, 2016 | | 10.7 | | | | | | |
| Average | 11.5 | 12.9 | 32.1 | 21.1 | 29.3 | 18.6 | 0.5 | 0.5 |
| Min | 7.70 | 10.7 | 24.1 | 12.6 | 24.1 | 15.8 | 0.5 | 0.5 |
| Max | 18.6 | 17.8 | 38.8 | 30.8 | 30.9 | 20.7 | 0.5 | 0.5 |

## Selenium (mg/L)

**City of Peterborough Detection Limits:** **0.0005** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0005 | 0.0005 | 0.0012 | 0.0005 | 0.0007 | 0.0005 | 0.0005 | 0.0005 |
| August 3, 2016 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| August 8, 2016 | 0.0005 | 0.0005 | 0.0006 | 0.0011 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| August 17, 2016 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0006 | 0.0008 | 0.0006 |
| August 24, 2016 | 0.0014 | 0.0005 | 0.0005 | 0.0011 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| August 31, 2016 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| September 6, 2016 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| Average | 0.0006 | 0.0005 | 0.0006 | 0.0007 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| Min | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| Max | 0.0014 | 0.0005 | 0.0012 | 0.0011 | 0.0007 | 0.0006 | 0.0008 | 0.0006 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | |
| August 3, 2016 | 0.0005 | 0.0005 | 0.0007 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| August 8, 2016 | 0.0005 | 0.0005 | 0.0007 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| August 17, 2016 | 0.0006 | 0.0005 | 0.0007 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| August 24, 2016 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| August 31, 2016 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| September 6, 2016 | | 0.0005 | | | | | | |
| Average | 0.0005 | 0.0005 | 0.0006 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| Min | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| Max | 0.0006 | 0.0005 | 0.0007 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |

## Silver (mg/L)

**City of Peterborough Detection Limits:** **0.0001** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0002 | 0.0001 | 0.0001 | 0.0001 |
| August 3, 2016 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| August 8, 2016 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| August 17, 2016 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0002 |
| August 24, 2016 | 0.0010 | 0.0001 | 0.0001 | 0.0004 | 0.0001 | 0.0001 | 0.0002 | 0.0001 |
| August 31, 2016 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| September 6, 2016 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0002 |
| Average | 0.0002 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| Min | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| Max | 0.0010 | 0.0001 | 0.0001 | 0.0004 | 0.0002 | 0.0001 | 0.0002 | 0.0002 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0002 | |
| August 3, 2016 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| August 8, 2016 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0002 |
| August 17, 2016 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| August 24, 2016 | 0.0001 | 0.0002 | 0.0001 | 0.0001 | 0.0008 | 0.0001 | 0.0001 | 0.0001 |
| August 31, 2016 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| September 6, 2016 | | 0.0001 | | | | | | |
| Average | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0002 | 0.0001 | 0.0001 | 0.0001 |
| Min | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| Max | 0.0001 | 0.0002 | 0.0001 | 0.0001 | 0.0008 | 0.0001 | 0.0002 | 0.0002 |

## Sodium (mg/L)

**City of Peterborough Detection Limits:** **0.05** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 45.1 | 52.3 | 75.8 | 66.2 | 78.7 | 50.9 | 50.0 | 58.2 |
| August 3, 2016 | 24.5 | 28.0 | 20.2 | 30.1 | 50.5 | 58.1 | 62.6 | 65.3 |
| August 8, 2016 | 15.5 | 16.4 | 39.8 | 92.7 | 35.9 | 46.5 | 54.8 | 53.5 |
| August 17, 2016 | 40.1 | 41.7 | 26.6 | 43.9 | 79.2 | 76.0 | 55.0 | 52.4 |
| August 24, 2016 | 122 | 21.1 | 34.3 | 51.2 | 51.2 | 34.8 | 54.5 | 44.3 |
| August 31, 2016 | 10.2 | 22.7 | 15.6 | 13.4 | 21.2 | 24.1 | 27.7 | 28.8 |
| September 6, 2016 | 10.7 | 22.0 | 73.9 | 33.5 | 48.6 | 36.4 | 26.8 | 27.5 |
| Average | 38.3 | 29.2 | 40.9 | 47.3 | 52.2 | 46.7 | 47.3 | 47.1 |
| Min | 10.2 | 16.4 | 15.6 | 13.4 | 21.2 | 24.1 | 26.8 | 27.5 |
| Max | 122 | 52.3 | 75.8 | 92.7 | 79.2 | 76.0 | 62.6 | 65.3 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 62.7 | 78.2 | 346 | 218 | 450 | 202 | 0.53 | |
| August 3, 2016 | 73.8 | 91.4 | 430 | 353 | 394 | 128 | 0.69 | 1.36 |
| August 8, 2016 | 48.5 | 92.7 | 384 | 331 | 373 | 105 | 0.87 | 0.20 |
| August 17, 2016 | 42.0 | 78.2 | 428 | 109.0 | 441 | 179 | 0.94 | 0.18 |
| August 24, 2016 | 43.7 | 60.2 | 295 | 56.6 | 342 | 134 | 0.92 | 1.44 |
| August 31, 2016 | 23.7 | 39.6 | 220 | 81.0 | 294 | 108 | 0.96 | 3.57 |
| September 6, 2016 | | 47.5 | | | | | | |
| Average | 49.1 | 69.7 | 351 | 191 | 382 | 143 | 0.82 | 1.35 |
| Min | 23.7 | 39.6 | 220 | 56.6 | 294 | 105 | 0.53 | 0.18 |
| Max | 73.8 | 92.7 | 430 | 353 | 450 | 202 | 0.96 | 3.57 |

## Strontium (mg/L)

**City of Peterborough Detection Limits:** **0.0001** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0615 | 0.0682 | 0.0875 | 0.0798 | 0.3260 | 0.1040 | 0.1370 | 0.1360 |
| August 3, 2016 | 0.0901 | 0.0702 | 0.0721 | 0.0784 | 0.1160 | 0.1240 | 0.1250 | 0.1360 |
| August 8, 2016 | 0.0660 | 0.0661 | 0.0817 | 0.0978 | 0.1080 | 0.1250 | 0.1430 | 0.1380 |
| August 17, 2016 | 0.0710 | 0.0672 | 0.0745 | 0.0825 | 0.1020 | 0.1040 | 0.1060 | 0.1210 |
| August 24, 2016 | 0.0891 | 0.0633 | 0.0667 | 0.0948 | 0.0934 | 0.0961 | 0.1060 | 0.0970 |
| August 31, 2016 | 0.0524 | 0.0600 | 0.0627 | 0.0622 | 0.0841 | 0.0825 | 0.0810 | 0.0869 |
| September 6, 2016 | 0.0547 | 0.0563 | 0.0634 | 0.0762 | 0.1040 | 0.1010 | 0.1140 | 0.1760 |
| Average | 0.0693 | 0.0645 | 0.0727 | 0.0817 | 0.1334 | 0.1052 | 0.1160 | 0.1273 |
| Min | 0.0524 | 0.0563 | 0.0627 | 0.0622 | 0.0841 | 0.0825 | 0.0810 | 0.0869 |
| Max | 0.0901 | 0.0702 | 0.0875 | 0.0978 | 0.3260 | 0.1250 | 0.1430 | 0.1760 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.1180 | 0.1640 | 0.5280 | 0.3160 | 0.3480 | 0.2420 | 0.0542 | |
| August 3, 2016 | 0.1250 | 0.1680 | 0.6300 | 0.3400 | 0.3470 | 0.1790 | 0.0714 | 0.0004 |
| August 8, 2016 | 0.1630 | 0.1820 | 0.5720 | 0.3710 | 0.4010 | 0.1880 | 0.0909 | 0.0005 |
| August 17, 2016 | 0.1140 | 0.2150 | 0.5310 | 0.2030 | 0.4940 | 0.2900 | 0.0960 | 0.0011 |
| August 24, 2016 | 0.0860 | 0.1560 | 0.3630 | 0.1410 | 0.5440 | 0.2200 | 0.0903 | 0.0039 |
| August 31, 2016 | 0.0791 | 0.1310 | 0.3160 | 0.1400 | 0.2470 | 0.2190 | 0.0855 | 0.0089 |
| September 6, 2016 | | 0.1570 | | | | | | |
| Average | 0.1142 | 0.1676 | 0.4900 | 0.2518 | 0.3968 | 0.2230 | 0.0814 | 0.0030 |
| Min | 0.0791 | 0.1310 | 0.3160 | 0.1400 | 0.2470 | 0.1790 | 0.0542 | 0.0004 |
| Max | 0.1630 | 0.2150 | 0.6300 | 0.3710 | 0.5440 | 0.2900 | 0.0960 | 0.0089 |

## Sulphur (mg/L)

**City of Peterborough Detection Limits:** **0.1** **mg/L**

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 3.9 | 4.2 | 8.0 | 5.8 | 9.7 | 8.1 | 6.8 | 7.1 |
| August 3, 2016 | 6.2 | 4.4 | 4.9 | 7.9 | 8.5 | 9.2 | 9.6 | 8.8 |
| August 8, 2016 | 3.6 | 4.1 | 7.7 | 11.6 | 7.0 | 7.9 | 8.9 | 7.2 |
| August 17, 2016 | 4.5 | 3.2 | 4.6 | 5.3 | 7.2 | 7.4 | 6.8 | 7.1 |
| August 24, 2016 | 11.5 | 3.2 | 3.3 | 7.2 | 4.9 | 4.3 | 4.6 | 4.5 |
| August 31, 2016 | 2.3 | 4.3 | 3.2 | 2.9 | 4.2 | 4.4 | 3.8 | 4.3 |
| September 6, 2016 | 2.7 | 3.2 | 4.2 | 4.0 | 5.0 | 4.7 | 4.4 | 5.5 |
| Average | 5.0 | 3.8 | 5.1 | 6.4 | 6.6 | 6.6 | 6.4 | 6.4 |
| Min | 2.3 | 3.2 | 3.2 | 2.9 | 4.2 | 4.3 | 3.8 | 4.3 |
| Max | 11.5 | 4.4 | 8.0 | 11.6 | 9.7 | 9.2 | 9.6 | 8.8 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 7.1 | 6.5 | 64.2 | 21.4 | 63.0 | 23.4 | 13.6 | |
| August 3, 2016 | 9.6 | 8.6 | 91.3 | 34.2 | 55.6 | 13.0 | 23.4 | <0.1 |
| August 8, 2016 | 7.0 | 10.2 | 74.3 | 33.5 | 50.1 | 11.8 | 28.9 | <0.1 |
| August 17, 2016 | 6.5 | 9.8 | 75.4 | 8.5 | 59.1 | 17.5 | 28.7 | <0.1 |
| August 24, 2016 | 3.5 | 5.4 | 51.4 | 5.0 | 47.1 | 11.9 | 32.0 | 0.4 |
| August 31, 2016 | 3.3 | 5.2 | 35.6 | 6.1 | 23.5 | 9.6 | 34.7 | 0.8 |
| September 6, 2016 | | 6.3 | | | | | | |
| Average | 6.2 | 7.4 | 65.4 | 18.1 | 49.7 | 14.5 | 26.9 | 0.3 |
| Min | 3.3 | 5.2 | 35.6 | 5.0 | 23.5 | 9.6 | 13.6 | <0.1 |
| Max | 9.6 | 10.2 | 91.3 | 34.2 | 63.0 | 23.4 | 34.7 | 0.8 |

## Tellurium (Te) (mg/L)

**City of Peterborough Detection Limits:** **0.001** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |
| August 3, 2016 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |
| August 8, 2016 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |
| August 17, 2016 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |
| August 24, 2016 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |
| August 31, 2016 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |
| September 6, 2016 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |
| Average | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |
| Min | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |
| Max | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | |
| August 3, 2016 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |
| August 8, 2016 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |
| August 17, 2016 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |
| August 24, 2016 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |
| August 31, 2016 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |
| September 6, 2016 | | 0.001 | | | | | | |
| Average | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |
| Min | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |
| Max | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |

## Thallium (mg/L)

**City of Peterborough Detection Limits:** **0.0003** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 |
| August 3, 2016 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 |
| August 8, 2016 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 |
| August 17, 2016 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 |
| August 24, 2016 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 |
| August 31, 2016 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 |
| September 6, 2016 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 |
| Average | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 |
| Min | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 |
| Max | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | |
| August 3, 2016 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 |
| August 8, 2016 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 |
| August 17, 2016 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 |
| August 24, 2016 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 |
| August 31, 2016 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 |
| September 6, 2016 | | 0.0003 | | | | | | |
| Average | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 |
| Min | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 |
| Max | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 |

## Tin (mg/L)

**City of Peterborough Detection Limits:** **0.0005** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0010 | 0.0273 | 0.0054 | 0.0149 | 0.0073 | 0.0018 | 0.0010 | 0.0011 |
| August 3, 2016 | 0.0017 | 0.0012 | 0.0012 | 0.0019 | 0.0016 | 0.0008 | 0.0008 | 0.0007 |
| August 8, 2016 | 0.0007 | 0.0008 | 0.0009 | 0.0005 | 0.0005 | 0.0018 | 0.0006 | 0.0008 |
| August 17, 2016 | 0.0023 | 0.0020 | 0.0012 | 0.0009 | 0.0009 | 0.0012 | 0.0019 | 0.0012 |
| August 24, 2016 | 0.0036 | 0.0034 | 0.0064 | 0.0078 | 0.0032 | 0.0022 | 0.0018 | 0.0019 |
| August 31, 2016 | 0.0008 | 0.0017 | 0.0021 | 0.0011 | 0.0017 | 0.0024 | 0.0067 | 0.0137 |
| September 6, 2016 | 0.0005 | 0.0006 | 0.0009 | 0.0010 | 0.0010 | 0.0010 | 0.0010 | 0.0011 |
| Average | 0.0015 | 0.0053 | 0.0026 | 0.0040 | 0.0023 | 0.0016 | 0.0020 | 0.0029 |
| Min | 0.0005 | 0.0006 | 0.0009 | 0.0005 | 0.0005 | 0.0008 | 0.0006 | 0.0007 |
| Max | 0.0036 | 0.0273 | 0.0064 | 0.0149 | 0.0073 | 0.0024 | 0.0067 | 0.0137 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0009 | 0.0006 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | |
| August 3, 2016 | 0.0009 | 0.0007 | 0.0005 | 0.0005 | 0.0005 | 0.0006 | 0.0005 | 0.0005 |
| August 8, 2016 | 0.0006 | 0.0007 | 0.0006 | 0.0005 | 0.0006 | 0.0008 | 0.0005 | 0.0015 |
| August 17, 2016 | 0.0019 | 0.0007 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| August 24, 2016 | 0.0006 | 0.0007 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| August 31, 2016 | 0.0012 | 0.0016 | 0.0005 | 0.0009 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| September 6, 2016 | | 0.0005 | | | | | | |
| Average | 0.0010 | 0.0008 | 0.0005 | 0.0006 | 0.0005 | 0.0006 | 0.0005 | 0.0007 |
| Min | 0.0006 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| Max | 0.0019 | 0.0016 | 0.0006 | 0.0009 | 0.0006 | 0.0008 | 0.0005 | 0.0015 |

## Titanium (mg/L)

**City of Peterborough Detection Limits:** **0.0005** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0074 | 0.0185 | 0.0141 | 0.0098 | 0.0731 | 0.0139 | 0.0141 | 0.0161 |
| August 3, 2016 | 0.0421 | 0.0097 | 0.0081 | 0.0215 | 0.0086 | 0.0083 | 0.0053 | 0.0065 |
| August 8, 2016 | 0.0106 | 0.0201 | 0.0075 | 0.0056 | 0.0059 | 0.0086 | 0.0094 | 0.0065 |
| August 17, 2016 | 0.0129 | 0.0074 | 0.0122 | 0.0073 | 0.0033 | 0.0504 | 0.0989 | 0.0136 |
| August 24, 2016 | 0.0274 | 0.0030 | 0.0018 | 0.0269 | 0.0025 | 0.0074 | 0.0103 | 0.0021 |
| August 31, 2016 | 0.0028 | 0.0585 | 0.0108 | 0.0046 | 0.0035 | 0.0028 | 0.0014 | 0.0017 |
| September 6, 2016 | 0.0005 | 0.0010 | 0.0013 | 0.0025 | 0.0032 | 0.0051 | 0.0100 | 0.0192 |
| Average | 0.0148 | 0.0169 | 0.0080 | 0.0112 | 0.0143 | 0.0138 | 0.0213 | 0.0094 |
| Min | 0.0005 | 0.0010 | 0.0013 | 0.0025 | 0.0025 | 0.0028 | 0.0014 | 0.0017 |
| Max | 0.0421 | 0.0585 | 0.0141 | 0.0269 | 0.0731 | 0.0504 | 0.0989 | 0.0192 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0082 | 0.0031 | 0.0025 | 0.0170 | 0.0116 | 0.0042 | 0.0008 | |
| August 3, 2016 | 0.0037 | 0.0105 | 0.0048 | 0.0025 | 0.0126 | 0.0033 | 0.0017 | 0.0005 |
| August 8, 2016 | 0.0223 | 0.0063 | 0.0044 | 0.0010 | 0.0026 | 0.0072 | 0.0005 | 0.0008 |
| August 17, 2016 | 0.0165 | 0.0386 | 0.0064 | 0.0117 | 0.0026 | 0.0026 | 0.0009 | 0.0005 |
| August 24, 2016 | 0.0040 | 0.0017 | 0.0136 | 0.0016 | 0.0299 | 0.0042 | 0.0018 | 0.0005 |
| August 31, 2016 | 0.0050 | 0.0054 | 0.0065 | 0.0015 | 0.0014 | 0.0006 | 0.0005 | 0.0005 |
| September 6, 2016 | | 0.0008 | | | | | | |
| Average | 0.0100 | 0.0095 | 0.0064 | 0.0059 | 0.0101 | 0.0037 | 0.0010 | 0.0006 |
| Min | 0.0037 | 0.0008 | 0.0025 | 0.0010 | 0.0014 | 0.0006 | 0.0005 | 0.0005 |
| Max | 0.0223 | 0.0386 | 0.0136 | 0.0170 | 0.0299 | 0.0072 | 0.0018 | 0.0008 |

## Tungsten (mg/L)

**City of Peterborough Detection Limits:** **0.0005** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0010 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0008 | 0.0005 | 0.0006 |
| August 3, 2016 | 0.0008 | 0.0006 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0010 | 0.0025 |
| August 8, 2016 | 0.0011 | 0.0009 | 0.0012 | 0.0014 | 0.0008 | 0.0011 | 0.0005 | 0.0005 |
| August 17, 2016 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0010 | 0.0005 |
| August 24, 2016 | 0.0040 | 0.0018 | 0.0006 | 0.0011 | 0.0005 | 0.0005 | 0.0021 | 0.0005 |
| August 31, 2016 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0015 | 0.0005 |
| September 6, 2016 | 0.0005 | 0.0005 | 0.0029 | 0.0016 | 0.0013 | 0.0011 | 0.0010 | 0.0009 |
| Average | 0.0012 | 0.0008 | 0.0010 | 0.0009 | 0.0007 | 0.0007 | 0.0011 | 0.0009 |
| Min | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| Max | 0.0040 | 0.0018 | 0.0029 | 0.0016 | 0.0013 | 0.0011 | 0.0021 | 0.0025 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0047 | |
| August 3, 2016 | 0.0008 | 0.0015 | 0.0005 | 0.0005 | 0.0005 | 0.0006 | 0.0021 | 0.0048 |
| August 8, 2016 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0012 | 0.0060 |
| August 17, 2016 | 0.0005 | 0.0020 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0042 |
| August 24, 2016 | 0.0014 | 0.0032 | 0.0005 | 0.0009 | 0.0008 | 0.0012 | 0.0011 | 0.0051 |
| August 31, 2016 | 0.0012 | 0.0024 | 0.0009 | 0.0006 | 0.0005 | 0.0007 | 0.0005 | 0.0005 |
| September 6, 2016 | | 0.0007 | | | | | | |
| Average | 0.0008 | 0.0015 | 0.0006 | 0.0006 | 0.0006 | 0.0007 | 0.0017 | 0.0041 |
| Min | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| Max | 0.0014 | 0.0032 | 0.0009 | 0.0009 | 0.0008 | 0.0012 | 0.0047 | 0.0060 |

## Uranium (mg/L)

**City of Peterborough Detection Limits:** **0.0005** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0009 | 0.0005 | 0.0005 | 0.0005 |
| August 3, 2016 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0006 | 0.0006 |
| August 8, 2016 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| August 17, 2016 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| August 24, 2016 | 0.0005 | 0.0005 | 0.0005 | 0.0006 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| August 31, 2016 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| September 6, 2016 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0008 |
| Average | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0006 | 0.0005 | 0.0005 | 0.0006 |
| Min | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| Max | 0.0005 | 0.0005 | 0.0005 | 0.0006 | 0.0009 | 0.0005 | 0.0006 | 0.0008 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0005 | 0.0007 | 0.0044 | 0.0013 | 0.0015 | 0.0011 | 0.0005 | |
| August 3, 2016 | 0.0006 | 0.0007 | 0.0050 | 0.0013 | 0.0013 | 0.0006 | 0.0005 | 0.0005 |
| August 8, 2016 | 0.0005 | 0.0007 | 0.0053 | 0.0015 | 0.0011 | 0.0006 | 0.0005 | 0.0005 |
| August 17, 2016 | 0.0005 | 0.0009 | 0.0052 | 0.0010 | 0.0015 | 0.0012 | 0.0005 | 0.0005 |
| August 24, 2016 | 0.0005 | 0.0007 | 0.0038 | 0.0007 | 0.0018 | 0.0009 | 0.0005 | 0.0005 |
| August 31, 2016 | 0.0005 | 0.0006 | 0.0031 | 0.0007 | 0.0009 | 0.0008 | 0.0005 | 0.0005 |
| September 6, 2016 | | 0.0010 | | | | | | |
| Average | 0.0005 | 0.0008 | 0.0045 | 0.0011 | 0.0014 | 0.0009 | 0.0005 | 0.0005 |
| Min | 0.0005 | 0.0006 | 0.0031 | 0.0007 | 0.0009 | 0.0006 | 0.0005 | 0.0005 |
| Max | 0.0006 | 0.0010 | 0.0053 | 0.0015 | 0.0018 | 0.0012 | 0.0005 | 0.0005 |

## Vanadium (mg/L)

**City of Peterborough Detection Limits:** **0.0001** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0007 | 0.0008 | 0.0016 | 0.0013 | 0.0149 | 0.0011 | 0.0023 | 0.0008 |
| August 3, 2016 | 0.0037 | 0.0019 | 0.0048 | 0.0070 | 0.0023 | 0.0011 | 0.0013 | 0.0010 |
| August 8, 2016 | 0.0004 | 0.0004 | 0.0006 | 0.0004 | 0.0009 | 0.0008 | 0.0021 | 0.0011 |
| August 17, 2016 | 0.0003 | 0.0004 | 0.0004 | 0.0004 | 0.0005 | 0.0006 | 0.0016 | 0.0018 |
| August 24, 2016 | 0.0020 | 0.0002 | 0.0003 | 0.0032 | 0.0006 | 0.0012 | 0.0010 | 0.0004 |
| August 31, 2016 | 0.0001 | 0.0002 | 0.0006 | 0.0004 | 0.0005 | 0.0005 | 0.0004 | 0.0006 |
| September 6, 2016 | 0.0001 | 0.0001 | 0.0003 | 0.0008 | 0.0012 | 0.0018 | 0.0036 | 0.0081 |
| Average | 0.0010 | 0.0006 | 0.0012 | 0.0019 | 0.0030 | 0.0010 | 0.0018 | 0.0020 |
| Min | 0.0001 | 0.0001 | 0.0003 | 0.0004 | 0.0005 | 0.0005 | 0.0004 | 0.0004 |
| Max | 0.0037 | 0.0019 | 0.0048 | 0.0070 | 0.0149 | 0.0018 | 0.0036 | 0.0081 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0006 | 0.0007 | 0.0008 | 0.0031 | 0.0015 | 0.0008 | 0.0002 | |
| August 3, 2016 | 0.0012 | 0.0012 | 0.0006 | 0.0005 | 0.0008 | 0.0004 | 0.0001 | 0.0001 |
| August 8, 2016 | 0.0083 | 0.0009 | 0.0006 | 0.0005 | 0.0006 | 0.0013 | 0.0001 | 0.0001 |
| August 17, 2016 | 0.0012 | 0.0011 | 0.0018 | 0.0003 | 0.0011 | 0.0005 | 0.0001 | 0.0001 |
| August 24, 2016 | 0.0002 | 0.0007 | 0.0012 | 0.0003 | 0.0133 | 0.0005 | 0.0001 | 0.0001 |
| August 31, 2016 | 0.0008 | 0.0017 | 0.0026 | 0.0006 | 0.0006 | 0.0002 | 0.0001 | 0.0001 |
| September 6, 2016 | | 0.0006 | | | | | | |
| Average | 0.0021 | 0.0010 | 0.0013 | 0.0009 | 0.0030 | 0.0006 | 0.0001 | 0.0001 |
| Min | 0.0002 | 0.0006 | 0.0006 | 0.0003 | 0.0006 | 0.0002 | 0.0001 | 0.0001 |
| Max | 0.0083 | 0.0017 | 0.0026 | 0.0031 | 0.0133 | 0.0013 | 0.0002 | 0.0001 |

## Zinc (mg/L)

**City of Peterborough Detection Limits:** **0.0005** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0378 | 0.0848 | 0.1400 | 0.0962 | 0.2160 | 0.0595 | 0.0386 | 0.0306 |
| August 3, 2016 | 0.1500 | 0.0741 | 0.0787 | 0.0567 | 0.0662 | 0.0533 | 0.0522 | 0.0556 |
| August 8, 2016 | 0.0694 | 0.0740 | 0.1170 | 0.1070 | 0.0652 | 0.0535 | 0.0627 | 0.0549 |
| August 17, 2016 | 0.0871 | 0.0462 | 0.0622 | 0.0523 | 0.0496 | 0.0532 | 0.1220 | 0.1090 |
| August 24, 2016 | 0.3890 | 0.0587 | 0.0731 | 0.3070 | 0.0862 | 0.0885 | 0.1050 | 0.0994 |
| August 31, 2016 | 0.0287 | 0.0492 | 0.1020 | 0.0468 | 0.0742 | 0.0726 | 0.0750 | 0.0673 |
| September 6, 2016 | 0.0165 | 0.0292 | 0.0513 | 0.0474 | 0.0737 | 0.0521 | 0.0664 | 0.1220 |
| Average | 0.1112 | 0.0595 | 0.0892 | 0.1019 | 0.0902 | 0.0618 | 0.0746 | 0.0770 |
| Min | 0.0165 | 0.0292 | 0.0513 | 0.0468 | 0.0496 | 0.0521 | 0.0386 | 0.0306 |
| Max | 0.3890 | 0.0848 | 0.1400 | 0.3070 | 0.2160 | 0.0885 | 0.1220 | 0.1220 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.0313 | 0.0278 | 0.0362 | 0.0323 | 0.0425 | 0.0390 | 0.0082 | |
| August 3, 2016 | 0.0510 | 0.0696 | 0.0591 | 0.0227 | 0.0606 | 0.0704 | 0.0040 | 0.0005 |
| August 8, 2016 | 0.0813 | 0.0543 | 0.0383 | 0.0342 | 0.0510 | 0.0731 | 0.0103 | 0.0014 |
| August 17, 2016 | 0.0924 | 0.0546 | 0.0319 | 0.0189 | 0.0402 | 0.0346 | 0.0034 | 0.0009 |
| August 24, 2016 | 0.0389 | 0.0445 | 0.0373 | 0.0429 | 0.1240 | 0.0531 | 0.0057 | 0.0015 |
| August 31, 2016 | 0.0526 | 0.0876 | 0.0341 | 0.0321 | 0.0548 | 0.0383 | 0.0031 | 0.0005 |
| September 6, 2016 | | 0.0345 | | | | | | |
| Average | 0.0579 | 0.0533 | 0.0395 | 0.0305 | 0.0622 | 0.0514 | 0.0058 | 0.0010 |
| Min | 0.0313 | 0.0278 | 0.0319 | 0.0189 | 0.0402 | 0.0346 | 0.0031 | 0.0005 |
| Max | 0.0924 | 0.0876 | 0.0591 | 0.0429 | 0.1240 | 0.0731 | 0.0103 | 0.0015 |

## Zirconium (mg/L)

**City of Peterborough Detection Limits:** **0.001** **mg/L**

***Values below detection limit are listed as the detection limit and highlighted in blue***

| Sample Description | Influent (16B1-1) | 16B1-2 | 16B2-1 | 16B2-2 | 16B3-1 | 16B3-2 | 16B4-P | 16B5-A |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.002 | 0.001 | 0.002 | 0.002 | 0.010 | 0.002 | 0.001 | 0.001 |
| August 3, 2016 | 0.003 | 0.002 | 0.001 | 0.001 | 0.002 | 0.001 | 0.001 | 0.001 |
| August 8, 2016 | 0.002 | 0.002 | 0.001 | 0.003 | 0.001 | 0.001 | 0.001 | 0.001 |
| August 17, 2016 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.002 | 0.001 |
| August 24, 2016 | 0.001 | 0.001 | 0.001 | 0.004 | 0.002 | 0.001 | 0.001 | 0.001 |
| August 31, 2016 | 0.003 | 0.003 | 0.003 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |
| September 6, 2016 | 0.001 | 0.001 | 0.002 | 0.001 | 0.002 | 0.005 | 0.002 | 0.002 |
| Average | 0.002 | 0.002 | 0.002 | 0.002 | 0.003 | 0.002 | 0.001 | 0.001 |
| Min | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |
| Max | 0.003 | 0.003 | 0.003 | 0.004 | 0.010 | 0.005 | 0.002 | 0.002 |

| Sample Description | 16B6-P | 16B6-A | 16BR-1 | 16SH-1 | 16SH-3 | 16SH-2 | Reference Stream | Blank |
|---|---|---|---|---|---|---|---|---|
| Sample Date | | | | | | | | |
| July 27, 2016 | 0.001 | 0.001 | 0.001 | 0.004 | 0.002 | 0.001 | 0.001 | |
| August 3, 2016 | 0.001 | 0.002 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |
| August 8, 2016 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |
| August 17, 2016 | 0.001 | 0.001 | 0.002 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |
| August 24, 2016 | 0.001 | 0.001 | 0.001 | 0.001 | 0.012 | 0.001 | 0.001 | 0.001 |
| August 31, 2016 | 0.001 | 0.001 | 0.003 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |
| September 6, 2016 | | 0.001 | | | | | | |
| Average | 0.001 | 0.001 | 0.002 | 0.002 | 0.003 | 0.001 | 0.001 | 0.001 |
| Min | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |
| Max | 0.001 | 0.002 | 0.003 | 0.004 | 0.012 | 0.001 | 0.001 | 0.001 |

# Centre for Alternative Wastewater Treatment

## Vision

The Centre for Alternative Wastewater Treatment (CAWT) strives to become a leader in the research, development, improvement, and commercialization of new water-related technologies and solutions. The CAWT is an internationally recognized research facility that conducts research in the areas of water and wastewater treatment and is part of Fleming College. Working with industry partners on emerging concepts to real world applications, it is our goal to turn innovative ideas into market advantage for a cleaner world.

cawt.ca