2018/2019 Biennial Report, Cavendish Waste Disposal Site

Provisional Certificate of Approval No.: A341206

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Prepared for:
The Corporation of the Municipality of Trent Lakes

 Reference No.: 8640-002

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Executive Summary

The Cavendish waste disposal site under Ministry of the Environment, Conservation and Parks Environmental Compliance Approval No. A341206. The Site is on part of Lot 15, Concession 3, geographic Cavendish Township, Municipality of Trent Lakes, County of Peterborough. The Site is at 3405 Highway 507, 750 m northwest of Mississagua Lake and consists of an approved fill area of 0.8 ha within a total site area of 2.0 ha. The site ceased landfilling in 2008 and now operates as a waste transfer station.

Groundwater flow continued to be toward the north and south of the waste mound, with a steeper gradient always towards the south. The primary flow path for impacted water was within the overburden and discharged to surface.

Results from the 2018/2019 monitoring period indicated that there were minor site-related impacts in down-gradient groundwater. The leachate plume had migrated farther south to DP6 where a weak leachate signature was observed. The impacts to the north did not reach the northern property boundary.

The surface water data continued to indicate leachate impacts were occurring at surface water locations near the landfill. Off-site impacts were also evident to a much lesser degree. Some of the elevated concentrations were attributed to natural processes and road salt impacts. The impacts were unlikely to result in adverse impacts to Mississagua Lake or the Miskwaa Ziibi River or to aquatic life in those systems.

An updated surface water trigger mechanism was proposed for the site in 2019. Application of this trigger did not activate Tier 1.

The Cavendish waste disposal site was operated in compliance with the Environmental Compliance Approval in 2018 and 2019.

Recommendations have been provided by Cambium Inc. regarding work to be completed in 2020 and 2021.

Respectfully submitted,

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1.0 Introduction

Cambium Inc. (Cambium) was retained by the Corporation of the Municipality of Trent Lakes (Municipality) to complete the 2018/2019 (monitoring period) biennial monitoring program for the Cavendish waste disposal site (Site). The Site operates in accordance with the Ontario Ministry of the Environment, Conservation and Parks (Ministry) Environmental Compliance Approval (ECA) No. A341206, issued on October 2, 2017 (Appendix A).

To aid in the understanding of the Site history and development, the following information is included digitally in the report package:

- Cavendish Landfill, Closure Plan and Transfer Station Application (TSH, 2006)
- *Surface Water/Wetland Biological Investigation* (AECOM, 2009)
- *Cavendish Landfill Site –Closure Plan* (WSP, 2015)
- Operations Amendment and supporting documents, submitted to the Ministry in May 2016
- Historical water quality included in the *Cavendish Transfer Station/Closed Landfill Site, 2014-2015 Biennial Monitoring Report* (WSP, 2016)

1.1 Site Location

The Site is on part of Lot 15, Concession 3, geographic Cavendish Township, Municipality of Trent Lakes, County of Peterborough. The Site is at 3405 Highway 507, 750 m northwest of Mississagua Lake. The Universal Transverse Mercator (UTM) coordinates for the Site entrance are Zone 17T, 710774m east 4954973m north (Figure 1).

1.2 Scope of Work

The scope of the 2018 and 2019 work program was based the results of the 2016-02017 monitoring program (Cambium, 2018), requirements of the ECA and included:

- Site inspection
- Review of Site operations and development

- Groundwater elevation monitoring in the spring and autumn
- Groundwater sampling and analysis in the spring and autumn
- Surface water sampling and analysis in the spring and autumn
- Preparation of this biennial report

In addition, this report addresses the following correspondence from the Ministry (Appendix B):

- Comments dated November 27, 2018, by Dana Cruikshank, Surface Water Evaluator, Eastern Region Technical Support Section, following review of the report entitled *Cavendish Waste Disposal Site, 2016-2017* (Cambium, 2018).
- Comments dated March 27, 2019, by Shawn Trimper, Groundwater Evaluator, Eastern Region Technical Support Section, following review of the report entitled *Cavendish Waste Disposal Site, 2016-2017* (Cambium, 2018).
- Email from Cambium to Gary Muloin, Senior Environmental Officer, requesting changes to the monitoring program, dated March 28, 2019.
- Letter dated March 28, 2019, by David Bradley, District Manager, regarding the request to change the analytical data reporting requirements for the Site.

1.3 Site Description

The Site operated as a natural attenuation landfill for the disposal of domestic, commercial, and non-hazardous solid industrial waste from 1972 until landfilling was ceased in December 2007. Following Ministry approval in February 2007, the Site was converted to a waste transfer station. Final grading and closure activities of the landfill portion of the Site were completed in 2015.

On October 2, 2017 a consolidated ECA was issued to revoke and replace all previously issued amendments to the ECA. The Site consists of an approved fill area of 0.8 ha within a licensed site area of 2.0 ha within a total property area of 7.5 ha. A Transfer Station for solid, non-hazardous municipal waste, municipal hazardous and special wastes (MHSW), waste electrical and electronic equipment (WEEE), and organic waste currently is licensed to operate

at the Site. A Local Topography Plan, a Sample Location Plan, and an Existing Conditions plan are attached as Figure 2, Figure 3, and Figure 4, respectively.

2.0 Methodology

The 2018 and 2019 work program was completed to maintain compliance with the Site ECA and Ministry guidelines and regulations. As such, the monitoring work program was completed consistent with the *Guidance Manual for Landfill Sites Receiving Municipal Waste* (MOEE, 1993) and *Monitoring and Reporting for Waste Disposal Sites, Groundwater and Surface Water, Technical Guidance Document* (MOE, 2010).

Field tasks were completed following Cambium's Standard Operating Procedures developed from recognized standard procedures such as those listed above and the Ministry document *Guidance on Sampling and Analytical Methods for use at Contaminated Sites in Ontario* (MOEE, 1996). A health and safety program was developed for site-specific conditions and all Cambium personnel working on the project were familiarized and required to follow the identified protocol.

Groundwater and surface water samples were collected at the locations and frequencies shown in Table 1. All collected surface water and groundwater samples were stored in coolers with freezer packs and maintained at less than 10°C after collection and during transport to Caduceon Environmental Laboratories in Kingston, Ontario (Caduceon). Caduceon is accredited by the Canadian Associations for Laboratory Accreditation Inc. for specific environmental tests listed in the scope of accreditation.

2.1 Groundwater Monitoring Program

Cambium staff were on-site on May 30 and November 13, 2018, and April 17 and November 12, 2019, to conduct groundwater sampling from the groundwater monitoring wells in the established groundwater monitoring network, listed below.

- DP1
- DP4
- DP5
- DP6

DP1 was frozen in November 2019 and a sample could not be obtained.

The following tasks were completed as part of the monitoring program:

- Prior to sampling, water levels were measured at each monitoring well using an electronic water level tape
- Each monitoring well to be sampled was purged of approximately three well bore volumes. Where wells were observed to go dry, only one well volume was purged. The required purge volume was calculated on-site during each monitoring based on the measured water level, well depth, and well diameter. Purged water was disposed of on-site, down-gradient of each respective monitor.
- Samples were collected using dedicated polyethylene tubing equipped with inertial-lift footvalves
- Groundwater samples for metals analysis were field filtered
- Field measurements were recorded, where possible, for pH, conductivity, temperature, dissolved oxygen (DO), and oxygen reduction potential (ORP).

Groundwater samples were submitted for the analysis of the parameters on Table 1. In 2019, Table 1 was amended to ensure parameters analyzed for surface and groundwater were harmonized, and include VOCs historically characteristic of the site. These changes were completed based on technical review of the data by Cambium and Ministry Technical Support Section staff, and approval by District Manager (Appendix B).

A summary of the groundwater elevations are in Table 2. The results of the groundwater monitoring program are discussed in Section 4.1 and summarized in Table 3 and Table 4.

Locations of groundwater monitoring wells are on Figure 3 to Figure 6. The groundwater field data sheets are in Appendix C, laboratory Certificates of Analysis as provided by Caduceon are in Appendix D, and photographs of the monitoring wells are in Appendix E.

Blind duplicate groundwater samples were collected from the wells identified below as part of the Quality Assurance/Quality Control (QA/QC) program:

- DP4 – May 2018
- DP5 – November 2018, April and November 2019

As this represents 10 percent of the samples taken, this program is considered sufficient. In addition to these samples, the laboratory completes internal QA/QC. The results of the QA/QC program are presented in Section 4.1.

2.2 Surface Water Monitoring Program

Cambium staff were on-site May 30 and November 13, 2018, and April 17 and November 12, 2019, to conduct surface water sampling from the following:

- SW1
- SW2
- SW3
- SW4
- SW5
- SW6

Samples were not collected as follows:

- SW2 and SW3 were partially frozen and had limited volumes of water in November 2018
- SW1, SW3, and SW6 were frozen in November 2019
- SW2 was dry in November 2019

The following tasks were completed as part of the monitoring program:

- Surface water samples were collected by immersing the sample container into the water body. When only a low volume of water volume was present, sampling was completed using a peristaltic pump as recommended by the Surface Water Scientist in his comments dated November 27, 2018 (Appendix B).
- Where sample bottles were prefilled with preservatives, a clean bottle was used to collect and decant the water directly into the sample bottle.
- Field measurements were recorded, where possible, for pH, conductivity, temperature, DO, and ORP.
- Where possible, measurements of depth, width, and flow velocity measurements were recorded at each surface water location.

Surface water samples were submitted for the analysis of the parameters in Table 1. As noted, the monitoring program was revised in 2019 to reflect recommendations from Cambium (Cambium, 2018) and the Ministry Technical Support Section (Appendix B).

The results of the surface water sampling program are discussed in Section 4.3 and summarized in Table 5. Surface water sample locations are included on Figure 3. Surface water field sheets are in Appendix C, the laboratory Certificates of Analysis as provided by Caduceon are in Appendix D, and photographs of the surface water sampling stations are in Appendix E.

Blind duplicate surface water samples were collected from station SW4 during all sampling events in 2018 and 2019 as part of the QA/QC program. As this represents 10 percent of the samples taken, this program is considered sufficient. In addition to these samples, the laboratory completes internal QA/QC. The results of the QA/QC program are presented in Section 4.1.

2.3 Landfill Gas Monitoring Program

Landfill gas (LFG) is not actively managed at the Site. The large, open site area and isolated location from the public supports passive landfill gas management, which allows generated landfill gas to naturally disperse through the waste and naturally-permeable cover to the atmosphere.

2.4 Site Inspection and Operations Overview

Site operations were observed during the visits conducted by Cambium staff in 2018 and 2019. In February 2019 and 2020, the Municipality provided additional Site maintenance information from the 2018 and 2019. The results of the Site inspections conducted are presented in Section 5.0.

During site visits the following items were inspected on accessed areas of the Site and observations noted in the field file:

- condition and layout of access roads, access gates
- condition and layout of recycling bins
- status of monitoring well security
- litter control
- final cover

3.0 Geological and Hydrogeological Context

3.1 Topography and Drainage

The Site is situated in the Great Lakes (St. Lawrence) primary watershed, the Lake Ontario and Niagara Peninsula secondary watershed, and the Kawartha Lakes tertiary watershed.

The Site is within a ravine between two north/south oriented trending granitic bedrock ridges and is bordered by wetlands to the north and south of the Site. Surface water surrounding the Site is characterized as ponded (unevaluated) wetland environment. Drainage from the waste mound area drains primarily to the south (a drop of 13.0 m); however, some overland drainage is present to the north of the waste mound toward the northern property boundary and the unevaluated wetland there (a drop of 7.0 m). This wetland drains north, under County Road 507, and drains into the Miskwaa Ziibi River (formerly known as the Squaw River) northwest of the Site. The Miskwaa Ziibi River eventually drains into Little Bald Lake, part of the Trent Severn Waterway. Drainage that flows overland to the south enters an unevaluated wetland and tributary that both drain into Mississagua Lake and River, south of the Site. Mississagua River also drains into the Trent Severn Waterway, but at Lower Buckhorn Lake. Any seasonal ponding that develops in the immediate vicinity and east of the waste mound typically infiltrates into the ground.

The following six surface water locations are on and around the Site (Figure 3):

- SW1 is at the northern toe of the waste mound
- SW2 is down-gradient and at the southern toe of the waste mound
- SW3 is in the southern wetland 25 m south of the southern property boundary
- SW4 is a culvert beneath West Bay Road 600 m south of the southern property boundary
- SW5 is in a tributary 1 km southeast of the southern property boundary
- SW6 is in the northern wetland within close proximity to the northern property boundary, 115 m north of the waste mound

The UTM coordinates for all surface water monitoring locations are also provided in Embedded Table 1.

Embedded Table 1 Surface Water Sampling Observations (2018 and 2019)

Station	Station UTM [1]	May 2018	November 2018	April 2019	November 2019
SW1 Velocity (m/s) Discharge (m³/s)	710839 m E 4955081 m N	< 0.1 < 0.02	Ponded – No Observable Flow	Ponded – No Observable Flow	Frozen
SW2 Velocity (m/s) Discharge (m³/s)	710844 m E 4954891 m N	Ponded – Wetland	Partially Frozen Insufficient Volumes	Ponded – No Observable Flow	Dry
SW3 Velocity (m/s) Discharge (m³/s)	710874 m E 4954839 m N	Ponded – Wetland	Partially Frozen Insufficient Volumes	Ponded – No Observable Flow	Frozen
SW4 Velocity (m/s) Discharge (m³/s)	710960 m E 4954273 m N	Ponded – No Observable Flow	0.1 0.001	< 0.1 <0.005	< 0.10 < 0.001
SW5 Velocity (m/s) Discharge (m³/s)	711351 m E 4953792 m E	Ponded – No Observable Flow	0.10 0.07	0.05 0.038	Too Wide/Deep for Accurate Measurement
SW6 Velocity (m/s) Discharge (m³/s)	710769 m E 4955159 m N	Ponded – No Observable Flow	Ponded – No Observable Flow	Ponded – No Observable Flow	Frozen

Notes:

1. Zone 17

In response to comments from the Surface Water Scientist dated November 27, 2018, Cambium staff were on-site almost monthly from May to October to record observations at SW2. The following was recorded:

- May 7: 0.1 m, Ponded
- June 24: water depth 0.1 m, Ponded
- July 16: Dry
- August 27: Dry
- October 10: Dry

There was some staining at SW1 in April 2019 that was indicative of groundwater leachate discharge (Appendix E). During the remainder of the sampling events in 2018 and 2019, where discolouration was present, it was attributed to the low-lying organic environments at each location and/or stagnant and ponded conditions.

The 2018 and 2019 precipitation data for Haliburton County (Government of Canada, 2019) were compared to the average precipitation data for 1981 to 2010 (Government of Canada, 2015) and indicated the total annual precipitation was consistent with historical normal; however, individual months varied. Notably, April and August 2018 and April and October 2019 received nearly double the normal. Conversely March 2018 and November 2019 received only about half and 2/3 the normal, respectively. Embedded Table 2 includes the amount of precipitation during and in the three days prior to the sampling events. Refer to Appendix C for field sheets and climate data.

Embedded Table 2 Historical and 2018 and 2019 Precipitation Data

Sampling Date	Average Monthly Precipitation (mm) (1981 – 2010)	2018 Monthly Precipitation (mm)	2019 Monthly Precipitation (mm)	Precipitation During and Prior to Sampling (mm)
May 30, 2018	93.3	79.4	-	0.0
November 13, 2018	116.4	107.0	-	6.0
April 17, 2019	75.6	-	142.0	26.6
November 12, 2019	116.4	-	75.4	3.0

3.2 Hydrogeology

Relief at the Site is controlled by bedrock topography. The overburden is composed of silty fine sand and extends to depths of about 2.5 m below ground surface (bgs). Materials underlying the shallow overburden unit likely consist of carbonate metasedimentary rock. The depth to the water table varies across the Site, but is generally 1.0 mbgs to the north and south of the waste mound. The shallow groundwater table is characterized by the presence of the wetlands to the north and south of the Site. (WSP, 2016)

The waste mound is within a bedrock depression and is surrounded by wetlands. Based on the presence of the shallow water table, impacted groundwater is interpreted to drain from the waste mound immediately to surface in the wetlands.

The current monitoring program consists of the following shallow drive-point piezometers:

- DP1 is down-gradient and at the southern toe of the waste mound, adjacent to SW2
- DP4 is within close proximity to the northern property boundary and is 115 m north of the waste mound, adjacent to SW6
- DP5 is at the northern toe of the waste mound and is adjacent SW1
- DP6 is 25 m south of the southern property boundary and is adjacent to SW3

Borehole logs were not available for the shallow drive-point monitors in recent annual reports; however, as discussed in Section 3.2.1, Ministry well records were available for monitors DP4, DP5, and DP6. Available logs indicated the drive-points were installed in organic soil (assumed to be peat) to depths ranging from 1.5 to 1.8 mbgs.

3.2.1 Water Well Records

A Ministry water well search was completed and one record for a domestic supply well was identified within 500 m of the waste mound (Cambium, 2018). The water well is east of the waste mound and Site and south of Scott's Road. It is completed 37.2 mbgs in the deep granite bedrock unit. Given that groundwater discharging from the waste mound is interpreted to be restricted to the shallow overburden unit and directed to the southwest, no adverse impacts from the Site are expected.

In addition to the domestic supply well, three well records were identified on the property which were determined to be wells DP4, DP5, and DP6, installed in 2009.

The water well records are in Appendix F and locations of all wells are on Figure 3.

3.2.2 Groundwater Flow Direction

Groundwater elevations collected from each monitoring well in 2018 and 2019 were used to define the horizontal groundwater flow direction at the Site. Groundwater elevation data is summarized in Table 2 and on Figure 5 and Figure 6. Elevations in 2018 and 2019 were consistent with historical results with the exception of DP6 in April 2019 which was considered high.

Regionally, the groundwater flow direction in the bedrock is east, towards Mississagua Lake. Local groundwater flow has been primarily to the south of the waste mound, toward the southern wetland. Historically there was a slight northern component of flow toward the wetland north of the waste mound which drains into the Miskwaa Ziibi River (formerly known as the Squaw River). It was inferred this component of flow was related to groundwater mounding which has receded since the waste mound was capped and closed.

The primary flow path for impacted groundwater was to the south of the waste mound, within the shallow overburden unit, ultimately discharging to surface. Horizontal gradients were an average of 0.022 m/m during all monitoring events in 2018 and 2019.

4.0 Results and Discussion

Water quality results are used to assess the existence, extent, and intensity of impacts to the surface water and groundwater environments related to waste disposal site activities. Water quality data are compared against background water quality and historical data for the Site to permit an analysis of any significant changes or trends in the water quality over time. This section presents the results of the 2018 and 2019 monitoring programs at the Site.

4.1 Quality Assurance/Quality Control

Analysis results for blind duplicate samples collected as part of the 2018 and 2019 monitoring program were evaluated. Parameter concentrations were considered to be significantly different if the relative percent difference (RPD) between the duplicate and the parent samples was greater than 30% when both results were greater than five times the reported detection limit (RDL).

Parent/duplicate samples with only one measurable concentration were assessed qualitatively. If the measurable concentration was close to the RDL, the sample results were considered valid and the measurable concentration was accepted.

Groundwater duplicate results showed good correlation with the parent sample results with the exception of the parameters outlined in Embedded Table 3 where the RPD exceeded the data quality objective (DQO) of 30%.

Embedded Table 3 QA/QC Evaluation (2018 & 2019)

November 2018 – DP5	November 2019 – DP5
Chemical Oxygen Demand (COD) – 49% Total Phosphorus – 38%	COD – 44%

The evaluation of the surface water data from the parent and duplicate samples did not identify any results where the RPD exceeded the DQO of 30%.

Overall, the water quality data were considered suitable for their intended use, which was to identify changes in water quality and analyzed parameters present at concentrations greater than the applicable standards. The water quality data were interpreted with confidence.

4.2 Groundwater Quality

Groundwater analytical data from 2006 to 2019 are summarized in Table 3. The groundwater quality data for samples collected in 2018 and 2019 have been compared with the historic results and background water quality data, and compliance has been assessed with Ministry Guideline B-7 Reasonable Use Concept (MOEE, 1994a). Given groundwater discharges to surface down-gradient of the waste mound, compliance was also assessed using the Provincial Water Quality Objectives (PWQO) (MOEE, 1994b). Where PWQO criteria were not available, or in the case of boron which was developed with more current toxicological information, the Canadian Water Quality Guidelines for the Protection of Aquatic Life (CWQG) (CCME, 2007) were used.

4.2.1 Background Groundwater Quality

When evaluating the impact a waste disposal site has on groundwater resources, a reference point or value must be established to assist in determining the magnitude of the impact. The quality of the groundwater that is not impacted by the waste disposal site operation (background water quality) should be used for comparison purposes.

Historically, there has not been a designated background monitor at the Site. Groundwater monitor DP4 has been considered representative of background groundwater quality at the Site given that it had the best water quality of all drive-point monitors on-site and because there is a shallower horizontal gradient towards the north (in the direction of this monitor).

Water quality at drive-point DP4 has historically been characterized by generally low parameter concentrations, with elevated total suspended solids (TSS) and iron. Only DO (low) did not meet the PWQO/CWQG in November 2019.

4.2.2 Leachate Characteristics

Leachate indicator parameters (LIPs) were identified for the Site by evaluating water quality at the immediate down-gradient monitor DP5, which has generally exhibited the poorest water quality at the Site. Monitor DP5 has exhibited elevated concentrations of most parameters, but most notably for those parameters outlined in Embedded Table 4. Following comments received from Shawn Trimper dated March 27, 2019 (Appendix B), barium, boron, magnesium, and potassium were added as LIPs. Time-concentrations graphs for the LIPs have been provided as (Figure 8 to Figure 23).

Embedded Table 4 Leachate Indicator Parameters

Alkalinity	Conductivity	TDS
DOC	COD	Chloride
Hardness	Calcium	Iron
Manganese	Sodium	Barium
Boron	Magnesium	Potassium
Sulphate		

Concentrations at DP5 were generally within historical ranges in 2019. Many LIPs concentrations have decreased since landfilling ceased (2007) and final closure activities were completed (2015). Conductivity, COD, and chloride were elevated greater than historical ranges in 2018 but have remained stable overall. Increasing trends for sodium and barium were identified. Conversely, sulphate decreased significantly in 2016 and has remained low. Chloride, iron, and DO (low) did not meet the PWQO/CWQG during most events in 2018 and 2019.

4.2.3 Down-gradient Groundwater Quality

Down-gradient groundwater quality is characterized by DP1 at the southern toe of the waste mound and DP6 just south of the southern property boundary.

- DP1 has exhibited poor water quality, characteristic of leachate impacts. Since landfilling operations have ceased, water quality at this location has improved. All LIP concentrations

have been stable or decreasing with the exception of barium which has been increasing. Notably, iron and manganese concentrations decreased significantly in 2014 and 2016, respectively, and have remained low. Only iron did not meet the PWQO in 2018 and 2019.

- Water quality at DP6 has historically exhibited parameter concentrations similar to background water quality. In recent years, LIP concentrations have increased reaching peak concentrations in 2018. This indicated there has been a shift in the location of the leachate plume and the plume has migrated farther south. Although parameter concentrations were greater when compared to background water quality, all concentrations were (significantly) less than those at monitors DP1 and DP5 (leachate) with the exception of COD. COD has significantly increased at DP6 in recent years, reaching concentrations similar to historical leachate concentrations at DP1 (Figure 12). Although impacts were evident at DP6, the impacts were dilute. Iron, chloride, and zinc did not meet the PWQO/CWQG in 2018 and 2019.

Overall, impacts were occurring down-gradient of the waste mound to the north (localized) and to the south. The impacts to the south have migrated to DP6 in recent years; however, only a weak leachate signature was present, with limited parameter concentrations exceeding the PWQO/CWQG.

4.2.4 Groundwater Volatile Organic Compound Monitoring

Volatile organic compound (VOC) analysis was completed during the autumn sampling events in 2018 and 2019 in accordance with Table 1. The VOC parameter list was updated in 2019 to include a more robust suite of parameters. The analytical list in 2019 included VOC parameters previously detected in groundwater at the Site. This was completed in response to comments received from the Ministry Hydrogeologist dated March 27, 2019 (Appendix B).

All VOC parameter concentrations were less than RDLs in 2019. Refer to Table 4 for a summary of VOC results.

4.2.5 Groundwater Compliance Assessment

The Ministry Reasonable Use Concept (RUC), Guideline B-7, (MOEE, 1994a) applies to operating waste disposal sites and sites closed post 1986. As the Site closed in 2002, the RUC applies to the Site.

Based on the existing hydrogeological model of the Site, leachate impacted groundwater discharges to the surface water systems down-gradient (north and south) of the Site. As dictated by the Ministry Guideline B-7 (MOEE, 1994a), where groundwater provides baseflow to a surface water feature, this is the recognized reasonable use of the groundwater; therefore, management approaches should be focused on the receiving surface water feature. As such, compliance with Ministry policies for the protection of the environment were focused to the surface water systems (Section 4.3). The Ministry Hydrogeologist agreed with this interpretation (Appendix B).

Notably, the only LIP concentrations to not meet the PWQO and/or CWQG persistently in down-gradient locations were chloride and iron. Surface water assessments in downstream surface water locations should therefore focus on these parameters.

4.3 Surface Water Quality

The surface water quality results from 2008 to 2019 are provided in Table 5 and locations are shown on Figure 3. Results from 1998 to 2007 are included digitally with this report package in the *2014-2015 Biennial Monitoring Report* (WSP, 2016). The surface water data have been compared to historic results and background water quality, and were assessed using the PWQO (MOEE, 1994b). Where PWQO criteria were not available, or in the case of boron where more current toxicological information was used to develop the criteria, the CWQG (CCME, 2007) were used. Time-concentrations graphs for the LIPs have been provided as (Figure 24 to Figure 39).

David Bradley, District Manager approved the request to remove cadmium, barium, lead, and chromium from the list of analytical reporting parameters for the Site, effective for the 2019 sampling year (Appendix B).

4.3.1 Background Surface Water Quality

Historically, a background surface water station has not been identified at the Site. Although downstream of the Site, based on the distance to SW5 (over 1.0 km south of the waste mound) and its historical water quality, SW5 has been considered representative of background surface water quality. SW5 has exhibited low concentrations of most parameters with the exception of elevated iron and total phosphorus, which were not unexpected given the ponded wetland environment. In 2018 and 2019, all parameter concentrations were stable and within historical ranges. Iron and total phosphorus exceeded the PWQO during one or more events in 2018. All parameters met compliance criteria in 2019.

4.3.2 Downstream Surface Water Quality

Surface water stations SW1 and SW6 are north of the waste mound. SW1 is immediately adjacent the waste mound and DP5. SW6 is at the property boundary, adjacent DP4 (Figure 3).

- Despite fluctuations and elevated concentrations of many parameters greater than historical ranges in May 2018, parameter concentrations at SW1 have decreased over time, significantly in many cases, since the Site was closed to landfilling in 2007. The only exception was the LIP sulphate which has increased (Figure 39). There was a dramatic shift in water quality in 2012 at SW1. Concentrations of iron, barium, and manganese, as well as non-LIPs total phosphorus and zinc increased significantly; however, have been stable since 2012. Prior to 2012, concentrations of these parameters were low or non-detect.
- Concentrations at SW6 have been stable over time. Although some parameter concentrations have been slightly greater than SW5 (background), this has been attributed to natural variations in sampling environments (variations in suspended solids and quantity of organic matter). Furthermore, SW6 is interpreted to have some elevated concentrations due to the proximity to County Road 506 and associated road de-icing activities (i.e., chloride and sodium).

- As noted, parameter concentrations were elevated in May 2018 at SW1. Otherwise, water quality at both locations were consistent with historical results in 2018 and 2019. Iron, total phosphorus, total phenolics, zinc, pH (low, lab), and DO (low) did not meet the PWQO at SW1 during one or more events. Iron and total phosphorus did not meet the PWQO at SW6 in 2018 and 2019. Chloride and DO (low) also did not meet the compliance criteria at SW6 in 2018.
- Minor impacts from the Site have been evident at SW6; however, no adverse impacts were expected to the downstream receptor Miskwaa Ziibi River. Some elevated parameter concentrations were also attributed to natural processes and road salt impacts.

SW2, SW3, and SW4 are south of the waste mound. SW2 is on-site near DP1, SW3 is just beyond the property boundary adjacent DP6, and SW4 is more than 0.5 km downstream.

- As groundwater discharges to surface almost immediately south of the waste mound, leachate impacts are expected at SW2. Furthermore, more than 1.5 m of peat has been reported in the wetland which contributes to elevated concentrations of some parameters such as iron and manganese. Water quality at SW2 and DP1 have been similar confirming the connectivity between the shallow overburden and the wetland. Water is generally only present in spring and due to persistently dry conditions in the autumn, SW2 has been sampled only 12 times since 2008. Following recommendations from the Ministry Surface Water Scientist (Appendix B), Cambium staff visited this location almost monthly from April to November in 2019. The location had less than 10 cm of water during the spring and was dry for the summer and autumn.

  Due to regular wetting and drying at this location, concentrations have fluctuated significantly making trends difficult to discern. Regardless, parameter concentrations have decreased since 2008, with concentrations in the spring of 2015 and 2019 being similar to background water quality at SW5. Chloride, DO (low), iron, total phosphorus, and un-ionized ammonia also did not meet the compliance criteria in May 2018. Only iron and total phosphorus did not meet the PWQO in 2019.

- Although water has been present at SW3 more often than SW2, this location has often been dry during autumn sampling events. SW3 has historically exhibited moderate parameter concentrations, greater than SW5 but less than SW2 for most LIPs, indicating attenuation is occurring over a short distance. Whether impacts are occurring via groundwater discharge or overland flow from SW2 is unclear; however, given the similarity between the water quality at DP6 and SW3, groundwater discharge is suspected.

  Concentrations have fluctuated at SW3, attributed to regular wetting and drying, but have been stable over time. Site-related impacts have been apparent but adverse impacts not anticipated. Elevated concentrations have also been attributed to the presence of organic soils (peat) and natural variations in sampling environments. Station SW5 is in a defined, permanent channel whereas SW3 is ephemeral. Iron, total phosphorus, and DO (low) did not meet the PWQO in May 2018. Only iron exceeded the PWQO criteria in April 2019.

- SW4 has had water quality similar to SW6 (except no evidence of road salt impacts), with most parameter concentrations slightly greater than background (SW5). Overall, only minor impacts have been evident at SW4. Iron, total phosphorus, and DO (low) did not meet the PWQO in May 2018.

A surface water and wetland investigation was completed in 2009 to assess if impacted surface water down-gradient and downstream of the landfill was toxic to the wetland plant life (AECOM, 2009). Results of this study determined iron was naturally occurring in the wetlands surrounding the Site. Although leachate is a source of iron, given the presence of suspended solids and organic matter (peat), it was not clear if the elevated concentrations of iron in downstream locations was due to the landfill, natural effects, or a combination of both. Given the uncertainty of the source of the elevated iron concentrations, the study determined boron was an appropriate indicator of leachate impacts.

Acute toxicity testing was completed using impacted water from the north wetlands (i.e., SW1 and SW6). Results found no mortality at 100% concentration. This indicated there were no acute effects on aquatic fish and biota in landfill-impacted water. At that time, the boron

concentrations were 0.54 mg/L. Due to insufficient water volumes, acute toxicity testing was not completed for the wetlands south of the landfill.

Aside from concentrations of select parameters at SW1, parameter concentrations have decreased at all downstream surface water locations since 2009, including boron which has decreased by almost half at SW1, SW2, and SW3. Notably, boron has also decreased since 2010 at DP1 and DP5. Given that water quality has improved both in the downstream surface water and down-gradient groundwater, the results from the 2009 study remain valid.

Embedded Table 5 Average Boron Concentrations

Location	Average Concentration (2008-2009)	Average Concentration (2010-2019)
SW1	0.458	0.289
SW2	**1.546**	0.785
SW3	0.508	0.356
SW4	0.072	0.066
SW5	0.033	0.029
SW6	0.011	0.078

Notes:

1. *Shaded values exceed the PWQO criteria of 0.2 mg/L.*
2. *Bold values exceed the CWQG criteria of 1.5 mg/L.*

Overall, the surface water data continued to indicate leachate impacts were occurring at surface water locations near the landfill (SW1 and SW2). Off-site impacts were also evident at SW3, SW4 and SW6, to a much lesser degree. Some of the elevated concentrations were attributed to natural processes and road salt impacts (SW6). The impacts were unlikely to result in adverse impacts to Mississagua Lake or the Miskwaa Ziibi River or to aquatic life in those systems. The Ministry Surface Water Scientist agreed with this assessment (Appendix B).

4.3.3 Compliance Assessment

As per Condition 6.1 (j) of the ECA, surface water samples are to be compared to the PWQO or Interim PWQO. As such, an assessment of surface water compliance for the Site should be completed using the following Water Management Policies:

> *Two provincial policies relate directly to the protection or restoration of satisfactory surface water quality. Policy 1 states that, where water quality is better than the PWQO, it shall be maintained at or above the objectives. Policy 2 states that water quality which does not meet the PWQO shall not be further degraded and all practical measures shall be taken to upgrade the water quality to the objectives.*

Ministry comments dated November 27, 2018, by Dana Cruikshank, Surface Water Scientist, following his review of the 2016-2017 biennial report (Appendix B), recommended the existing trigger mechanism be updated. The existing mechanism triggers Tier II sampling almost every sampling event. The proposed trigger mechanism is herein and considers the PWQO policies in accordance with the ECA.

The Site has been closed to landfilling since 2007 and final closure activities were completed in 2015. Water quality has improved since the Site ceased landfilling, with (significant) improvements seen in the downstream surface water and down-gradient groundwater. Studies in 2009 (AECOM, 2009) determined there were no acute effects on aquatic fish and biota in landfill-impacted water. This study further identified boron as a suitable parameter to assess potential adverse impacts to downstream surface water quality.

Based on results of the assessments completed by Cambium to date, there is a potential for elevated concentrations of iron and chloride in groundwater discharging to surface, greater than the PWQO and CWQG (Section 4.2.5).

Considering the above, the proposed trigger assessment is based on water quality impairments beyond those reported in 2009 with a specific focus on LIPs that have a PWQO or CWQG criteria. The only LIPs that have criteria listed in the PWQO and/or the CWQG are chloride, boron, and iron. Given that iron is naturally elevated in the vicinity of the Site (Sections 4.3.1 and 4.3.2), the background concentration for iron should be used for the trigger assessment, opposed to the PWQO. The background concentration is defined as the maximum concentration of iron at SW5 since 2009, not including the current year, for the purpose of this assessment.

4.3.3.1 Proposed Trigger Mechanism

A trigger exceedance for the surface water regime for the Site is defined as the numerical elevation:

1. greater than the CWQG for boron or chloride, or
2. greater than the background concentration for iron.

Three consecutive exceedances for boron, chloride, or iron at surface water stations SW3 or SW6, would trigger Tier 1 of the contingency plan outlined in Section 4.3.3.2.

4.3.3.2 Contingency Plan

The surface water monitoring trigger mechanism for the Site includes a three-tier system, where:

- Tier 1 is a confirmatory phase
- Tier 2 is an assessment phase
- Tier 3 is a remediation or mitigation phase

Tier 1 involves a detailed analysis of historical monitoring results by a qualified professional. The objective of this analysis is to determine if the observed impact can be attributed to the landfill. Possible outcomes of Tier 1 include:

- A determination that the exceedances are not due to landfill impacts or are not significant. In this instance, the professional might recommend changes to the trigger mechanism to avoid repeating the triggering event.
- A recommendation to proceed with Tier 2 studies. This recommendation should include detailed terms of reference for a study to determine the impact of the exceedance. This might include a recommendation for more frequent or more extensive sampling (such as toxicity sampling) or for a detailed surface water/biological study to determine if the exceedance is having an unacceptable quality/biological impact on the receiving watercourse.

- A recommendation to proceed with Tier 3 remedial action.

Recommendations for further study should include time frames for initiation and completion. The Tier 1 report should be completed and submitted to Ministry's District Manager in conjunction with the submission of the Annual Report in which the Tier 1 trigger is deemed to be occurring.

Tier 2 would involve implementation of the study phase recommended by the Tier 1 report. Possible outcomes of Tier 2 include:

- A determination that the exceedances are not having an adverse impact on the receiving watercourse. In this instance the professional might recommend changes to the trigger mechanism to avoid repeating the triggering event.
- A recommendation to proceed with Tier 3 remedial action.

Tier 3 is remedial action. Further study may be required to determine the most appropriate action(s). Follow up monitoring will be required to confirm the adequacy of the action. Remedial actions that may be considered include:

- Drainage improvements
- Installation of additional low permeability soil or geotextile capping
- Installation of a leachate collection and treatment system

Any recommendation for remedial action should include a time frame for completion of studies and implementation as well as recommended changes to the monitoring program to confirm the effectiveness of the action taken.

4.3.3.3 2019 Assessment

The proposed trigger mechanism was applied to the Site to assess the 2018 and 2019 data. Iron concentrations at SW3 exceeded the assessment criteria for three consecutive events in May 2018; however, the iron concentration was less than the assessment criteria in May 2019. There were no other instances where the concentrations of chloride, iron, or boron exceeded

the assessment criteria on three or more consecutive occasions. Tier I of the trigger was not activated.

4.4 Adequacy of Monitoring Program

In an effort to have a refined and concise monitoring program at the Site, the existing monitoring program is reviewed annually to determine if it sufficiently monitors impacts at the Site. Following the 2018 and 2019 assessment, the monitoring program continues to effectively characterize Site conditions, groundwater and any groundwater discharges from the Site, and surface water conditions and includes data that relates to upstream/background and downstream receiving water conditions.

Although the parameter suite for groundwater and surface water were updated in 2019 to reflect recommendations and support from the Ministry Technical Support Section, the following recommendations were made with following the 2018/2019 assessment.

Approval was granted by the Ministry District Manager to remove barium from the approved monitoring program. As barium was identified by Shawn Trimper, Hydrogeologist as a LIP (Appendix B), this parameter should be included in the groundwater parameter suites, during the spring and autumn. Similarly, potassium was also identified as a LIP and is currently only included in the autumn parameter suite. Potassium should be added to the groundwater parameter suite in the spring.

Although the recently approved monitoring program included a short suite for surface water in the spring and a long suite in the autumn, Dana Cruickshank, Surface Water Scientist recommended that the long suite of parameters be analyzed in the spring and autumn, particularly given SW2 and SW3 are often dry in the autumn (Appendix B). As such, the long (autumn) suite should be analyzed twice per year. Refer to Embedded Table 6 for the monitoring program to be implemented at the Site in 2020.

As discussed in Section 4.3.3, modifications have been recommended for the surface water trigger mechanism. The proposed trigger mechanism should be provided to the Technical Support Section for review and comment.

Embedded Table 6 2020 Monitoring Program

Location	Task	Frequency	Parameters
GROUNDWATER			
DP1, DP4, DP5, DP6 1 QA/QC Duplicate	• Measure groundwater levels • Groundwater sampling • Field Measurements (pH, temperature, conductivity, dissolved oxygen, ORP)	Once (Spring)	Alkalinity, Ammonia, Barium, Boron, Calcium, Chloride, Conductivity, COD, DOC, Iron, Magnesium, Manganese, Nitrate, Nitrite, pH, Potassium, Sodium, TDS, Sulphate, Hardness
DP1, DP4, DP5, DP6 1 QA/QC Duplicate	• Measure groundwater levels • Groundwater sampling Field Measurements (pH, temperature, conductivity, dissolved oxygen, ORP)	Once (Autumn)	Alkalinity, Ammonia, Arsenic, Barium, Boron, Calcium, Chloride, Conductivity, COD, DOC, Copper, Iron, Magnesium, Manganese, Mercury, Nitrate, Nitrite, pH, Potassium, Sodium, TDS, Sulphate, Zinc, Hardness Acetone, Benzene, Chlorobenzene, 1,4-Dichlorobenzene, 1,1-Dichloroethane, cis-1,2-Dichloroethylene, Dichloromethane, Methyl Ethyl Ketone, Toluene, and Vinyl Chloride
DP-1		Twice (Spring and Autumn)	BOD, TSS
SURFACE WATER			
SW1, SW2, SW3, SW4, SW5, SW6 1 QA/QC Duplicate	• Surface water sampling • Flow estimates • Field measurements (pH, temperature, conductivity, dissolved oxygen and ORP)	Twice (Spring and Autumn)	Alkalinity, Ammonia, Arsenic, Barium, Boron, Calcium, Chloride, Conductivity, COD, DOC, Copper, Iron, Magnesium, Manganese, dissolved Mercury, Nitrate, Nitrite, pH, Potassium, Sodium, TDS, Sulphate, Zinc, Hardness, Total Phosphorous, TSS, BOD, Phenols, TKN

5.0 Site Operations

This section presents a summary of operations in 2018 and 2019 for the Site. Furthermore, this section addresses the requirements detailed in Condition 6 (1) and 6 (3) of the ECA.

- The report shall include the status of all monitoring wells and a statement as to compliance with R.R.O. 1990 Regulation 903 - Wells (Section 5.7)
- A summary of type and quantity of incoming waste accepted and transferred from the Transfer Station (Section 5.8 and Table 6)
- A summary of the site's operation procedure and compliance (Section 5.9)
- A summary of recycling operations (Section 5.8)
- A summary of any rejected wastes (Section 5.6)
- A summary of any incidents (Section 5.5)
- A summary of complaints received (Section 5.5)
- Any changes to the Site Operations and Maintenance Manual and/or the Transfer Station Safety and Emergency Response Procedures since the last annual report (Section 5.10)
- A statement as to compliance with all conditions of this Approval, a description of any operational changes and/or transfer station improvements undertaken and all other operational issues (Section 5.11)
- Any recommendations to minimize environmental impacts from the operation of the Site and to improve Site operations and monitoring programs in this regard (Section 5.9)

5.1 Site Access and Security

The Site is well screened by surrounding forest and thick vegetation. Site access is controlled from County Road 507 by a chain linked fence which was observed to be in good repair during the monitoring period. An access pass card is provided to all tax paying residents of the Municipality, where access is only permitted during operational hours and with the presence of a Site attendant.

Signage is posted at the gate and the attendants shelter, which lists the hours of operation, emergency contact information, acceptable waste types, Site rules, a warning against illegal dumping, and a bear advisory.

The hours of operation during the monitoring period were:

Winter (October 1 to April 30)

Wednesday……... 8:00 AM to 12:00 PM

Saturday…….. 8:00 AM to 4:00 PM

Sunday……. 12:00 PM to 5:00 PM

Summer (May 1 to September 30)

Monday……. 8:00 AM to 1:00 PM

Wednesday…… 8:00 AM to 12:00 PM

Saturday……... 8:00 AM to 4:00 PM

Sunday…….. 12:00 PM to 8:00 PM

Previously no dates were provided for the summer and winter hours at some sites with the Municipality; simply Victoria Day to Thanksgiving Day. The hours were updated at all operating sites in the Municipality in 2018 to comply with the ECAs in regards to operating during daylight hours and to make the changeover between summer and winter hours straight forward. The change consisted of stating a date the changeover occurs as opposed to Thanksgiving weekend which then left uncertainty as to which day the change occurred.

5.2 Site Operation

In 2018 and 2019, all transfer operations were conducted under the supervision and direction of the site attendant, employed by the Municipality. The site attendant was responsible for ensuring that the safe and orderly operation and maintenance of the Site complied with the requirements of the ECA and the Environmental Protection Act and its Regulations as administered by the Ministry. The site attendant's responsibilities included, but were not limited to the following:

- controlling admission of authorized vehicles with acceptable wastes

- ensuring proper daily litter control
- controlling collection and haulage of materials by a licensed hauler
- maintain a daily record of all operations which are available for inspection by the Ministry

As part of the daily operation of the Site and outlined in the Standard Operating Procedures (MTL, 2019a), the site attendant used the following forms on each operating day, as applicable:

- TS-1 Daily Inspection Form
- TS-2 Issues and Deficiencies Forms
- TS-3 Daily Incoming Waste Form
- TS-4 Tipping Fee Form
- TS-5 Tire Form
- TS-6 Reuse Centre Form
- TS-7 Unaccepted Refused Waste & Entry Form
- TS-8 Complaint Form
- TS-9 Daily Record of Material Removed Form

5.3 Training

Semi-annual meetings were held in 2018 and 2019 with site attendants and municipal staff that operate and/or are responsible for transfer station operations. These meetings were held on March 28 and October 3, 2019. The following items were covered by these meetings and all operating personnel were trained in the following items. A record is kept of all staff who attend the meetings and/or training.

- site operating responsibilities
- receiving and recording procedures
- storage, handling, sorting and shipping procedures

- equipment inspection, operation and maintenance procedures
- housekeeping and nuisance control procedures
- site inspection procedures
- occupational health and safety concerns (related to waste)
- complaint response procedures
- procedures to be followed in the event of a spill, fire medical or other emergency
- a review of the ECA

Additionally, the following training was provided during the monitoring period.

2017 (Cambium, 2018):

- Lock out/tag out
- Handling difficult people
- Transportation of dangerous goods
- Site attendants received an educational tour of a Global Electric Electronic Processing (GEEP) plant

2018:

- First Aid/CPR
- Workplace Hazardous Materials and Information Systems (WHIMS)
- interactive training sessions of scenarios that may occur in the workplace

2019:

- Paintball Gun Training (for bear deterrence)
- Fire Extinguisher Awareness Training
- Lifting Loads Safely

5.4 Site Inspections

The following section discusses observations during site inspections conducted by Cambium and discusses information provided by the Township during the monitoring period.

As reported by the Township, daily site inspections of the on-site equipment and facilities were completed by the Site Attendant, as per Condition 3.27 of the ECA.

5.4.1 Litter Control

As noted by Cambium staff, the Site was in good condition, and minimal evidence of blown litter was noted during any of the site visits during the monitoring period.

The intent of good housekeeping practices is to protect on-site worker health and safety, and the surrounding environment from nuisance effects. Nuisance effects are minimized by adopting good housekeeping measures as part of the Site operations. Regular housekeeping is essential to control such nuisances as:

- Blowing and loose litter
- Odour
- Rodents and insects
- Scavenging birds

5.4.2 Roads

The access road had sufficient width at the entrance and within the Site to allow unimpeded winter travel and access for emergency and snow removal equipment. The Site access roads were observed to be well maintained and graded and were reported to be regularly cleared of snow with a sand mixture applied as needed by the Municipality during the winter months.

5.4.3 Final Cover Integrity

The waste mound was adequately covered and there was minimal evidence of erosion observed from areas visited by Cambium staff during the monitoring period. Furthermore, the waste mound was well vegetated, which is an effective erosion control measure. No seeps were observed by Cambium personnel in 2018 or 2019.

5.5 Complaints and Incidents

According to the Municipality, complaints were received from residents in regards to the following:

- Residents being denied entry to the Site as they did not have their access pass.
- The mandatory clear garbage bag program, as the rules were deemed to be too strict and residents considered it an invasion of privacy.
- The number of garbage bags permitted at no charge.

Minor incidents were reported based on inappropriate behavior of the residents caused from the complaints listed above. Several incidents of trespassing were reported where items were stolen from the Site. The Municipality notified the Ontario Provincial Police about any incidents that involved trespassing.

5.6 Waste Refusal

The Municipality has a Clear Bag Policy. Any garbage bag that had any visible blue box materials, municipal hazardous and special wastes (MHSW), or more than 20% divertible items (i.e., clothing, organics, waste electrical electronic equipment (WEEE)), is not accepted at the Site. The site attendant is required to fill out the “TS-7 Unaccepted Refused Waste and Entry” form as detailed in the Municipal document *Transfer Station Standard Operating Procedures* (MTL, 2019a). This Municipality keeps these forms on file.

5.7 Monitoring Well Security

As part of the groundwater monitoring program, each monitoring well listed in Table 1 was inspected for compliance with R.R.O. 1990 Regulation 903 - Wells. The following well repairs should be completed in 2020:

- A well extension should be installed on monitor DP5.
- Monitoring well DP6 requires the casing to be re-secured.

Refer to Appendix E for photographs of the monitoring wells.

5.8 Materials Summary

The following waste types are collected at the Site; refer to Figure 4 for the collection locations of each material.

- Household Waste
- Construction and Demolition (C&D) Materials
- Bulky Items
- Shingles and Drywall
- Brush
- White Goods
- Leaf and Yard Waste
- Boats/RVs
- Tires
- Scrap Metal
- WEEE
- MHSW

On June 16, 2019, Waste By-Law B2016-142 was amended to suspend the quarterly restriction on waste cards. This allows seasonal residents the ability to dispose of 52 weeks' worth of waste during cottage season opposed to having to be restricted to disposing of one bag per week. This amendment is a one-year trial and will be revisited in 2020.

Condition 3.6 of the Site ECA defines the limited quantities and types of MHSW that can be accepted at the Site and are as follows:

- A maximum of 50 vehicular batteries;
- A maximum of one 250 litre (L) drum of lithium, dry cell, and/or rechargeable batteries;
- A maximum of one 250 L capacity container for the bulk collection of empty motor oil containers; and,
- A maximum of 50 units of fluorescent light bulbs.

Condition 3.5 dictates the maximum volume of waste stored at the Site at any one time (2,740 m^3) and provides a detailed breakdown of requirements for each type of waste. Based upon information reported by the Municipality and observations made by Cambium staff when on-site, the facility is being operated in accordance with the requirements of ECA Condition 3.5. Currently the infrastructure on-site (available storage containers and segregated waste

storage areas) ensures compliance with the ECA as it relates to volumes of materials permitted on-site at any given time.

Site usage, as documented by the Municipality, is summarized in Embedded Table 7. Waste collected is transferred to the Peterborough Waste Management Facility and landfilled. A monthly breakdown of waste transferred from the Site is provided in Table 6.

Embedded Table 7 Summary of Site Usage

	2019	2018	2017	2016
Vehicles – Private	11,638	11,266	11,978	N/A
Bags of Garbage	15,202	14,026	14,014	23,247
Waste - Tonnes	166.77	158.8	144.4	211
C&D Materials – Tonnes[2]	96.87	37.08	N/A	N/A

Notes:

1. *In 2019 and 2018, 36 and 34 bins transferred to the Peterborough Waste Management Facility respectively.*
2. *C&D materials tonnages unreported in 206 and 2017.*
3. *N/A means not available.*

5.8.1 Site Diversion

Embedded Table 8 provides a summary of the materials diverted from landfilling during the monitoring period, as provided by the Municipality and the County of Peterborough.

Embedded Table 8 Summary of Diverted Materials

Material	2019	2018
Blue Box		
Plastic Containers	25.51 tonnes	24.58 tonnes
Fibre	37.14 tonnes	37.96 tonnes
Durable Plastics (from June to September 2019)	1.99 tonnes	Not Collected
Empty Oil Containers	0.11 tonnes	0.06 tonnes
Textiles	2.33 tonnes	2.26 tonnes
Scrap Metal and White Goods	26.18 tonnes	36.28 tonnes
WEEE	10.32 tonnes	7.15 tonnes
TOTAL	**103.58 tonnes**	**108.29 tonnes**
Material	Unit	Unit
Tires	99	200

Additionally, the following tonnes of brush was collected, chipped, and used as cover for rehabilitation on Municipal properties:

- In 2018: 30 tonnes
- In 2019: 45 tonnes

5.8.2 Municipal Wide Diversion

The Site is approved to accept limited MHSW as are various transfer stations in the Municipality including the Bobcaygeon, Crystal Lake, and Buckhorn sites. Embedded Table 9 provides a summary of the limited MHSW accepted at all of these sites during the monitoring period.

Embedded Table 9 Summary of Limited MHSW Collected – Municipality

MHSW	2019	2018
Batteries	1.32 tonnes	1.63 tonnes
Florescent Tubes	0.34 tonnes	0.60 tonnes
Car Batteries	2.51 tonnes	2.09 tonnes
Empty Oil/Anti-freeze Containers	1.52 tonnes	1.58 tonnes
TOTAL	**5.69 tonnes**	**5.90 tonnes**

Embedded Table 10 provides a detailed breakdown of the quantities of divertible materials received on the annual Environment Day event hosted by the County at the Buckhorn waste disposal site on June 10, 2018 and June 9, 2019.

Embedded Table 10 Summary of Divertible Materials – Environment Day

Material	2019	2018
Polystyrene	0.02 tonnes	0.04 tonnes
Media and Car Seat	0.58 tonnes	0.19 tonnes
Hard Cover Books	0.20 tonnes	0.07 tonnes
Mattresses	0.83 tonnes	0.57 tonnes
TOTAL	**1.63 tonnes**	0.87 tonnes

5.9 Operations and Procedures

The Township has made conscientious efforts to mitigate risk to the surrounding environment and promote a safe location for the disposal of waste for the site attendants and residents. As such, Cambium has no recommendation in regards to the operation of the Site.

5.10 Site and Documentation Reviews and Updates

The following documents are maintained by the Municipality, reviewed annually, and updated as required.

- Current Design and Operation Plan consisting of:
    - Report entitled "Cavendish Landfill - Closure Plan and Transfer Station Application" prepared for the Township of Galway-Cavendish and Harvey by TSH dated July 2006.
    - Letter dated November 29, 2006 addressed to Ms. Pat Kemp, Deputy Clerk, Township of Galway-Cavendish and Harvey from Mr. Dale Gable, Ministry of the Environment requesting additional information on the closure plan and transfer station operations.
    - Letter and supporting documentation dated December 14, 2006 addressed to Mr. Dale Gable, Ministry of the Environment from Mr. Chris Visser, TSH providing additional information on the final contours, FBAL, closure plan and waste storage/transfer operations. The supporting documentation included the following:
        - Drawing No. 3R entitled "Final Contours and Transfer Station Layout" prepared by TSH (Project No. 52-27854) dated December 17, 2006. Scale 1:500.

- *Municipality of Trent Lakes – Transfer Station Standard Operating Procedures* (MTL, 2019a)
- *Municipality of Trent Lakes – Transfer Station Safety, Emergency and Spills Procedures* (MTL, 2019b)

Copies of the Operations Procedures and Emergency and Spills Procedures are included with this report digitally.

Specifically,

- No changes were made to the Design and Operations Plan in 2018 or 2019.
- The Standard Operating Procedures were reviewed and updated on February 15, 2019. Minor changes were made to this plan as a result of the review to maintain compliance with the Site ECA.
- The Emergency and Spills Procedure was reviewed on January 30, 2019. Minor were made to this plan as a result of the review to maintain compliance with the Site ECA.

5.11 Compliance with Ministry Approval

No operational changes and/or transfer station improvements were undertaken during the monitoring period. No operational issues were identified that required the implementation of remedial measures.

The Municipality operated the Site in compliance with all ECA Conditions in 2018 and 2019.

6.0 Conclusions and Recommendations

Based on the 2018/2019 monitoring program, Cambium provides the following conclusions regarding the Cavendish waste disposal site:

- The primary direction of local groundwater flow was toward the south within the overburden unit where it discharged to surface into the southern wetland and the tributary of Mississagua Lake. There was a small component of flow to the north that also discharged to surface and drained to the Miskwaa Ziibi River (formerly known as the Squaw River).
- The monitoring program was updated in 2019 to reflect previous recommendations (Cambium, 2018) and comments provided by the Ministry Technical Support Section (Appendix B). These changes were approved by the District Manager March 2019.
- Impacts were occurring down-gradient of the waste mound to the north (localized) and south. The impacts to the south have migrated to DP6 in recent years; however, only a weak leachate signature was present with limited parameter concentrations exceeding the PWQO/CWQG. The impacts to the north did not reach the northern property boundary.
- Elevated concentrations of iron and chloride were present in the groundwater discharging to surface, at concentrations greater than the PWQO and CWQG.
- Volatile organic compound analysis was completed at all monitoring wells during the autumn sampling events in 2018 and 2019. All VOC concentrations were less than their respective RDLs.
- The surface water data continued to indicate leachate impacts were occurring at surface water locations near the landfill (SW1 and SW2). Off-site impacts were also evident at SW3, SW4 and SW6, to a much lesser degree. Some of the elevated concentrations were attributed to natural processes and road salt impacts (SW6). The impacts were not anticipated to cause adverse impacts to Mississagua Lake or the Miskwaa Ziibi River or to aquatic life in those systems.
- A surface water and wetland investigation was completed in 2009 to assess if impacted surface water down-gradient and downstream of the landfill was toxic to the wetland plant

life (AECOM, 2009). The study determined boron was an appropriate indicator of leachate impacts. Furthermore, the results indicated there were no acute effects on aquatic fish and biota in landfill-impacted water. Given that water quality has improved both in the downstream surface water and down-gradient groundwater since that time, the results from the 2009 study remain valid.

- Following comments received from the Ministry Surface Water Scientist, an updated trigger mechanism was proposed for the Site. The proposed trigger assessment was based on water quality impairments beyond those reported in 2009 with a specific focus on the LIPs iron, chloride, and boron. Downstream locations SW3 and SW6 were proposed for the assessment. Application of the proposed trigger mechanism in 2018 and 2019 did not trigger Tier I.
- Municipal records indicated that a total of 158.8 and 166.77 tonnes of disposable waste was accepted at the site in 2018 and 2019, respectively. In addition, approximately 108.29 tonnes of divertible materials and 200 tires were collected in 2018; approximately 103.58 tonnes of divertible materials and 99 tires were collected in 2019.
- The Site was operated in compliance with the ECA in 2018 and 2019.

Based on the results of the 2018/2019 monitoring program, Cambium recommends the following:

- The monitoring and reporting program should continue in 2020 as approved (Table 1); however, some minor revisions were recommended. These included the addition of the LIPs barium and potassium to both groundwater and surface parameter suites during the spring and autumn, as well as the use of the surface water long (autumn) parameter suite during all monitoring events (Embedded Table 6).
- The proposed surface water trigger mechanism should be provided to the Technical Support Section for review and comment.
- A well extension should be installed on monitor DP5 and the casing on DP6 should be re-secured.

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WSP. (2016). *Cavendish Transfer Station/Closed Landfill Site - 2014-2015 Biennial Monitoring Report.* WSP Canada Inc.

Glossary of Terms

Active Face/Area
The portion of the landfill facility where waste is currently being deposited, spread and/or, compacted prior to the placement of cover material.

Adverse Environmental Impact
Any direct or indirect undesirable effect on the environment resulting from an emission or discharge that is caused or likely to be caused by human activity.

Annual Report
Report documenting the results of water quality, environmental quality, and operations monitoring for the year, or for a period as prescribed in the Certificate of Approval.

Approved Design and Operations Plan
The design of a landfill site and its facilities which have been submitted along with the application documents for which formal Ministry approval has been issued through the Certificate of Approval.

Approved Site or Facility
A landfill site/facility for which there is an existing and current Certificate of Approval.

Aquifer
A geologic unit (soil or rock) that contains sufficient saturated permeable material to yield measurable quantities of water to wells and springs.

Attenuation
Natural process through which the concentrations of landfill generated contaminants are reduced to safe levels.

Borehole
A hole drilled for soil sampling purposes.

Buffer Area
An area of land situated within the peripheral area surrounding an active filling area, but limited in extent to the property boundary, assigned to provide space for remedial measures, contaminant control measures, and for the reduction or elimination of adverse environmental impact caused by migrating contaminants.

Certificate of Approval
The license or permit issued by the Ministry for the operation of a landfill site. Issued to the owner of the site with conditions of compliance stated therein.

Contaminant
A compound, element, or physical parameter, usually resulting from human activity, or found at elevated concentrations that have or may have a harmful effect on public health or the environment.

Contaminant Migration Path
Route by which a contaminant will move from the site into adjacent properties or the natural environment. Usually a route that offers the least resistance to movement.

Contamination Attenuation Zone
The zone beneath the surface, located beyond the landfill site boundary, where contaminants will be naturally attenuated to predetermined levels. Also, see Reasonable Use Policy.

Contingency Plan
A documented plan detailing a co-ordinated course of action to be followed to control and remediate occurrences such as a fire, explosion, or release of contaminants in an uncontrolled manner that could threaten the environment and public health.

Cover Material
Material approved by the Ministry that is used to cover compacted solid waste. Usually, a soil with suitable characteristics for specific end-use.

Site Development Plan and Operations Report
Development and Operations Plan or Report is a document detailing the planned sequence of activities through the landfill site's active life, the control systems, site facilities and monitoring systems that are necessary. This document is required for obtaining a Certificate of Approval.

Design Capacity
The maximum amount of waste that is planned to be disposed of at a landfill site.

Detection Limit
Concentration under which a parameter cannot be quantitatively measured.

EAA or EA Act
Environmental Assessment Act, Revised Statutes of Ontario, 1990. One of the primary acts of legislation intended to protect, conserve, and wisely manage Ontario's environment through regulating planning and development.

Environmental Compliance Approval
The license or permit issued by the Ministry for the operation of a landfill site. Issued to the owner of the site with conditions of compliance stated therein.

EPA
Environmental Protection Act, Revised Status of Ontario, 1990. EPA is another of the primary pieces of Provincial legislation governing the protection of the natural environment of the Province.

Evapotranspiration
The evaporation of all water from soil, snow, ice, vegetation and other surfaces, including the water absorbed by plants, that is released to the atmosphere as vapour.

Fill Area
The area of a landfill site designed and designated for the disposal of waste.

Final Cover
Soil material or soil in combination with synthetic membranes, overlain by vegetation in a planned landscape, placed over a waste cell that has reached the end of its active life.

Groundwater
Subsurface water that occurs beneath the water table in soils and rocks that are fully saturated.

Hydraulic Conductivity
The rate of flow of water through a cross-section under a specific hydraulic gradient. It is a property of the geologic formation and the fluid, in hydrogeologic applications where the fluid is water (Units of m/day or cm/s).

Hydraulic Gradient
The head drop per unit distance in the direction of flow, the driving force for groundwater flow.

Hydrogeology
The study of subsurface waters and related geologic aspects of surface waters.

Impermeable Fill
Soil material that is placed as filling material that is sufficiently cohesive and fine grained to impede and restrict the flow of water through it.

In situ Testing
Testing done on-site, in the field, of material or naturally occurring substances in their original state.

Landfill Gas
Combustible gas (primarily methane and carbon dioxide) generated by the decomposition of organic waste materials.

Landfill Site
A parcel of land where solid waste is disposed of in or on land for the purposes of waste management.

Leachate
Water or other liquid that has been contaminated by dissolved or suspended particles due to contact with solid waste.

Leachate Breakout
Location where leachate comes to the ground surfaces; a seep or spring.

Limit of Filling
The outermost limit at which waste has been disposed of, or approved or proposed for disposal at a landfill.

Ministry
Ontario Ministry of the Environment, Conservation and Parks.

Monitoring
Regular or spontaneous procedures used to methodically inspect and collect data on the performance of a landfill site relating to environmental quality (i.e., air, leachate, gas, ground or surface water, unsaturated soils, etc.).

Monitoring Well
The constructed unit of casing (riser and screen) installed in a borehole.

Multi-Level Monitoring Well
More than one monitoring well installed at a given test well location.

Native Soil
Soil material occurring naturally in the ground at a location.

Natural Attenuation
Where contaminants are reduced to acceptable concentration levels by natural mechanisms (dilution, absorption onto the soil matrix, etc.), biological action, and chemical interaction.

Occupational Health and Safety Act
The primary act of legislation enacted by Ontario Ministry of Labour to regulate and control the safety in the workplace; also Occupational Health and Safety Act, Revised Statutes of Ontario, 1990.

Odour Control
Minimizing or eliminating the nuisance and undesirable impact of objectionable or unpleasant odours arising from waste disposal operations.

Open Burning
Burning any matter whereby the resultant combustion products are emitted directly to the atmosphere without passing through an adequate stack, duct, or chimney.

Operations Plan
A document detailing the waste disposal operations in a planned, and if necessary, a staged manner, that ensure compliance with regulatory provisions concerning the operations of a landfill site.

Operator (Site Operator)/Attendant
The individual or organization who, through ownership or under contract, manages and operates a landfill site for the purpose of waste disposal.

Owner
A person, persons, organization, or municipal authority who own a landfill facility or part of a landfill facility, and in whose name the Certificate of Approval for the site is issued.

Percolation
The movement of infiltrating water through soil.

Permeability
Often used interchangeable with hydraulic conductivity, but not strictly correct. Permeability is a property of the porous media only. Dependent upon media properties that affect flow, diameter, sphericity, roundness, and packing of the grains.

Piezometer
A well that intersects a confined aquifer.

Provisional Certificate of Approval (Provisional C of A)
Same as Certificate of Approval.

Reasonable Use Policy
A policy developed by the Ministry to stipulate limits to the level of groundwater quality impairment that may be permitted to occur at site property boundaries, to allow the reasonable use of adjacent properties or land without adversely affecting public health and the environment.

Recharge Zone
An area where precipitation or surface run-off infiltrates into the ground and then, through natural percolation enters an aquifer.

Recycling
Sorting, collecting or processing waste materials that can be used as a substitute for the raw materials in a process or activity for the production of (the same or other) goods. For example, the "Blue Box" system, in-plant scrap handling, or raw material recovery systems. Recycling is also the marketing of products made from recycled or recycled materials.

Reduction (of waste or component of 3Rs program)
Those actions, practices, or processes that result in the production or generation of less waste.

Remedial Action
Corrective action taken to clean-up or remedy a spill, an uncontrolled discharge of a contaminant, or a breach in a facility or its operations, in order to minimize the consequent threat to public health and the environment.

Representative Sample
A small portion of soil, water, etc. which can be subjected to testing and analysis, that is expected to yield results that will reliably represent the identical characteristics of the source of the material or of a larger body of material.

Reuse (component of 3Rs program)
The use of an item again in its original form, for a similar purpose as originally intended, or to fulfil a different function.

Run-off
The part of precipitation (rainwater, snowmelt) that flows overland and does not infiltrate the surface material (soil or rock).

Saturated Zone
The zone of a subsurface soil where all voids are filled with water.

Sedimentation
The deposition of fine grained soil in an undesirable location, caused by the scouring, erosion and transportation of earth materials by surface run-off.

Sensitive Land Use
A land use where humans or the natural environment may experience an adverse environmental impact.

Settlement
The subsidence of the top surface and underlying waste of a landfill or waste cell as a result of densification under its own weight.

Site Capacity
The maximum amount of waste that is planned to be disposed (design capacity) or that has been disposed of at a landfill site.

Site Closure
The planned and approved cessation or termination of landfilling activities at a landfill site upon reaching its site capacity.

Site Life
The period from its inception through active period of waste disposal, to the time when a landfill site reaches its' site capacity, when it ceases to receive any further waste, including and up to closure.

Solid Waste
Any waste matter that cannot be characterized by its physical properties as a liquid waste product.

Solid Waste Disposal Site or Facility
A site or facility such as a landfill site where solid waste is disposed of.

Source Separation
The separation of various wastes at their point of generation for the purposes of recycling or further processing.

Standpipe
A monitoring well that intersects the water table aquifer.

Storm water
Run-off that occurs as a direct result of a storm event or thaw.

Storm water Detention
Control of storm water by the construction of impoundments of structures for the purpose of regulating storm water flows during high intensity rainfall events that would otherwise transport excessive amounts of sediment, cause soil erosion or cause flooding.

Stratigraphy
The geologic sub-structuring, usually layered with different distribution, deposition and age.

Surface Run-off (Drainage)
See Run-off.

Surface Water
Water that occurs at the earth's surface (ponds, streams, rivers, lakes, oceans).

Sub-Soil
Soil horizons below the topsoil.

Test hole
A hole drilled for soil sampling purposes.

Topsoil
The uppermost layer of the soil containing appreciable organic materials in mineral soils. Adequate fertility to support plant growth.

Unsaturated Zone
The zone (also vadose zone) in a porous sub-soil, where the voids are not completely water-filled, but contain some air-filled voids. Limited above by the land surface and below by the water table.

Vector
A disease carrier and transmitter; usually an insect or rodent.

VOC
Volatile organic compounds are those compounds that will readily volatilize (convert from liquid to gas phase) at conditions normally found in the environment.

Waste
Ashes, garbage, refuse, domestic waste, industrial waste, or municipal refuse and other used products as are designated or interpreted by the provisions of the Environmental Protection Act.

Waste Disposal Site (Facility)
Any land or land covered by water upon, into, in or through which, or building or structure in which, waste is deposited or processed and any machinery or equipment or operation required for the treatment or disposal of waste.

Waste Management System
All facilities, equipment and operations for the complete management of waste, including the collection, handling, transportation, storage, processing and disposal thereof, and may include one or more waste disposal sites.

Water Table
The water level attained in a monitoring well, which screens the surficial unconfined aquifer.

Water Balance
Amounts of water to various components in a system so that water entering the system equals the amount of water contained within and discharged out of a system.

Water Level
The level of water in a well.

Well Casing
The pipe that is used to construct a well.

Well Screen
A filtering device used to keep sediment from entering a well.

Wetlands

Areas where water is at, near or above the land surface long enough to be capable of supporting aquatic or hydrolytic vegetation, and which have soils indicative of wet conditions.

Abbreviations

RFP	Request For Proposal	**µS**	microSiemens
MECP	Ontario Ministry of the Environment, Conservation and Parks	**ODWQS**	Ontario Drinking Water Quality Standards
MNRF	Ontario Ministry of Natural Resources and Forestry	**PC of A**	Provisional Certificate of Approval
ECA	Environmental Compliance Approval	**PWQO**	Provincial Water Quality Objectives
EPA	Environmental Protection Act	**TOC**	Total Organic Carbon
EAA	Environmental Assessment Act	**VOC**	Volatile Organic Compound
MW	monitoring well	**BTU**	British Thermal Unit
masl	metres above sea level	**°C**	temperature in degrees Celsius
kg	kilogram	**N/A**	not available
mm	millimetres	**%**	percent
m	metres	**cfm**	cubic feet per minute
km	kilometres	**ppmdv**	part per million by dry volume
ha	hectare	**ppmv**	part per million by volume
m^3	cubic metres	**ppm**	part per million
m^2	square metres	**min**	minimum
mg/l	milligrams per litre	**max**	maximum

Units of Measurement and Conversions

Length

1 metre (m)	=	3.28 feet
1 millimetre (mm)	=	0.039 inches
1 kilometre (km)	=	0.621 miles

Area

1 hectare (ha)	=	2.47 acres
1 square metre (m^2)	=	10.76 square feet

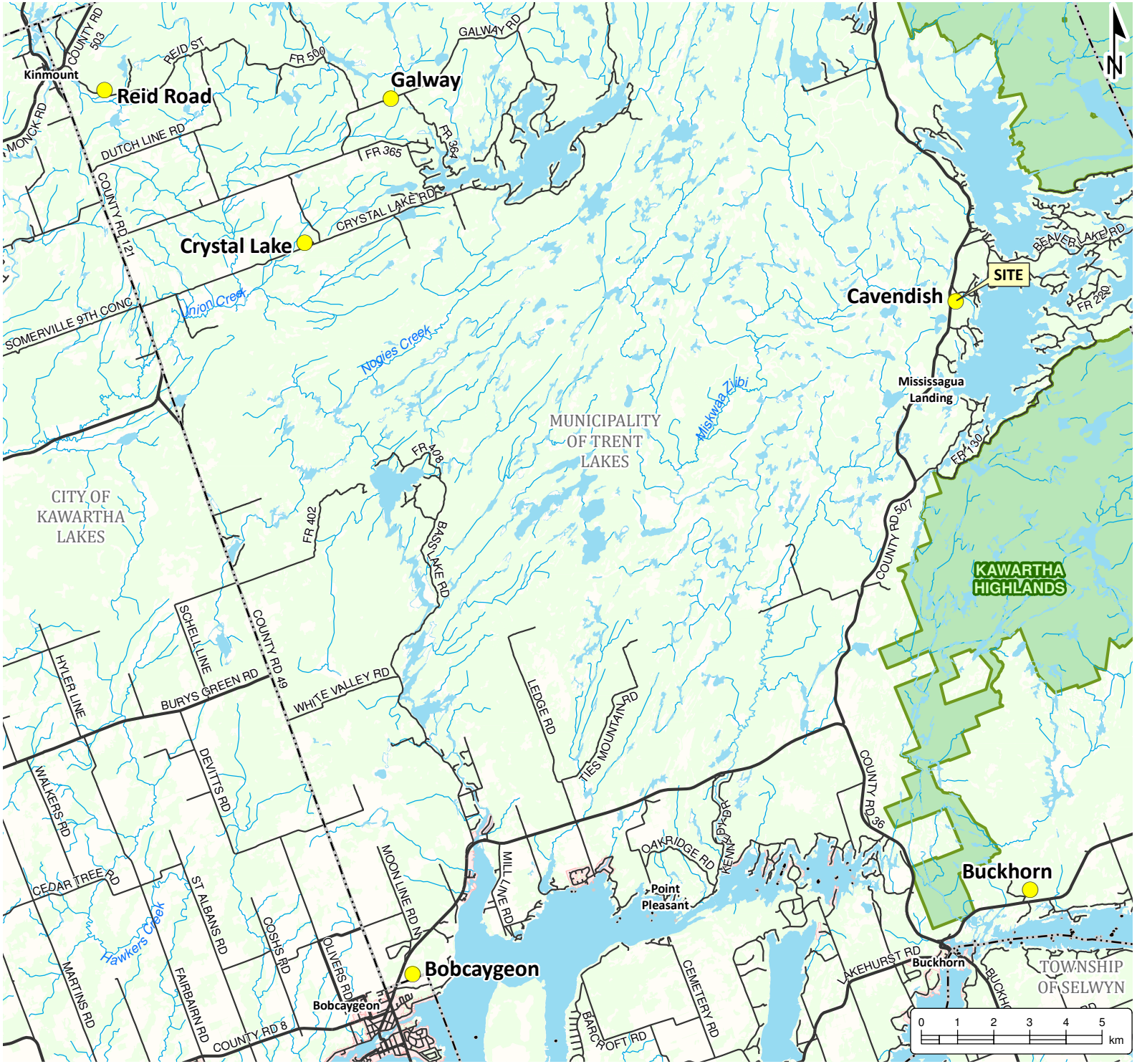
Volume

1 cubic metre(m^3)	=	35.29 cubic feet
1 litre(L)	=	0.220 gallons

Mass

1 metric ton (tonne)	=	1.10 Imperial tons
1 kilogram (kg)	=	2.20 lbs
pound (lb)	=	453.6 g
gram (g)	=	---
milligrams (mg)	=	1 x 10^{-3} g
microgram (µg)	=	1 x 10^{-6} g
nanogram (ng)	=	1 x 10^{-9} g
kilogram (kg)	=	1000 g
picogram (pg)	=	1 x 10^{12} g
metric tonne (t)	=	1000 kg

Appended Figures



CAVENDISH WASTE DISPOSAL SITE

Municipality of Trent Lakes
County of Peterborough

LEGEND

- Trent Lakes Waste Disposal Sites
- Major Road
- Minor Road
- Watercourse
- Water Area
- Provincial Park
- Built-Up Area
- Wooded Area
- Municipal Boundary

Notes:
- Base mapping features are © Queen's Printer of Ontario, 2017 (this does not constitute an endorsement by the Ministry of Natural Resources or the Ontario Government).
- Distances on this plan are in metres and can be converted to feet by dividing by 0.3048.
- Cambium Inc. makes every effort to ensure this map is free from errors but cannot be held responsible for any damages due to error or omissions. This map should not be used for navigation or legal purposes. It is intended for general reference use only.

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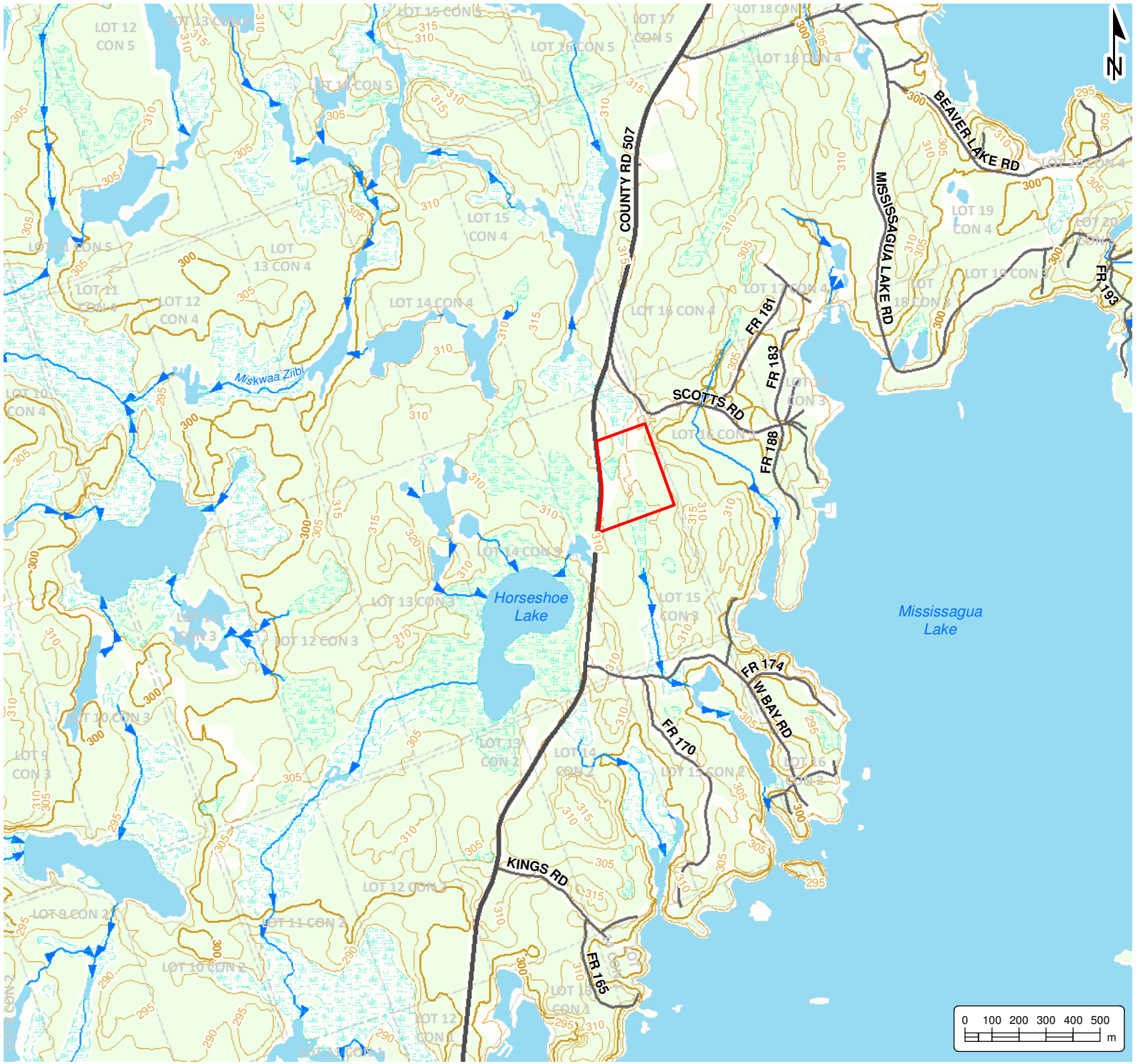
REGIONAL LOCATION PLAN

Project No.: 8640-002		Date: June 2020	Rev.:
Scale: 1:150,000		Projection: NAD 1983 UTM Zone 17N	
Created by: TLC	Checked by: SNR	Figure: 1	

O:\GIS\project_MXDs\8600 to 8699\8640-002 MTL - Cavendish Landfill AMP 2019\2020-02-19 FIG 1 - Regional Location Plan.mxd



CAVENDISH WASTE DISPOSAL SITE

Municipality of Trent Lakes
County of Peterborough

LEGEND

- Major Road
- Minor Road
- Watercourse, Permanent
- Contour 5m Interval (Major)
- Contour 5m Interval (Minor)
- Property Boundary (7.49 ha.)
- Lot / Concession
- Wetland Area
- Water Area
- Wooded Area

Notes:
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LOCAL TOPOGRAPHY PLAN

Project No.:	8640-002	Date:	June 2020
		Rev.:	
Scale:	1:20,000	Projection:	NAD 1983 UTM Zone 17N
Created by:	TLC	Checked by:	SNR
Figure:	2		

O:\GIS\project_MXDs\8600 to 8699\8640-002 MTL - Cavendish Landfill AMP 2019\2020-02-19 FIG 2 - Local Topography Plan.mxd

CAVENDISH WASTE DISPOSAL SITE

Municipality of Trent Lakes
County of Peterborough

LEGEND

- Select Water Wells
- Drive Point Location
- Surface Water Location
- Major Road
- Minor Road
- Watercourse, Permanent
- Contour 5m Interval (Major)
- Contour 5m Interval (Minor)
- Property Boundary (7.49 ha.)
- Limit of Existing Waste (0.8 ha.)
- Lot / Concession
- Wetland Area
- Water Area
- Wooded Area

Notes:
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- Distances on this plan are in metres and can be converted to feet by dividing by 0.3048.
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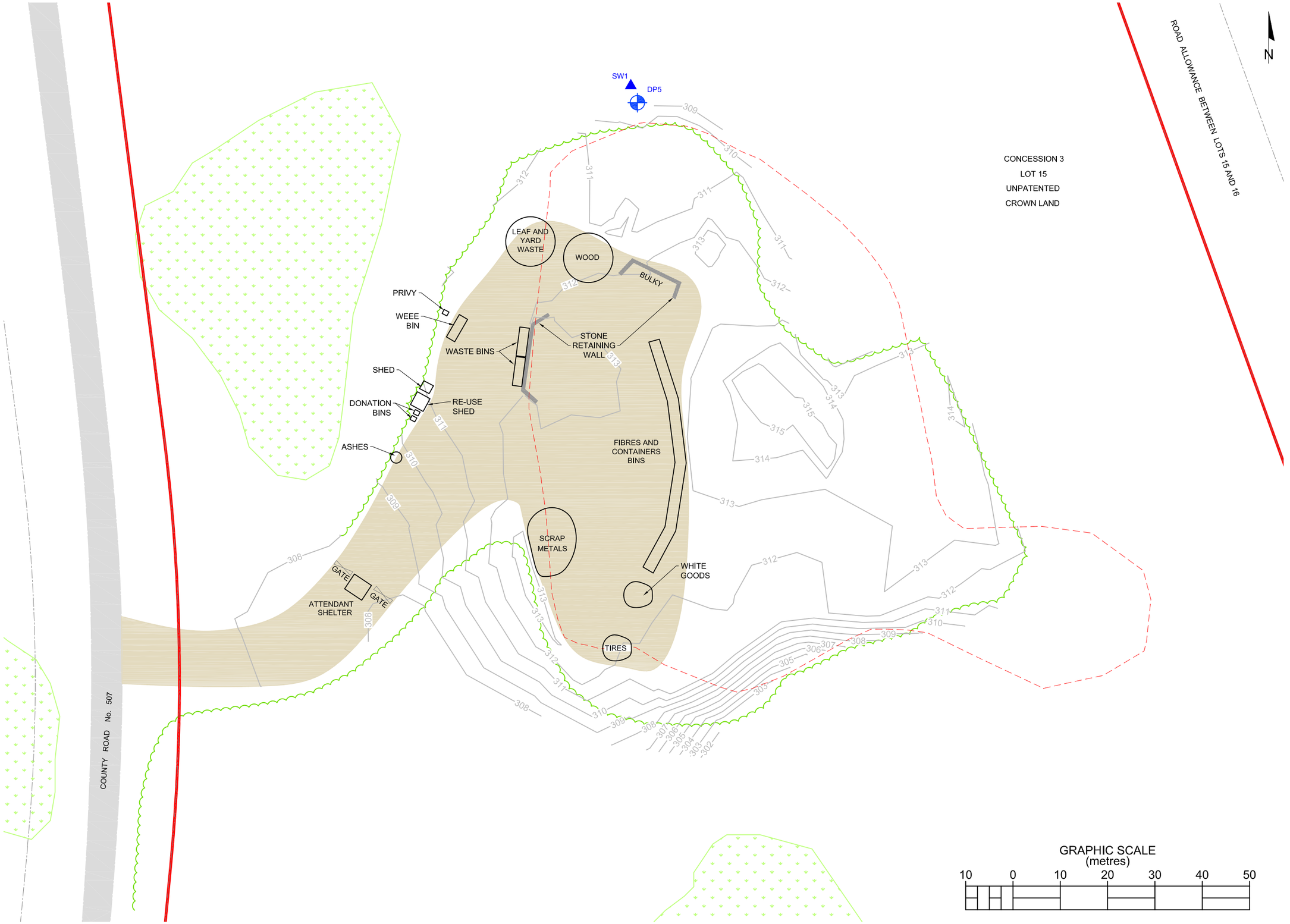
SAMPLE LOCATION PLAN

Project No.:	8640-002	Date:	June 2020
		Rev.:	
Scale:	1:7,500	Projection:	NAD 1983 UTM Zone 17N
Created by:	TLC	Checked by:	SNR
Figure:	3		

O:\GIS\project_MXDs\8600 to 8699\8640-002 MTL - Cavendish Landfill AMP 2019\2020-02-19 FIG 3 - Sample Location Plan.mxd

CAVENDISH
WASTE DISPOSAL SITE
MUNICIPALITY OF
TRENT LAKES



LEGEND

- Surface Water Sample Location
- Monitoring Well Location
- Topographic Contour Line
- Property Boundary (7.5 ha)
- Existing Limit of Waste (0.8 ha) (Approximate)
- Lot Line
- Gate
- Gravel Road
- Asphalt Road
- Tree Line (Approximate)
- Wetland

Notes:

1. Base mapping features adapted from a site plan prepared by Coe Fisher Cameron Land Surveyors dated January 21, 2015.
2. Waste disposal site features are approximate and are adapted from a site plan prepared by WSP dated June 2014.
2. Wetland features are © Queen's Printer of Ontario, 2015 (this does not constitute an endorsement by the Ministry of Natural Resources or the Ontario Government).
3. Distances on this plan are in metres and can be converted to feet by dividing by 0.3048.
4. Projection: NAD 1983 UTM Zone 17T.

Benchmarks:

5. ORP A is an SIB located at the SW property corner (not shown on this plan).
   Northing: 4954801.4 Easting: 710727.1 Elevation: 313.69
6. ORP B is an SIB located at the NW property corner (not shown on this plan).
   Northing: 4955138.8 Easting: 710718.3 Elevation: 309.90
7. Elevations shown hereon are geodetic and are referred to Geodetic Surveys Canada Benchmark #0011971u206, being a tablet in the top of a concrete dam on the Bobcaygeon River in the Village of Bobcaygeon, 0.34m from the south end of the dam, having an elevation of 249.20m (cgvd28-1978).

GRAPHIC SCALE
(metres)

10 0 10 20 30 40 50

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EXISTING SITE CONDITIONS

Project No.:	Date:
8640-002	June 2020
	Rev.:
Horizontal Scale:	Vertical Scale:
1:750	N/A
Drawn By:	Checked By:	Figure:
TLC	SNR	4

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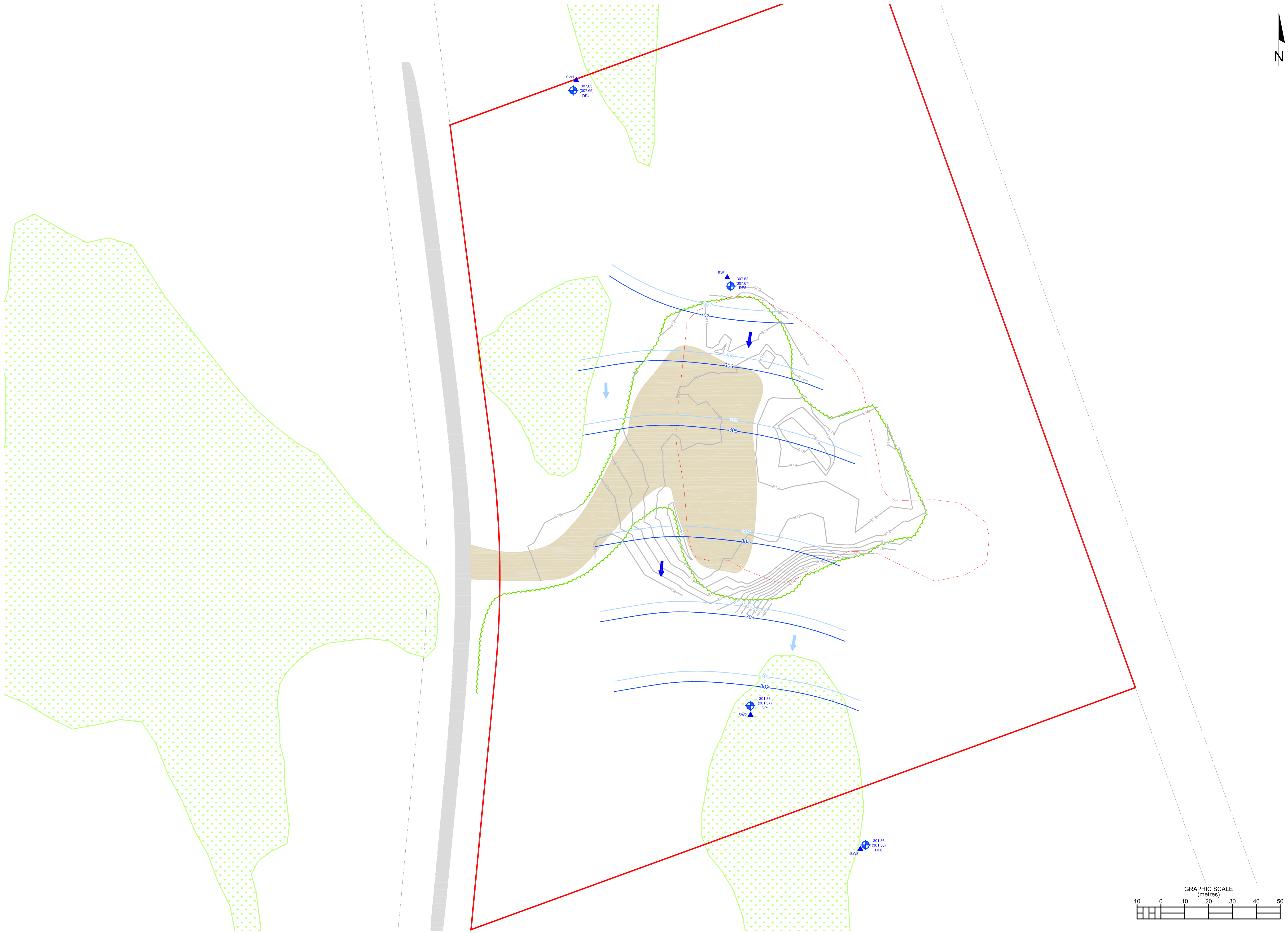

CAVENDISH WASTE DISPOSAL SITE MUNICIPALITY OF TRENT LAKES

LEGEND

- Surface Water Sample Location
- Monitoring Well Location
- 307.66 (307.43) — Groundwater Elevation May 30, 2018 (November 13, 2018)
- Topographic Contour Line
- Property Boundary (7.5 ha)
- Existing Limit of Waste (0.8 ha) (Approximate)
- Lot Line
- Groundwater Contour May 30, 2018
- Groundwater Contour November 13, 2018
- Gravel Road
- Asphalt Road
- Tree Line (Approximate)
- Wetland
- Groundwater Flow Direction May 30, 2018
- Groundwater Flow Direction November 13, 2018

Notes:

1. Base mapping features adapted from a site plan prepared by Coe Fisher Cameron Land Surveyors dated January 21, 2015.
2. Waste disposal site features are approximate and are adapted from a site plan prepared by WSP dated June 2014.
2. Wetland features are © Queen's Printer of Ontario, 2015 (this does not constitute an endorsement by the Ministry of Natural Resources or the Ontario Government).
3. Distances on this plan are in metres and can be converted to feet by dividing by 0.3048.
4. Projection: NAD 1983 UTM Zone 17T.

Benchmarks:

5. ORP A is an SIB located at the SW property corner (not shown on this plan).
   Northing: 4954801.4 Easting: 710727.1 Elevation: 313.69
6. ORP B is an SIB located at the NW property corner (not shown on this plan).
   Northing: 4955138.8 Easting: 710718.3 Elevation: 309.90
7. Elevations shown hereon are geodetic and are referred to Geodetic Surveys Canada Benchmark #0011971u206, being a tablet in the top of a concrete dam on the Bobcaygeon River in the Village of Bobcaygeon, 0.34m from the south end of the dam, having an elevation of 249.20m (cgvd28-1978).

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2018 GROUNDWATER CONFIGURATION

Project No.:	8640-002	Date:	June 2020
		Rev.:	
Horizontal Scale:	1:1,500	Vertical Scale:	N/A
Drawn By: TLC	Checked By: SNR	Figure:	5

CAVENDISH
WASTE DISPOSAL SITE
MUNICIPALITY OF
TRENT LAKES

N

SW1
307.60
(307.55)
DP4

SW4
307.77
(307.65)
DP5

SW2
301.07
DP1

SW3
301.60
(301.33)
DP2

GRAPHIC SCALE
(metres)
10 0 10 20 30 40 50

LEGEND

- Surface Water Sample Location
- Monitoring Well Location
- 307.66 (307.43) Groundwater Elevation April 17, 2019 (November 12, 2019)
- Topographic Contour Line
- Property Boundary (7.5 ha)
- Existing Limit of Waste (0.8 ha) (Approximate)
- Lot Line
- Groundwater Contour April 17, 2019
- Groundwater Contour November 12, 2019
- Gravel Road
- Asphalt Road
- Tree Line (Approximate)
- Wetland
- Groundwater Flow Direction April 17, 2019
- Groundwater Flow Direction November 12, 2019

Notes:
1. Base mapping features adapted from a site plan prepared by Coe Fisher Cameron Land Surveyors dated January 21, 2015.
2. Waste disposal site features are approximate and are adapted from a site plan prepared by WSP dated June 2014.
2. Wetland features are © Queen's Printer of Ontario, 2015 (this does not constitute an endorsement by the Ministry of Natural Resources or the Ontario Government).
3. Distances on this plan are in metres and can be converted to feet by dividing by 0.3048.
4. Projection: NAD 1983 UTM Zone 17T.

Benchmarks:
5. ORP A is an SIB located at the SW property corner (not shown on this plan).
Northing: 4954801.4 Easting: 710727.1 Elevation: 313.69
6. ORP B is an SIB located at the NW property corner (not shown on this plan).
Northing: 4955138.8 Easting: 710718.3 Elevation: 309.90
7. Elevations shown hereon are geodetic and are referred to Geodetic Surveys Canada Benchmark #00119711206, being a tablet in the top of a concrete dam on the Bobcaygeon River in the Village of Bobcaygeon, 0.34m from the south end of the dam, having an elevation of 249.20m (cgvd28-1978).

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2019 GROUNDWATER CONFIGURATION

Project No.: 8640-002		Date: June 2020	Rev.:
Horizontal Scale: 1:1,500		Vertical Scale: N/A	
Drawn By: TLC	Checked By: SNR	Figure: 6	

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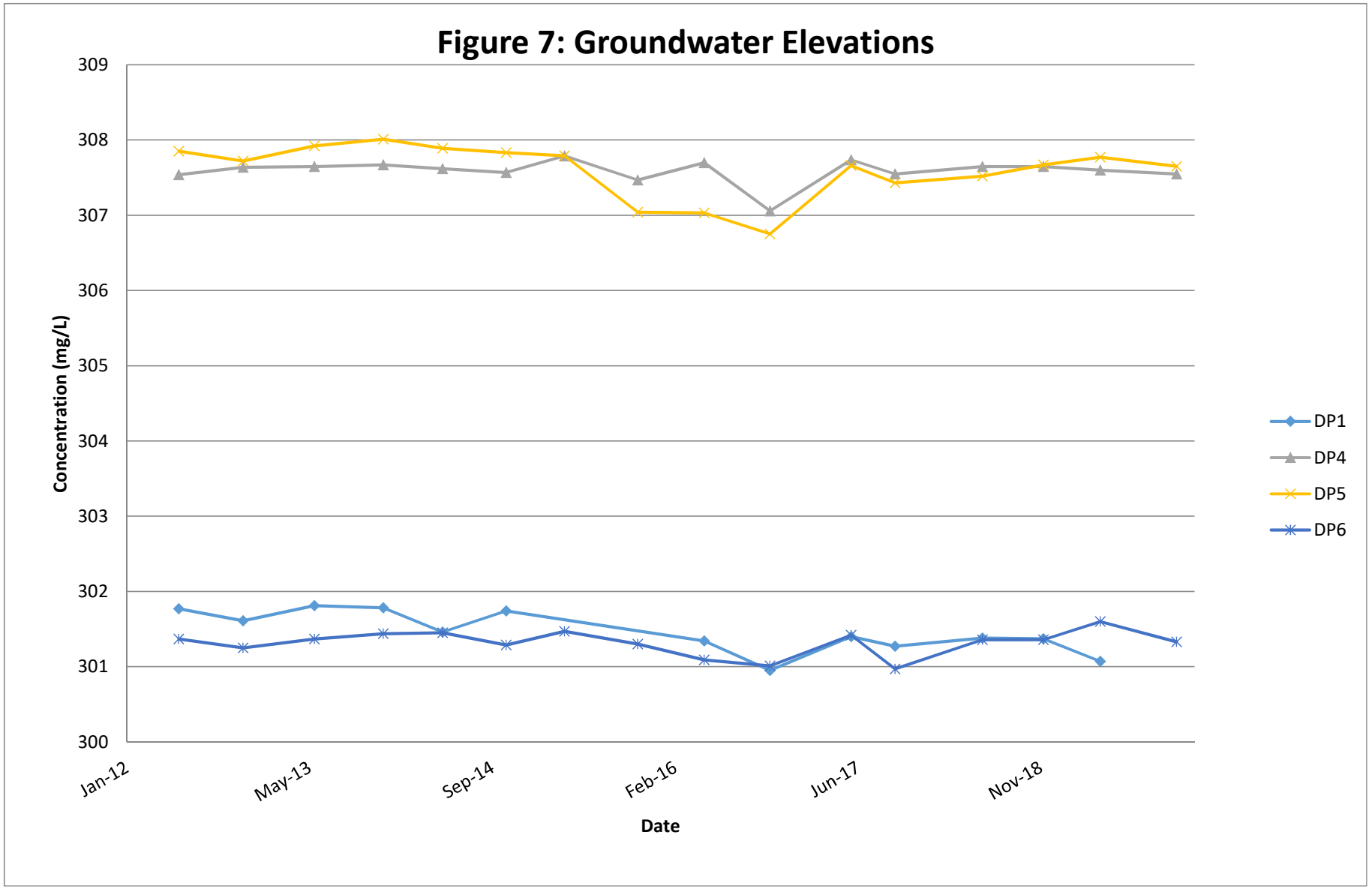


Figure 7: Groundwater Elevations
309
308
307
306
305
304
303
302
301
300
Concentration (mg/L)
Jan-12
May-13
Sep-14
Feb-16
Jun-17
Nov-18
Date
DP1
DP4
DP5
DP6

Figure 8: Alkalinity Concentrations - Groundwater

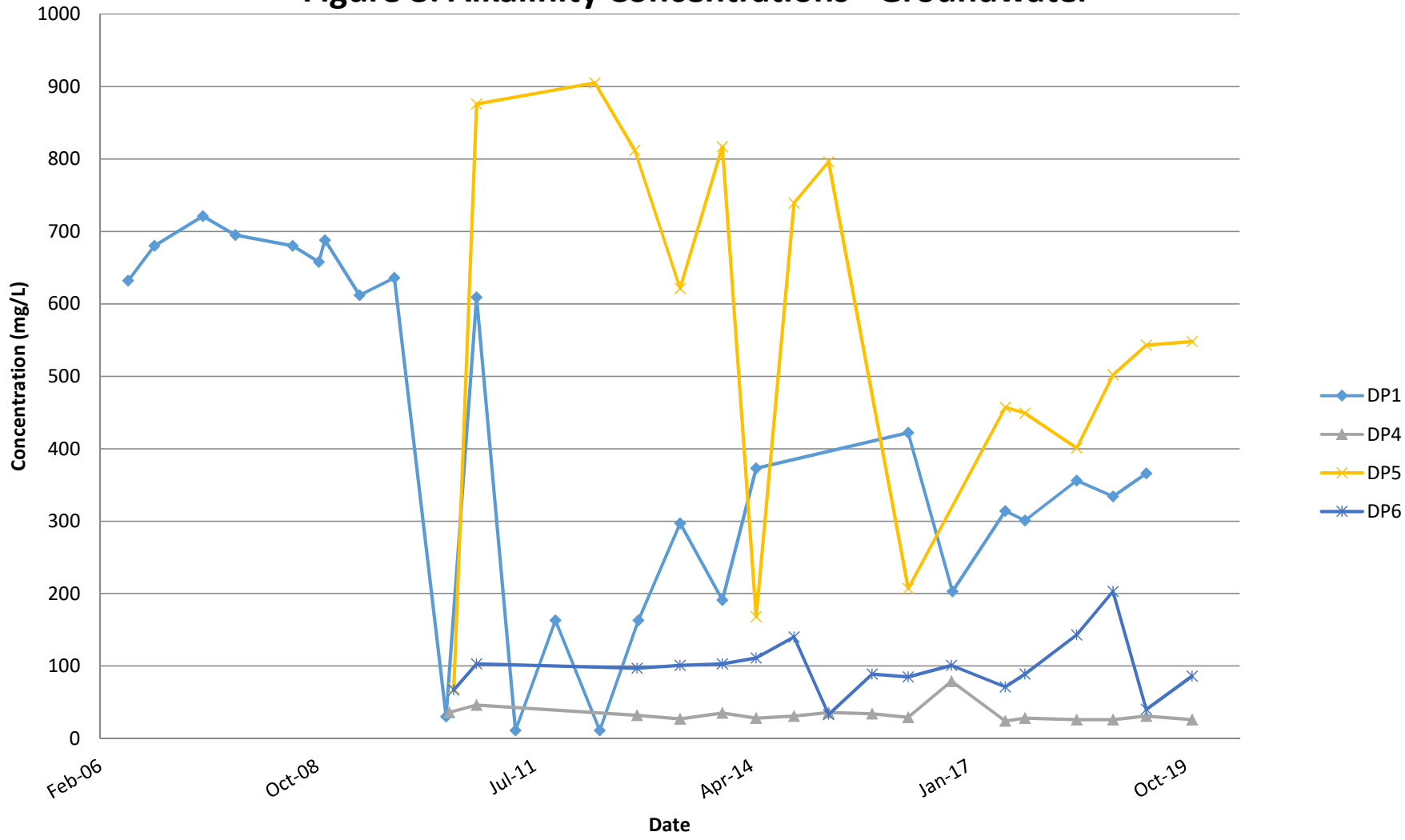


Figure 9: Conductivity Concentrations - Groundwater

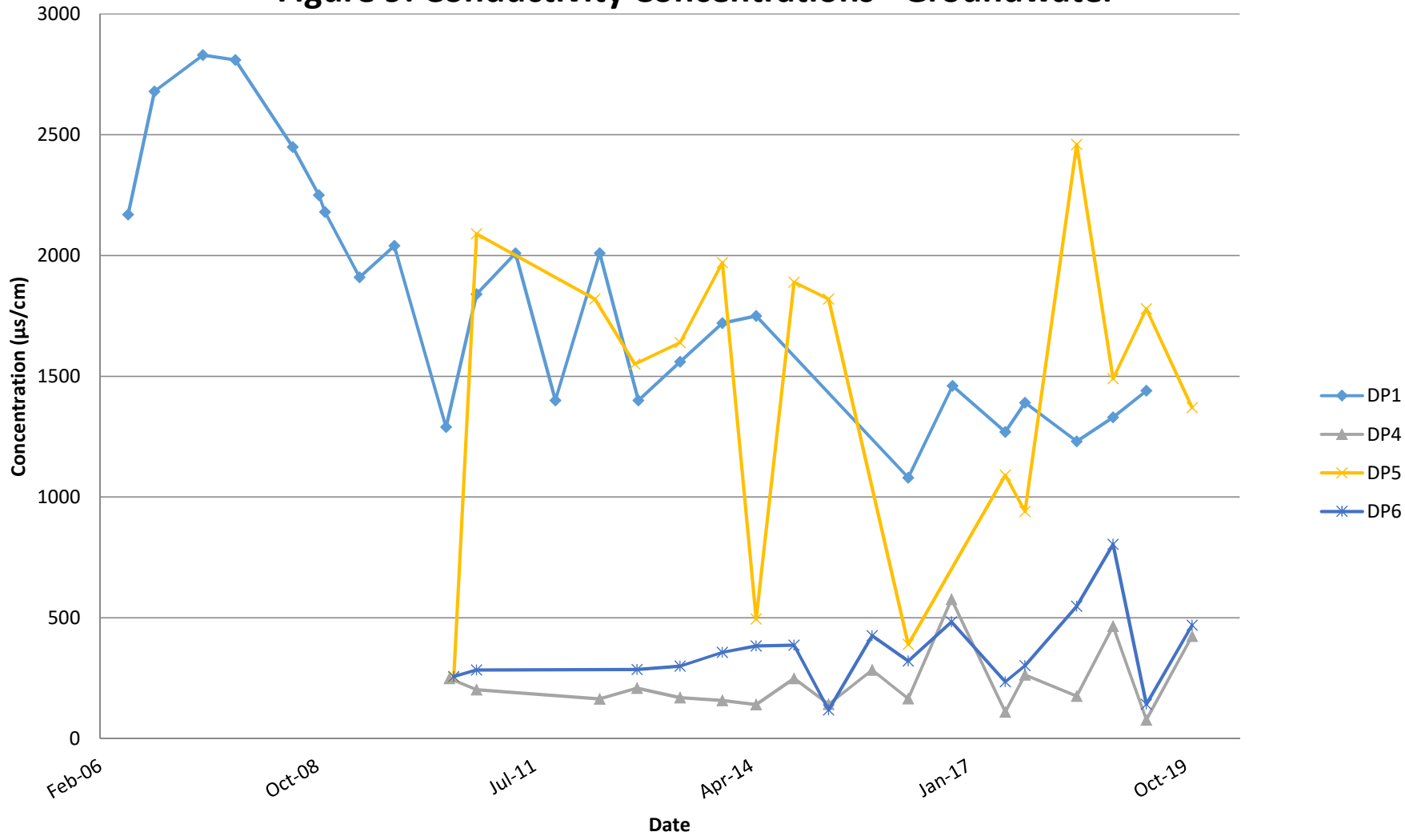


Figure 10: Total Dissolved Solids Concentrations - Groundwater

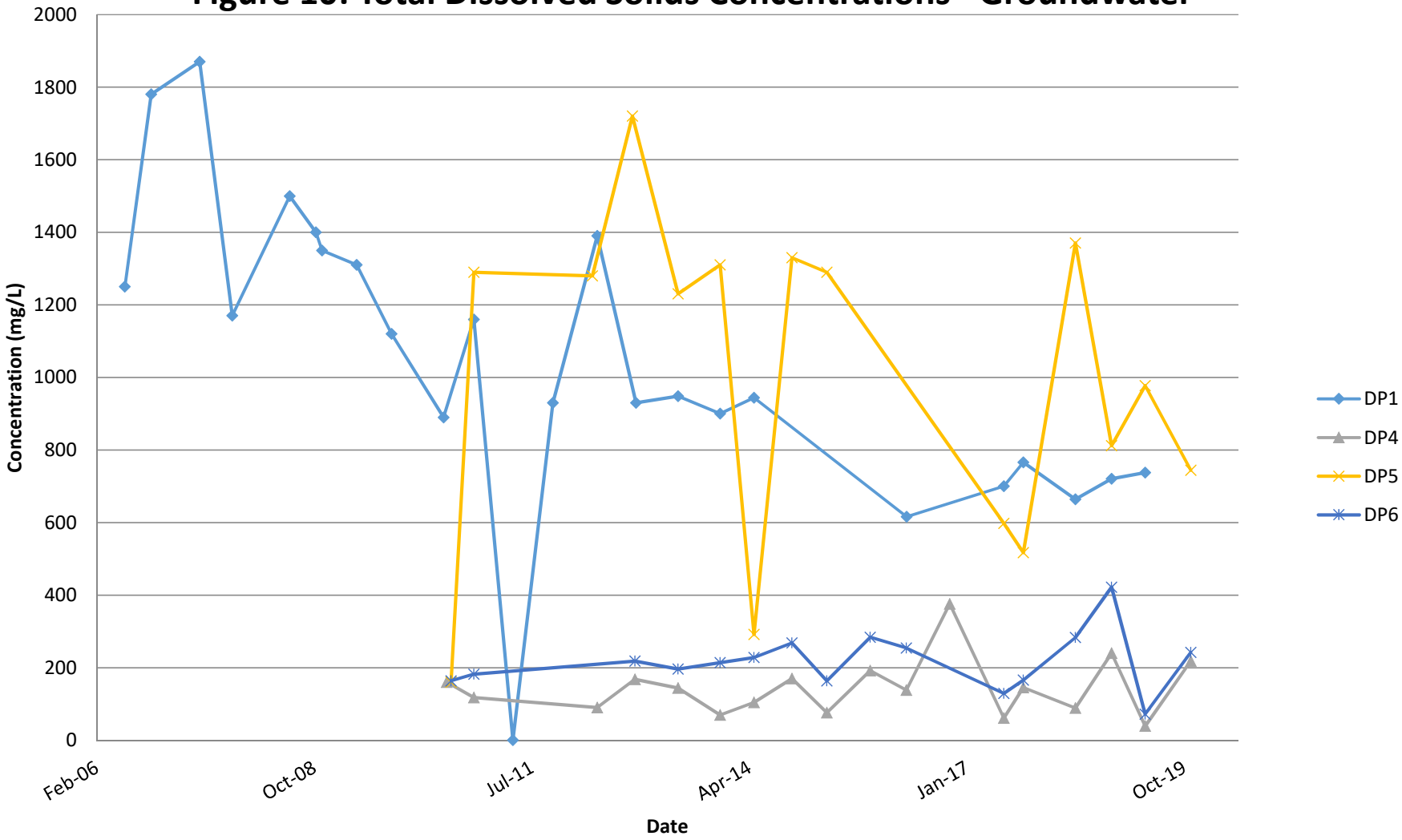


Figure 11: Dissolved Organic Carbon Concentrations - Groundwater

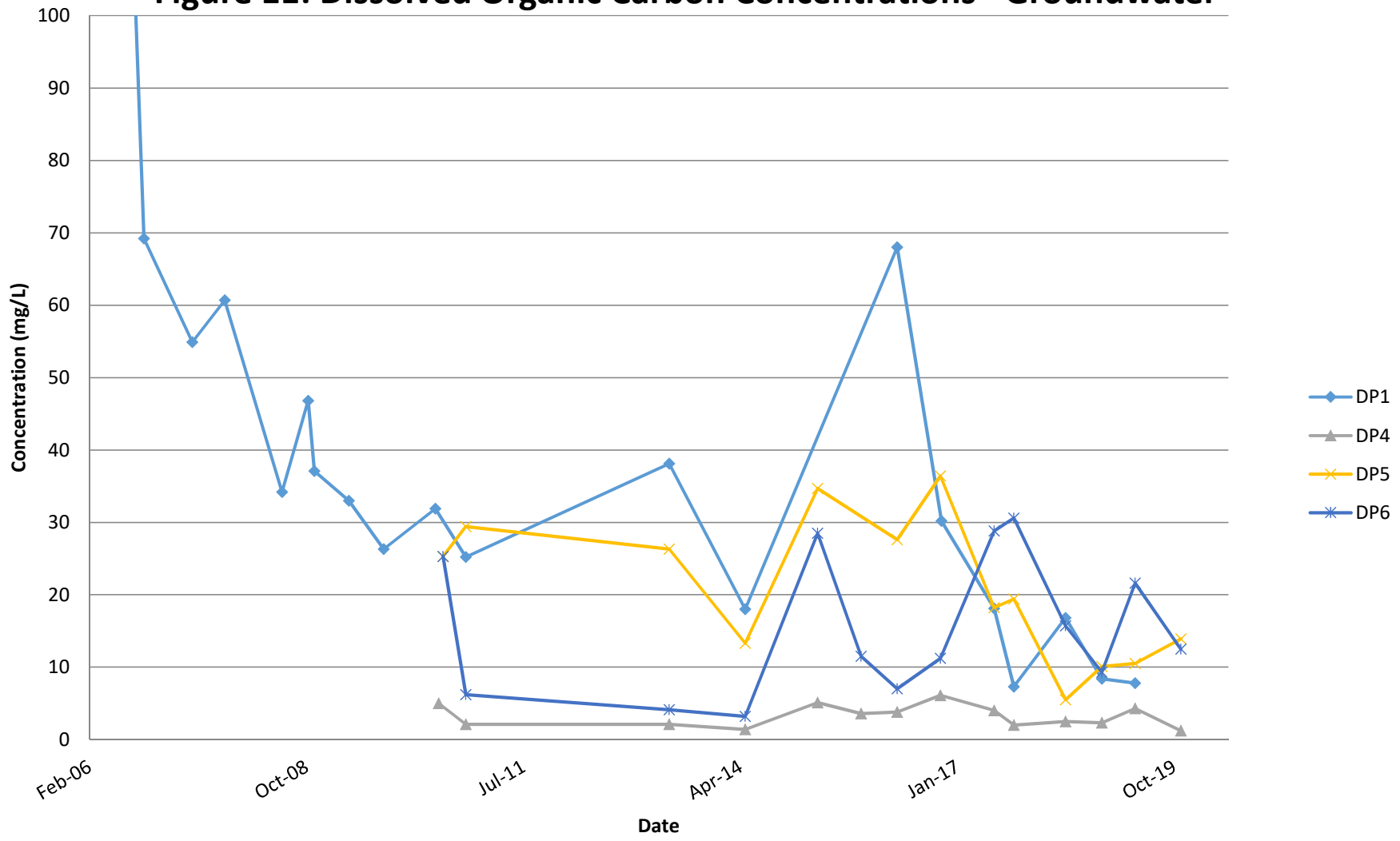


Figure 12: Chemical Oxygen Demand Concentrations - Groundwater

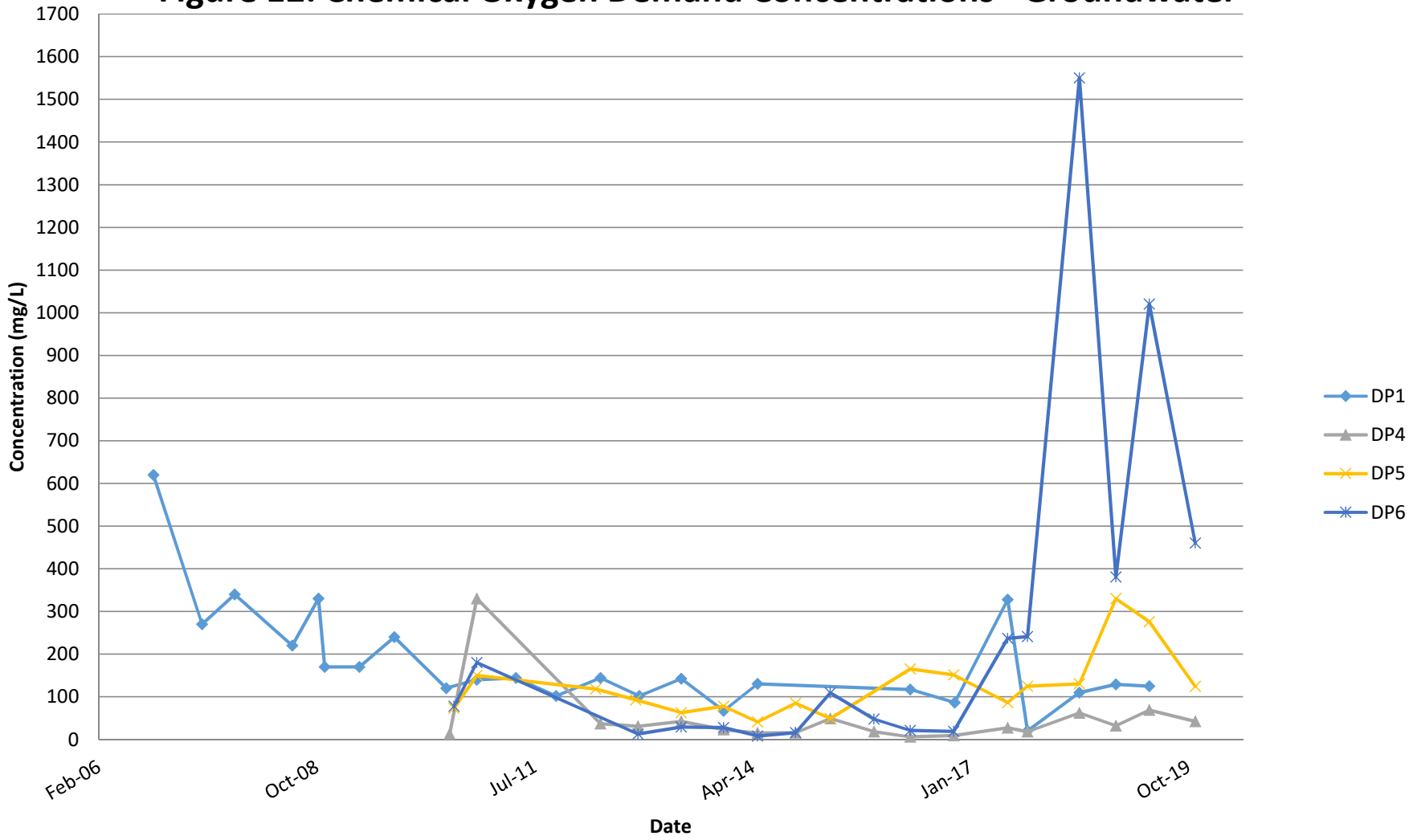


Figure 13: Chloride Concentrations - Groundwater

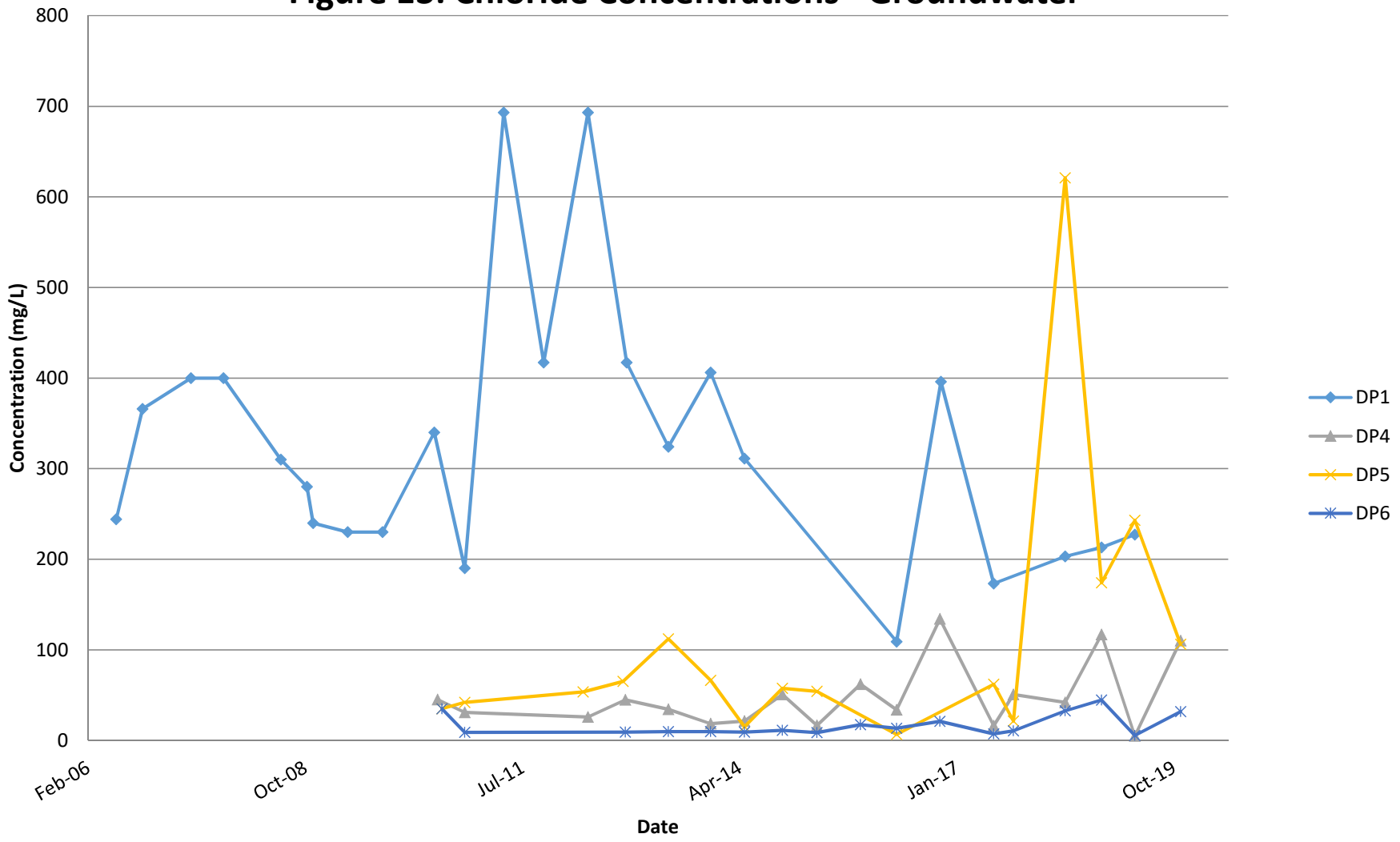


Figure 14: Hardness Concentrations - Groundwater

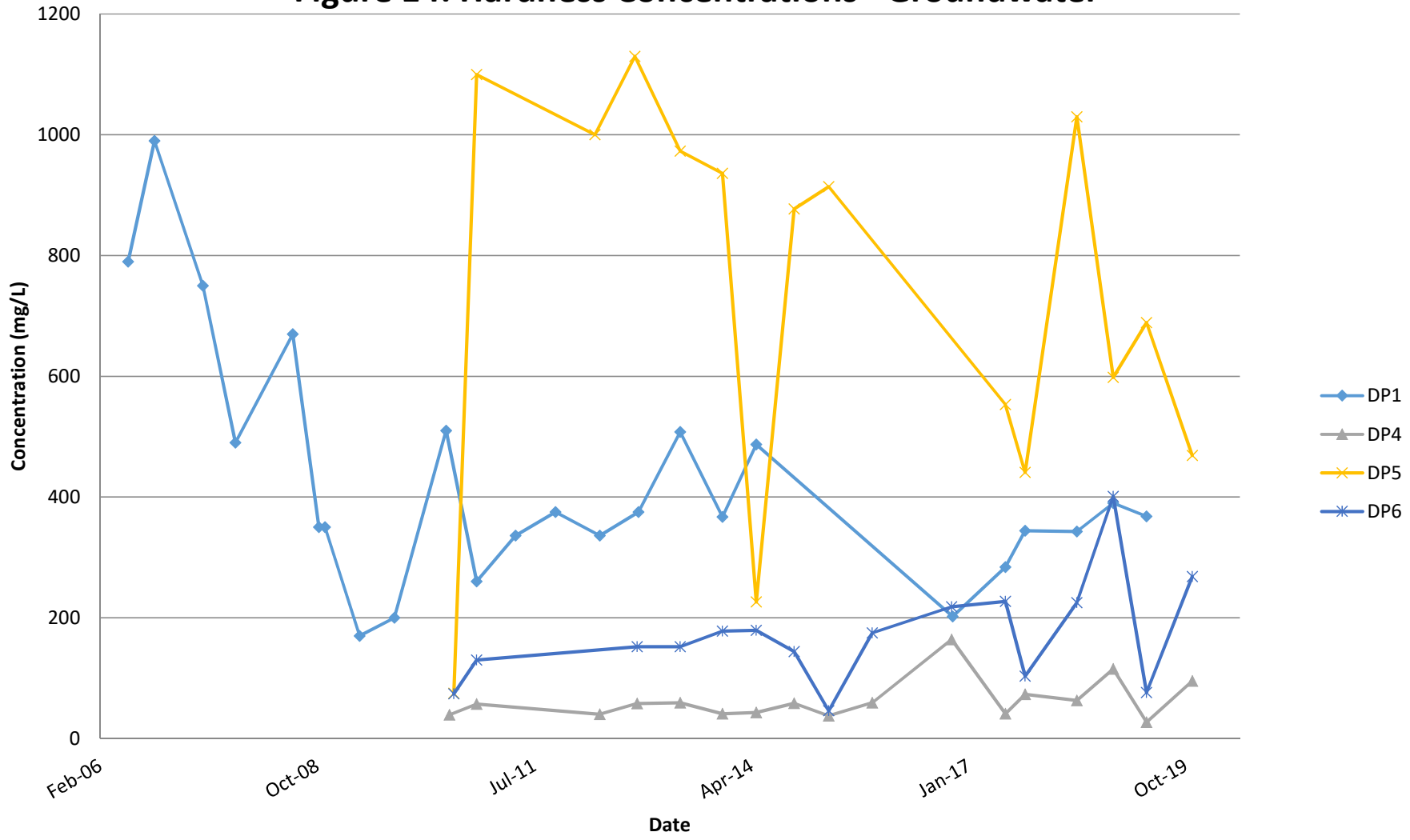


Figure 15: Calcium Concentrations - Groundwater

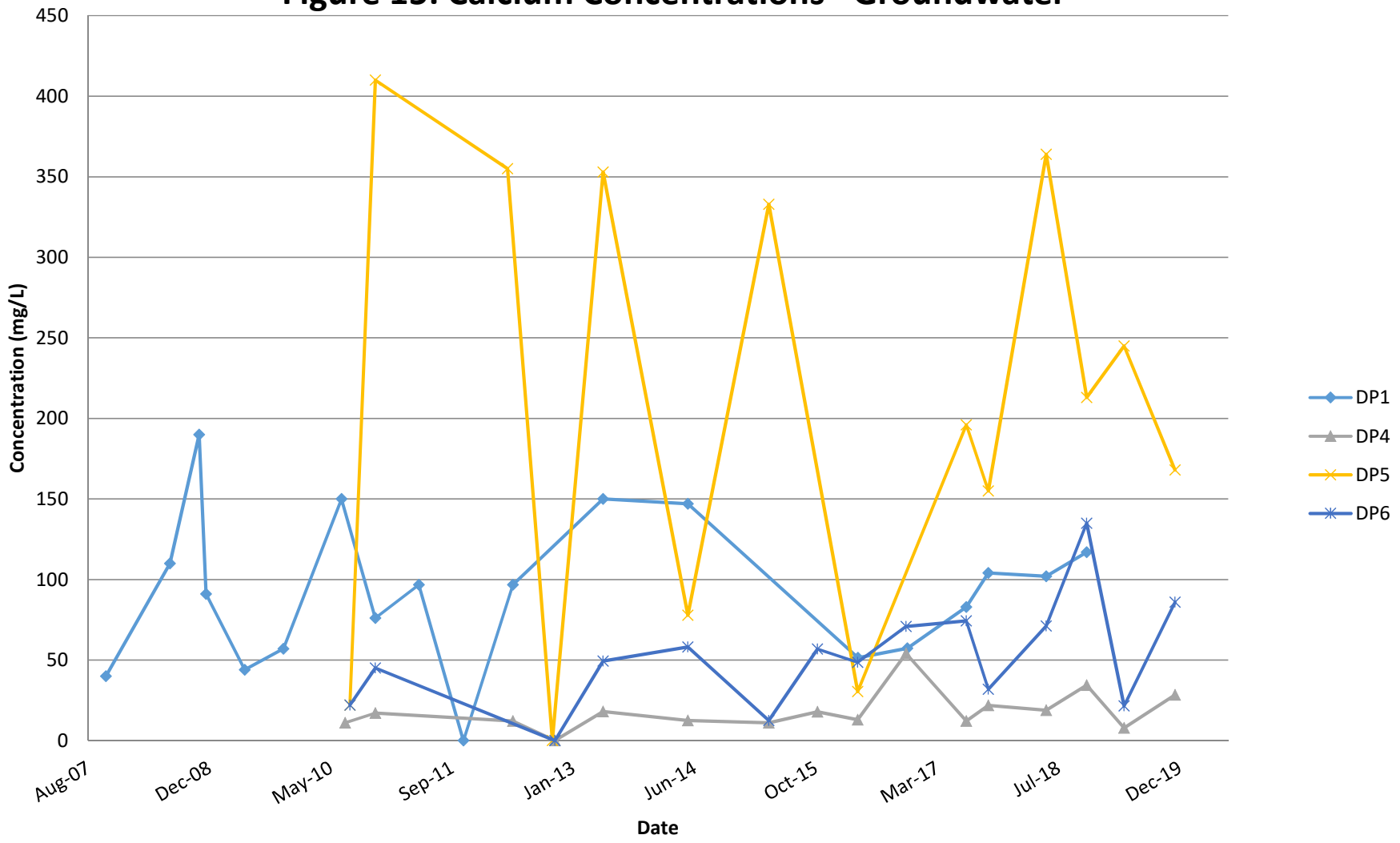


Figure 16: Iron Concentrations - Groundwater

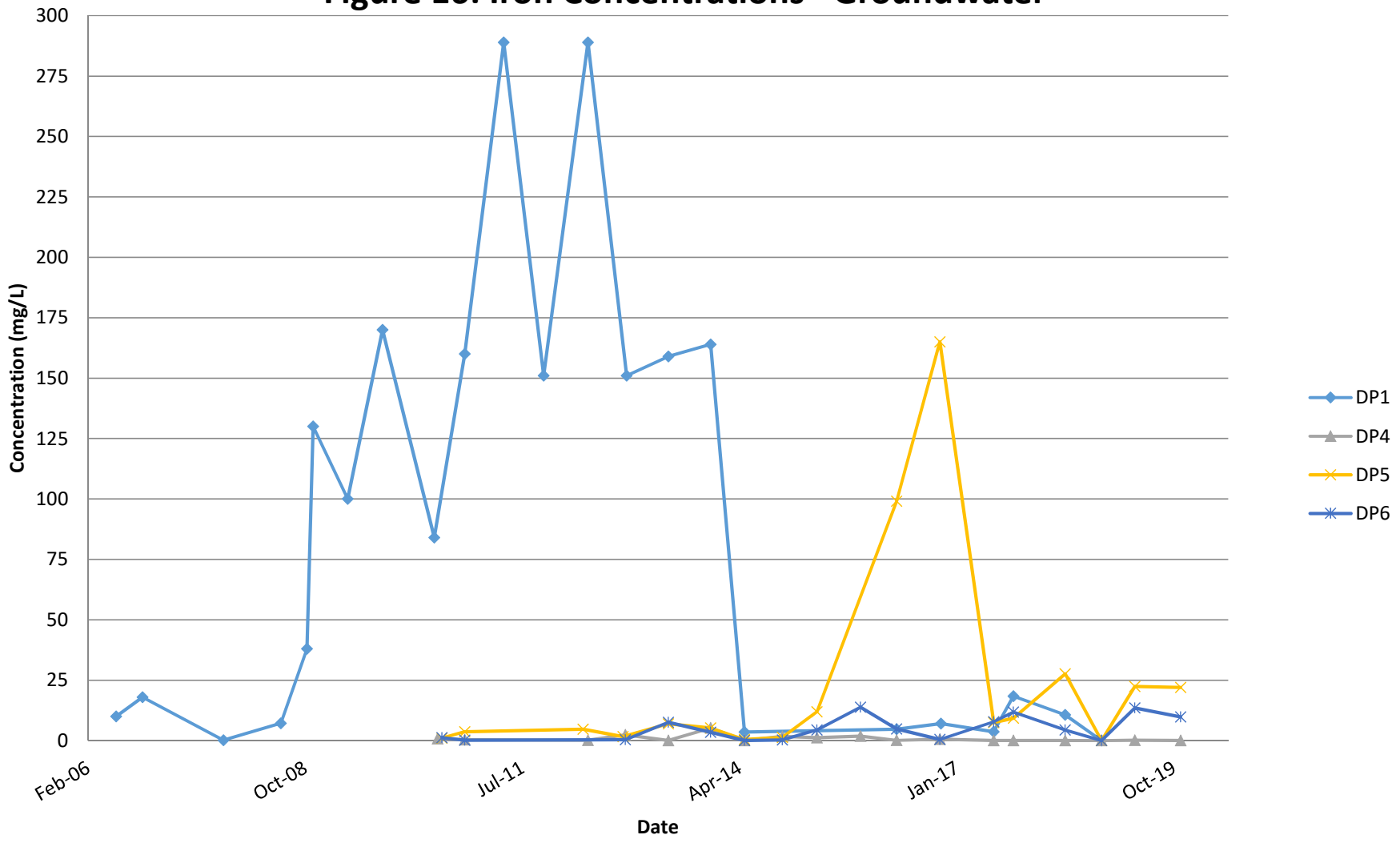


Figure 17: Manganese Concentrations - Groundwater

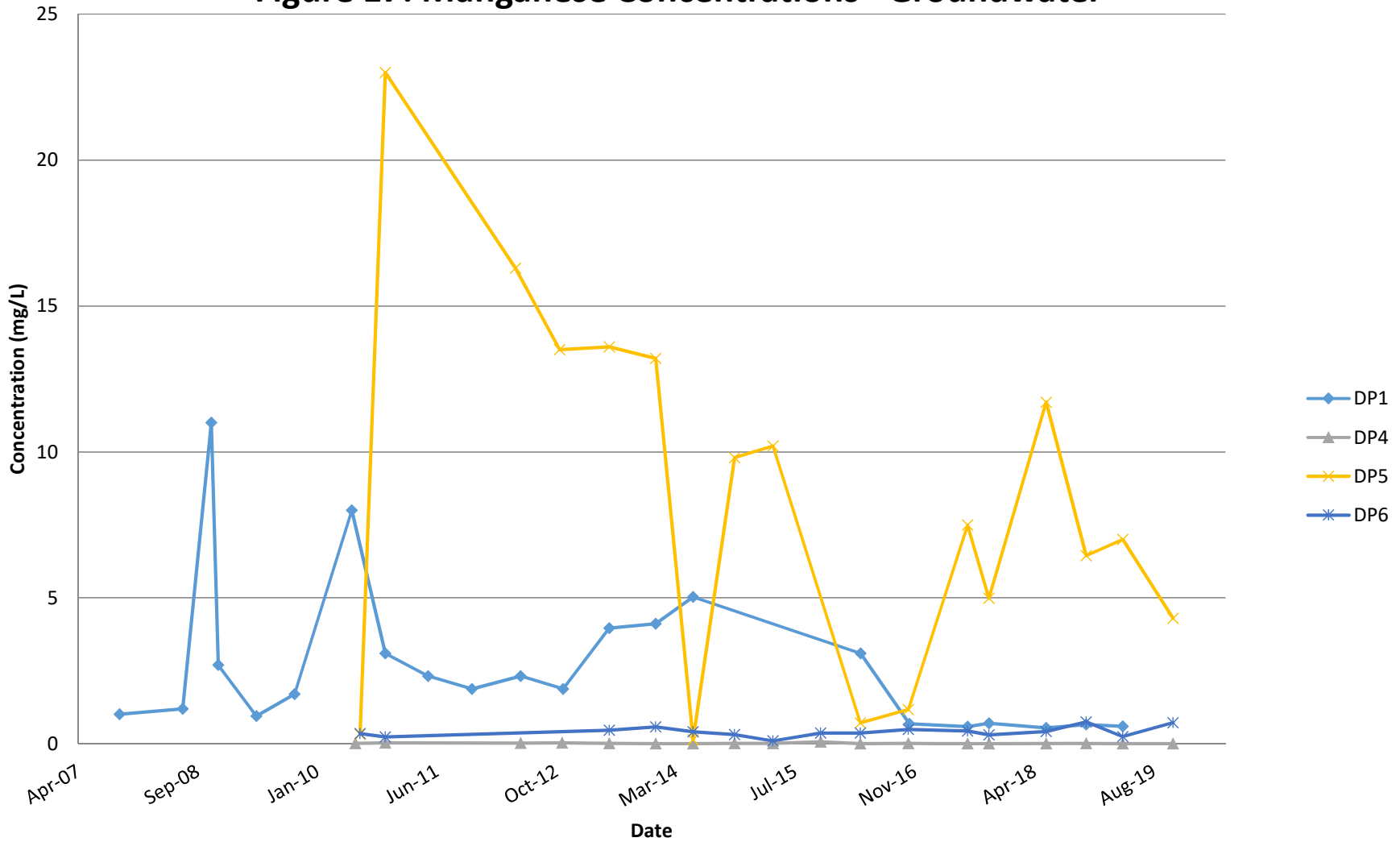


Figure 18: Sodium Concentrations - Groundwater

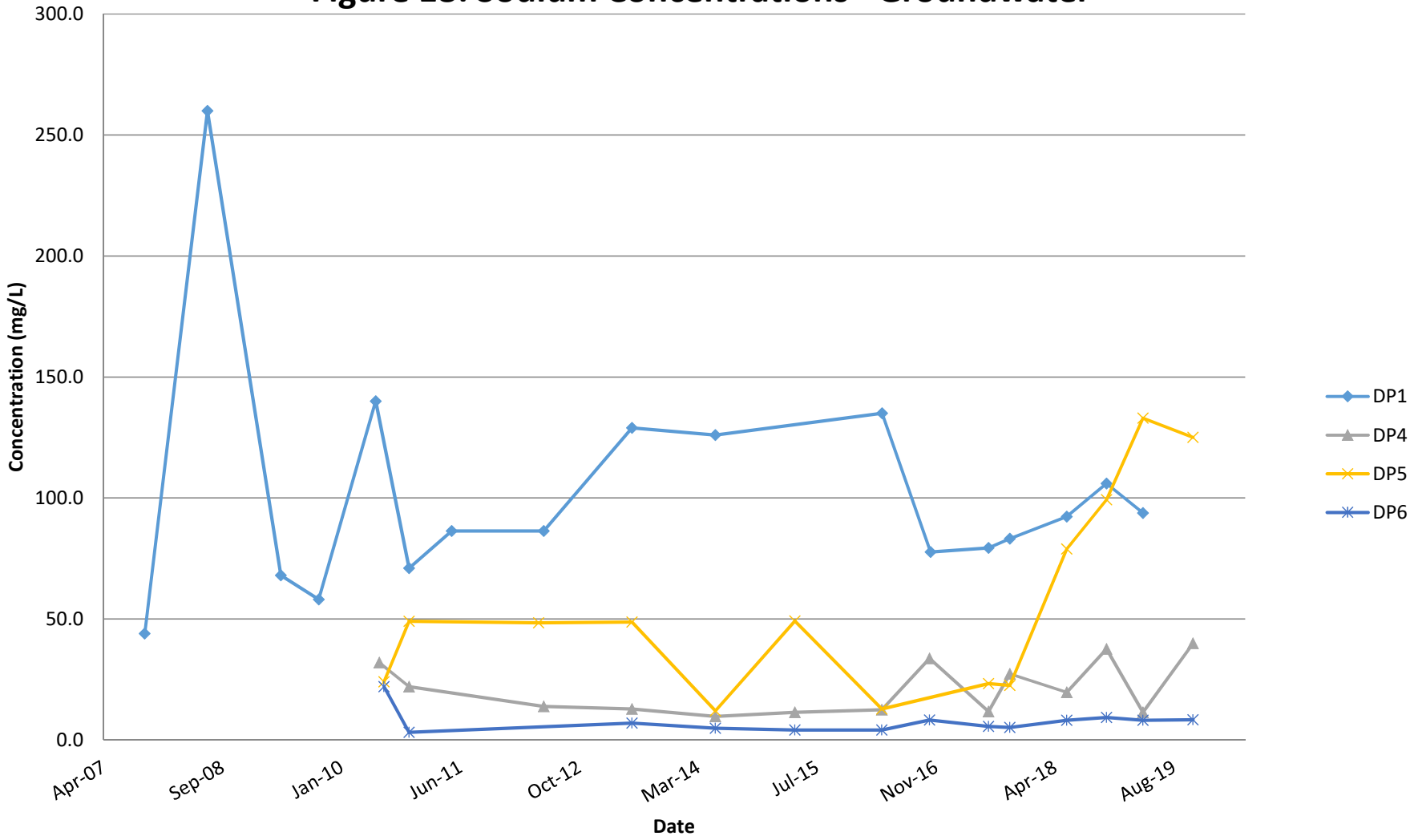


Figure 19: Barium Concentrations - Groundwater

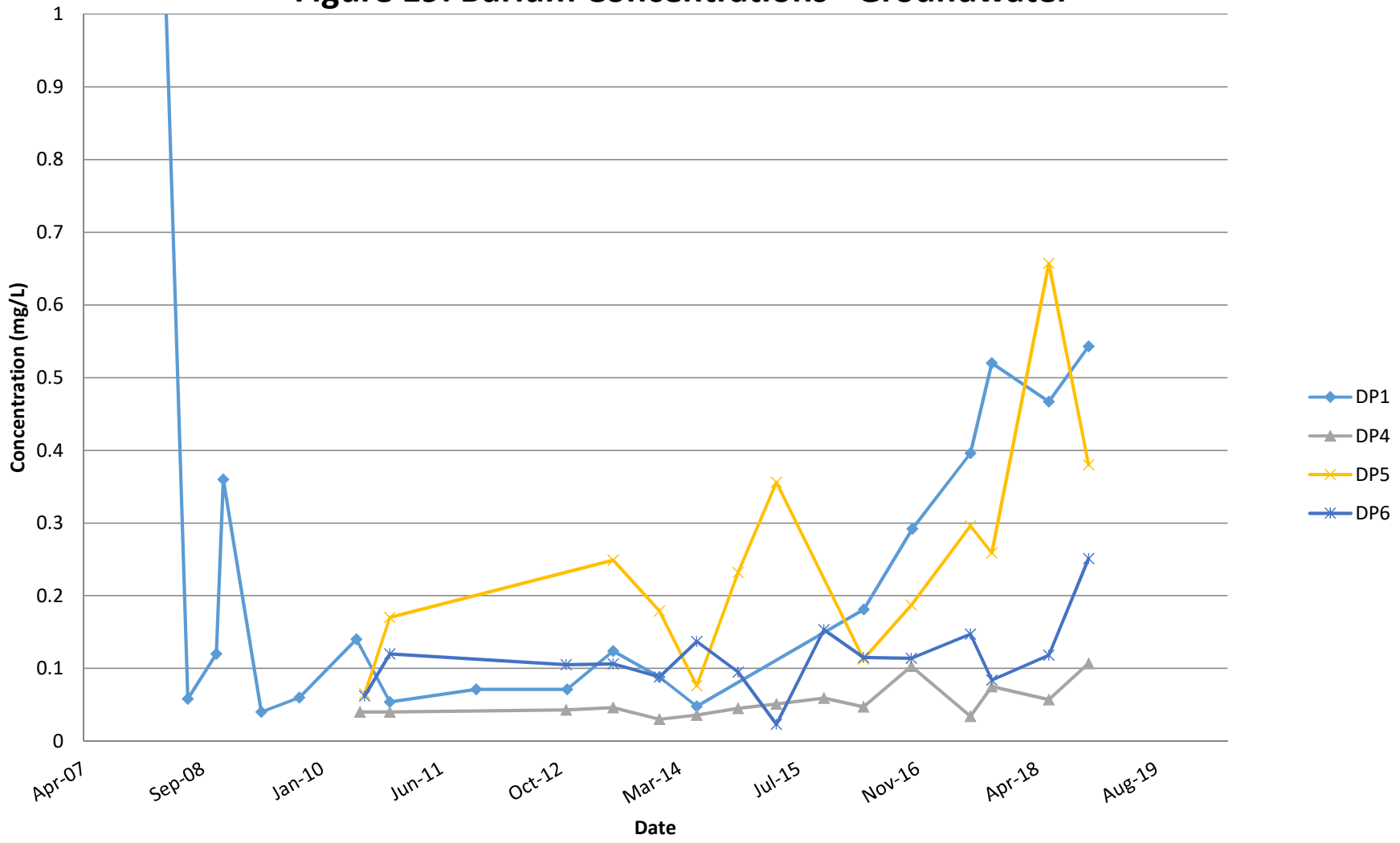


Figure 20: Boron Concentrations - Groundwater

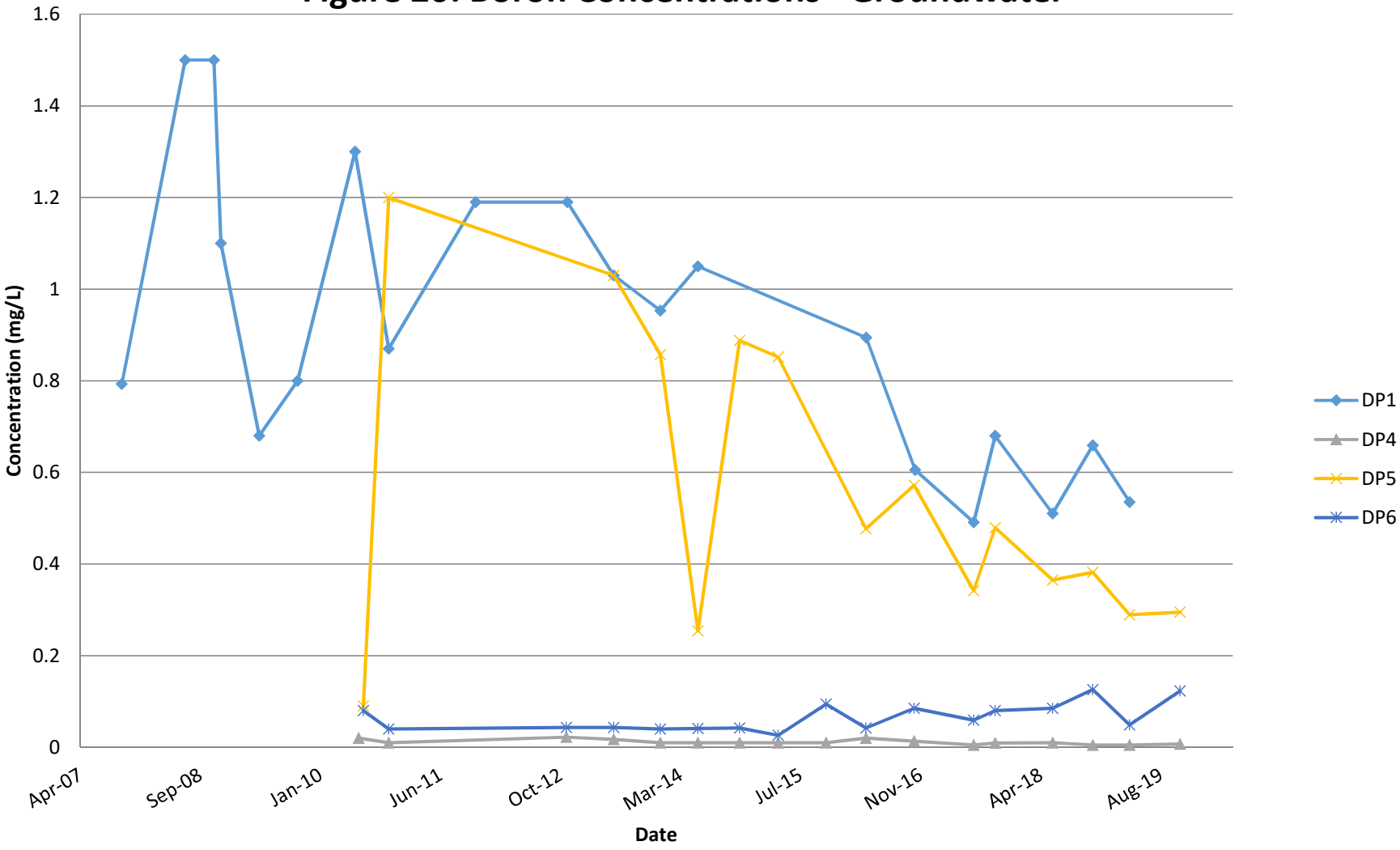


Figure 21: Magnesium Concentrations - Groundwater

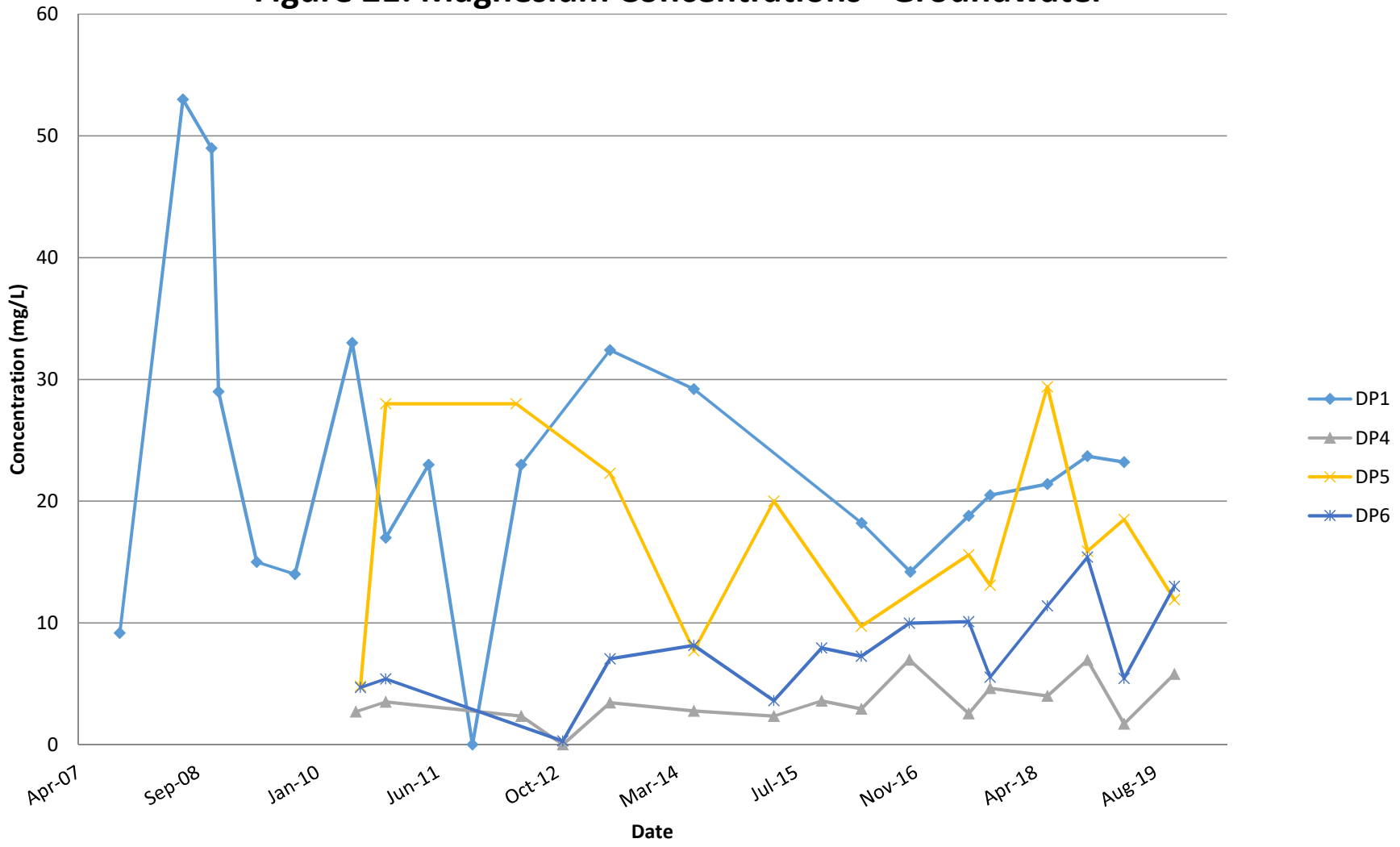


Figure 22: Potassium Concentrations - Groundwater

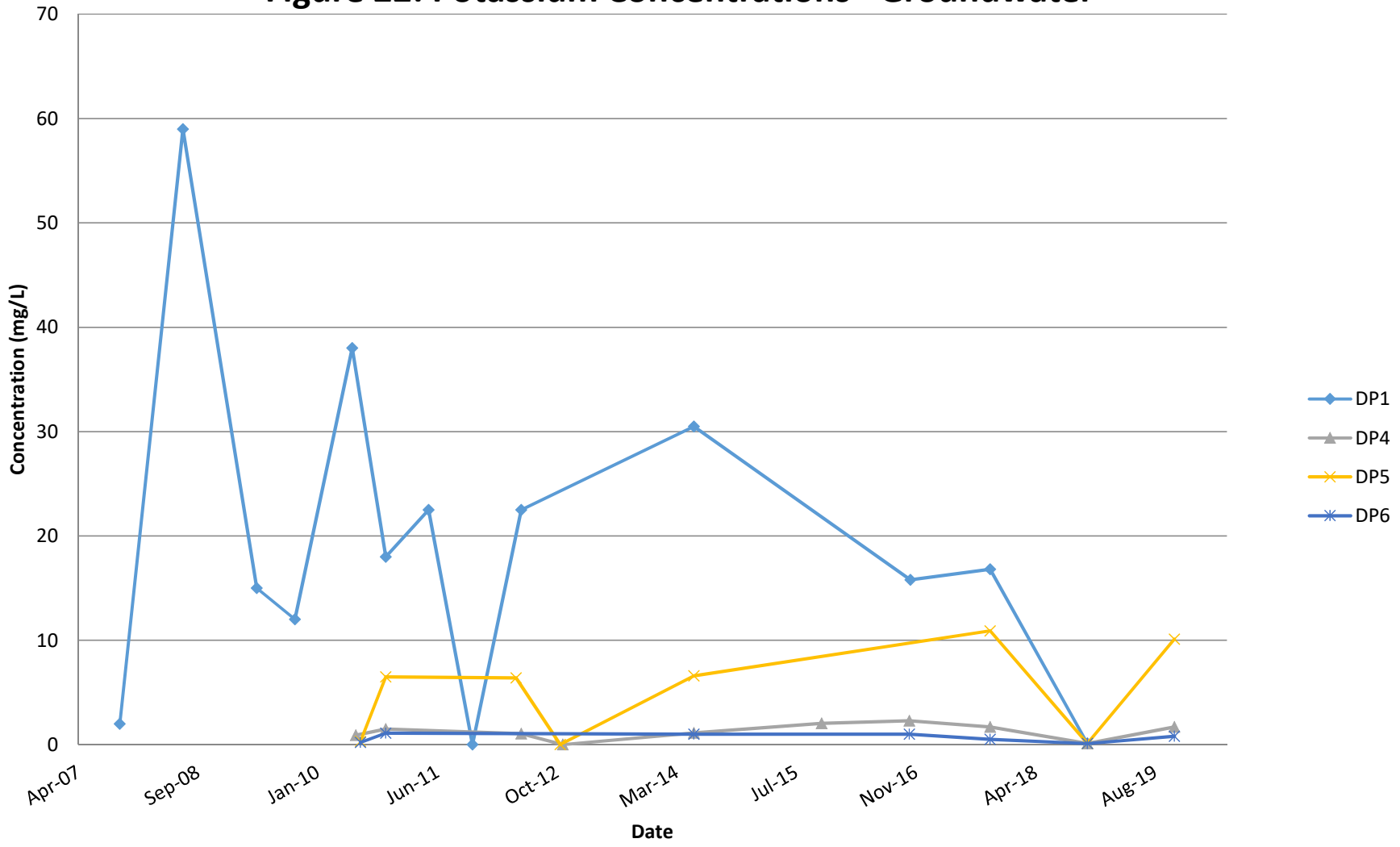
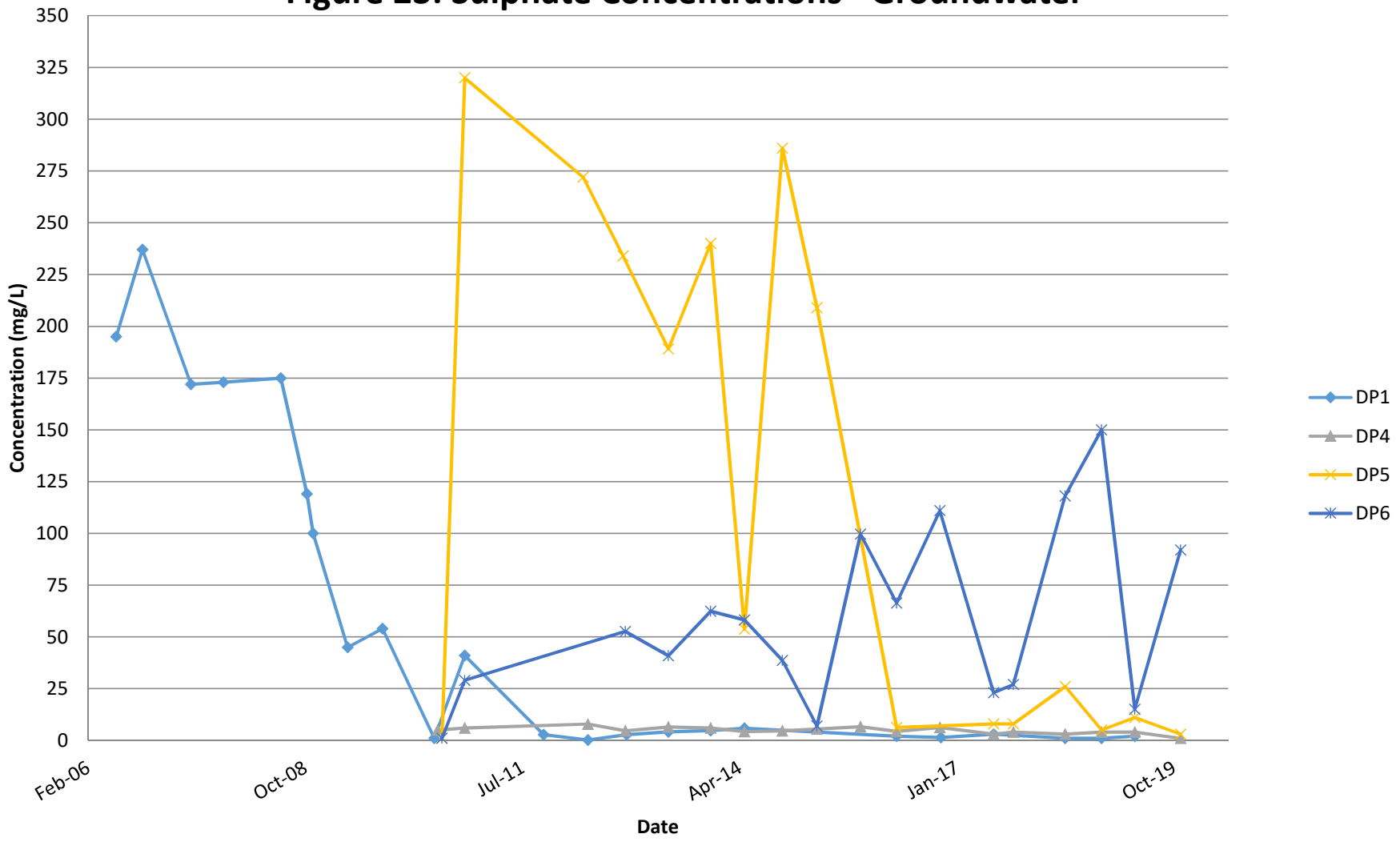


Figure 23: Sulphate Concentrations - Groundwater



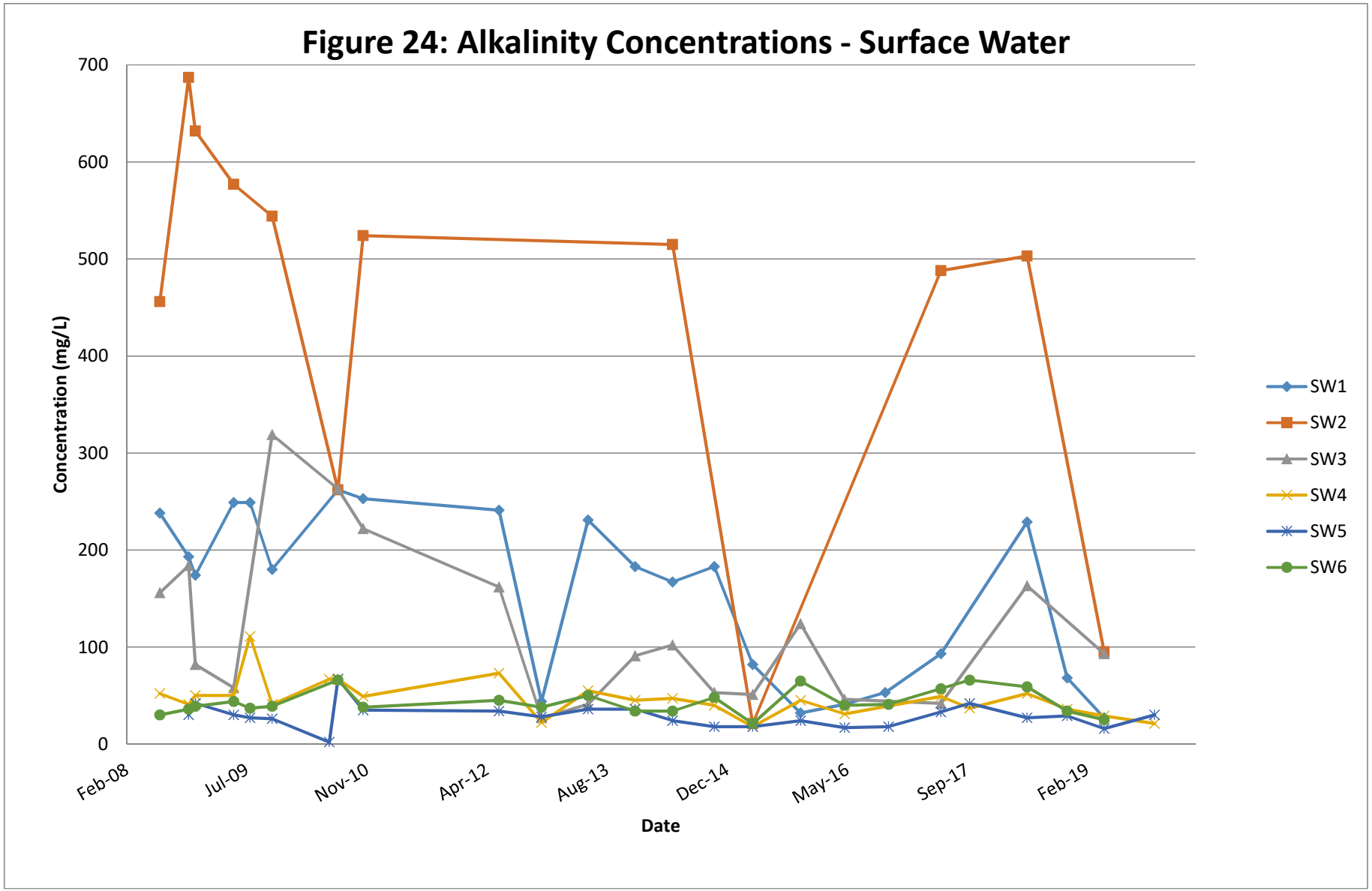


Figure 24: Alkalinity Concentrations - Surface Water
Concentration (mg/L)
700
600
500
400
300
200
100
0
Feb-08
Jul-09
Nov-10
Apr-12
Aug-13
Dec-14
May-16
Sep-17
Feb-19
Date
SW1
SW2
SW3
SW4
SW5
SW6

Figure 25: Conductivity Concentrations - Surface Water

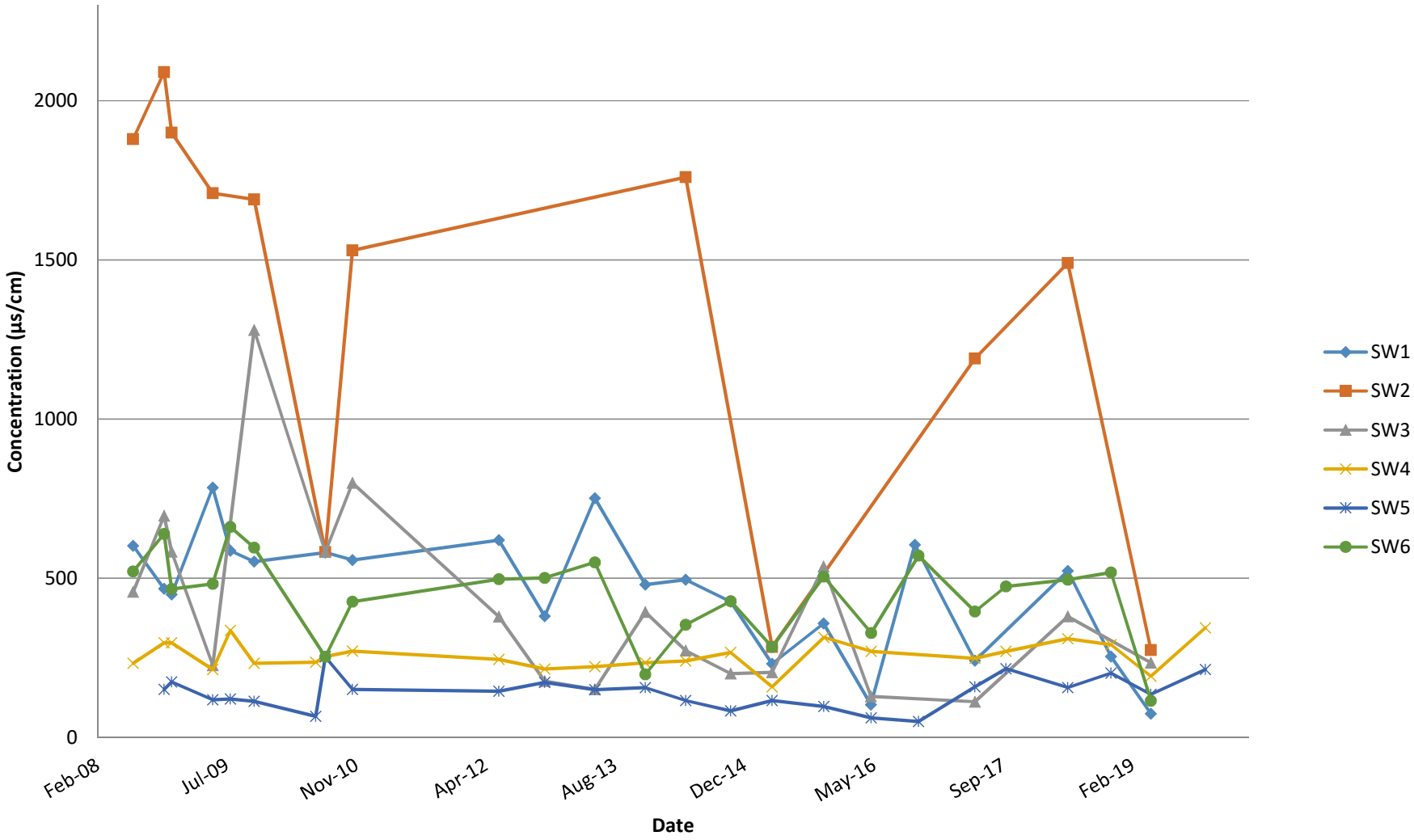


Figure 26: Total Dissolved Solids Concentrations - Surface Water

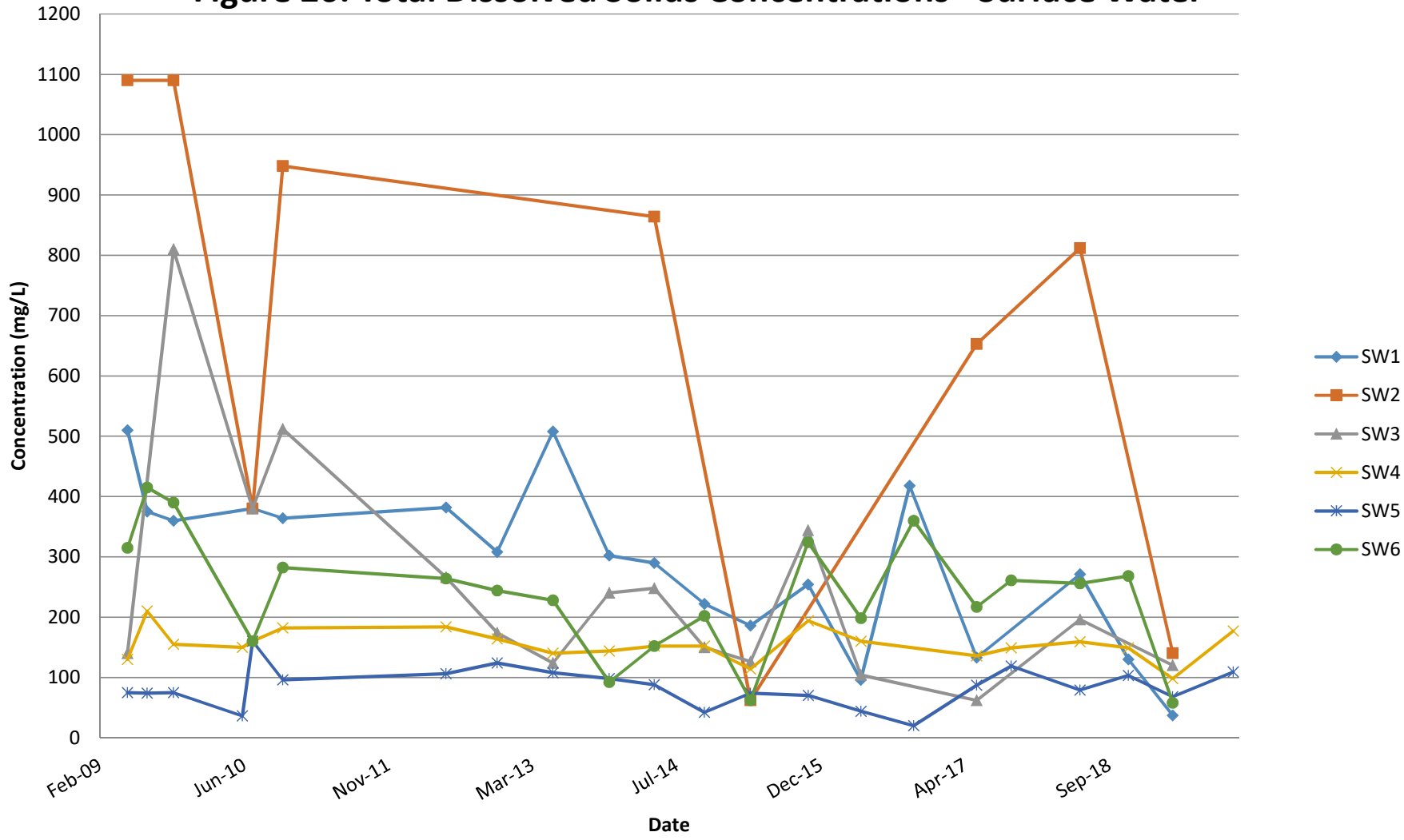


Figure 27: Dissolved Organic Carbon Concentrations - Surface Water

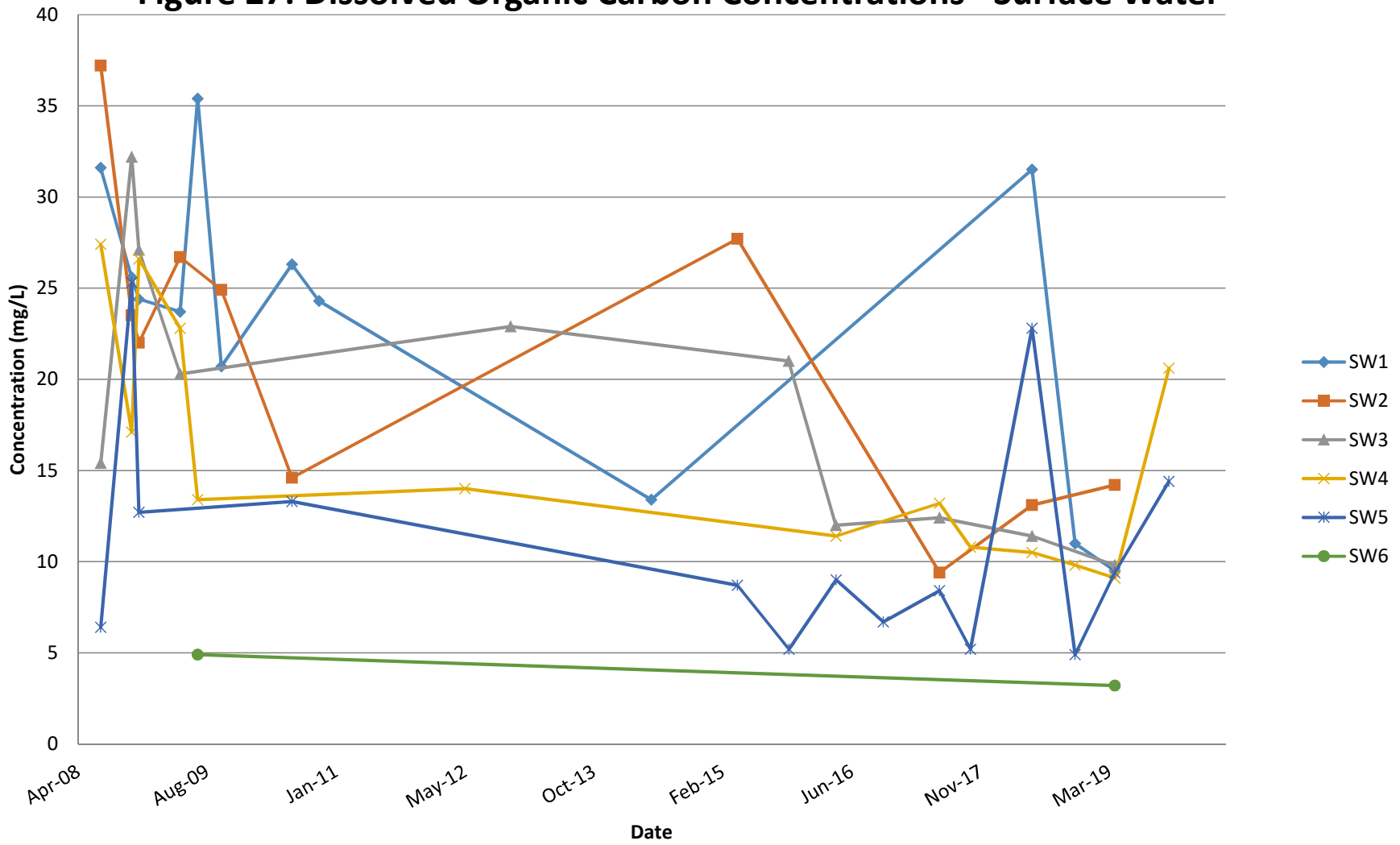


Figure 28: Chemical Oxygen Demand Concentrations - Surface Water

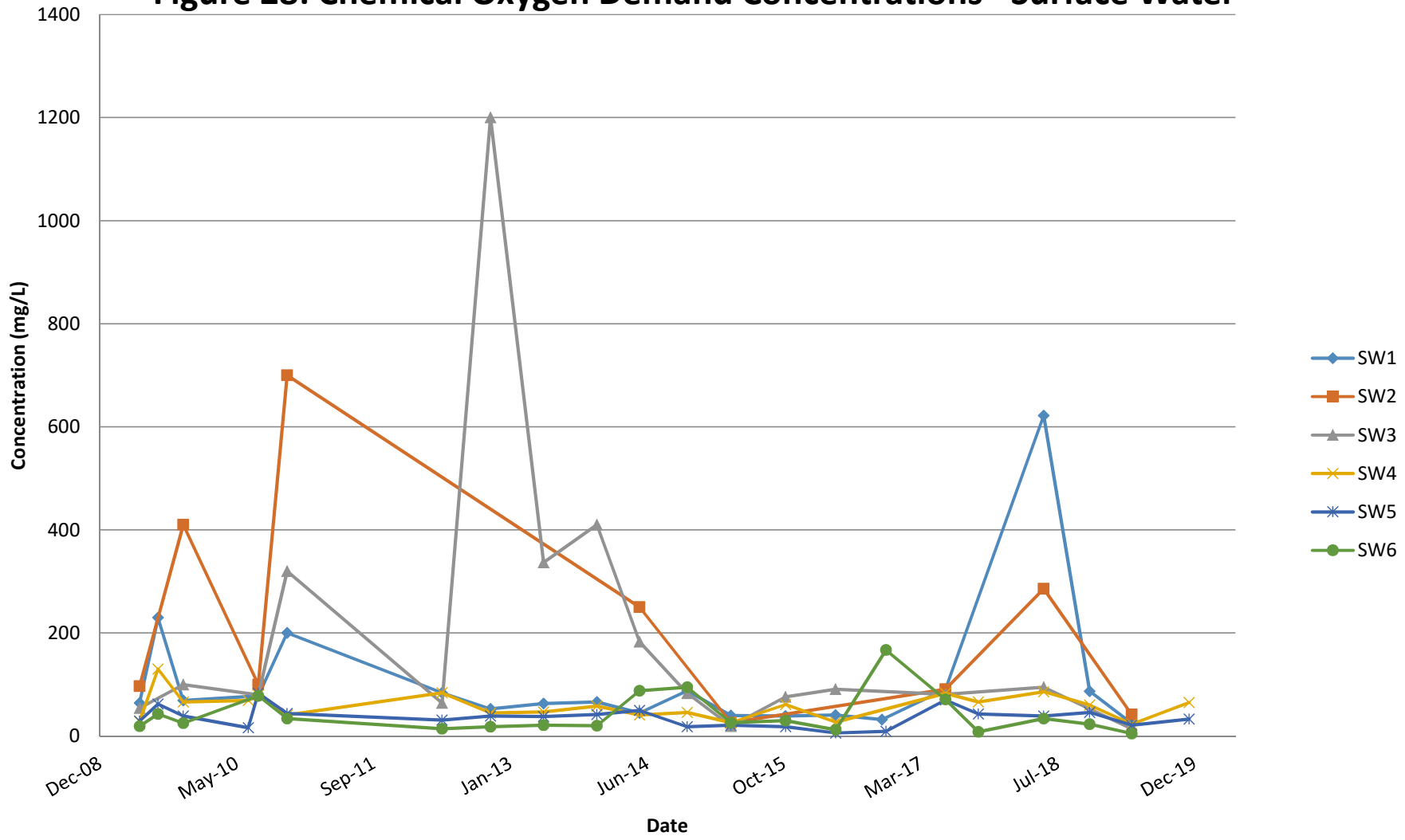


Figure 29: Chloride Concentrations - Surface Water

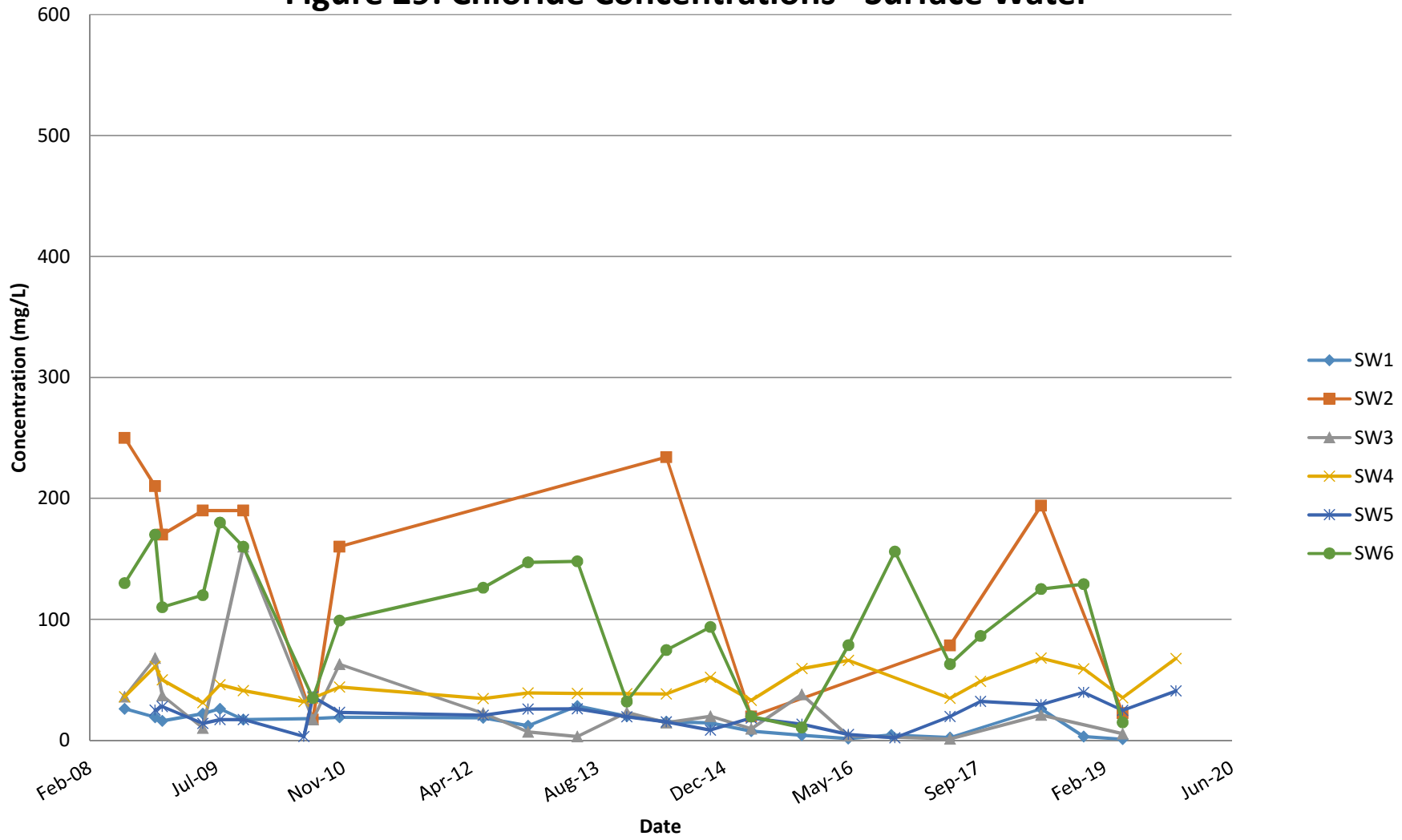


Figure 30: Hardness Concentrations - Surface Water

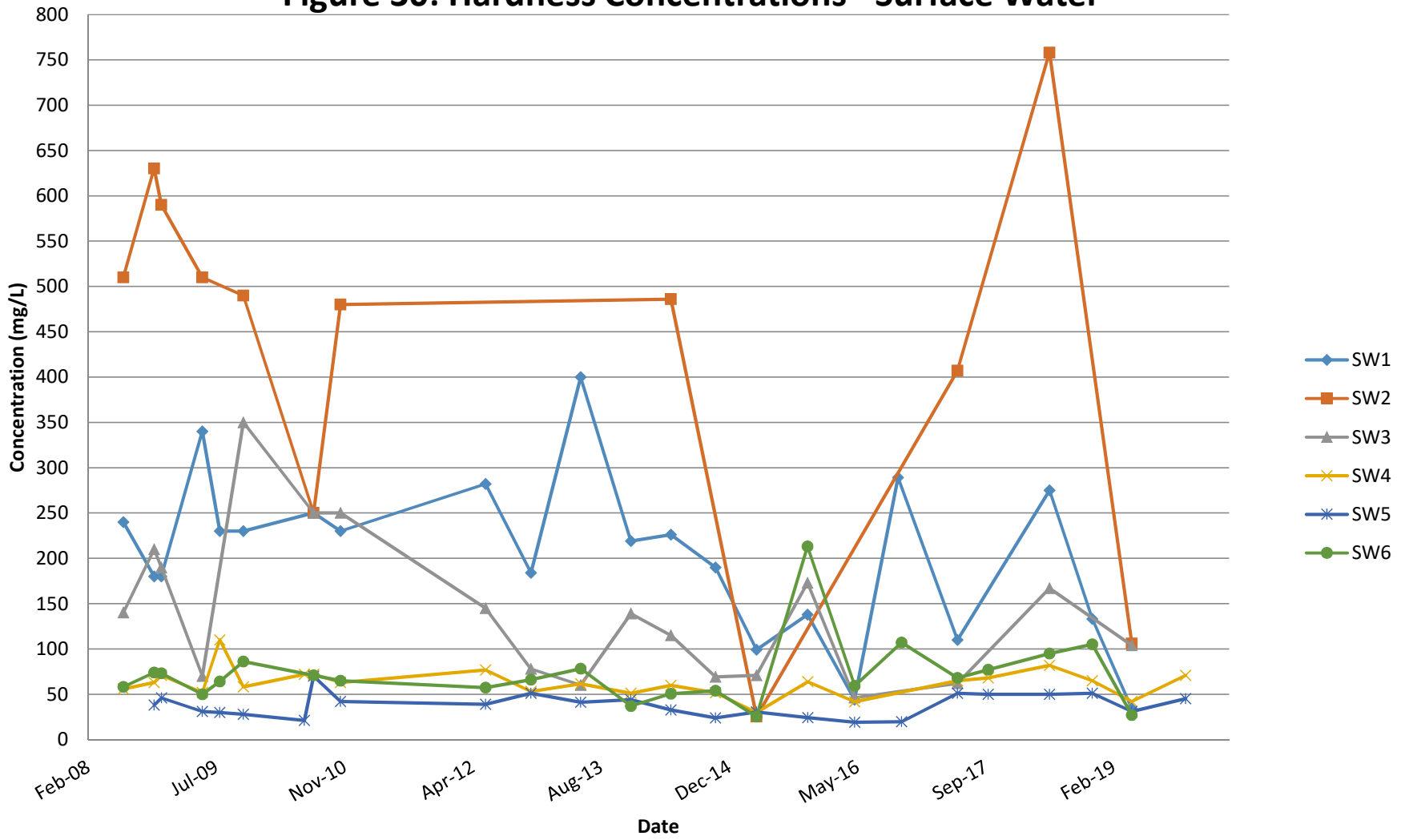


Figure 31 : Calcium Concentrations - Surface Water

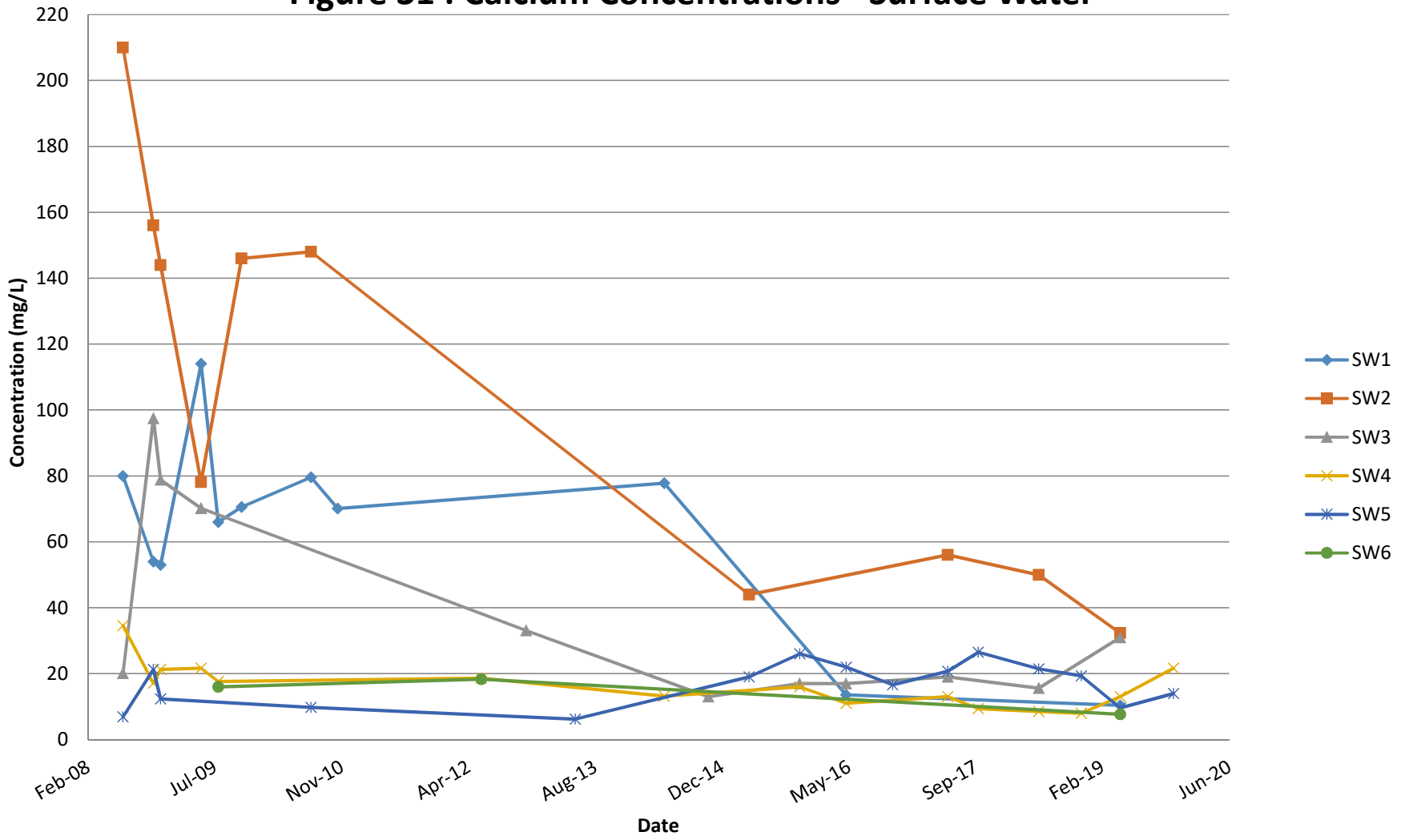


Figure 32: Iron Concentrations - Surface Water

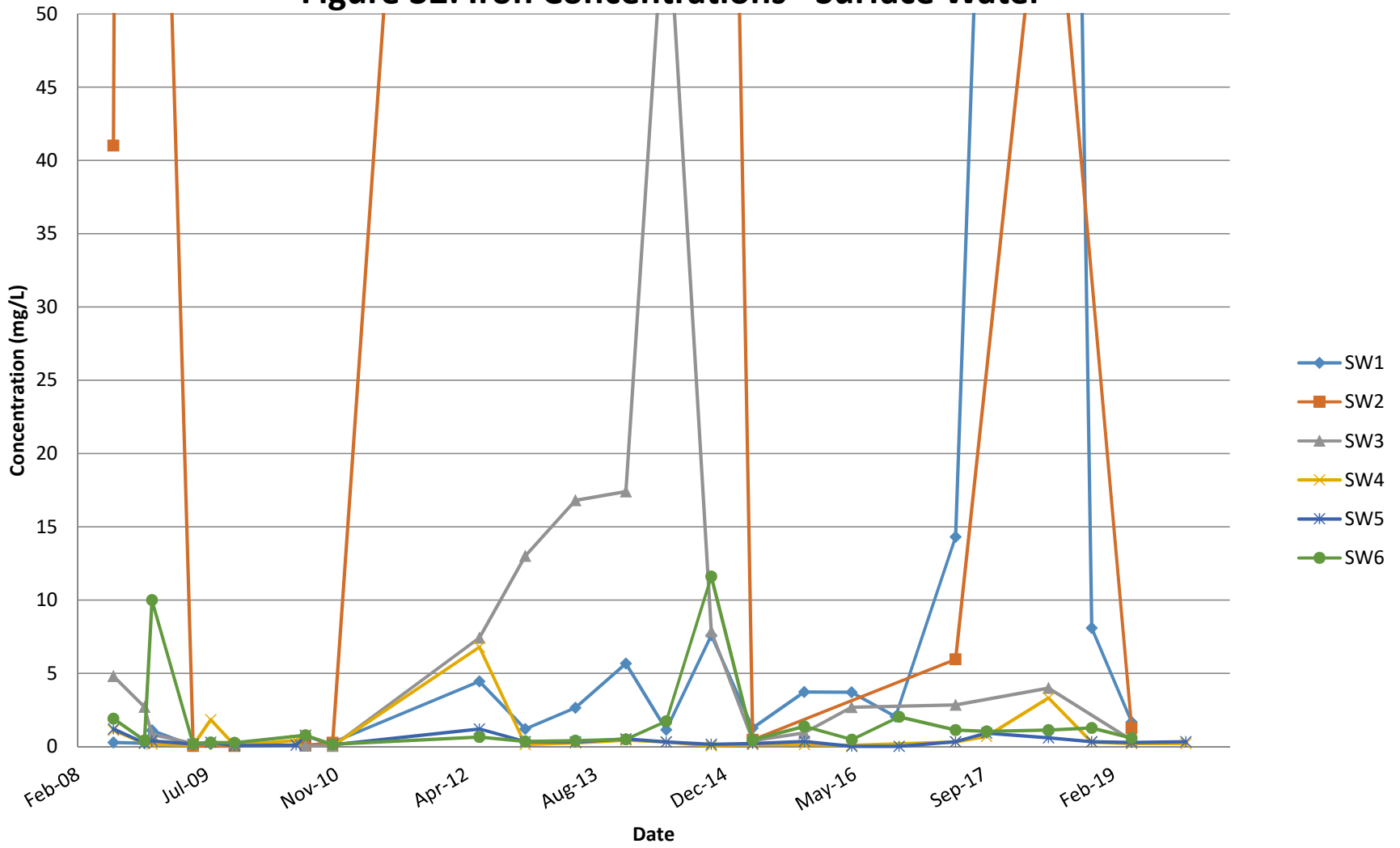


Figure 33: Manganese Concentrations - Surface Water

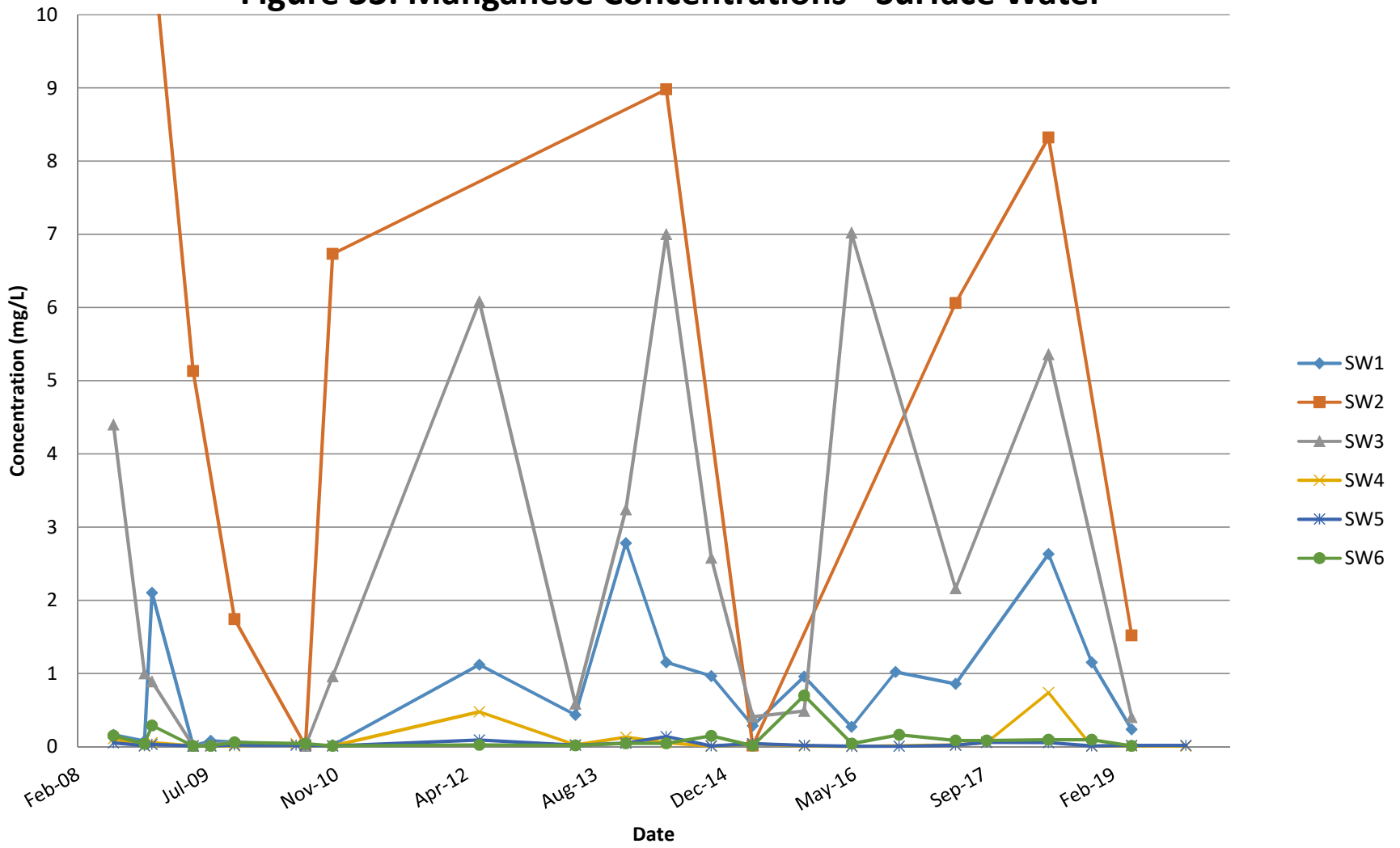


Figure 34: Sodium Concentrations - Surface Water

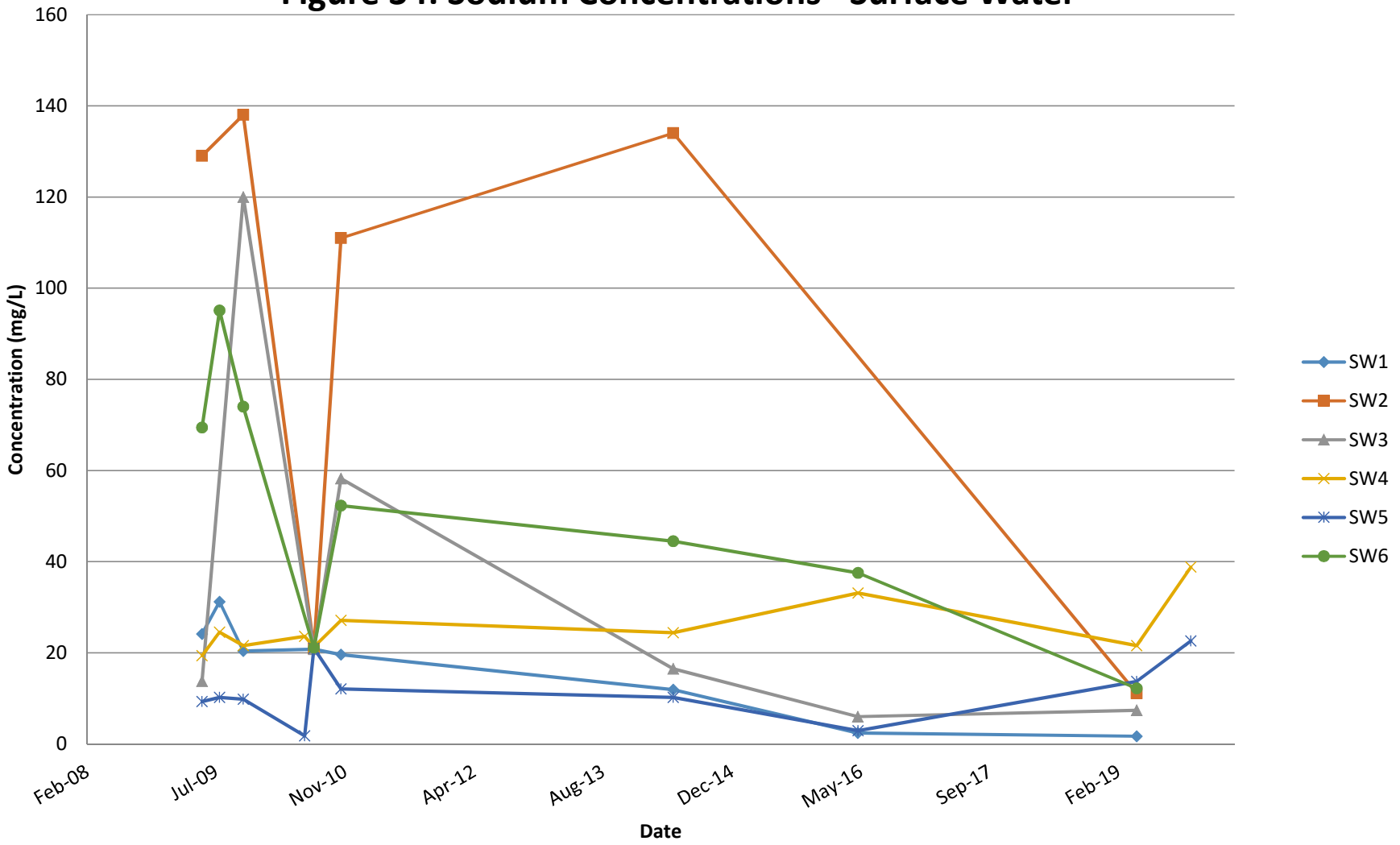


Figure 35: Barium Concentrations - Surface Water

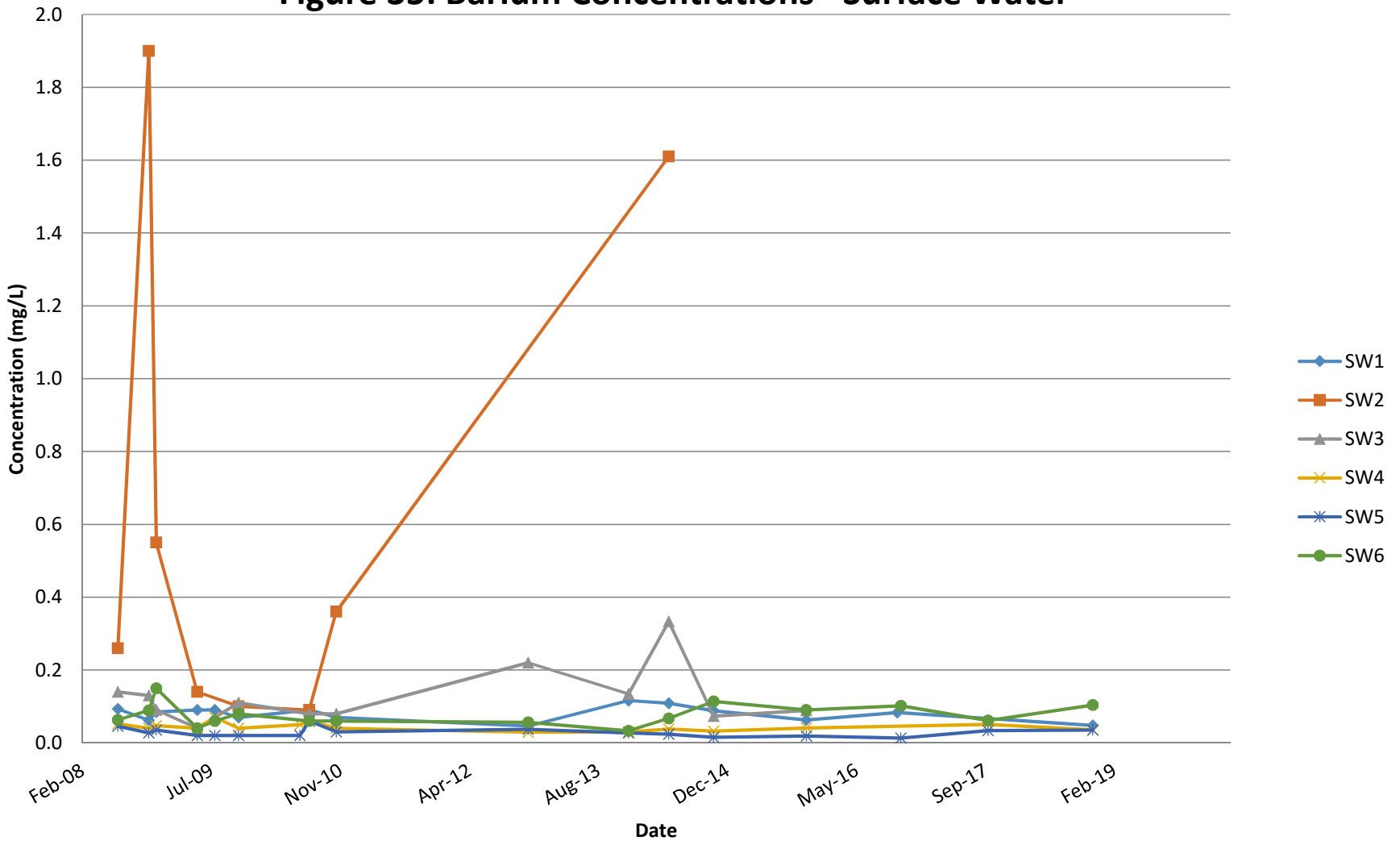


Figure 36: Boron Concentrations - Surface Water

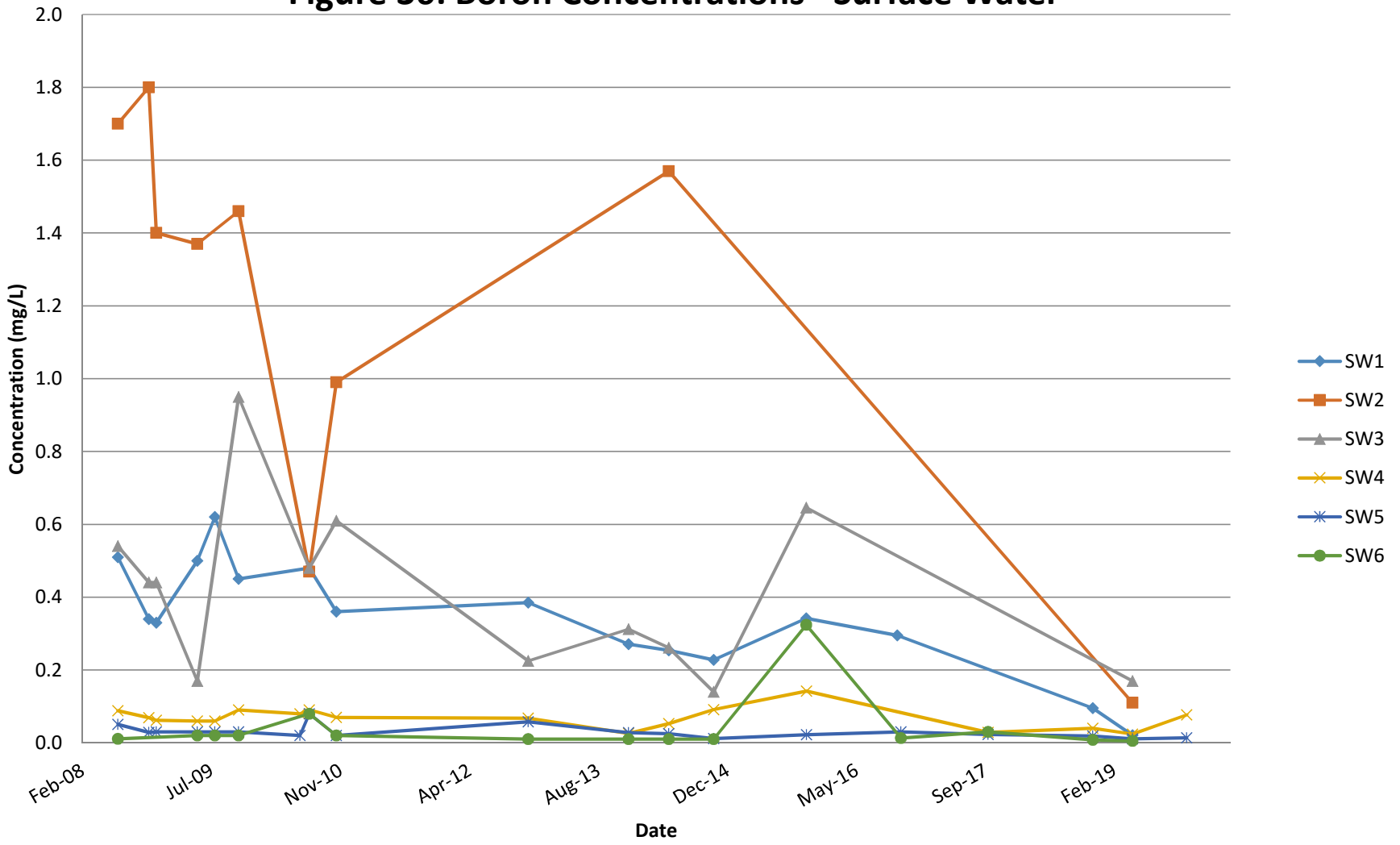


Figure 37: Magnesium Concentrations - Surface Water

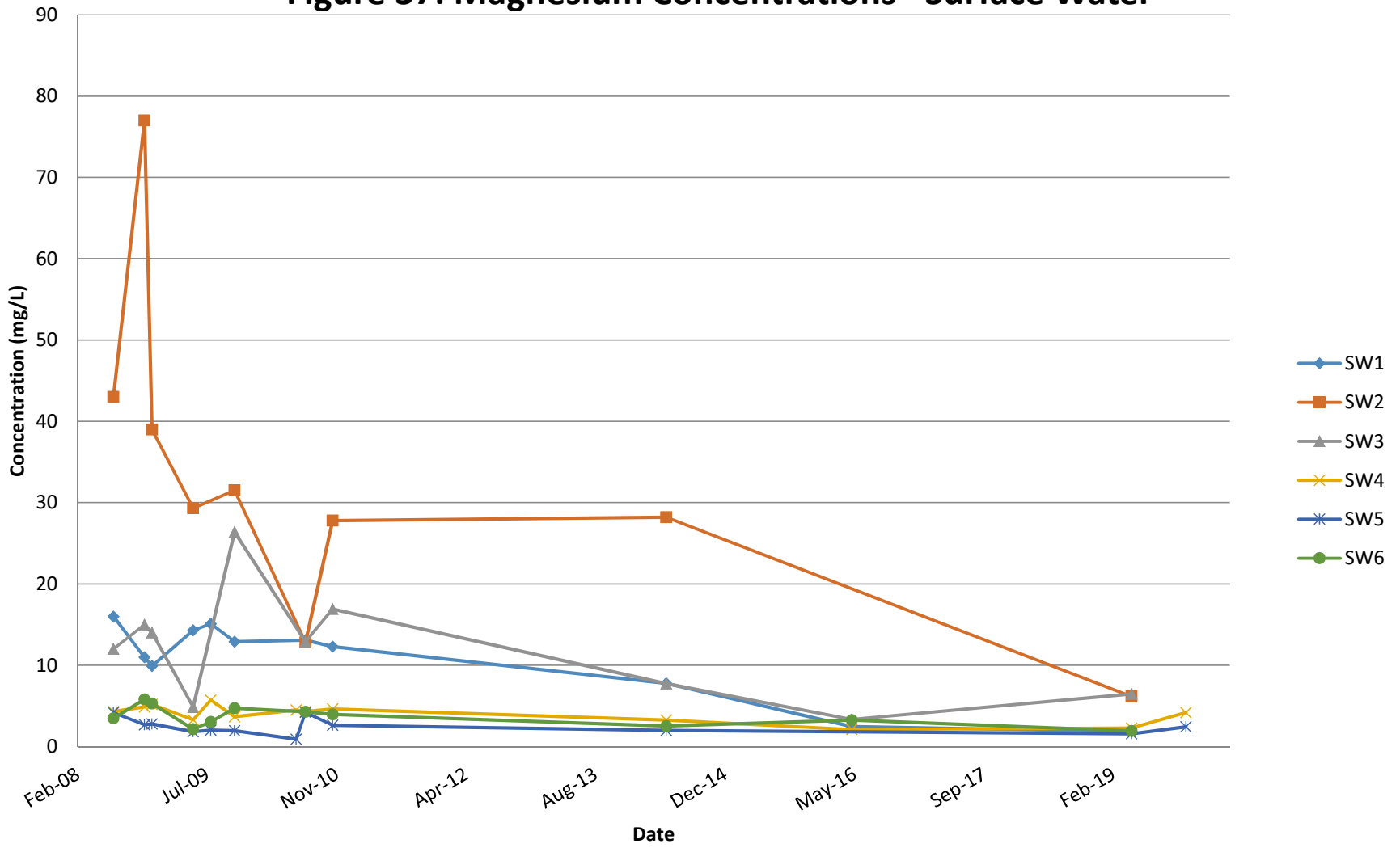


Figure 38: Potassium Concentrations - Surface Water

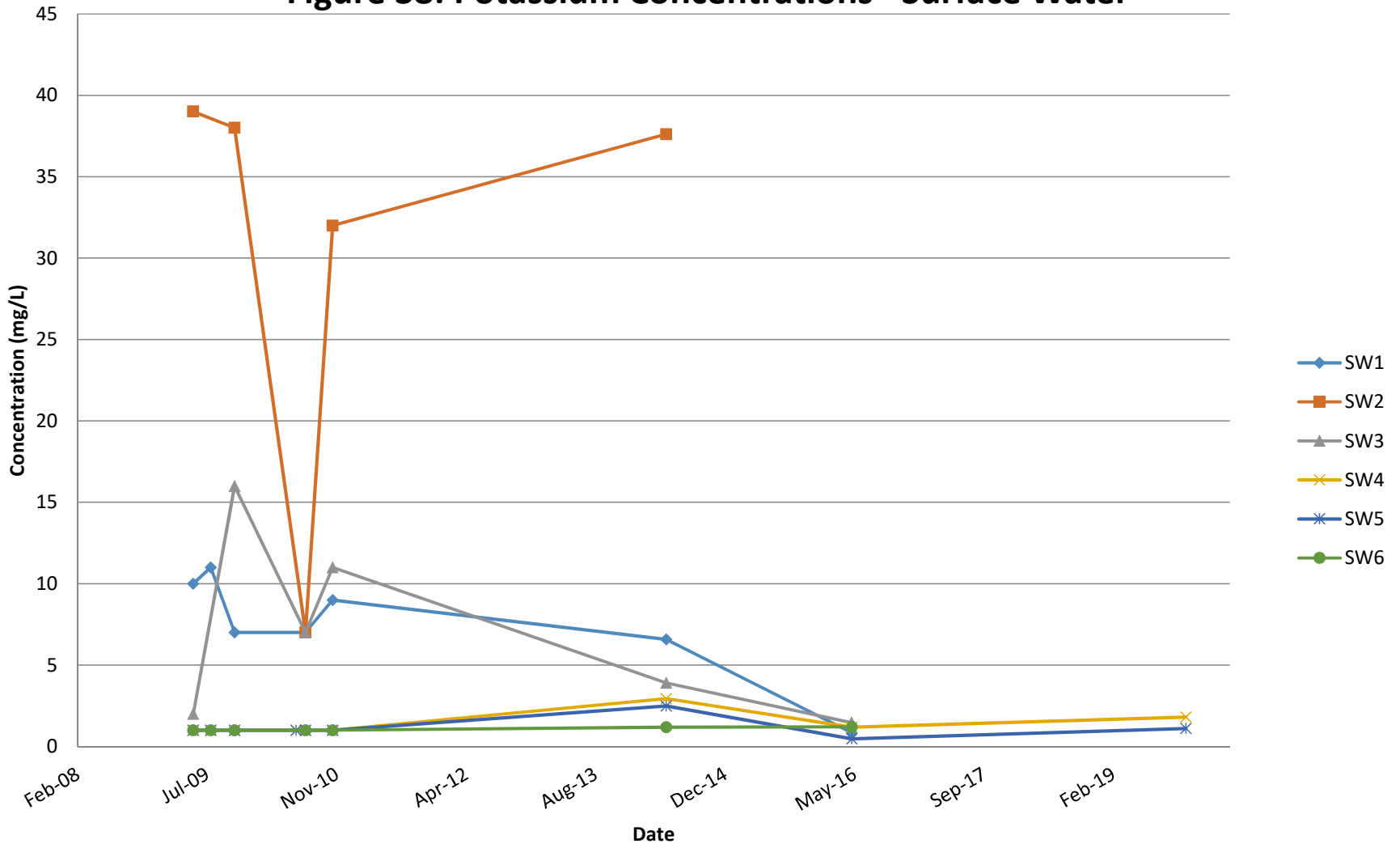
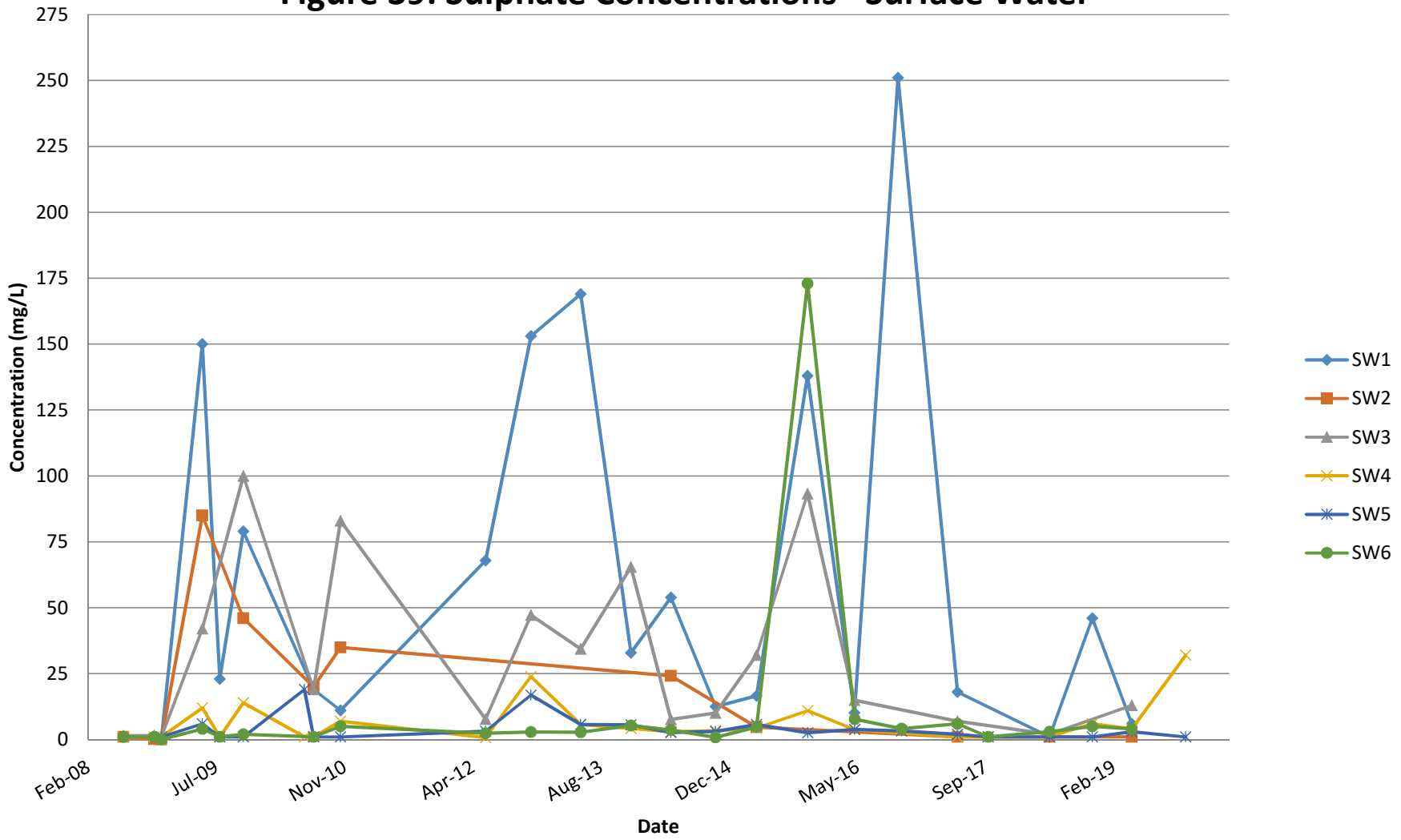


Figure 39: Sulphate Concentrations - Surface Water



Appended Tables

CAMBIUM

Table 1
2018 Cavendish Closed Landfill/Transfer Station Monitoring Program

Location	Task	Frequency	Parameters
GROUNDWATER			
DP1, DP4, DP5, DP6 1 QA/QC Duplicate	• Measure groundwater levels • Groundwater sampling • Field Measurements (pH, temperature, conductivity, dissolved oxygen, ORP)	Once (Spring)	Alkalinity, Ammonia, Barium, Boron, Calcium, Chloride, Conductivity, Iron, Magnesium, Nitrate, pH, Sodium, TDS, Sulphate, COD, DOC, Hardness, Manganese
DP1, DP4, DP5, DP6 1 QA/QC Duplicate	• Measure groundwater levels • Groundwater sampling Field Measurements (pH, temperature, conductivity, dissolved oxygen, ORP)	Once (Autumn)	Alkalinity, Ammonia, Arsenic, Barium, Boron, Cadmium, Calcium, Chloride, Chromium, Conductivity, COD, DOC, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Nitrate, Nitrite, TKN, pH, Phenols, Total Phosphorous, Potassium, Sodium, TDS, Sulphate, Zinc, Hardness Benzene, 1,4- Dichlorobenzene, Dichloromethane, Toluene, Vinyl Chloride
DP-1		Twice (Spring and Autumn)	BOD, TSS
SURFACE WATER			
SW1, SW2, SW3, SW4, SW5, SW6 1 QA/QC Duplicate	• Surface water sampling • Flow estimates • Field measurements (pH, temperature, conductivity, dissolved oxygen and ORP)	Once (Spring)	Alkalinity, Ammonia, Chloride, Conductivity, Iron, Nitrate, Nitrite, TKN, pH, Total Phosphorous, TSS, TDS, Sulphate, BOD, COD, Phenols, Hardness, Manganese
SW1, SW2, SW3, SW4, SW5, SW6 1 QA/QC Duplicate	• Surface water sampling • Flow estimates • Field measurements (pH, temperature, conductivity, dissolved oxygen and ORP)	Once (Autumn)	Alkalinity, Ammonia, Arsenic, Barium, Boron, Cadmium, Chloride, Chromium, Conductivity, Copper, Iron, Lead, Mercury, Nitrate, Nitrite, TKN, pH, Total Phosphorous, TSS, TDS, Sulphate, Zinc, BOD, COD, Phenols, Hardness, Manganese

CAMBIUM

2019 Cavendish Closed Landfill/Transfer Station Monitoring Program

Location	Task	Frequency	Parameters
GROUNDWATER			
DP1, DP4, DP5, DP6 1 QA/QC Duplicate	• Measure groundwater levels • Groundwater sampling • Field Measurements (pH, temperature, conductivity, dissolved oxygen, ORP)	Once (Spring)	Alkalinity, Ammonia, Boron, Calcium, Chloride, Conductivity, Iron, Magnesium, Manganese, Nitrate, Nitrite, pH, Sodium, TDS, Sulphate, COD, DOC, Hardness
DP1, DP4, DP5, DP6 1 QA/QC Duplicate	• Measure groundwater levels • Groundwater sampling Field Measurements (pH, temperature, conductivity, dissolved oxygen, ORP)	Once (Autumn)	Alkalinity, Ammonia, Arsenic, Boron, Calcium, Chloride, Conductivity, COD, DOC, Copper, Iron, Magnesium, Manganese, Mercury, Nitrate, Nitrite, pH, Potassium, Sodium, TDS, Sulphate, Zinc, Hardness Acetone, Benzene, Chlorobenzene, 1,4-Dichlorobenzene, 1,1-Dichloroethane, cis-1,2-Dichloroethylene, Dichloromethane, Methyl Ethyl Ketone, Toluene, and Vinyl Chloride
DP-1		Twice (Spring and Autumn)	BOD, TSS
SURFACE WATER			
SW1, SW2, SW3, SW4, SW5, SW6 1 QA/QC Duplicate	• Surface water sampling • Flow estimates • Field measurements (pH, temperature, conductivity, dissolved oxygen and ORP)	Once (Spring)	Alkalinity, Ammonia, Boron, Calcium, Chloride, Conductivity, Iron, Magnesium, Manganese, Nitrate, Nitrite, pH, Sodium, TDS, Sulphate, COD, DOC, Hardness, Total Phosphorous, TSS, BOD, Phenols, TKN
SW1, SW2, SW3, SW4, SW5, SW6 1 QA/QC Duplicate	• Surface water sampling • Flow estimates • Field measurements (pH, temperature, conductivity, dissolved oxygen and ORP)	Once (Autumn)	Alkalinity, Ammonia, Arsenic, Boron, Calcium, Chloride, Conductivity, COD, DOC, Copper, Iron, Magnesium, Manganese, dissolved Mercury, Nitrate, Nitrite, pH, Potassium, Sodium, TDS, Sulphate, Zinc, Hardness, Total Phosphorous, TSS, BOD, Phenols, TKN

Table 2: Groundwater Elevation Data

Monitor	DP1	DP4	DP5	DP6
Northing **Easting** [2]	710845 4954895	710769 4955153	710836 4955071	710892 4954835
Original Ground Elevation (masl)	301.39	308.45	308.63	301.56
Stick Up (m)	1.36	0.95	0.09	0.87
Depth (m)	2.59	2.80	2.80	2.35
Measuring Point (masl)	302.74	309.40	308.72	302.43
23-May-12	301.77	307.54	307.85	301.37
15-Nov-12	301.61	307.64	307.72	301.25
29-May-13	301.81	307.65	307.92	301.37
03-Dec-13	301.78	307.67	308.01	301.44
14-May-14	301.46	307.62	307.89	301.45
04-Nov-14	301.74	307.57	307.83	301.29
13-Apr-15	-	307.79	307.79	301.47
30-Oct-15	-	307.47	307.04	301.30
29-Apr-16	301.34	307.70	307.03	301.09
26-Oct-16	300.95	307.06	306.75	301.01
5-Jun-17	301.40	307.74	307.66	301.42
3-Oct-17	301.27	307.55	307.43	300.97
30-May-18	301.38	307.65	307.52	301.36
13-Nov-18	301.37	307.65	307.67	301.36
17-Apr-19	301.07	307.60	307.77	301.60
12-Nov-19	-	307.55	307.65	301.33

1. Elevations are geodetic.
2. Zone 17, accurate to +/- 5.0 metres
3. "-" Water Level data unavailable for sampling even

Table 3: Summary of Groundwater Quality

Parameter	PWQO[2]	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1
		16-Jun-10	03-Nov-10	01-May-11	01-Nov-11	23-May-12	17-Nov-12	29-May-13	09-Dec-13	14-May-14	14-Apr-16	04-Nov-16	05-Jul-17	03-Oct-17	30-May-18	13-Nov-18	16-Apr-19
Alkalinity ($CaCO_3$)	decrease >25%	30	609	11	163	11	163	297	191	373	422	203	314	301	356	334	366
Conductivity (µs/cm)	NV	1290	1840	2010	1400	2010	1400	1560	1720	1750	1080	1460	1270	1390	1230	1330	1440
pH (units)	6.5 - 8.5	**6.10**	7.79	**5.87**	7.08	**5.87**	7.08	7.78	7.30	7.73	7.95	7.19	7.60	7.58	7.79	7.63	7.48
Solids - Total Dissolved (TDS)	NV	890	1160	<0.2	930	1390	930	948	900	944	616	-	700	766	664	721	738
Solids - Total Suspended (TSS)	NV	180	160	254	364	254	364	553	596	-	1390	-	-	-	-	-	-
Carbon - Dissolved Organic (DOC)	NV	31.9	25.2	-	-	-	-	38.1	-	18	68	30.2	18.1	7.3	16.8	8.4	7.8
Oxygen Demand - Biological (BOD)	NV	41	3	14	<5	14	<5	<5	7	-	-	-	-	-	-	-	-
Oxygen Demand - Chemical (COD)	NV	120	140	144	102	144	102	142	67	130	117	86	328	20	110	129	125
Total - Phenolics	0.005	-	-	0.002	0.002	0.002	0.002	-	**0.007**	-	-	<0.001	-	< 0.001	-	0.003	-
Chloride[3]	120	**340**	**190**	**693**	**417**	**693**	**417**	**324**	**406**	**311**	109	**396**	**173**	-	**203**	**213**	**227**
Sulphate	NV	1	41	-	2.75	<0.2	2.75	4.16	4.77	5.8	2.04	1.46	3	-	1	1	2
Nitrogen - Ammonia (NH_3) & Ammonium (NH_4)	NV	13	10	2.39	6.23	2.39	6.23	8.3	2.22	1.82	3.48	1.36	2.59	2.74	2.88	3.12	3.06
Nitrogen - Nitrite (NO_2)[3]	0.6	-	-	<0.1	<0.05	<0.1	<0.05	-	<0.5	<0.25	-	<0.05	-	-	-	< 0.05	< 0.05
Nitrogen - Nitrate (NO_3)[3]	13	0.1	<0.1	<0.1	<0.05	<0.1	<0.05	<0.5	<0.5	<0.25	<0.25	<0.05	< 0.05	-	0.33	0.16	0.07
Nitrogen - Total Kjeldahl (TKN)	NV	14	12	3.42	7.64	3.42	7.64	-	5.23	12	-	5.14	-	3.6	-	4.4	-
Mercury	NV	-	-	-	<0.0001	-	<0.0001	-	<0.0001	-	-	<0.0001	-	< 0.00002	-	< 0.00002	-
Hardness (as $CaCO_3$)	NV	510	260	336	375	336	375	508	367	487	-	202	284	344	343	390	368
Arsenic	0.1	-	-	-	0.003	-	0.003	-	<0.003	-	-	<0.003	-	0.0019	-	0.0007	-
Barium	NV	0.14	0.054	-	0.071	-	0.071	0.124	0.088	0.048	0.181	0.292	0.396	0.52	0.467	0.543	-
Boron[3]	1.5	1.3	0.87	-	1.19	-	1.19	1.03	0.953	1.05	0.894	0.605	0.491	0.68	0.51	0.659	0.535
Cadmium	0.001	-	-	-	<0.001	-	<0.001	-	<0.001	<0.02	-	<0.001	-	0.000033	-	< 0.000015	-
Calcium	NV	150	76	96.8	-	96.8	-	150	-	147	51.5	57.3	82.9	104	102	117	109
Chromium	0.0089	-	-	-	**0.014**	-	**0.014**	-	<0.003	<0.003	-	<0.003	-	< 0.001	-	< 0.001	-
Copper	0.005	-	-	-	0.003	-	0.003	-	<0.002	<0.003	-	<0.002	-	0.0009	-	0.001	-
Iron	0.3	**84**	**160**	**289**	**151**	**289**	**151**	**159**	**164**	**3.54**	**4.66**	**6.99**	**3.64**	**18.4**	**10.6**	< 0.005	**29.2**
Lead	0.002	-	-	-	<0.002	-	<0.002	-	<0.002	<0.002	-	**0.007**	-	0.00033	-	0.00017	-
Magnesium	NV	33	17	23	-	23	-	32.4	-	29.2	18.2	14.2	18.8	20.5	21.4	23.7	23.2
Manganese	NV	8	3.1	2.32	1.88	2.32	1.88	3.96	4.11	5.03	3.1	0.682	0.589	0.704	0.542	0.654	0.594
Phosphorus - Dissolved	NV	-	-	<0.02	0.1	<0.02	0.1	-	<0.05	<0.50	-	0.18	-	0.06	-	0.09	-
Potassium	NV	38	18	22.5	-	22.5	-	-	-	30.5	-	15.8	-	16.8	-	< 0.1	-
Sodium	NV	140.0	71.0	86.3	-	86.3	-	129.0	-	126.0	135.0	77.6	79.3	83.2	92.3	106.0	93.8
Zinc	0.03	-	-	-	**32.6**	-	**32.6**	-	**4.47**	**41.4**	-	**331**	-	**105**	-	**51.8**	-
Conductivity (µs/cm)[4]	NV	-	-	-	-	-	-	-	-	1432	-	-	-	-	1210	1320	1220
pH (units)[4]	6.5-8.5	-	-	-	-	-	-	-	-	6.70	-	-	-	-	7.34	6.65	6.77
Temperature (°C)[4]	NV	-	-	-	-	-	-	-	-	13.0	-	-	-	-	13.5	6.1	3
Oxidation Reduction Potential (mV)[4]	NV	-	-	-	-	-	-	-	-	-73	-	-	-	-	89	150	150
Dissolved Oxygen[4]	5	-	-	-	-	-	-	-	-	11.80	-	-	-	-	9.7	10.35	6.13

Notes:
1. Results expressed in mg/L unless otherwise stated
2. PWQO means Provincial Water Quality Objectives, unless otherwise stated.
3. Canadian Water Quality Guidelines for the Protection of Aquatic Life (CWQG).
3. Bold text and shading indicates values exceeding compliance criteria.
4. Results from field analysis
5. NV indicates No Value
6. "-" denotes parameter not analysed

Table 3: Summary of Groundwater Quality

Parameter	DP4	DP4	DP4	DP4	DP4	DP4	DP4	DP4	DP4	DP4	DP4	DP4	DP4	DP4	DP4	DP4	DP4	DP4
	01-Jul-10	03-Nov-10	23-May-12	12-Nov-12	29-May-13	09-Dec-13	14-May-14	04-Nov-14	13-Apr-15	30-Oct-15	13-Apr-16	30-Oct-16	05-Jul-17	03-Oct-17	30-May-18	13-Nov-18	16-Apr-19	12-Nov-19
Alkalinity ($CaCO_3$)	36	46	-	32	27	35	28	31	36	34	29	79	24	28	26	26	31	26
Conductivity (µs/cm)	248	202	164	208	169	157	140	248	141	283	165	576	110	263	175	465	77	423
pH (units)	6.90	7.12	7.23	7.04	7.51	7.28	7.01	7.33	7.51	7.14	7.21	7.79	6.95	7.07	7.47	7.15	7.01	6.97
Solids - Total Dissolved (TDS)	160	118	90	168	144	70	104	170	76	192	138	376	61	145	89	240	39	218
Solids - Total Suspended (TSS)	<10	210000	11800	5760	1700	6190	-	4180	4550	1160	1380	1560	-	-	-	-	-	-
Carbon - Dissolved Organic (DOC)	5	2.1	-	-	2.1	-	1.4	-	5.1	3.6	3.8	6.1	4	2	2.5	2.3	4.3	1.2
Oxygen Demand - Biological (BOD)	<2	<2	<5	<5	<5	<5	-	<5	<5	<5	<5	<5	-	-	-	-	-	-
Oxygen Demand - Chemical (COD)	13	330	37	31	42	23	15	16	49	18	6	9	27	18	62	32	69	42
Total - Phenolics	-	-	<0.001	<0.001	-	<0.001	-	<0.001	-	0.001	-	<0.001	-	< 0.001	-	0.002	-	-
Chloride[3]	45	31	25.7	44.8	34.4	18.5	21.4	50.7	16.5	61.9	33.7	**134**	16.3	50.7	42	117	4.9	110
Sulphate	5	6	7.89	4.63	6.47	6	4.27	4.62	5.48	6.57	4.43	6.2	3	4	3	4	4	< 1
Nitrogen - Ammonia (NH_3) & Ammonium (NH_4)	<0.05	0.09	<0.02	0.06	<0.02	0.04	0.03	<0.02	<0.02	0.03	<0.02	<0.02	< 0.01	< 0.01	0.02	0.03	0.03	0.03
Nitrogen - Nitrite (NO_2)[3]	-	-	<0.05	<0.05	-	<0.05	<0.25	<0.05	-	<0.05	-	<0.05	-	< 0.05	-	< 0.05	< 0.05	< 0.05
Nitrogen - Nitrate (NO_3)[3]	<0.1	<0.1	<0.05	<0.05	<0.05	<0.05	<0.25	0.05	<0.05	0.05	<0.05	<0.05	0.05	< 0.05	0.09	< 0.05	< 0.05	< 0.05
Nitrogen - Total Kjeldahl (TKN)	0.5	14	0.56	0.22	-	1.17	0.68	0.32	-	0.65	-	1.19	-	0.3	-	0.3	-	-
Mercury	-	-	-	>0.0001	-	<0.0001	-	<0.0001	-	<0.0001	-	<0.0001	-	< 0.00002	-	< 0.00002	-	0.00005
Hardness (as $CaCO_3$)	39	57	40.1	58	59	41	43	58.4	37.4	59.2	-	164	41	73	63	115	27	95
Arsenic	-	-	-	<0.003	-	<0.003	-	<0.003	-	<0.003	-	<0.003	-	0.0002	-	< 0.0001	-	< 0.0001
Barium	0.04	0.04	-	0.043	0.046	0.03	0.036	0.045	0.051	0.059	0.047	0.103	0.034	0.075	0.057	0.107	-	-
Boron[3]	0.02	<0.01	-	0.022	0.017	<0.010	<0.010	0.01	<0.010	<0.010	0.02	0.013	< 0.005	0.009	0.01	< 0.005	< 0.005	0.007
Cadmium	-	-	-	<0.001	-	<0.001	<0.02	<0.001	-	<0.001	-	<0.001	-	< 0.000014	-	0.000015	-	-
Calcium	11	17	12.2	-	18.1	-	12.5	-	11.1	17.8	12.9	54.1	12.2	21.8	18.8	34.4	7.92	28.4
Chromium	-	-	-	<0.003	-	<0.003	<0.003	<0.003	-	<0.003	-	<0.003	-	< 0.001	-	0.003	-	-
Copper	-	-	-	<0.002	-	<0.002	<0.003	<0.002	-	<0.002	-	<0.002	-	**0.0056**	-	0.0006	-	0.0015
Iron	**0.8**	**0.4**	0.194	**2.34**	0.053	**5.2**	<0.010	**1.7**	**1.2**	**1.8**	0.111	**0.537**	0.036	0.069	0.037	< 0.005	0.134	0.031
Lead	-	-	-	<0.002	-	<0.002	<0.017	<0.002	-	<0.002	-	**0.003**	-	0.00099	-	< 0.00002	-	-
Magnesium	2.7	3.5	2.35	-	3.45	-	2.76	-	2.34	3.59	2.94	6.96	2.56	4.62	3.99	6.94	1.7	5.8
Manganese	0.011	0.031	0.022	0.028	0.012	0.003	0.003	0.01	0.016	0.064	0.006	0.016	0.001	0.007	0.002	0.008	0.002	0.003
Phosphorus - Dissolved	-	-	7.47	7.31	-	-	<0.10	0.12	-	0.38	-	0.8	-	0.56	-	0.5	-	-
Potassium	0.9	1.5	1.04	-	-	-	1.13	-	-	2.03	-	2.29	-	1.7	-	< 0.1	-	1.7
Sodium	32.0	22.0	13.8	-	12.8	-	9.7	-	11.4	-	12.4	33.6	11.7	27.3	19.7	37.6	11.4	39.9
Zinc	-	-	-	0.006	-	<0.005	<0.005	<0.005	-	0.013	-	0.012	-	**0.037**	-	0.005	-	< 0.005
Conductivity (µs/cm)[4]	-	-	-	-	-	-	164	-	129	257	-	-	190	260	300	490	120	460
pH (units)[4]	-	-	-	-	-	-	7.90	-	6.99	7.98	-	-	6.53	6.55	6.57	6.84	7.51	7.68
Temperature (°C)[4]	-	-	-	-	-	-	12.8	-	6.0	6.1	-	-	10.6	11.9	9.5	7.1	3	7.2
Oxidation Reduction Potential (mV)[4]	-	-	-	-	-	-	-7	-	211	137	-	-	50	142	7	108	96	-2
Dissolved Oxygen[4]	-	-	-	-	-	-	11.50	-	9.6	11.8	-	-	9.92	6.34	9.41	7.88	8.21	**4.95**

Notes:
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3. Bold text and shading indicates values exceeding compliance
4. Results from field analysis
5. NV indicates No Value
6. "-" denotes parameter not analysed

Table 3: Summary of Groundwater Quality

Parameter	DP5	DP5	DP5	DP5	DP5	DP5	DP5	DP5	DP5	DP5	DP5	DP5	DP5	DP5	DP5	DP5	DP5
	21-Jul-10	03-Nov-10	01-May-12	01-Nov-12	29-May-13	09-Dec-13	14-May-14	04-Nov-14	13-Apr-15	30-Oct-15	13-Apr-16	30-Oct-16	05-Jul-17	03-Oct-17	30-May-18	13-Nov-18	16-Apr-19	12-Nov-19
Alkalinity ($CaCO_3$)	69	876	905	812	621	817	168	739	796	-	207	-	457	449	401	502	543	548
Conductivity (µs/cm)	253	2090	1820	1550	1640	1970	494	1890	1820	-	390	-	1090	940	2460	1490	1780	1370
pH (units)	7.20	7.50	7.56	7.96	7.91	7.74	7.90	7.85	8.02	-	7.47	-	7.47	7.59	7.52	7.60	7.65	7.56
Solids - Total Dissolved (TDS)	160	1290	1280	1720	1230	1310	292	1330	1290	-	-	-	598	517	1370	812	977	744
Solids - Total Suspended (TSS)	10	15000	10700	41800	19800	65400	-	22400	4450	-	-	-	-	-	-	-	-	-
Carbon - Dissolved Organic (DOC)	25.3	29.4	-	-	26.3	-	13.3	-	34.7	-	27.6	36.4	18.2	19.4	5.5	10.1	10.5	13.9
Oxygen Demand - Biological (BOD)	<2	<2	<5	<5	<5	<5	-	<5	<5	-	<5	-	-	-	-	-	-	-
Oxygen Demand - Chemical (COD)	73	150	118	93	63	78	41	85	49	-	165	151	86	125	130	330	276	124
Total - Phenolics	-	-	**0.007**	<0.001	-	0.003	-	0.003	-	**0.012**	-	0.003	-	< 0.001	-	0.005	-	-
Chloride[3]	35	42	53.6	65.1	112	66.2	15.2	57.6	54.2	-	6.61	-	61.9	21.4	**621**	**174**	**243**	106
Sulphate	<1	320	272	234	189	240	53.7	286	209	-	6.27	-	8	8	26	5	11	3
Nitrogen - Ammonia (NH_3) & Ammonium (NH_4)	0.18	0.3	2.1	0.98	1.09	0.94	<0.02	1.08	0.54	-	1.11	1.75	0.52	0.57	0.91	0.93	0.85	1.19
Nitrogen - Nitrite (NO_2)[3]	-	-	<0.1	<0.05	-	<0.5	<0.25	<0.5	-	-	-	-	-	< 0.05	-	< 0.05	< 0.05	< 0.05
Nitrogen - Nitrate (NO_3)[3]	<0.1	<0.1	<0.1	<0.05	<0.5	<0.5	<0.25	<0.5	<0.5	-	<0.05	-	0.08	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nitrogen - Total Kjeldahl (TKN)	1.6	7	4	1.98	-	5.8	0.76	2.04	-	-	-	4.4	-	2.5	-	14.5	-	-
Mercury	-	-	-	-	-	<0.0001	-	<0.0001	-	<0.0001	-	<0.0001	-	< 0.00002	-	< 0.00002	-	0.00005
Hardness (as $CaCO_3$)	75	1100	1000	1130	973	936	226	877	914	-	-	-	553	441	1030	598	689	469
Arsenic	-	-	-	-	-	<0.003	-	<0.003	-	-	-	<0.003	-	0.0018	-	0.0015	-	0.0017
Barium	0.065	0.17	-	-	0.249	0.179	0.076	0.232	0.356	-	0.113	0.187	0.296	0.259	0.657	0.38	-	-
Boron[3]	0.09	1.2	-	-	1.03	0.857	0.254	0.888	0.852	-	0.477	0.572	0.342	0.479	0.365	0.382	0.289	0.295
Cadmium	-	-	-	<0.001	-	<0.001	<0.02	<0.001	-	-	-	<0.001	-	0.000044	-	< 0.000015	-	-
Calcium	22	410	355	-	353	-	77.9	-	333	-	30.4	-	196	155	364	213	245	168
Chromium	-	-	-	0.008	-	<0.003	<0.003	0.003	-	-	-	<0.003	-	< 0.001	-	< 0.001	-	-
Copper	-	-	-	<0.002	-	<0.002	<0.003	<0.002	-	-	-	<0.002	-	0.0043	-	0.0008	-	0.0004
Iron	**1**	**3.6**	**4.7**	**1.6**	**6.9**	**5.22**	**0.442**	**1.29**	**11.9**	-	**99.1**	**165**	**7.45**	**9.25**	**27.6**	< 0.005	**22.4**	**22**
Lead	-	-	-	<0.002	-	<0.002	<0.027	<0.002	-	-	-	**0.005**	-	0.00093	-	< 0.00002	-	-
Magnesium	4.8	28	28	-	22.3	-	7.7	-	20	-	9.73	-	15.6	13.1	29.4	15.9	18.5	11.9
Manganese	0.32	23	16.3	13.5	13.6	13.2	0.138	9.8	10.2	-	0.706	1.17	7.5	4.99	11.7	6.44	7	4.3
Phosphorus - Dissolved	-	-	7.33	21.4	-	-	<0.10	43.9	-	-	-	0.34	-	4.06	-	14.4	-	-
Potassium	0.3	6.5	6.39	-	-	-	6.59	-	-	-	-	-	-	10.9	-	< 0.1	-	10.1
Sodium	24.0	49.0	48.4	-	48.7	-	12.0	-	49.1	-	12.8	-	23.3	22.5	78.9	99.3	133.0	125.0
Zinc	-	-	-	0.006	-	<0.005	**20.2**	<0.005	-	-	-	**48**	-	**0.031**	-	0.011	-	0.01
Conductivity (µs/cm)[4]	-	-	-	-	-	-	1597	-	1801	-	-	-	1050	990	2300	1340	1480	1360
pH (units)[4]	-	-	-	-	-	-	6.90	-	7.06	-	-	-	6.67	6.93	6.86	6.61	6.92	6.78
Temperature (°C)[4]	-	-	-	-	-	-	12.6	-	11.4	-	-	-	9.9	13.5	10.6	8.6	5	8
Oxidation Reduction Potential (mV)[4]	-	-	-	-	-	-	-55	-	-36	-	-	-	-15	154	62	118	145	-13
Dissolved Oxygen[4]	-	-	-	-	-	-	9.20	-	9.80	-	-	-	**2.82**	**2.95**	5.84	**2.39**	8.69	**3.32**

Notes:
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4. Results from field analysis
5. NV indicates No Value
6. "-" denotes parameter not analysed

Table 3: Summary of Groundwater Quality

Parameter	DP6	DP6	DP6	DP6	DP6	DP6	DP6	DP6	DP6	DP6	DP6	DP6	DP6	DP6	DP6	DP6	DP6
	21-Jul-10	03-Nov-10	12-Nov-12	29-May-13	09-Dec-13	14-May-14	04-Nov-14	13-Apr-15	30-Oct-15	13-Apr-16	30-Oct-16	05-Jul-17	03-Oct-17	30-May-18	13-Nov-18	16-Apr-19	12-Nov-19
Alkalinity ($CaCO_3$)	67	103	97	101	103	111	140	33	89	85	101	71	89	143	203	40	86
Conductivity (µs/cm)	256	284	286	299	357	383	386	118	426	321	483	235	302	547	804	141	469
pH (units)	7.10	7.56	7.98	8.11	7.92	7.75	7.81	6.92	7.65	7.97	7.80	6.94	7.30	7.52	7.55	6.93	7.22
Solids - Total Dissolved (TDS)	164	182	218	196	214	228	268	164	284	254	-	129	166	283	422	72	242
Solids - Total Suspended (TSS)	14	8800	9230	3070	1700	-	3080	1200	1820	1410	-	-	-	-	-	-	-
Carbon - Dissolved Organic (DOC)	25.3	6.2	-	4.1	-	3.2	-	28.5	11.5	7	11.2	28.8	30.6	15.7	9.3	21.6	12.5
Oxygen Demand - Biological (BOD)	<2	3	<5	<5	<5	-	<5	<5	8	<5	<5	-	-	-	-	-	-
Oxygen Demand - Chemical (COD)	78	180	13	29	28	8	16	109	48	21	19	237	241	1550	381	1020	460
Total - Phenolics	-	-	<0.001	-	0.003	-	<0.001	-	0.002	-	<0.001	-	< 0.001	-	< 0.002	-	-
Chloride[3]	35	9	9.12	9.65	9.78	9.03	11	8.55	17.4	13.5	21.1	7.2	10.5	32.6	44.5	5.5	31.8
Sulphate	<1	29	52.6	40.9	62.4	58.2	38.7	6.92	99.6	66.4	111	23	27	118	150	15	92
Nitrogen - Ammonia (NH_3) & Ammonium (NH_4)	0.07	0.72	0.08	0.19	0.24	1.92	0.5	0.02	0.46	0.26	0.31	0.26	0.18	0.51	0.84	0.5	0.37
Nitrogen - Nitrite (NO_2)[3]	-	-	<0.05	-	<0.05	<0.25	<0.05	-	<0.05	-	<0.05	-	< 0.05	-	< 0.05	< 0.05	< 0.05
Nitrogen - Nitrate (NO_3)[3]	<0.1	<0.1	0.06	<0.05	<0.05	<0.25	0.06	<0.05	0.06	0.06	<0.05	< 0.05	0.1	0.06	0.13	< 0.05	< 0.05
Nitrogen - Total Kjeldahl (TKN)	1.6	<10	0.18	-	1.37	2.01	1.22	-	1.19	-	0.68	-	2.2	-	5.6	-	-
Mercury	-	-	<0.0001	-	<0.0001	-	<0.0001	-	<0.0001	-	<0.0001	-	< 0.00002	-	< 0.00002	-	0.00006
Hardness (as $CaCO_3$)	74	130	152	152	178	179	144	45.8	175	-	218	227	103	225	401	76	268
Arsenic	-	-	<0.003	-	<0.003	-	<0.003	-	<0.003	-	<0.003	-	0.0006	-	0.0003	-	0.0004
Barium	0.062	0.12	0.105	0.106	0.088	0.137	0.095	0.023	0.153	0.115	0.114	0.147	0.084	0.118	0.251	-	-
Boron[3]	0.08	0.04	0.043	0.043	0.04	0.041	0.042	0.026	0.094	0.042	0.085	0.059	0.08	0.085	0.126	0.049	0.123
Cadmium	-	-	<0.001	-	<0.001	<0.02	<0.001	-	<0.001	-	<0.001	-	< 0.000014	-	< 0.000015	-	-
Calcium	22	45	-	49.3	-	58.1	-	12.4	56.9	48.6	70.9	74.3	31.9	71.1	135	21.6	85.9
Chromium	-	-	<0.003	-	<0.003	<0.003	<0.003	-	<0.003	-	<0.003	-	< 0.001	-	< 0.001	-	-
Copper	-	-	0.002	-	<0.002	<0.003	<0.002	-	<0.002	-	<0.002	-	0.0009	-	0.0002	-	0.0023
Iron	**1.2**	<0.1	**0.326**	**7.55**	**3.38**	<0.010	0.287	**4.41**	**13.8**	**4.85**	**0.472**	**7.79**	**11.8**	**4.38**	< 0.005	**13.5**	**9.81**
Lead	-	-	<0.002	-	<0.002	<0.034	<0.002	-	<0.002	-	<0.002	-	0.00028	-	< 0.00002	-	-
Magnesium	4.7	5.4	0.296	7.05	-	8.14	-	3.61	7.94	7.26	9.97	10.1	5.55	11.4	15.4	5.43	13
Manganese	0.35	0.23	-	0.464	0.575	0.408	0.311	0.096	0.368	0.367	0.493	0.437	0.306	0.42	0.748	0.239	0.72
Phosphorus - Dissolved	-	-	1.05	-	-	<0.10	1.93	-	1.4	-	0.76	-	1.13	-	2.39	-	-
Potassium	0.2	1.1	-	-	-	0.99	-	-	-	-	1	-	0.5	-	< 0.1	-	0.8
Sodium	22.0	3.1	-	7.0	-	4.8	-	4.1	-	4.0	8.3	5.6	5.1	8.1	9.3	8.1	8.3
Zinc	-	-	0.012	-	0.02	**3.4**	0.012	-	0.011	-	0.026	-	**0.049**	-	0.021	-	0.008
Conductivity (µs/cm)[4]	-	-	-	-	-	336	-	208	350	537	-	260	220	550	680	310	880
pH (units)[4]	-	-	-	-	-	7.40	-	7.07	7.11	7.53	-	**6.20**	6.94	6.85	7.33	7.02	7.40
Temperature (°C)[4]	-	-	-	-	-	12.3	-	6.8	6.8	4.1	-	11.1	10	12.1	4.3	1.0	5.3
Oxidation Reduction Potential (mV)[4]	-	-	-	-	-	-47	-	27	283	163	-	-40	139	59	96	106	-29
Dissolved Oxygen[4]	-	-	-	-	-	12.00	-	6.99	7.56	7.60	-	5.72	10.25	2.80	9.81	2.29	3.79

Notes:
1. Results expressed in mg/L unless otherwise stated
2. PWQO means Provincial Water Quality Objectives, unless o
3. Canadian Water Quality Guidelines for the Protection of Aqua
3. Bold text and shading indicates values exceeding compliance
4. Results from field analysis
5. NV indicates No Value
6. "-" denotes parameter not analysed

Table 4: Summary of Groundwater Quality
VOCs

Parameter	ODWQS [2]	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1
		22-May-07	19-Oct-07	9-Jul-08	6-Nov-08	4-Dec-08	13-May-09	16-Jun-10	3-Nov-10	21-Nov-12	9-Dec-13	4-Nov-14	26-Oct-16	3-Oct-17	13-Nov-18
Acetone	NV	ND	14	ND	17	16	73	<50	<20	<1.0	<2.0	<2.0	-	-	-
Benzene	5	0.4	0.3	0.4	0.1	0.2	0.5	<0.5	0.2	0.32	<0.40	<0.40	<0.20	<0.5	<0.5
Bromodichloromethane	NV	ND	ND	ND	ND	ND	<0.1	<0.5	<0.2	<0.20	<0.40	<0.40	-	-	-
Bromoform	NV	ND	ND	ND	ND	ND	<0.2	<1	<0.4	<0.10	<0.20	<0.20	-	-	-
Bromomethane	NV	ND	ND	ND	ND	ND	<0.5	<3	<1	<0.20	<0.40	<0.40	-	-	-
Carbon Tetrachloride	5	ND	ND	ND	ND	ND	<0.1	<0.5	<0.2	<0.20	<0.40	<0.40	-	-	-
Chlorobenzene	NV	0.2	0.2	0.2	ND	0.1	<0.1	<0.5	<0.2	<0.10	<0.20	<0.20	-	-	-
Chloroethane	NV	-	-	-	-	-	-	-	-	-	<0.40	<0.40	-	-	-
Chloroform	NV	ND	ND	ND	ND	ND	<0.1	<0.5	<0.2	<0.20	<0.40	<0.40	-	-	-
Chloromethane	NV	-	-	-	-	-	-	-	-	-	<0.80	<0.80	-	-	-
Dibromochloromethane	NV	ND	ND	ND	ND	ND	<0.2	<1	<0.4	<0.10	<0.20	<0.20	-	-	-
1,2-Dibromoethane (Ethylene dibromide)	NV	ND	ND	ND	ND	ND	<0.2	<1	<0.4	<0.10	<0.20	<0.20	-	-	-
1,2-Dichlorobenzene	200	ND	ND	ND	ND	ND	<0.2	<1	<0.4	<0.10	<0.20	<0.20	-	-	-
1,3-Dichlorobenzene	NV	ND	ND	ND	ND	ND	<0.2	<1	<0.4	<0.10	<0.20	<0.20	-	-	-
1,4-Dichlorobenzene	5	ND	ND	ND	ND	ND	<0.2	<1	<0.4	<0.10	<0.20	<0.20	<0.10	<0.2	<0.5
Dichlorodifluoromethane	NV	-	-	-	-	-	-	-	-	-	<0.40	<0.40	-	-	-
1,1-Dichloroethane	NV	0.6	0.7	0.4	0.2	0.2	0.2	<0.5	<0.2	<0.30	<0.60	<0.60	-	-	-
1,2-Dichloroethane	5	ND	ND	ND	ND	ND	<0.2	<1	<0.4	<0.20	<0.40	<0.40	-	-	-
1,1-Dichloroethylene	NV	ND	ND	ND	ND	ND	<0.1	<0.5	<0.2	<0.30	<0.60	<0.60	-	-	-
cis-1,2-Dichloroethylene	NV	0.2	0.2	0.1	ND	ND	0.2	<0.5	<0.2	-	-	<0.40	-	-	-
trans-1,2-Dichloroethylene	NV	ND	ND	ND	ND	ND	<0.1	<0.5	<0.2	<0.20	<0.40	<0.40	-	-	-
Dichloromethane (Methylene Chloride)	50	ND	ND	ND	ND	ND	<0.5	<3	<1	<0.30	<0.60	<0.60	<0.30	<0.3	<0.3
1,2-Dichloropropane	NV	ND	ND	ND	ND	ND	<0.1	<0.5	<0.2	<0.20	<0.40	<0.40	-	-	-
cis-1,3-Dichloropropene	NV	ND	ND	ND	ND	ND	<0.2	<1	<0.4	-	-	<0.40	-	-	-
trans-1,3-Dichloropropene	NV	ND	ND	ND	ND	ND	<0.2	<1	<0.4	-	<0.60	<0.40	-	-	-
Ethylbenzene	ND	ND	ND	ND	ND	ND	<0.1	<0.5	<0.2	<0.10	<0.20	<0.20	-	<0.1	-	-
n-Hexane	NV	-	-	-	-	-	-	-	-	-	<0.40	<0.40	-	-	-
2-Hexanone	NV	-	-	-	-	-	-	-	-	-	<0.60	<0.60	-	-	-
Methy Ethyl Ketone (MEK)	NV	ND	ND	ND	ND	ND	6	<30	<10	<1.0	<2.0	<2.0	-	-	-
Methyl Isobutyl Ketone (MIBK)	NV	ND	ND	ND	ND	ND	<5	<30	<10	<1.0	<2.0	<2.0	-	-	-
Methyl-t-Butyl Ether	NV	ND	ND	ND	ND	ND	<0.2	<1	<0.4	<0.20	<0.40	<0.40	-	-	-
1,2,4-Trichlorobenzene	NV	-	-	-	-	-	-	-	-	-	<0.60	<0.60	-	-	-
1,1,1,2-Tetrachloroethane	NV	ND	ND	ND	ND	ND	<0.1	<0.5	<0.2	<0.10	<0.20	<0.20	-	-	-
1,1,2,2-Tetrachloroethane	NV	ND	ND	ND	ND	ND	<0.2	<1	<0.4	<0.10	<0.20	<0.20	-	-	-
Tetrachloroethylene	30	ND	ND	ND	ND	ND	<0.1	<0.5	<0.2	<0.20	<0.40	<0.40	-	-	-
1,1,1- Trichloroethane	NV	ND	ND	ND	ND	ND	<0.1	<0.5	<0.2	<0.30	<0.60	<0.60	-	-	-
1,1,2- Trichloroethane	NV	ND	ND	ND	ND	ND	<0.2	<1	<0.4	<0.20	<0.40	<0.40	-	-	-
Trichloroethane	NV	ND	ND	ND	ND	ND	<0.1	<0.5	<0.2	<0.20	<0.40	<0.40	-	-	-
Trichlorofluoromethane	NV	-	-	-	-	-	-	-	-	-	<0.80	<0.80	-	-	-
Toluene	24	-	0.3	ND	0.2	ND	<0.2	<1	<0.4	<0.20	<0.40	<0.60	0.24	<0.5	<0.5
Styrene	NV	ND	ND	ND	ND	ND	<0.2	<1	<0.4	<0.10	<0.20	<0.20	-	-	-
Vinyl Chloride	2	ND	ND	ND	ND	ND	<0.2	<1	<0.4	<0.17	<0.34	<0.34	<0.17	<0.2	<0.5
m-Xylene & p-Xylene	NV	ND	ND	ND	ND	ND	<0.1	<0.5	<0.2	<0.20	<0.40	<0.40	-	-	-
o-Xylene	NV	ND	ND	ND	ND	ND	<0.1	<0.5	<0.2	<0.10	<0.20	<0.20	-	-	-
Xylene (Total)	300	ND	ND	ND	ND	ND	<0.1	<0.5	<0.2	<0.20	<0.40	<0.40	-	-	-

Notes:
1. Results expressed in ug/L unless otherwise stated
2. ODWQS means Ontario Drinking Water Quality Standards
3. Bold text and shading indicates values exceeding ODWQS
4. Results from field analysis
5. NV indicates No Value
6. "-" denotes parameter not analysed

Table 4: Summary of Groundwater Quality
VOCs

Parameter	ODWQS [2]	DP4	DP4	DP4	DP4	DP4	DP4	DP4	DP4	DP4	DP4	DP5	DP5	DP5	DP5	DP5	DP5	DP5	DP5	DP5	DP5
		16-Jun-10	3-Nov-10	21-Nov-12	9-Dec-13	4-Nov-14	30-Oct-15	26-Oct-16	3-Oct-17	13-Nov-18	12-Nov-19	21-Jul-10	21-Nov-10	21-Nov-12	9-Dec-13	4-Nov-14	30-Oct-15	26-Oct-16	3-Oct-17	13-Nov-18	12-Nov-19
Acetone	NV	<10	<10	<1.0	<1.0	<1.0	-	-	-	-	<30	<10	<10	<1.0	<2.0	<2.0	-	-	-	-	<30
Benzene	5	<0.1	<0.1	<0.20	<0.20	<0.20	<0.20	<0.20	<0.5	<0.5	<0.5	<0.1	<0.1	<1.0	<0.40	<0.40	<0.20	<0.20	<0.5	<0.5	<0.5
Bromodichloromethane	NV	<0.1	<0.1	<0.20	<0.20	<0.20	-	-	-	-	-	<0.1	<0.1	<0.20	<0.40	<0.40	-	-	-	-	-
Bromoform	NV	<0.2	<0.2	<0.10	<0.10	<0.10	-	-	-	-	-	<0.2	<0.2	<0.10	<0.20	<0.20	-	-	-	-	-
Bromomethane	NV	<0.5	<0.5	<0.20	<0.20	<0.20	-	-	-	-	-	<0.5	<0.5	<0.20	<0.40	<0.40	-	-	-	-	-
Carbon Tetrachloride	5	<0.1	<0.1	<0.20	<0.20	<0.20	-	-	-	-	-	<0.1	<0.1	<0.20	<0.40	<0.40	-	-	-	-	-
Chlorobenzene	NV	<0.1	<0.1	<0.10	<0.10	<0.10	-	-	-	-	<0.5	<0.1	<0.1	<0.10	<0.20	<0.20	-	-	-	-	<0.5
Chloroethane	NV	-	-	-	<0.20	<0.20	-	-	-	-	-	-	-	-	<0.40	<0.40	-	-	-	-	-
Chloroform	NV	<0.1	<0.1	<0.20	<0.20	<0.20	-	-	-	-	-	<0.1	<0.1	<0.20	<0.40	<0.40	-	-	-	-	-
Chloromethane	NV	-	-	-	<0..40	<0.40	-	-	-	-	-	-	-	-	<0.80	<0.80	-	-	-	-	-
Dibromochloromethane	NV	<0.2	<0.2	<0.10	<0.10	<0.10	-	-	-	-	-	<0.2	<0.2	<0.10	<0.20	<0.20	-	-	-	-	-
1,2-Dibromoethane (Ethylene dibromide)	NV	<0.2	<0.2	<0.10	<0.10	<0.10	-	-	-	-	-	<0.2	<0.2	<0.10	<0.20	<0.20	-	-	-	-	-
1,2-Dichlorobenzene	200	<0.2	<0.2	<0.10	<0.10	<0.10	-	-	-	-	-	<0.2	<0.2	<0.10	<0.20	<0.20	-	-	-	-	-
1,3-Dichlorobenzene	NV	<0.2	<0.2	<0.10	<0.10	<0.10	-	-	-	-	-	<0.2	<0.2	<0.10	<0.20	<0.20	-	-	-	-	-
1,4-Dichlorobenzene	5	<0.2	<0.2	<0.10	<0.10	<0.10	<0.10	<0.10	<0.2	<0.5	<0.5	<0.2	<0.2	<0.10	<0.20	<0.20	<0.10	<0.10	<0.2	<0.5	<0.5
Dichlorodifluoromethane	NV	-	-	-	<0.20	<0.20	-	-	-	-	-	-	-	-	<0.40	<0.40	-	-	-	-	-
1,1-Dichloroethane	NV	<0.1	<0.1	<0.30	<0.30	<0.30	-	-	-	-	<0.5	<0.1	<0.1	<0.30	<0.60	<0.60	-	-	-	-	<0.5
1,2-Dichloroethane	5	<0.2	<0.2	<0.20	<0.20	<0.20	-	-	-	-	-	<0.2	<0.2	<0.20	<0.40	<0.40	-	-	-	-	-
1,1-Dichloroethylene	NV	<0.1	<0.1	<0.30	<0.30	<0.30	-	-	-	-	-	<0.1	<0.1	<0.30	<0.60	<0.60	-	-	-	-	-
cis-1,2-Dichloroethylene	NV	<0.1	<0.1	-	-	<0.20	-	-	-	-	<0.5	<0.1	<0.1	-	<0.40	<0.40	-	-	-	-	<0.5
trans-1,2-Dichloroethylene	NV	<0.1	<0.1	<0.20	<0.20	<0.20	-	-	-	-	-	<0.1	<0.1	<0.20	<0.40	<0.40	-	-	-	-	-
Dichloromethane (Methylene Chloride)	50	<0.5	<0.5	<0.30	<0.30	<0.30	<0.30	<0.30	<0.3	<0.3	<5	<0.5	<0.5	<0.30	<0.60	<0.60	<0.30	<0.30	<0.3	<0.3	<5
1,2-Dichloropropane	NV	<0.1	<0.1	<0.20	<0.20	<0.20	-	-	-	-	-	<0.1	<0.1	<0.20	<0.40	<0.40	-	-	-	-	-
cis-1,3-Dichloropropene	NV	<0.2	<0.2	-	-	<0.20	-	-	-	-	-	<0.2	<0.2	-	<0.40	<0.40	-	-	-	-	-
trans-1,3-Dichloropropene	NV	<0.2	<0.2	-	-	<0.20	-	-	-	-	-	<0.2	<0.2	-	<0.60	<0.40	-	-	-	-	-
Ethylbenzene	ND	<0.1	<0.10	<0.10	<0.10	-	-	<0.1	-	-	-	<0.1	<0.10	<0.20	<0.20	-	-	<0.1	-	-	-
n-Hexane	NV	-	-	-	<0.20	<0.20	-	-	-	-	-	-	-	-	<0.40	<0.40	-	-	-	-	-
2-Hexanone	NV	-	-	-	<0.30	<0.30	-	-	-	-	-	-	-	-	<0.60	<0.60	-	-	-	-	-
Methy Ethyl Ketone (MEK)	NV	<5	<5	<1.0	<1.0	<1.0	-	-	-	-	<20	<5	<5	<1.0	<2.0	<2.0	-	-	-	-	<20
Methyl Isobutyl Ketone (MIBK)	NV	<5	<5	<1.0	<1.0	<1.0	-	-	-	-	-	<5	<5	<1.0	<2.0	<2.0	-	-	-	-	-
Methyl-t-Butyl Ether	NV	<0.2	<0.2	<0.20	<0.20	<0.20	-	-	-	-	-	<0.2	<0.2	<0.20	<0.40	<0.40	-	-	-	-	-
1,2,4-Trichlorobenzene	NV	-	-	-	<0.30	<0.30	-	-	-	-	-	-	-	-	<0.60	<0.60	-	-	-	-	-
1,1,1,2-Tetrachloroethane	NV	<0.1	<0.1	<0.10	<0.10	<0.10	-	-	-	-	-	<0.1	<0.1	<0.10	<0.20	<0.20	-	-	-	-	-
1,1,2,2-Tetrachloroethane	NV	<0.2	<0.2	<0.10	<0.10	<0.10	-	-	-	-	-	<0.2	<0.2	<0.10	<0.20	<0.20	-	-	-	-	-
Tetrachloroethylene	30	<0.1	<0.1	<0.20	<0.20	<0.20	-	-	-	-	-	<0.1	<0.1	<0.20	<0.40	<0.40	-	-	-	-	-
1,1,1- Trichloroethane	NV	<0.1	<0.1	<0.30	<0.30	<0.30	-	-	-	-	-	<0.1	<0.1	<0.30	<0.60	<0.60	-	-	-	-	-
1,1,2- Trichloroethane	NV	<0.2	<0.2	<0.20	<0.20	<0.20	-	-	-	-	-	<0.2	<0.2	<0.20	<0.40	<0.40	-	-	-	-	-
Trichloroethane	NV	<0.1	<0.1	<0.20	<0.20	<0.20	-	-	-	-	-	<0.1	<0.1	<0.20	<0.40	<0.40	-	-	-	-	-
Trichlorofluoromethane	NV	-	-	-	<0.40	<0.40	-	-	-	-	-	-	-	-	<0.80	<0.80	-	-	-	-	-
Toluene	24	0.3	<0.2	<0.20	<0.20	<0.30	<0.20	<0.20	<0.5	<0.5	<0.5	<0.2	<0.2	<0.20	<0.40	<0.60	0.57	0.23	<0.5	<0.5	<0.5
Styrene	NV	<0.2	<0.2	<0.10	<0.10	<0.10	-	-	-	-	-	<0.2	<0.2	<0.10	<0.20	<0.20	-	-	-	-	-
Vinyl Chloride	2	<0.2	<0.2	<0.17	<0.17	<0.17	<0.17	<0.17	<0.2	<0.5	<0.2	<0.2	<0.2	<0.17	<0.34	<0.34	<0.17	<0.17	<0.2	<0.5	<0.2
m-Xylene & p-Xylene	NV	<0.1	<0.1	<0.20	<0.20	<0.20	-	-	-	-	-	<0.1	<0.1	<0.20	<0.40	<0.40	-	-	-	-	-
o-Xylene	NV	<0.1	<0.1	<0.10	<0.10	<0.10	-	-	-	-	-	<0.1	<0.1	<0.10	<0.20	<0.20	-	-	-	-	-
Xylene (Total)	300	<0.1	<0.1	<0.20	<0.20	<0.20	-	-	-	-	-	<0.1	<0.1	<0.20	<0.40	<0.40	-	-	-	-	-

Notes:
1. Results expressed in ug/L unless otherwise stated
2. ODWQS means Ontario Drinking Water Quality Standards
3. Bold text and shading indicates values exceeding ODWQS
4. Results from field analysis
5. NV indicates No Value
6. "-" denotes parameter not analysed

Table 4: Summary of Groundwater Quality
VOCs

Parameter	ODWQS [2]	DP6	DP6	DP6	DP6	DP6	DP6	DP6	DP6	DP6	DP6
		21-Jul-10	21-Nov-12	9-Dec-13	4-Nov-14	30-Oct-15	26-Oct-16	3-Oct-17	13-Nov-18	13-Nov-18	12-Nov-19
Acetone	NV	<10	<1.0	<1.0	<1.0	-	-	-	-	-	<30
Benzene	5	<0.1	<1.0	<0.20	<0.20	<0.20	<0.20	<0.5	<0.5	<0.5	<0.5
Bromodichloromethane	NV	<0.1	<0.20	<0.20	<0.20	-	-	-	-	-	-
Bromoform	NV	<0.2	<0.10	<0.10	<0.10	-	-	-	-	-	-
Bromomethane	NV	<0.5	<0.20	<0.20	<0.20	-	-	-	-	-	-
Carbon Tetrachloride	5	<0.1	<0.20	<0.20	<0.20	-	-	-	-	-	-
Chlorobenzene	NV	<0.1	<0.10	<0.10	<0.10	-	-	-	-	-	<0.5
Chloroethane	NV	-	-	<0.20	<0.20	-	-	-	-	-	-
Chloroform	NV	<0.1	<0.20	<0.20	<0.20	-	-	-	-	-	-
Chloromethane	NV	-	-	<0..40	<0.40	-	-	-	-	-	-
Dibromochloromethane	NV	<0.2	<0.10	<0.10	<0.10	-	-	-	-	-	-
1,2-Dibromoethane (Ethylene dibromide)	NV	<0.2	<0.10	<0.10	<0.10	-	-	-	-	-	-
1,2-Dichlorobenzene	200	<0.2	<0.10	<0.10	<0.10	-	-	-	-	-	-
1,3-Dichlorobenzene	NV	<0.2	<0.10	<0.10	<0.10	-	-	-	-	-	-
1,4-Dichlorobenzene	5	<0.2	<0.10	<0.10	<0.10	<0.10	<0.10	<0.2	<0.5	<0.5	<0.5
Dichlorodifluoromethane	NV	-	-	<0.20	<0.20	-	-	-	-	-	-
1,1-Dichloroethane	NV	<0.1	<0.30	<0.30	<0.30	-	-	-	-	-	<0.5
1,2-Dichloroethane	5	<0.2	<0.20	<0.20	<0.20	-	-	-	-	-	-
1,1-Dichloroethylene	NV	<0.1	<0.30	<0.30	<0.30	-	-	-	-	-	-
cis-1,2-Dichloroethylene	NV	<0.1	-	-	<0.20	-	-	-	-	-	<0.5
trans-1,2-Dichloroethylene	NV	<0.1	<0.20	<0.20	<0.20	-	-	-	-	-	-
Dichloromethane (Methylene Chloride)	50	<0.5	<0.30	<0.30	<0.30	<0.30	<0.30	<0.3	<0.3	<0.3	<5
1,2-Dichloropropane	NV	<0.1	<0.20	<0.20	<0.20	-	-	-	-	-	-
cis-1,3-Dichloropropene	NV	<0.2	-	-	<0.20	-	-	-	-	-	-
trans-1,3-Dichloropropene	NV	<0.2	-	-	<0.20	-	-	-	-	-	-
Ethylbenzene	ND	<0.10	<0.10	<0.10	-	-	-	-	-	-	-
n-Hexane	NV	-	-	<0.20	<0.20	-	-	-	-	-	-
2-Hexanone	NV	-	-	<0.30	<0.30	-	-	-	-	-	-
Methy Ethyl Ketone (MEK)	NV	<5	<1.0	<1.0	<1.0	-	-	-	-	-	<20
Methyl Isobutyl Ketone (MIBK)	NV	<5	<1.0	<1.0	<1.0	-	-	-	-	-	-
Methyl-t-Butyl Ether	NV	<0.2	<0.20	<0.20	<0.20	-	-	-	-	-	-
1,2,4-Trichlorobenzene	NV	-	-	<0.30	<0.30	-	-	-	-	-	-
1,1,1,2-Tetrachloroethane	NV	<0.1	<0.10	<0.10	<0.10	-	-	-	-	-	-
1,1,2,2-Tetrachloroethane	NV	<0.2	<0.10	<0.10	<0.10	-	-	-	-	-	-
Tetrachloroethylene	30	<0.1	<0.20	<0.20	<0.20	-	-	-	-	-	-
1,1,1- Trichloroethane	NV	<0.1	<0.30	<0.30	<0.30	-	-	-	-	-	-
1,1,2- Trichloroethane	NV	<0.2	<0.20	<0.20	<0.20	-	-	-	-	-	-
Trichloroethane	NV	<0.1	<0.20	<0.20	<0.20	-	-	-	-	-	-
Trichlorofluoromethane	NV	-	-	<0.40	<0.40	-	-	-	-	-	-
Toluene	24	<0.2	<0.20	<0.20	<0.30	<0.20	<0.20	<0.5	<0.5	<0.5	<0.5
Styrene	NV	<0.2	<0.10	<0.10	<0.10	-	-	-	-	-	-
Vinyl Chloride	2	<0.2	<0.17	<0.17	<0.17	<0.17	<0.17	<0.2	<0.5	<0.5	<0.2
m-Xylene & p-Xylene	NV	<0.1	<0.20	<0.20	<0.20	-	-	-	-	-	-
o-Xylene	NV	<0.1	<0.10	<0.10	<0.10	-	-	-	-	-	-
Xylene (Total)	300	<0.1	<0.20	<0.20	<0.20	-	-	-	-	-	-

Notes:
1. Results expressed in ug/L unless otherwise stated
2. ODWQS means Ontario Drinking Water Quality Standards
3. Bold text and shading indicates values exceeding ODWQS
4. Results from field analysis
5. NV indicates No Value
6. "-" denotes parameter not analysed

Table 5 Summary of Surface Water Quality Data

Parameter	PWQO[2]	SW Trigger[4]	SW1	SW1	SW1	SW1	SW1	SW1	SW1	SW1	SW1	SW1	SW1	SW1	SW1	SW1
			09-Jul-08	06-Nov-08	04-Dec-08	13-May-09	20-Jul-09	20-Oct-09	21-Jul-10	03-Nov-10	22-May-12	15-Nov-12	28-May-13	09-Dec-13	14-May-14	04-Nov-14
Alkalinity (as $CaCO_3$)	decrease >25%	NV	238	193	174	249	249	180	262	253	241	44	231	183	167	183
Conductivity (µs/cm)	NV	NV	602	467	449	785	586	552	581	557	620	381	751	480	495	426
pH (Units)	6.5 - 8.5	NV	8.10	8.10	7.80	7.60	7.90	7.60	7.80	7.63	8.26	7.34	8.51	7.69	7.83	8.07
Solids - Total Dissolved (TDS)	NV	NV	-	-	-	510	375	360	380	364	382	308	508	302	290	222.0
Solids - Total Suspended (TSS)	NV	NV	ND	ND	ND	18	330	7	<10	290	99	22	65	270	-	180
Dissolved Organic Carbon (DOC)	NV	NV	32	26	24	24	35	21	26	24	-	-	-	-	13	-
Oxygen Demand - Biological (BOD)	NV	NV	-	-	-	3	5	4	12	22	7	<5	<5	<5	-	22.0
Oxygen Demand - Chemical (COD)	NV	NV	-	-	-	64	230	69	78	200	84	53	63	66	45	88
Phenolics- Total	0.005	NV	-	-	-	0.001	0.005	<0.001	<0.001	0.013	<0.001	<0.001	<0.001	0.006	-	0.003
Chloride[3]	120	120	26.0	19.0	16.0	22.0	26.0	17.0	18.0	19.0	18.5	12.1	28.4	19.9	15.3	14.3
Sulphate	NV	NV	<1	<1	0.1	150.0	23.0	79.0	19.0	11.0	67.9	153.0	169	32.9	53.9	12.5
Ammonia, Unionized (as N) [5]	0.02	NV	-	-	-	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	0.003	<0.02
Nitrogen - Ammonia (NH_3) & Ammonium (NH_4)	NV	NV	<0.05	<0.05	0.2	<0.05	0.3	<0.05	<0.05	0.09	<0.02	0.02	<0.02	<0.02	1.3	0.2
Nitrogen - Nitrite (NO_2)[3]	0.6	NV	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.05	<0.25	<0.05	<0.05	<0.10
Nitrogen - Nitrate (NO_3)[3]	13	NV	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.05	<0.25	<0.05	<0.05	0.1
Nitrogen - Total Kjeldhal (TKN)	NV	NV	1.4	1.1	1.5	1.4	5.6	1.4	1.5	4.8	1.82	1.09	1.84	3.96	1.3	2.7
Mercury	NV	NV	-	-	-	-	-	-	-	-	-	<0.0001	-	<0.0001	-	<0.0001
Mercury - dissolved	0.0002	NV	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hardness (as $CaCO_3$)	NV	NV	240	180	180	340	230	230	250	230	282	184	400	219	226	190
Arsenic	0.1	NV	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.003	-	0.004	-	0.003
Barium	NV	NV	0.09	0.06	0.09	0.09	0.09	0.07	0.09	0.07	-	0.046	-	0.116	0.109	0.088
Boron[3]	1.5	1.5	0.51	0.34	0.33	0.50	0.62	0.45	0.48	0.36	-	0.385	-	0.271	0.254	0.228
Cadmium	0.001	NV	ND	ND	ND	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.001	-	0.0002	<0.0001	0.0001
Calcium	NV	NV	80.0	54.0	53.0	114.0	66.0	70.6	79.6	70.1	-	-	-	-	77.8	-
Chromium	0.0089	NV	ND	ND	ND	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.003	-	<0.003	<0.003	<0.003
Copper	0.005	NV	ND	ND	0.0020	<0.02	<0.02	<0.02	<0.02	<0.02	-	0.0050	-	0.004	0.0030	<0.002
Iron	0.3	1.19	0.28	0.23	1.10	0.04	0.17	0.19	0.05	0.28	**4.44**	**1.20**	**2.64**	**5.66**	1.15	**7.60**
Lead	0.002	NV	ND	ND	ND	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.002	-	0.002	<0.002	0.003
Magnesium	NV	NV	16.00	11.00	9.90	14.30	15.10	12.90	13.10	12.30	-	-	-	-	7.79	-
Manganese	NV	NV	0.16	0.08	2.10	<0.01	0.08	ND	<0.01	0.02	1.12	-	0.43	2.78	1.15	0.965
Phosphorous - Total	0.02	NV	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	0.08	0.13	0.06	0.35	<0.10	0.26
Potassium	NV	NV	-	-	-	10	11	7.00	7.00	9.00	-	-	-	-	6.58	-
Sodium	NV	NV	-	-	-	24.1	31.2	20.4	20.8	19.6	-	-	-	-	11.9	-
Zinc	0.03	NV	ND	0.007	0.018	<0.01	<0.01	<0.01	<0.01	<0.01	-	0.059	-	0.051	0.026	0.039
Conductivity (µS/cm) [6]	NV	NV	-	-	-	-	-	-	-	-	-	-	-	-	476	407
pH (units) [6]	6.5-8.5	NV	-	-	-	-	-	-	7.90	7.90	-	-	-	-	6.89	7.64
Temperature (°C) [6]	NV	NV	-	-	-	-	-	-	5.4	7.6	-	-	-	-	14.1	7.0
Oxidation Reduction Potential (mV)[6]	NV	NV	-	-	-	-	-	-	-	-	-	-	-	-	23	-39
Dissolved Oxygen (DO) [6]	5	NV	-	-	-	-	-	-	-	-	-	-	-	-	9.78	1.58

Notes:
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3. CWQG means Canadian Water Quality Guidelines for the Protection of Aquatic Life.
4. SW Trigger is the PWQO for all parameters except iron and total phosphorous (75% percentile).
5. Calculated from Total Ammonia and field data.
6. Results from field analysis.

Bold text and shading indicate values exceeding PWQO/CWQG.
NV indicates No Value.
"-" parameter not analyzed.

Table 5 Summary of Surface Water Quality Data

Parameter	PWQO[2]	SW Trigger[4]	SW1	SW1	SW1	SW1	SW1	SW1	SW1	SW1
			13-Apr-15	29-Oct-15	29-Apr-16	16-Oct-16	05-Jun-17	30-May-18	13-Nov-18	16-Apr-19
Alkalinity (as $CaCO_3$)	decrease >25%	NV	82	32	41	53	93	229	68	27
Conductivity (µs/cm)	NV	NV	231	358	103	605	241	523	254	74
pH (Units)	6.5 - 8.5	NV	7.81	6.36	7.35	7.35	6.91	7.33	6.87	6.49
Solids - Total Dissolved (TDS)	NV	NV	186	254	96	418	133	271	130	37
Solids - Total Suspended (TSS)	NV	NV	12	38	17	13	28	900	8	< 3
Dissolved Organic Carbon (DOC)	NV	NV	-	-	-	-	-	32	11	10
Oxygen Demand - Biological (BOD)	NV	NV	<5	<5	<5	<5	< 2	69	5	< 3
Oxygen Demand - Chemical (COD)	NV	NV	40	39	41	32	91	622	87	25
Phenolics- Total	0.005	NV	<0.001	0.002	0.001	<0.001	0.013	0.013	0.004	< 0.002
Chloride[3]	120	120	7.5	4.1	1.3	4.4	2.3	26.0	3.1	0.9
Sulphate	NV	NV	16.6	138.0	10.2	251.0	18.0	1.0	46.0	6.0
Ammonia, Unionized (as N) [5]	0.02	NV	-	-	-	-	<0.005	<0.005	<0.005	< 0.005
Nitrogen - Ammonia (NH_3) & Ammonium (NH_4)	NV	NV	0.1	0.69	<0.02	<0.02	0.09	0.41	0.16	0.08
Nitrogen - Nitrite (NO_2)[3]	0.6	NV	<0.05	<0.05	<0.05	<0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nitrogen - Nitrate (NO_3)[3]	13	NV	<0.05	0.11	<0.05	<0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nitrogen - Total Kjeldhal (TKN)	NV	NV	1.1	1.5	1.2	0.8	1.1	24.9	1.3	0.4
Mercury	NV	NV	-	<0.0001	-	<0.0001	-	-	< 0.00002	-
Mercury - dissolved	0.0002	NV	-	-	-	-	-	-	-	-
Hardness (as $CaCO_3$)	NV	NV	99	138	44	289	110	275	133	34
Arsenic	0.1	NV	-	<0.003	-	<0.003	-	-	0.001	-
Barium	NV	NV	-	0.063	-	0.083	-	-	0.048	-
Boron[3]	1.5	1.5	-	0.342	-	0.295	-	-	0.095	0.021
Cadmium	0.001	NV	-	0.0002	-	<0.0001	-	-	0.000051	-
Calcium	NV	NV	-	-	13.6	-	-	-	-	10.4
Chromium	0.0089	NV	-	<0.003	-	<0.003	-	-	< 0.001	-
Copper	0.005	NV	-	0.004	-	0.007	-	-	0.0020	-
Iron	0.3	1.19	**1.27**	**3.72**	**3.71**	**2.04**	**14.30**	**197.00**	**8.09**	**1.67**
Lead	0.002	NV	-	<0.002	-	<0.002	-	-	0.00034	-
Magnesium	NV	NV	-	-	2.47	-	-	-	-	1.85
Manganese	NV	NV	0.286	0.958	0.270	1.020	0.859	2.63	1.15	0.23
Phosphorous - Total	0.02	NV	0.14	0.11	0.10	0.19	0.12	7.29	0.11	0.05
Potassium	NV	NV	-	-	0.85	-	-	-	-	-
Sodium	NV	NV	-	-	2.41	-	-	-	-	1.7
Zinc	0.03	NV	-	0.069	-	0.064	-	-	0.045	-
Conductivity (µS/cm) [6]	NV	NV	324	367	1.19	558	320	620	360	170
pH (units) [6]	6.5-8.5	NV	7.43	7.77	8.17	7.96	6.33	7.11	6.85	6.91
Temperature (°C) [6]	NV	NV	11.8	7.2	6.2	1.5	13.5	17.4	0.8	1.8
Oxidation Reduction Potential (mV)[6]	NV	NV	-4	196	255	344	-33	18	105	125
Dissolved Oxygen (DO) [6]	5	NV	6.1	6.79	7.59	9.11	2.24	1.53	9.43	10.49

Notes:
1. All results are expressed in mg/L unless otherwise stated.
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4. SW Trigger is the PWQO for all parameters except iron and total phosphorous (75% percentile).
5. Calculated from Total Ammonia and field data.
6. Results from field analysis.

Bold text and shading indicate values exceeding PWQO/CWQG.
NV indicates No Value.
"-" parameter not analyzed.

Table 5 Summary of Surface Water Quality Data

Parameter	PWQO[2]	SW Trigger[4]	SW2	SW2	SW2	SW2	SW2	SW2	SW2	SW2	SW2	SW2	SW2	SW2
			09-Jul-08	06-Nov-08	04-Dec-08	13-May-09	20-Oct-09	21-Jul-10	03-Nov-10	14-May-14	13-Apr-15	05-Jun-17	30-May-18	16-Apr-19
Alkalinity (as $CaCO_3$)	decrease >25%	NV	456	687	632	577	544	262	524	515	21	488	503	95
Conductivity (µs/cm)	NV	NV	1880	2090	1900	1710	1690	582	1530	1760	284	1190	1490	274
pH (Units)	6.5 - 8.5	NV	8.30	7.90	7.90	7.70	7.60	7.80	7.65	7.68	7.35	7.48	7.67	7.22
Solids - Total Dissolved (TDS)	NV	NV	-	-	-	1090	1090	380	948	864	62	653	812	140
Solids - Total Suspended (TSS)	NV	NV	1100	18000	11000	3200	5400	10	17000	-	68	42	1400	12
Dissolved Organic Carbon (DOC)	NV	NV	37	24	22	27	25	15	-	-	28	9	13	14
Oxygen Demand - Biological (BOD)	NV	NV	-	-	-	4	4	6	6	-	<5	6	16	6
Oxygen Demand - Chemical (COD)	NV	NV	-	-	-	97	410	100	700	250	26	91	286	42
Phenolics- Total	0.005	NV	-	-	-	<0.001	<0.001	<0.001	0.007	-	<0.001	0.024	< 0.001	0.005
Chloride[3]	120	120	**250.0**	**210.0**	**170.0**	**190.0**	**190.0**	17.0	**160.0**	**234**	19.6	78.3	**194**	22.4
Sulphate	NV	NV	<1	0.1	0.0	85.0	46.0	20.0	35.0	24.2	4.77	< 1	< 1	< 1
Ammonia, Unionized (as N) [5]	0.02	NV	-	-	-	-	-	-	-	-	-	0.0059	0.026	< 0.005
Nitrogen - Ammonia (NH_3) & Ammonium (NH_4)	NV	NV	2.3	12	10	12	2.5	<0.05	9.7	6.74	0.37	4.37	4.75	0.63
Nitrogen - Nitrite (NO_2)[3]	0.6	NV	-	-	-	0.07	0.27	<0.01	0.73	<0.25	<0.05	< 0.05	< 0.05	< 0.05
Nitrogen - Nitrate (NO_3)[3]	13	NV	1.9	0.1	0.3	0.6	1.6	<0.1	1.5	<0.25	<0.05	0.12	< 0.05	< 0.05
Nitrogen - Total Kjeldhal (TKN)	NV	NV	4.3	13.0	11.0	12.0	18.0	1.8	27.0	73.8	1.1	5.9	8.3	1.2
Mercury	NV	NV	-	-	-	-	-	-	-	-	-	-	-	-
Mercury - dissolved	0.0002	NV	-	-	-	-	-	-	-	-	-	-	-	-
Hardness (as $CaCO_3$)	NV	NV	510	630	590	510	490	250	480	486	25	407	758	106
Arsenic	0.1	NV	-	-	-	<0.2	<0.2	<0.2	<0.2	-	-	-	-	-
Barium	NV	NV	0.260	1.900	0.550	0.140	0.100	0.090	0.360	1.61	-	-	-	-
Boron[3]	1.5	1.5	**1.70**	**1.80**	1.40	1.37	1.46	0.47	0.99	**1.57**	-	-	-	0.11
Cadmium	0.001	NV	0.0002	0.003	0.0005	<0.005	<0.005	<0.005	<0.005	0.0007	-	-	-	-
Calcium	NV	NV	210.0	156.0	144.0	78.1	146.0	148.0	-	-	44.0	56.0	50.0	32.3
Chromium	0.0089	NV	0.01	0.079	0.016	<0.01	<0.01	<0.01	<0.01	<0.003	-	-	-	-
Copper	0.005	NV	-	-	-	<0.02	<0.02	<0.02	<0.02	0.017	-	-	-	-
Iron	0.3	1.19	**41.00**	**480.00**	**97.00**	<0.02	<0.02	0.06	0.26	**326.00**	0.46	**5.95**	**65.10**	**1.25**
Lead	0.002	NV	0.016	0.13	0.028	<0.05	<0.05	<0.05	<0.05	0.004	-	-	-	-
Magnesium	NV	NV	43.00	77.00	39.00	29.30	31.50	12.80	27.80	28.20	-	-	-	6.16
Manganese	NV	NV	13.00	28.00	11.00	5.13	1.74	<0.01	6.73	8.98	0.014	6.06	8.32	1.52
Phosphorous - Total	0.02	NV	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.50	0.24	0.06	1.17	0.07
Potassium	NV	NV	-	-	-	39.00	38.00	7.00	32.00	37.60	-	-	-	-
Sodium	NV	NV	-	-	-	129	138	20.9	111	134	-	-	-	11.1
Zinc	0.03	NV	0.130	0.870	0.170	<0.01	<0.01	0.010	<0.01	0.371	-	-	-	-
Conductivity (µS/cm) [6]	NV	NV	-	-	-	-	-	-	-	1632	-	1250	1470	270
pH (units) [6]	6.5-8.5	NV	-	-	-	-	-	-	-	6.9	-	6.8	7.13	7.35
Temperature (°C) [6]	NV	NV	-	-	-	-	-	-	-	15.6	-	11.9	20.7	1.4
Oxidation Reduction Potential (mV)[6]	NV	NV	-	-	-	-	-	-	-	-73	-	-38	69	120
Dissolved Oxygen (DO) [6]	5	NV	-	-	-	-	-	-	-	7	-	4.11	3.85	5.13

Notes:
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Bold text and shading indicate values exceeding PWQO/CWQG.
NV indicates No Value.
"-" parameter not analyzed.

Table 5 Summary of Surface Water Quality Data

Parameter	PWQO[2]	SW Trigger[4]	SW3	SW3	SW3	SW3	SW3	SW3	SW3	SW3	SW3	SW3	SW3	SW3	SW3	SW3
			09-Jul-08	06-Nov-08	04-Dec-08	13-May-09	20-Oct-09	21-Jul-10	03-Nov-10	22-May-12	15-Nov-12	28-May-13	09-Dec-13	14-May-14	04-Nov-14	13-Apr-15
Alkalinity (as $CaCO_3$)	decrease >25%	NV	156	184	82	58	319	263	222	162	27	41	91	102	53	51
Conductivity (µs/cm)	NV	NV	457	696	583	226	1280	582	799	379	177	151	394	273	200	204
pH (Units)	6.5 - 8.5	NV	7.6	7.8	7.6	6.8	7.6	7.8	7.59	7.95	6.71	7.58	7.41	7.05	7.45	7.59
Solids - Total Dissolved (TDS)	NV	NV	-	-	-	140	810	380	512	266	174	124	240	248	150	126
Solids - Total Suspended (TSS)	NV	NV	97	990	25	65	190	<10	260	165	1550	278	488	-	17	<10
Dissolved Organic Carbon (DOC)	NV	NV	15	32	27	20	-	-	-	-	23	-	-	-	-	-
Oxygen Demand - Biological (BOD)	NV	NV	-	-	-	<2	3	4	16	13	14	14	23	-	7	<5
Oxygen Demand - Chemical (COD)	NV	NV	-	-	-	54	100	80	320	64	1200	337	410	183	83	19
Phenolics- Total	0.005	NV	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.004	-	0.002	<0.001
Chloride[3]	120	120	36	68	37	10	**160**	17	63	22.4	7.0	3.1	23.0	14.5	19.9	9.4
Sulphate	NV	NV	1.39	1.48	<1	42	100	19	83	7.77	47.2	34.4	65.5	7.6	10.1	32.0
Ammonia, Unionized (as N) [5]	0.02	NV	-	-	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.02	<0.02	-
Nitrogen - Ammonia (NH_3) & Ammonium (NH_4)	NV	NV	0.07	0.19	0.22	<0.05	0.08	<0.05	0.13	<0.02	0.1	<0.02	0.2	0.5	<0.02	0.0
Nitrogen - Nitrite (NO_2)[3]	0.6	NV	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen - Nitrate (NO_3)[3]	13	NV	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	0.06	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen - Total Kjeldhal (TKN)	NV	NV	4.7	14	1.3	1.2	2.7	1.5	10	1.07	3.3	10.6	8.3	34.2	1.3	0.4
Mercury	NV	NV	-	-	-	-	-	-	-	-	<0.0001	-	<0.0001	-	<0.0001	-
Mercury - dissolved	0.0002	NV	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hardness (as $CaCO_3$)	NV	NV	140	210	190	70	350	250	250	145	78	60	139	115	69	71
Arsenic	0.1	NV	-	-	-	<0.2	<0.2	<0.2	<0.2	-	<0.003	-	<0.003	-	<0.003	-
Barium	NV	NV	0.14	0.13	0.09	0.04	0.11	0.08	0.08	-	0.220	-	0.13	0.33	0.07	-
Boron[3]	1.5	1.5	0.54	0.44	0.44	0.17	0.95	0.48	0.61	-	0.225	-	0.31	0.26	0.14	-
Cadmium	0.001	NV	ND	0.0001	ND	<0.005	<0.005	<0.005	<0.005	-	0.001	-	0.0001	0.0008	<0.0001	-
Calcium	NV	NV	20.1	97.5	78.8	70.2	-	-	-	-	33.1	-	-	-	13.0	-
Chromium	0.0089	NV	ND	ND	ND	<0.01	<0.01	<0.01	<0.01	-	<0.003	-	<0.003	<0.003	<0.003	-
Copper	0.005	NV	-	-	-	<0.02	<0.02	<0.02	<0.02	-	0.024	-	0.007	0.015	<0.002	-
Iron	0.3	1.19	**4.80**	**2.70**	0.82	0.21	0.14	0.04	<0.02	**7.41**	**13.00**	**16.80**	**17.40**	**59.40**	**7.86**	0.40
Lead	0.002	NV	0.0016	0.0022	ND	<0.05	<0.05	<0.05	<0.05	-	0.028	-	0.008	0.021	<0.002	-
Magnesium	NV	NV	12.00	15.00	14.00	4.85	26.40	12.90	16.90	-	-	-	-	7.75	-	-
Manganese	NV	NV	4.40	1.00	0.89	<0.01	0.060	<0.01	0.96	6.08	-	0.586	3.24	7.00	2.58	0.409
Phosphorous - Total	0.02	NV	-	-	-	<0.1	<0.1	<0.1	<0.1	0.06	1.28	0.71	0.67	<0.10	0.14	0.03
Potassium	NV	NV	-	-	-	2.00	16.00	7.00	11.00	-	-	-	-	3.90	-	-
Sodium	NV	NV	-	-	-	13.8	120	20.8	58.2	-	-	-	-	16.5	-	-
Zinc	0.03	NV	0.017	0.013	0.02	<0.01	<0.01	<0.01	<0.01	-	0.114	-	0.027	0.09	0.0090	-
Conductivity (µS/cm) [6]	NV	NV	-	-	-	-	-	-	-	-	-	-	-	397	383	407
pH (units) [6]	6.5-8.5	NV	-	-	-	-	-	-	-	-	-	-	-	6.73	7.01	6.82
Temperature (°C) [6]	NV	NV	-	-	-	-	-	-	-	-	-	-	-	14.8	8.2	9.9
Oxidation Reduction Potential (mV)[6]	NV	NV	-	-	-	-	-	-	-	-	-	-	-	-79	-45	71
Dissolved Oxygen (DO) [6]	5	NV	-	-	-	-	-	-	-	-	-	-	-	3.68	6.52	7.53

Notes:
1. All results are expressed in mg/L unless otherwise stated.
2. PWQO means Provincial Water Quality Objectives.
3. CWQG means Canadian Water Quality Guidelines for the Protection of Aquatic Life.
4. SW Trigger is the PWQO for all parameters except iron and total phosphorous (75% percentile).
5. Calculated from Total Ammonia and field data.
6. Results from field analysis.
Bold text and shading indicate values exceeding PWQO/CWQG.
NV indicates No Value.
"-" parameter not analyzed.

Table 5 Summary of Surface Water Quality Data

Parameter	PWQO[2]	SW Trigger[4]	SW3	SW3	SW3	SW3	SW3
			29-Oct-15	29-Apr-16	05-Jun-17	30-May-18	16-Apr-19
Alkalinity (as $CaCO_3$)	decrease >25%	NV	124	46	42	163	93
Conductivity (µs/cm)	NV	NV	537	129	112	380	234
pH (Units)	6.5 - 8.5	NV	7.48	7.67	6.81	7.42	7.11
Solids - Total Dissolved (TDS)	NV	NV	344	104	62	196	120
Solids - Total Suspended (TSS)	NV	NV	25	652	112	330	< 3
Dissolved Organic Carbon (DOC)	NV	NV	21	12	12	11	10
Oxygen Demand - Biological (BOD)	NV	NV	<5	20	15	9	< 3
Oxygen Demand - Chemical (COD)	NV	NV	76	91	81	95	14
Phenolics- Total	0.005	NV	0.002	<0.001	0.017	< 0.001	< 0.002
Chloride[3]	120	120	37.9	3.7	1.1	20.9	5.4
Sulphate	NV	NV	93.3	14.9	7.0	2.0	13.0
Ammonia, Unionized (as N) [5]	0.02	NV	-	-	<0.005	<0.005	< 0.005
Nitrogen - Ammonia (NH_3) & Ammonium (NH_4)	NV	NV	<0.02	<0.02	0.03	0.06	0.04
Nitrogen - Nitrite (NO_2)[3]	0.6	NV	<0.10	<0.05	< 0.05	< 0.05	< 0.05
Nitrogen - Nitrate (NO_3)[3]	13	NV	<0.10	<0.05	< 0.05	< 0.05	< 0.05
Nitrogen - Total Kjeldhal (TKN)	NV	NV	1.1	6.2	4.4	1.4	0.3
Mercury	NV	NV	<0.0001	-	-	-	-
Mercury - dissolved	0.0002	NV	-	-	-	-	-
Hardness (as $CaCO_3$)	NV	NV	173	46	62	167	104
Arsenic	0.1	NV	<0.003	-	-	-	-
Barium	NV	NV	0.0890	-	-	-	-
Boron[3]	1.5	1.5	0.6460	-	-	-	0.170
Cadmium	0.001	NV	<0.0001	-	-	-	-
Calcium	NV	NV	17.0	17.0	19.0	15.6	31
Chromium	0.0089	NV	<0.003	-	-	-	-
Copper	0.005	NV	0.0040	-	-	-	-
Iron	0.3	1.19	0.93	**2.68**	**2.83**	**3.98**	0.43
Lead	0.002	NV	<0.002	-	-	-	-
Magnesium	NV	NV	-	3.34	-	-	6.47
Manganese	NV	NV	0.486	7.02	2.16	5.36	0.40
Phosphorous - Total	0.02	NV	0.08	0.64	0.5	0.13	0.02
Potassium	NV	NV	-	1.47	-	-	-
Sodium	NV	NV	-	5.99	-	-	7.4
Zinc	0.03	NV	0.008	-	-	-	-
Conductivity (µS/cm) [6]	NV	NV	541	135	130	430	240
pH (units) [6]	6.5-8.5	NV	7.49	7.95	6.15	6.84	6.93
Temperature (°C) [6]	NV	NV	7.1	1.4	12.7	14.9	1.0
Oxidation Reduction Potential (mV)[6]	NV	NV	167	145	-56	55	134
Dissolved Oxygen (DO) [6]	5	NV	7.02	5.78	2.89	2.23	7.43

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5. Calculated from Total Ammonia and field data.
6. Results from field analysis.
Bold text and shading indicate values exceeding PWQO/CWQG.
NV indicates No Value.
"-" parameter not analyzed.

Table 5 Summary of Surface Water Quality Data

Parameter	PWQO[2]	SW Trigger[4]	SW4	SW4	SW4	SW4	SW4	SW4	SW4	SW4	SW4	SW4	SW4	SW4	SW4	SW4
			09-Jul-08	06-Nov-08	04-Dec-08	13-May-09	20-Jul-09	20-Oct-09	15-Jun-10	21-Jul-10	03-Nov-10	22-May-12	15-Nov-12	28-May-13	09-Dec-13	14-May-14
Alkalinity (as $CaCO_3$)	decrease >25%	NV	52	41	50	50	111	41	67	67	49	73	22	55	45	47
Conductivity (µs/cm)	NV	NV	233	297	297	213	336	233	236	254	271	245	215	222	234	240
pH (Units)	6.5 - 8.5	NV	7.60	7.70	7.40	6.60	7.30	6.80	7.30	7.10	7.09	7.62	6.76	7.93	7.04	7.29
Solids - Total Dissolved (TDS)	NV	NV	-	-	-	130	210	155	150	160	182	184	164	140	144	152
Solids - Total Suspended (TSS)	NV	NV	ND	ND	ND	<1	120	17	2	10	5	19	<10	11	<10	-
Dissolved Organic Carbon (DOC)	NV	NV	27	17	27	23	13	-	-	-	-	14	-	-	-	-
Oxygen Demand - Biological (BOD)	NV	NV	-	-	-	<2	5	<2	<2	<2	<2	<5	<5	<5	<5	-
Oxygen Demand - Chemical (COD)	NV	NV	-	-	-	28	130	66	69	80	41	84	45	47	58	41
Phenolics- Total	0.005	NV	-	-	-	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	0.002	<0.001	<0.001	0.002	-
Chloride[3]	120	120	36.0	61.0	50.0	31.0	46.0	41.0	32.0	35.0	44.0	34.5	39.1	38.7	38.6	38.3
Sulphate	NV	NV	<1	<1	<1	12.0	<1	14.0	<1	<1	7.0	0.7	23.9	5.7	4.3	3.0
Ammonia, Unionized (as N) [5]	0.02	NV	-	-	-	-	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001
Nitrogen - Ammonia (NH_3) & Ammonium (NH_4)	NV	NV	<0.05	<0.05	<0.05	<0.05	0.08	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	<0.02	0.03	<0.02
Nitrogen - Nitrite (NO_2)[3]	0.6	NV	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen - Nitrate (NO_3)[3]	13	NV	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen - Total Kjeldhal (TKN)	NV	NV	1.3	0.6	0.6	0.5	2.9	1.3	1.0	1.4	0.9	0.9	0.5	1.0	0.6	0.6
Mercury	NV	NV	-	-	-	-	-	-	-	-	-	-	<0.0001	-	<0.0001	-
Mercury - dissolved	0.0002	NV	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hardness (as $CaCO_3$)	NV	NV	56	63	71	52	110	58	72	72	63	77	53	62	51	60
Arsenic	0.1	NV	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.003	-	<0.003	-
Barium	NV	NV	0.0520	0.040	0.047	0.040	0.070	0.040	0.050	0.060	0.040	-	0.029	-	0.030	0.038
Boron[3]	1.5	1.5	0.0880	0.069	0.062	0.060	0.060	0.090	0.080	0.090	0.070	-	0.068	-	0.026	0.053
Cadmium	0.001	NV	ND	ND	ND	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.001	-	<0.0001	<0.0001
Calcium	NV	NV	34.6	17.1	21.3	21.7	17.6	-	-	-	-	18.6	-	-	-	13.2
Chromium	0.0089	NV	ND	ND	ND	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.003	-	<0.003	<0.003
Copper	0.005	NV	-	-	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	-	<0.002	-	<0.002	<0.002
Iron	0.3	1.19	1.10	0.20	0.17	0.08	**1.84**	0.09	0.41	0.78	0.05	**6.79**	0.13	0.24	0.43	0.32
Lead	0.002	NV	ND	ND	ND	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.002	-	<0.002	<0.002
Magnesium	NV	NV	4.30	4.90	5.20	3.29	5.72	3.69	4.52	4.31	4.62	-	-	-	-	3.27
Manganese	NV	NV	0.110	0.010	0.057	<0.01	<0.01	<0.01	0.040	0.020	<0.01	0.475	-	0.023	0.128	0.055
Phosphorous - Total	0.02	NV	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.16	0.02	0.03	0.04	<0.10
Potassium	NV	NV	-	-	-	<1	1.00	<1	1.00	<1	1.00	-	-	-	-	2.94
Sodium	NV	NV	-	-	-	19.4	24.5	21.6	23.6	21.3	27.1	-	-	-	-	24.4
Zinc	0.03	NV	ND	ND	ND	<0.01	<0.01	0.010	0.010	<0.01	<0.01	-	0.006	-	0.008	<0.005
Conductivity (µS/cm) [6]	NV	NV	-	-	-	-	-	-	-	-	-	-	-	-	-	276
pH (units) [6]	6.5-8.5	NV	-	-	-	-	-	-	-	-	-	-	7.70	8.00	-	7.39
Temperature (°C) [6]	NV	NV	-	-	-	-	-	-	-	-	-	-	3.2	7.0	-	14.8
Oxidation Reduction Potential (mV)[6]	NV	NV	-	-	-	-	-	-	-	-	-	-	-	-	-	-46
Dissolved Oxygen (DO) [6]	5	NV	-	-	-	-	-	-	-	-	-	-	-	-	-	3.64

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"-" parameter not analyzed.

Table 5 Summary of Surface Water Quality Data

Parameter	PWQO[2]	SW Trigger[4]	SW4	SW4	SW4	SW4	SW4	SW4	SW4	SW4	SW4	SW4
			04-Nov-14	13-Apr-15	30-Oct-15	30-Apr-16	05-Jun-17	03-Oct-17	30-May-18	13-Nov-18	16-Apr-19	12-Nov-19
Alkalinity (as $CaCO_3$)	decrease >25%	NV	40	18	45	31	49	37	52	36	29	21
Conductivity (µs/cm)	NV	NV	267	159	314	270	248	270	310	291	192	344
pH (Units)	6.5 - 8.5	NV	7.35	7.08	7.28	7.29	7.05	6.83	7.09	7.16	6.83	6.89
Solids - Total Dissolved (TDS)	NV	NV	152	114	194	160	136	149	159	149	98	177
Solids - Total Suspended (TSS)	NV	NV	<10	<10	<10	<10	< 3	12	< 3	< 3	3	< 3
Dissolved Organic Carbon (DOC)	NV	NV	-	-	-	11	13	11	11	10	9	21
Oxygen Demand - Biological (BOD)	NV	NV	<5	<5	<5	<5	< 2	< 2	2	4	< 3	< 3
Oxygen Demand - Chemical (COD)	NV	NV	46	26	61	27	83	66	86	60	23	65
Phenolics- Total	0.005	NV	<0.001	<0.001	0.017	<0.001	0.007	< 0.001	< 0.001	0.002	< 0.002	< 0.002
Chloride[3]	120	120	52.0	33.1	59.2	66.0	34.8	48.6	67.9	59.1	35.1	67.6
Sulphate	NV	NV	3.4	4.3	10.9	3.8	< 1	< 1	< 1	6.0	4.0	32.0
Ammonia, Unionized (as N) [5]	0.02	NV	<0.02	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrogen - Ammonia (NH_3) & Ammonium (NH_4)	NV	NV	<0.02	<0.02	<0.02	<0.02	< 0.01	0.05	0.05	0.02	0.04	0.05
Nitrogen - Nitrite (NO_2)[3]	0.6	NV	<0.05	<0.05	<0.10	<0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nitrogen - Nitrate (NO_3)[3]	13	NV	<0.05	<0.05	<0.10	<0.05	< 0.05	< 0.05	< 0.05	<	< 0.05	< 0.05
Nitrogen - Total Kjeldhal (TKN)	NV	NV	0.7	0.3	0.7	0.7	0.6	0.9	1.0	0.6	0.4	0.7
Mercury	NV	NV	<0.0001	-	<0.0001	-	-	< 0.00002	-	< 0.00002	-	-
Mercury - dissolved	0.0002	NV	-	-	-	-	-	-	-	-	-	0.00007
Hardness (as $CaCO_3$)	NV	NV	52	30	64	42	65	68	82	65	42	71
Arsenic	0.1	NV	<0.003	-	<0.003	-	-	0.0004	-	0.0002	-	0.0003
Barium	NV	NV	0.032	-	0.041	-	-	0.051	-	0.036	-	-
Boron[3]	1.5	1.5	0.091	-	0.142	-	-	0.029	-	0.040	0.024	0.077
Cadmium	0.001	NV	<0.0001	-	<0.0001	-	-	0.000048	-	< 0.000015	-	-
Calcium	NV	NV	-	-	16.0	11.0	13.0	9.4	8.5	8.0	13.0	21.7
Chromium	0.0089	NV	<0.003	-	<0.003	-	-	< 0.001	-	< 0.001	-	-
Copper	0.005	NV	<0.002	-	<0.002	-	-	0.0064	-	0.0010	-	0.0019
Iron	0.3	1.19	0.05	0.14	0.13	0.08	0.32	0.71	**3.32**	0.29	0.20	0.20
Lead	0.002	NV	<0.002	-	<0.002	-	-	0.00042	-	0.00009	-	-
Magnesium	NV	NV	-	-	-	2.11	-	-	-	-	2.29	4.19
Manganese	NV	NV	0.006	0.038	0.010	0.002	0.022	0.056	0.737	0.004	0.010	0.005
Phosphorous - Total	0.02	NV	0.20	0.02	0.03	0.01	0.04	0.05	0.08	0.02	< 0.01	0.02
Potassium	NV	NV	-	-	-	1.19	-	-	-	-	-	1.80
Sodium	NV	NV	-	-	-	33.1	-	-	-	-	21.6	38.8
Zinc	0.03	NV	<0.005	-	0.006	-	-	0.04	-	0.02	-	0.01
Conductivity (µS/cm) [6]	NV	NV	246	128	190	283	270	280	360	330	110	70
pH (units) [6]	6.5-8.5	NV	7.50	7.49	8.04	8.08	6.31	6.52	6.56	7.19	6.69	7.53
Temperature (°C) [6]	NV	NV	6.4	2.0	7.2	6.9	13.2	9.3	17.8	0.5	5.5	0.7
Oxidation Reduction Potential (mV)[6]	NV	NV	-179	206	250	308	-25	134	25	113	96	11
Dissolved Oxygen (DO) [6]	5	NV	7.21	7.31	7.31	8.36	3.08	3.96	4.07	8.72	6.30	7.38

Notes:
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4. SW Trigger is the PWQO for all parameters except iron and total phosphorous (75% percentile).
5. Calculated from Total Ammonia and field data.
6. Results from field analysis.

Bold text and shading indicate values exceeding PWQO/CWQG.
NV indicates No Value.
"-" parameter not analyzed.

Table 5 Summary of Surface Water Quality Data

Parameter	PWQO[2]	SW Trigger[4]	SW5	SW5	SW5	SW5	SW5	SW5	SW5	SW5	SW5	SW5	SW5	SW5	SW5	SW5
			9-Jul-08	6-Nov-08	04-Dec-08	13-May-09	20-Jul-09	20-Oct-09	15-Jun-10	21-Jul-10	03-Nov-10	22-May-12	15-Nov-12	28-May-13	09-Dec-13	14-May-14
Alkalinity (as $CaCO_3$)	decrease >25%	NV	-	30	42	30	27	26	2	67	35	34	28	36	36	24
Conductivity (µs/cm)	NV	NV	-	151	174	118	121	113	66	253	151	145	173	150	156	116
pH (Units)	6.5 - 8.5	NV	-	7.6	7.9	6.4	6.9	6.5	5.9	7.1	7.43	7.33	7.11	7.79	7.33	6.93
Solids - Total Dissolved (TDS)	NV	NV	-	-	-	75	74	75	36	160	96	106	124	108	98	88
Solids - Total Suspended (TSS)	NV	NV	-	ND	ND	1	100	36	18	<10	3	<10	<10	<10	<10	-
Dissolved Organic Carbon (DOC)	NV	NV	6	25	13	-	-	-	-	13	-	-	-	-	-	-
Oxygen Demand - Biological (BOD)	NV	NV	-	-	-	<2	<2	<2	<2	<2	<2	<5	<5	<5	<5	-
Oxygen Demand - Chemical (COD)	NV	NV	-	-	-	29	62	39	16	83	44	31	39	38	42	50
Phenolics- Total	0.005	NV	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	-
Chloride[3]	120	120	-	25	28	14	17	17	3	36	23	20.8	25.8	25.9	19.4	15.2
Sulphate	NV	NV	-	-	<1	6	<1	<1	19	<1	<1	3.18	16.9	5.7	5.6	2.7
Ammonia, Unionized (as N) [5]	0.02	NV	-	-	-	-	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	-
Nitrogen - Ammonia (NH_3) & Ammonium (NH_4)	NV	NV	-	<0.05	0.06	<0.05	0.13	<0.05	<0.05	<0.05	<0.05	<0.02	0.06	<0.02	0.12	<0.02
Nitrogen - Nitrite (NO_2)[3]	0.6	NV	-	-	-	<0.01	0.01	<0.01	<0.01	<0.1	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen - Nitrate (NO_3)[3]	13	NV	-	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<1	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrogen - Total Kjeldhal (TKN)	NV	NV	-	0.6	0.8	0.6	1.6	1.2	0.6	1.3	0.7	0.55	0.66	1.31	0.54	0.86
Mercury	NV	NV	-	-	-	-	-	-	-	-	-	-	<0.0001	-	<0.0001	-
Mercury - dissolved	0.0002	NV	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hardness (as $CaCO_3$)	NV	NV	-	38	46	31	30	28	21	70	42	39	51	41	44	33
Arsenic	0.1	NV	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.003	-	<0.003	-
Barium	NV	NV	0.046	0.027	0.035	0.02	0.02	<0.02	<0.02	0.06	0.03	-	0.037	-	0.027	0.024
Boron[3]	1.5	1.5	0.051	0.029	0.03	0.03	0.03	0.03	<0.02	0.08	<0.02	-	0.058	-	0.028	0.025
Cadmium	0.001	NV	0.0008	ND	ND	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.001	-	<0.0001	<0.0001
Calcium	NV	NV	6.9	21.3	12.3	-	-	-	-	9.8	-	-	-	6.2	-	-
Chromium	0.0089	NV	ND	ND	ND	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.003	-	<0.003	<0.003
Copper	0.005	NV	-	-	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	-	<0.002	-	<0.002	<0.002
Iron	0.3	1.19	**1.20**	0.24	0.39	0.17	0.29	0.07	0.10	0.73	0.11	1.19	0.34	0.32	0.52	0.32
Lead	0.002	NV	0.0026	ND	ND	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.002	-	<0.002	<0.002
Magnesium	NV	NV	4.20	2.70	2.80	1.83	2.02	1.97	0.91	4.21	2.63	-	-	-	-	1.99
Manganese	NV	NV	0.051	0.012	0.030	<0.01	<0.01	0.020	0.020	0.020	<0.01	0.092	-	0.019	0.049	0.137
Phosphorous - Total	0.02	NV	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.05	0.02	0.03	0.05	<0.10
Potassium	NV	NV	-	-	-	<1	<1	<1	<1	<1	<1	-	-	-	-	2.49
Sodium	NV	NV	-	-	-	9.3	10.2	9.8	1.8	21	12.1	-	-	-	-	10.2
Zinc	0.03	NV	0.021	ND	0.006	<0.01	<0.01	0.02	0.02	0.02	<0.01	-	<0.005	-	0.0060	0.0100
Conductivity (µS/cm) [6]	NV	NV	-	-	-	-	-	-	-	-	-	-	-	-	-	156
pH (units) [6]	6.5-8.5	NV	-	-	-	7.50	8.00	-	-	-	-	-	-	-	-	7.49
Temperature (°C) [6]	NV	NV	-	-	-	2.7	6.8	-	-	-	-	-	-	-	-	14.8
Oxidation Reduction Potential (mV)[6]	NV	NV	-	-	-	-	-	-	-	-	-	-	-	-	-	35
Dissolved Oxygen (DO) [6]	5	NV	-	-	-	-	-	-	-	-	-	-	-	-	-	8.07

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6. Results from field analysis.

Bold text and shading indicate values exceeding PWQO/CWQG.
NV indicates No Value.
"-" parameter not analyzed.

Table 5 Summary of Surface Water Quality Data

Parameter	PWQO[2]	SW Trigger[4]	SW5	SW5	SW5	SW5	SW5	SW5	SW5	SW5	SW5	SW5	SW5
			04-Nov-14	13-Apr-15	30-Oct-15	30-Apr-16	30-Oct-16	05-Jun-17	03-Oct-17	30-May-18	13-Nov-18	16-Apr-19	12-Nov-19
Alkalinity (as $CaCO_3$)	decrease >25%	NV	18	18	24	17	18	33	42	27	29	16	30
Conductivity (µs/cm)	NV	NV	83	116	97	61	50	159	216	156	202	135	213
pH (Units)	6.5 - 8.5	NV	7.15	7.16	7.08	7.49	7.25	7.43	7.38	7.34	7.29	6.78	7.36
Solids - Total Dissolved (TDS)	NV	NV	42	74	70	44	20	87	119	79	103	68	109
Solids - Total Suspended (TSS)	NV	NV	<10	<10	<10	<10	<10	< 3	4	< 3	< 3	< 3	< 3
Dissolved Organic Carbon (DOC)	NV	NV	-	9	5	9	7	8	5	23	5	9	14
Oxygen Demand - Biological (BOD)	NV	NV	<5	<5	<5	<5	<5	< 2	< 2	< 2	4	< 3	< 3
Oxygen Demand - Chemical (COD)	NV	NV	18	21	18	6	9	70	43	39	46	21	33
Phenolics- Total	0.005	NV	<0.001	<0.001	0.001	<0.001	<0.001	0.006	< 0.001	< 0.001	0.003	< 0.002	< 0.002
Chloride[3]	120	120	8.4	18.3	13.3	4.8	2.0	19.6	32.2	29.5	39.5	24.7	40.8
Sulphate	NV	NV	3.1	5.7	2.6	3.9	3.3	2.0	< 1	1.0	< 1	3.0	< 1
Ammonia, Unionized (as N) [5]	0.02	NV	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	< 0.005	< 0.005
Nitrogen - Ammonia (NH_3) & Ammonium (NH_4)	NV	NV	<0.02	0.03	0.08	<0.02	<0.02	0.03	0.11	0.08	0.04	0.04	0.06
Nitrogen - Nitrite (NO_2)[3]	0.6	NV	<0.05	<0.05	<0.05	<0.05	<0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nitrogen - Nitrate (NO_3)[3]	13	NV	0.05	0.17	<0.05	0.1	<0.05	0.06	0.08	0.09	< 0.05	< 0.05	< 0.05
Nitrogen - Total Kjeldhal (TKN)	NV	NV	0.34	0.26	0.4	1.14	0.19	0.5	0.7	0.5	0.6	0.3	0.6
Mercury	NV	NV	<0.0001	-	<0.0001	-	<0.0001	-	< 0.00002	-	< 0.00002	-	-
Mercury - dissolved	0.0002	NV	-	-	-	-	-	-	-	-	-	-	0.00007
Hardness (as $CaCO_3$)	NV	NV	24	30	24	19	20	51	50	50	51	31	45
Arsenic	0.1	NV	<0.003	-	<0.003	-	<0.003	-	0.0003	-	0.0002	-	0.0001
Barium	NV	NV	0.015	-	0.019	-	0.013	-	0.034	-	0.035	-	-
Boron[3]	1.5	1.5	0.012	-	0.0220	-	0.0300	-	0.023	-	0.019	0.011	0.014
Cadmium	0.001	NV	<0.0001	-	<0.0001	-	<0.0001	-	0.000053	-	< 0.000015	-	-
Calcium	NV	NV	-	19.0	26.0	22.0	16.6	20.7	26.5	21.4	19.3	9.65	14.00
Chromium	0.0089	NV	<0.003	-	<0.003	-	<0.003	-	< 0.001	-	< 0.001	-	-
Copper	0.005	NV	<0.002	-	<0.002	-	<0.002	-	0.0066	-	0.0005	-	0.001
Iron	0.3	1.19	0.15	0.21	0.35	0.02	<0.010	0.33	0.92	0.59	0.33	0.28	0.33
Lead	0.002	NV	<0.002	-	<0.002	-	<0.002	-	0.00038	-	0.00004	-	-
Magnesium	NV	NV	-	-	-	-	-	-	-	-	-	1.58	2.45
Manganese	NV	NV	0.008	0.042	0.015	0.005	0.004	0.019	0.058	0.055	0.011	0.018	0.016
Phosphorous - Total	0.02	NV	0.02	0.02	0.02	<0.01	<0.01	0.04	0.04	0.04	0.02	0.02	0.01
Potassium	NV	NV	-	-	-	0.47	-	-	-	-	-	-	1.10
Sodium	NV	NV	-	-	-	2.91	-	-	-	-	-	13.7	22.6
Zinc	0.03	NV	<0.005	-	0.007	-	<0.005	-	< 0.005	-	0.013	-	< 0.005
Conductivity (µS/cm) [6]	NV	NV	670	128	108	61	51	180	230	180	230	360	180
pH (units) [6]	6.5-8.5	NV	7.80	7.22	7.83	8.55	8.49	6.77	7.00	7.01	7.29	7.43	7.92
Temperature (°C) [6]	NV	NV	8.4	7.5	8.3	8.6	7.1	15.3	11.8	20.9	2.5	1.5	2.5
Oxidation Reduction Potential (mV)[6]	NV	NV	113	174	275	307	392	-13	118	23	108	123	14
Dissolved Oxygen (DO) [6]	5	NV	5.37	9.6	10.19	11.44	10.06	7.4	5.62	6.17	10.23	6.28	9.58

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"-" parameter not analyzed.

Table 5 Summary of Surface Water Quality Data

Parameter	PWQO[2]	SW Trigger[4]	SW6	SW6	SW6	SW6	SW6	SW6	SW6	SW6	SW6	SW6	SW6	SW6	SW6	SW6
			09-Jul-08	06-Nov-08	04-Dec-08	13-May-09	20-Jul-09	20-Oct-09	21-Jul-10	03-Nov-10	22-May-12	15-Nov-12	28-May-13	09-Dec-13	14-May-14	04-Nov-14
Alkalinity (as $CaCO_3$)	decrease >25%	NV	30	36	39	44	37	39	66	38	45	38	50	34	34	48
Conductivity (µs/cm)	NV	NV	521	639	466	482	661	596	253	426	497	501	550	198	354	428
pH (Units)	6.5 - 8.5	NV	7.40	7.6	7.2	6.50	7	6.6	7.10	6.81	7.45	7.08	7.96	6.82	6.99	7.22
Solids - Total Dissolved (TDS)	NV	NV	-	-	-	315	415	390	160	282	264	244	228	92	152	202
Solids - Total Suspended (TSS)	NV	NV	ND	ND	420	4	<10	<10	10.0	<1	<10	<10	26.0	18.0	-	16.0
Dissolved Organic Carbon (DOC)	NV	NV	-	-	-	-	5	-	-	-	-	-	-	-	-	-
Oxygen Demand - Biological (BOD)	NV	NV	-	-	-	<2	<2	<2	<2	<2	<5	<5	<5	<5	-	<5
Oxygen Demand - Chemical (COD)	NV	NV	-	-	-	19	43.0	25.0	78	34	14	18	21	20	88	95
Phenolics- Total	0.005	NV	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	0.001
Chloride[3]	120	120	**130.0**	**170.0**	110	120.0	**180.0**	**160.0**	35.0	99.0	**126.0**	**147.0**	**148.0**	32.0	74.6	93.6
Sulphate	NV	NV	<1	<1	0.03	4.0	<1	2.0	<1	5.0	2.4	2.9	2.8	5.3	3.7	0.8
Ammonia, Unionized (as N) [5]	0.02	NV	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02
Nitrogen - Ammonia (NH_3) & Ammonium (NH_4)	NV	NV	<0.05	<0.05	0.13	<0.05	<0.05	0.14	<0.05	<0.05	<0.02	0.02	<0.02	0.06	<0.02	<0.02
Nitrogen - Nitrite (NO_2)[3]	0.6	NV	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.05	<0.10	<0.05	<0.05	<0.05
Nitrogen - Nitrate (NO_3)[3]	13	NV	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.05	<0.10	<0.05	<0.05	<0.05
Nitrogen - Total Kjeldhal (TKN)	NV	NV	0.8	0.4	1.9	0.5	0.9	0.5	1.2	0.6	0.39	0.28	0.02	0.37	1.29	2.39
Mercury	NV	NV	-	-	-	-	-	-	-	-	-	<0.0001	-	<0.0001	-	<0.0001
Mercury - dissolved	0.0002	NV	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hardness (as $CaCO_3$)	NV	NV	58	74	73	50	64	86	71	65	57	66	78	37	50	54
Arsenic	0.1	NV	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	-	<0.003	-	<0.003	-	<0.003
Barium	NV	NV	0.063	0.089	0.15	0.04	0.06	0.08	0.06	0.06	-	0.056	-	0.033	0.067	0.114
Boron[3]	1.5	1.5	0.0110	ND	ND	<0.02	<0.02	<0.02	0.0800	<0.02	-	<0.010	-	<0.010	0.0100	<0.010
Cadmium	0.001	NV	ND	ND	ND	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.001	-	<0.0001	<0.0001	<0.0001
Calcium	NV	NV	-	-	-	-	16.0	-	-	-	18.3	-	-	-	-	-
Chromium	0.0089	NV	ND	ND	0.007	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.003	-	<0.003	<0.003	<0.003
Copper	0.005	NV	-	-	-	<0.02	<0.02	<0.02	<0.02	<0.02	-	<0.002	-	<0.002	0.0005	<0.002
Iron	0.3	1.19	**1.90**	0.42	**10.00**	0.19	0.28	0.25	0.77	0.15	0.64	0.34	0.40	0.49	**1.72**	**11.60**
Lead	0.002	NV	ND	ND	0.0046	<0.05	<0.05	<0.05	<0.05	<0.05	-	<0.002	-	<0.002	<0.002	<0.002
Magnesium	NV	NV	3.50	5.80	5.30	2.15	3.03	4.72	4.28	3.98	-	-	-	-	2.54	-
Manganese	NV	NV	0.150	0.038	0.290	<0.01	<0.01	0.060	0.040	<0.01	0.024	-	0.015	0.043	0.044	0.148
Phosphorous - Total	0.02	NV	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	<0.02	0.83	0.04	<0.10	0.31
Potassium	NV	NV	-	-	-	1.00	<1	<1	<1	<1	-	-	-	-	1.19	-
Sodium	NV	NV	-	-	-	69.4	95.1	74	21.1	52.3	-	-	-	-	44.5	-
Zinc	0.03	NV	0.026	ND	0.013	<0.01	<0.01	<0.01	<0.01	<0.01	-	0.018	-	<0.005	0.010	0.023
Conductivity (µS/cm) [6]	NV	NV	-	-	-	-	-	-	-	-	-	-	-	-	449	293
pH (units) [6]	6.5-8.5	NV	-	-	-	-	-	-	-	-	-	-	-	-	7.27	7.89
Temperature (°C) [6]	NV	NV	-	-	-	-	-	-	-	-	-	-	-	-	14.8	8.0
Oxidation Reduction Potential (mV)[6]	NV	NV	-	-	-	-	-	-	-	-	-	-	-	-	56	91
Dissolved Oxygen (DO) [6]	5	NV	-	-	-	-	-	-	-	-	-	-	-	-	9.98	5.40

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"-" parameter not analyzed.

Table 5 Summary of Surface Water Quality Data

Parameter	PWQO[2]	SW Trigger[4]	SW6	SW6	SW6	SW6	SW6	SW6	SW6	SW6	SW6
			13-Apr-15	29-Oct-15	30-Apr-16	30-Oct-16	05-Jun-17	03-Oct-17	30-May-18	13-Nov-18	16-Apr-19
Alkalinity (as $CaCO_3$)	decrease >25%	NV	21	65	40	41	57	66	59	34	25
Conductivity (µs/cm)	NV	NV	284	505	328	571	395	474	495	518	115
pH (Units)	6.5 - 8.5	NV	7.35	7.39	7.61	6.97	7.36	7.37	7.48	6.77	6.56
Solids - Total Dissolved (TDS)	NV	NV	62	324	198	360	217	261	256	268	58
Solids - Total Suspended (TSS)	NV	NV	68.0	43.0	<10	129.0	6.0	4.0	5.0	5.0	< 3
Dissolved Organic Carbon (DOC)	NV	NV	-	-	-	-	-	-	-	-	3
Oxygen Demand - Biological (BOD)	NV	NV	<5	<5	<5	<5	< 2	< 2	< 2	4	< 3
Oxygen Demand - Chemical (COD)	NV	NV	26	30	12	167	71	8	34	23	< 5
Phenolics- Total	0.005	NV	<0.001	0.003	<0.001	<0.001	0.009	< 0.001	< 0.001	< 0.002	< 0.002
Chloride[3]	120	120	19.6	10.5	78.5	**156.0**	63.0	86.3	**125.0**	**129.0**	14.8
Sulphate	NV	NV	4.8	173.0	7.7	4.1	6.0	1.0	3.0	5.0	4.0
Ammonia, Unionized (as N) [5]	0.02	NV	-	-	-	-	<0.005	<0.005	<0.005	<0.005	< 0.005
Nitrogen - Ammonia (NH_3) & Ammonium (NH_4)	NV	NV	0.37	0.25	<0.02	0.06	< 0.01	0.13	0.02	0.04	0.05
Nitrogen - Nitrite (NO_2)[3]	0.6	NV	<0.05	<0.10	<0.05	<0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nitrogen - Nitrate (NO_3)[3]	13	NV	<0.05	<0.10	<0.05	<0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nitrogen - Total Kjeldhal (TKN)	NV	NV	1.1	0.88	0.48	4.78	0.6	0.6	0.6	0.3	0.2
Mercury	NV	NV	-	<0.0001	-	<0.0001	-	< 0.00002	-	< 0.00002	-
Mercury - dissolved	0.0002	NV	-	-	-	-	-	-	-	-	-
Hardness (as $CaCO_3$)	NV	NV	25	213	59	107	68	77	95	105	27
Arsenic	0.1	NV	-	<0.003	-	<0.003	-	0.0003	-	< 0.0001	-
Barium	NV	NV	-	0.09	-	0.102	-	0.061	-	0.104	-
Boron[3]	1.5	1.5	-	0.324	-	0.013	-	0.03	-	0.008	< 0.005
Cadmium	0.001	NV	-	<0.0001	-	<0.0001	-	< 0.000014	-	< 0.000015	-
Calcium	NV	NV	-	-	-	-	-	-	-	-	7.67
Chromium	0.0089	NV	-	<0.003	-	<0.003	-	< 0.001	-	< 0.001	-
Copper	0.005	NV	-	0.0040	-	<0.002	-	0.0006	-	0.0005	-
Iron	0.3	1.19	0.46	**1.38**	0.48	**2.03**	1.12	1.03	1.13	**1.27**	0.58
Lead	0.002	NV	-	<0.002	-	0.005	-	0.00003	-	0.00004	-
Magnesium	NV	NV	-	-	3.28	-	-	-	-	-	1.92
Manganese	NV	NV	0.014	0.697	0.040	0.162	0.084	0.084	0.094	0.095	0.011
Phosphorous - Total	0.02	NV	0.24	0.12	0.04	0.39	0.03	0.03	0.03	0.03	0.05
Potassium	NV	NV	-	-	1.21	-	-	-	-	-	-
Sodium	NV	NV	-	-	37.5	-	-	-	-	-	12.2
Zinc	0.03	NV	-	0.031	-	0.013	-	< 0.005	-	0.018	-
Conductivity (µS/cm) [6]	NV	NV	190	512	438	550	420	490	600	640	120
pH (units) [6]	6.5-8.5	NV	6.90	7.81	7.39	8.65	6.75	7.15	6.88	6.66	7.00
Temperature (°C) [6]	NV	NV	6.0	8.6	11.4	2.1	11.6	10.3	20.9	3.1	5.2
Oxidation Reduction Potential (mV)[6]	NV	NV	110	199	264	323	-65	155	15	117	94
Dissolved Oxygen (DO) [6]	5	NV	2.63	7.86	9.09	5.89	4.15	3.35	5.75	3.65	7.02

Notes:
1. All results are expressed in mg/L unless otherwise stated.
2. PWQO means Provincial Water Quality Objectives.
3. CWQG means Canadian Water Quality Guidelines for the Protection of Aquatic Life.
4. SW Trigger is the PWQO for all parameters except iron and total phosphorous (75% percentile).
5. Calculated from Total Ammonia and field data.
6. Results from field analysis.

Bold text and shading indicate values exceeding PWQO/CWQG.
NV indicates No Value.
"-" parameter not analyzed.

Table 6: Monthly Summary of Materials Accepted and Transferred (2018)

Quantity accepted at the Site, as recorded on daily incoming waste forms										
Month	**Vehicles**	**Total Garbage Bags**	**Bulky Waste (yd^3)**	**Shingles & Drywall (yd^3)**	**Major Appliances without Freon (quantity)**	**Major Appliances with Freon (quantity)**	**Reuse Centre Bins (40 yd - quantity)**	**Brush (tonnes)**	**Tires (quantity)**	**Alcohol Containers (quantity)**
January	308	420	-	0.25	-	-	-	-	-	-
February	262	351	-	-	-	-	-	-	-	-
March	371	386	-	-	-	1	-	-	-	-
April	355	372	-	0.50	1	1	-	-	-	-
May	960	965	0.5	1.00	-	4	-	-	-	-
June	1,207	1,221	-	1.00	-	7	-	-	-	-
July	1,855	2,264	-	5.00	1	8	-	-	-	-
August	2,010	2,529	-	3.20	3	13	-	-	-	-
September	1,382	2,238	-	3.90	6	4	-	-	-	-
October	870	1,114	0.5	1.65	1	1	-	-	-	-
November	377	493	-	1.00	7	-	-	-	-	-
December	439	559	-	1.15	4	-	-	-	-	-
Annual Total	**10,396**	**12,912**	**1.00**	**18.65**	**23**	**39**	**1.5**	**30**	**200**	**42,014**

Quantity reported to be removed from the Site, transported/processed as noted											
Month	**Waste[1] (tonnes)**	**Loads[1]**	**C&D Materials[3] (tonnes)**	**Containers[4] (tonnes)**	**Fibres[4] (tonnes)**	**Furniture[5] (tonnes)**	**Scrap Metals & White Goods (tonnes)**	**WEEE[6] (tonnes)**	**Empty Oil Containers (tonnes)**	**Textiles (tonnes)[7]**	**MHSW[8] (tonnes)**
January	6.15	2	-	0.77	1.49	-	-	-	-	-	-
February	3.92	1	-	1.01	1.08	-	-	-	-	-	-
March	2.81	1	-	1.10	1.85	-	-	-	-	-	-
April	3.53	1	-	1.18	1.70	-	-	-	-	-	-
May	16.66	4	-	1.80	4.43	-	-	2.53	-	-	-
June	15.18	5	-	2.48	3.80	4.79	-	-	-	-	-
July	24.70	4	-	3.94	6.12	-	-	-	-	-	-
August	38.93	5	-	5.87	6.93	-	-	1.83	-	-	-
September	17.89	3	-	2.39	4.05	3.57	-	-	-	-	-
October	8.09	2	-	2.22	3.29	3.87	-	-	-	-	-
November	12.01	3	-	0.86	1.27	-	-	2.79	-	-	-
December	8.97	3	-	0.96	1.95	-	-	-	-	-	-
Annual Total		**34.00**	**37.08**	**24.58**	**37.96**	**12.23**	**36.12**	**7.15**	**0.06**	**2.26**	**5.90**

Notes:

1. Scaled weights from the Bensfort Road Waste Disposal Site

2. Transported by ABA Recycling to Harper Road Compost Facility or SusGlobal Energy Belleville

3. Transported and processed by Waste Connections (formerly M&M Disposal)

4. Transported by Waste Connections of Canada to Peterborough Materials Recovery Facility for processing by HGC

5. Collected at all MTL transfer stations, transferred to the Peterborough Waste Management Facility

6. Transported and processed by GEEP on contract with the County of Peterborough

7. Transferred to the Diabetes Association

8. Limited MHSW collected at all transfer sites, including batteries (Call 2 Cycle), flourscent tubes (Photech), empty oil/anitfreeze containers (Pnweko), and car batteries (Photech)

Table 6: Monthly Summary of Materials Accepted and Transferred (2019)

Quantity accepted at the Site, as recorded on daily incoming waste forms										
Month	**Vehicles**	**Total Garbage Bags**	**Bulky Waste (yd^3)**	**Shingles & Drywall (yd^3)**	**Major Appliances without Freon (quantity)**	**Major Appliances with Freon (quantity)**	**Reuse Centre Bins (40 yd - quantity)**	**Brush (tonnes)**	**Tires (quantity)**	**Alcohol Containers (quantity)**
January	304	427	-	-	-	-	-	-	-	-
February	245	320	-	-	-	-	-	-	-	-
March	333	348	-	-	-	-	-	-	-	-
April	385	844	-	-	-	-	-	-	-	-
May	862	1,125	-	-	-	-	-	-	-	-
June	1,158	1,447	-	-	-	-	-	-	-	-
July	2,262	2,610	-	-	-	-	-	-	-	-
August	2,282	3,038	-	-	-	-	-	-	-	-
September	1,507	1,957	-	-	-	-	-	-	-	-
October	817	1,084	-	-	-	-	-	-	-	-
November	1,156	1,550	-	-	-	-	-	-	-	-
December	327	452	-	-	-	-	-	-	-	-
Annual Total	**11,638**	**15,202**	**-**	**42**	**31**	**43**	**2.0**	**45**	**99**	**41,307**

Quantity reported to be removed from the Site, transported/processed as noted												
Month	**Waste[1] (tonnes)**	**Loads[1]**	**C&D Materials[3] (tonnes)**	**Containers[4] (tonnes)**	**Fibres[4] (tonnes)**	**Furniture[5] (tonnes)**	**Scrap Metals & White Goods (tonnes)**	**WEEE[6] (tonnes)**	**Empty Oil Containers (tonnes)**	**Textiles (tonnes)[7]**	**MHSW[8] (tonnes)**	**Durable Plastics (Tonnes)[9]**
January	3.06	1	-	1.14	0.38	-	-	-	-	-	-	-
February	6.41	2	-	0.61	1.27	-	-	-	-	-	-	-
March	3.67	1	20.63	0.76	1.48	-	-	-	-	-	-	-
April	8.19	2	-	1.24	1.18	-	-	-	0.06	-	-	-
May	12.26	3	-	2.77	4.74	4.34	-	3.86	-	-	-	-
June	8.38	2	23.52	2.34	3.63	9.69	-	-	-	-	-	-
July	27.74	4	-	3.60	5.51	-	-	-	-	-	-	-
August	38.15	5	-	5.31	6.41	-	-	3.15	0.04	-	-	-
September	27.97	5	-	3.07	2.84	4.68	-	-	-	-	-	-
October	15.49	4	52.72	2.27	4.18	-	-	-	0.01	-	-	-
November	7.57	2	-	1.30	2.51	-	-	2.58	-	-	-	-
December	7.88	2	-	1.10	3.01	-	-	-	-	-	-	-
Annual Total	**166.77**	**33.00**	**96.87**	**25.51**	**37.14**	**18.71**	**26.18**	**9.60**	**0.11**	**2.33**	**5.69**	**1.99**

Notes:

1. Scaled weights from the Bensfort Road Waste Disposal Site

2. Transported by ABA Recycling to Harper Road Compost Facility or SusGlobal Energy Belleville

3. Transported and processed by Waste Connections (formerly M&M Disposal)

4. Transported by Waste Connections of Canada to Peterborough Materials Recovery Facility for processing by HGC

5. Collected at all MTL transfer stations, transferred to the Peterborough Waste Management Facility

6. Transported and processed by GEEP on contract with the County of Peterborough

7. Transferred to the Diabetes Association

8. Limited MHSW collected at all transfer sites, including batteries (Call 2 Cycle), flourscent tubes (Photech), empty oil/anitfreeze containers (Pnweko), and car batteries (Photech)

9. County program from June to September 2019.

Appendix A
Environmental Compliance Approval

Content Copy Of Original

Ontario

Ministry of the Environment and Climate Change
Ministère de l'Environnement et de l'Action en matière de changement climatique

AMENDED ENVIRONMENTAL COMPLIANCE APPROVAL
NUMBER A341206
Issue Date: October 2, 2017

The Corporation of the Municipality of Trent Lakes
760 Peterborough County Road 36,
Trent Lakes, Ontario
K0M 1A0

Site Location: Cavendish Transfer Station
3020 Hwy 507,
Municipality of Trent Lakes,
County of Peterborough,
Ontario

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act, R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

a 0.8 hectare for the use and operation of a waste disposal site within a total site area of 2 hectares, being known as the Cavendish Landfill Site for the receipt, temporary storage and transfer of solid, non-hazardous municipal waste, MHSW, WEEE and organic waste.

For the purpose of this environmental compliance approval, the following definitions apply:

"Act" and "EPA" means *Environmental Protection Act* , R.S.O. 1990, c. E. 19, as amended;

"Approval" means this Environmental Compliance Approval and any Schedules to it, including the application and supporting documentation listed in Schedule "A";

"CAZ" means the contaminated attenuation zone;

" *Director"* means any *Ministry* employee appointed in writing by the Minister pursuant to section 5 of the *EPA* as a Director for the purposes of Part II.1 of the *EPA;*

" *District Manager"* means the District Manager of the local district office of the *Ministry* for the geographic area in which the *Site* is located;

"EPA" means the Environmental Protection Act, R.S.O. 1990, C.E-19 as amended;

" ***leaf and yard waste*** *"* means waste plant materials including natural Christmas trees but excludes tree limbs or other woody materials in excess of 7 centimetres in diameter;

" ***MHSW*** *"* means Municipal Hazardous and/or Special Waste restricted to waste classes 121, 122, 148, 252 and 331, generated within the geographic boundaries of the Municipality of Trent Lakes;

" *Ministry"* and ***"MOECC"*** means the ministry of the government of Ontario responsible for the *EPA* and includes all officials, employees or other persons acting on its behalf;

"Ontario Regulation 101/94" means Ontario Regulation 101/94 – Recycling and Composting of Municipal Waste, as made under the EPA;

" ***Ontario Regulation 393/04 "*** means Ontario Regulation 393/04 Waste Electrical and Electronic Equipment made under the Waste Diversion Act 2002;

" ***Ontario Regulation 463/10 "*** means Ontario Regulation 463/10, Ozone Depleting Substances and Other Halocarbons, made under the *EPA;*

*" **Ontario Regulation 189/94"*** means Ontario Regulation, Refrigerants, made under the Environmental Protection Act ;

" ***Operator*** *"* means any person, other than the *Owner's* employees, authorized by the *Owner* as having the charge, management or control of any aspect of the *Site;*

" *Owner"* means any person that is responsible for the establishment or operation of the site being approved by this *Approval* , and includes the Corporation of the Municipality of Trent Lakes, its successors and assigns;

"OWRA" means the *Ontario Water Resources Act,* R.S.O. 1990, c. O.40, as amended;

" ***PA*** *"* means the *Pesticides Act,* R.S.O. 1990, c. P-11, as amended from time to time;

" ***Provincial Officer*** " means any person designated in writing by the Minister as a provincial officer pursuant to section 5 of the *OWRA* or section 5 of the *EPA* or section 17 of *PA;*

" ***Transfer Station "*** means the area of land identified as the proposed waste, *recyclable material, MHSW, WEEE* and organic waste transfer station as described in Item 1, Schedule "A";

"Reasonable Use Guideline" means the Ministry Guideline B-7 entitled "Incorporation of the Reasonable Use Concept into MOE Groundwater Management Activities, dated April 1994, as amended

"Regional Director" means the Director of Eastern Region, Ministry of the Environment;

"Regulation 347" means Regulation 347 R.R.O. 1990; and

" ***Recyclable Material "*** means solid, non-hazardous municipal waste that includes, but is not limited to, waste in one or more of the categories set out in *Ontario Regulation 101/94,* Schedules 1, 2 and 3;

"Site" means the Cavendish Landfill Site located at 3405 Hwy 507, Municipality of Trent Lakes, County of Peterborough, Ontario.

*" **Source Separated Organic Waste "*** means organic waste suitable for anaerobic digestion which has been separated at its source of origin by the generator of the waste;

" *Trained Personnel* " means competent personnel that have been trained through instruction

and/or practice in accordance with the conditions of this Approval.

"Transfer Station" refers to the area of land contiguous to the landfill area and part of the Site, to be used for the temporary storage of wastes prior to the removal of the wastes to a final disposal site; and

" ***Waste Electrical and Electronic Equipment*** *"* means devices listed in Schedules 1 through 7 of Ontario Regulation 393/04, Waste Electrical and Electronic Equipment made under the *Waste Diversion Act* 2002; and

"White goods which contain Refrigerants" means white goods which contain, or may contain refrigerants, and which include, but is not restricted to, refrigerators, freezers and air-conditioning systems.

You are hereby notified that this environmental compliance approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

PART 1 - GENERAL

Revoke and Replace

1.1 This *Approval*revokes Provisional Certificate of Approval No. A341206, issued *on August 12, 1980, and amended on February 12, 2007, May 8, 2007, May 28, 2009*and *December 8, 2009.*The approval given herein, including the terms and conditions set out, replaces all previously issued approvals and related terms and conditions under Part V of the *EPA*for this *Site.*

Compliance

1.2 The *Owner* and *Operator* shall ensure compliance with all the conditions of this *Approval* and shall ensure that any person authorized to carry out work on or operate any aspect of the *Site* is notified of this *Approval* and the conditions herein and shall take all reasonable measures to ensure any such person complies with the same.

1.3 Any person authorized to carry out work on or operate any aspect of the *Site* shall comply with the conditions of this *Approval* .

In Accordance

1.4 Except as otherwise provided for in this *Approval* , the *Site* shall be designed, developed, built, operated and maintained in accordance with the application for this *Approval,* and the supporting documentation listed in Schedule “A”.

Interpretation

1.5 Where there is a conflict between a provision of any document, including the application, referred to in this *Approval* , and the conditions of this *Approval,* the conditions in this *Approval* shall take precedence.

1.6 Where there is a conflict between the application and a provision in any documents listed in Schedule "A", the application shall take precedence, unless it is clear that the purpose of the document was to amend the application and that the *Ministry* approved the amendment.

1.7 Where there is a conflict between any two documents listed in Schedule "A", other than the application, the document bearing the most recent date shall take precedence.

1.8 The conditions of this *Approval* are severable. If any condition of this *Approval* , or the application of any condition of this *Approval* to any circumstance, is held invalid or unenforceable, the application of such condition to other circumstances and the remainder of this *Approval* shall not be affected thereby.

Other Legal Obligations

1.9 The issuance of, and compliance with, this Approval does not:

a. relieve any person of any obligation to comply with any provision of any applicable statute, regulation or other legal requirement; or
b. limit in any way the authority of the *Ministry* to require certain steps be taken or to require the *Owner* and *Operator* to furnish any further information related to compliance with this *Approval* .

Adverse Effect

1.10 The *Owner* and *Operator* shall take steps to minimize and ameliorate any adverse effect on the natural environment or impairment of water quality resulting from the *Site* , including such accelerated or additional monitoring as may be necessary to determine the nature and extent of the effect or impairment.

1.11 Despite an *Owner* , *Operator* or any other person fulfilling any obligations imposed by this *Approval* , the person remains responsible for any contravention of any other condition of this *Approval* or any applicable statute, regulation, or other legal requirement resulting from any act or omission that caused the adverse effect to the natural environment or impairment of water quality.

Change of Owner

1.12 The *Owner* shall notify the *Director* , in writing, and forward a copy of the notification to the *District Manager* , within 30 days of the occurrence of any changes in the following information:
a. the ownership of the *Site* ;
b. the *Operator* of the *Site* ;
c. the address of the *Owner* or *Operator* ;
d. the partners, where the *Owner* or *Operator* is or at any time becomes a partnership and a copy of the most recent declaration filed under the *Business Names Act* , R. S. O. 1990,
c. B.17, shall be included in the notification.

1.13 a. In the event of any change in *Ownership* of the works, other than change to a successor municipality, the *Owner* shall notify the successor of and provide the successor with a copy of this *Approval* , and the Owner shall provide a copy of the notification to the *District Manager* and the *Director.*
b. Upon the Owner obtaining ownership of the land the Site is located, the Owner shall notify the Ministry forthwith of the acquisition and that the Approval of Registration condition requirements shall be completed forthwith.
c. Starting on September 1, 2007 and every six months thereafter until the lands have been acquired by the Owner, the Owner shall submit to the District Manager, a letter

providing an update on the status of the ownership transfer.

Certificate of Registration/Requirement

1.14 Pursuant to Section 197 of the *EPA* , no person having an interest in the Site shall deal in any way with the *Site* without first giving a copy of this *Approval* to each person acquiring an interest in the *Site* as a result of the dealing.

1.15 Upon completion of the land ownership transfer, two copies of a completed Certificate of Registration, containing a registerable description of the *Site,* shall be submitted to the *Director* for the *Director's* signature within 60 calendar days of the obtaining ownership of the land .

1.16 The Certificate of Registration shall be registered in the appropriate land registry office on title to the *Site* by the *Owner* within 10 calendar days of receiving the Certificate of Registration signed by the *Director,* and a duplicate registered copy shall be submitted to the *Director* .

Inspections

1.17 No person shall hinder or obstruct a *Provincial Officer* from carrying out any and all inspections authorized by the *OWRA* , the *EPA* , or the *PA* , of any place to which this *Approval* relates, and without limiting the foregoing:

a. to enter upon the premises where the approved works are located, or the location where the records required by the conditions of this *Approval* are kept;
b. to have access to, inspect, and copy any records required to be kept by the conditions of this *Approval* ;
c. to inspect the *Site,* related equipment and appurtenances;
d. to inspect the practices, procedures, or operations required by the conditions of this *Approval* ; and
e. to sample and monitor for the purposes of assessing compliance with the terms and conditions of this *Approval* or the *EPA* , the *OWRA* or the *PA* .

Information and Record Retention

1.18 Any information requested, by the *Ministry,* concerning the *Site* and its operation under this *Approval* , including but not limited to any records required to be kept by this *Approval* shall be provided **t** o the Ministry, upon request, in a timely manner. Records shall be retained for three (3) years except for as otherwise authorized in writing by the *Director.*

1.19 The receipt of any information by the *Ministry* or the failure of the *Ministry* to prosecute any person or to require any person to take any action, under this *Approval* or under any statute, regulation or other legal requirement, in relation to the information, shall not be construed as:

a. an approval, waiver, or justification by the *Ministry* of any act or omission of any person that contravenes any term or condition of this *Approval* or any statute, regulation or other legal requirement; or
b. acceptance by the Ministry of the information's completeness or accuracy.

PART 2 - LANDFILL SITE

Closure

2.1 The *Landfill Site* is hereby closed in accordance with Items 1 through to 3 in Schedule "A".

2.2 The *Owner* shall take all necessary action to ensure that no additional waste is deposited in or on the *Landfill Site.*

Long Term Care and Monitoring Plan

2.3 The *Owner* shall perform the groundwater and surface water monitoring of the *Landfill Site* in accordance with recommendations discussed in Items 7 of Schedule "A".

2.4 The groundwater and surface water samples shall be collected and analysed at the pre-determined frequency in accordance with the Schedule "B".

2.5 The groundwater and surface water monitoring program, may be amended from time-to-time with the prior written consent of the District Manager.

Stormwater Management

2.6 a. The Owner shall prepare a detailed storm water management plan which shall be included in the Closure and Long Term Monitoring Plan for the *Landfill Site;* and

b. Storm water management controls constructed as part of the above plan shall be constructed in accordance with the *OWRA.*

PART 3 - TRANSFER STATION OPERATIONS

In Accordance

3.1 Except as otherwise provided by these conditions, the *Transfer Station* shall be located, constructed, used, maintained, operated, inspected, reported and closed, and all facilities, equipment and fixtures shall be built and installed, in accordance with the Environmental Compliance Approval application dated May 10, 2016, and supporting documentation, and plans and specifications listed in Schedule "A".

Hours of operation

3.2 a. The *Owner* shall set operational hours which provides an adequate level of service. The hours of operation shall be any day of the week, during daylight hours, as specified in Item 9 of Schedule "A".

b. Hours of operation may be changed by the *Owner* at any time, provided that the hours are correctly posted at the *Site* gate, and that suitable public notice is given of any change.

c. The *Owner* shall notify the *District Manager,* in writing, of any changes to the hours of operation.

Approved Waste and Quantities

3.3 The *Transfer Station* shall only accept municipal waste limited to solid non-hazardous residential, industrial, commercial, institutional, *construction and demolition waste, WEEE,* and *MHSW* from the Municipality of Trent Lakes located in the County of Peterborough.

3.4 The *Transfer Station* shall receive up to 500 m3 of waste per day, of which a maximum of 20 m3 may be *MHSW.*

3.5 The total volumes of waste/materials stored at the *Transfer Station* at any one time shall not exceed 2740 m3 , in accordance with Item 9, Schedule "A" and shall include:

a. Disposable Waste 150 m3

b. Recyclable Materials 150.m3

c. Furniture 400 m3

d. Scrap Metal 400 m3

e. Leaf and Yard Waste 400 m3

f. Tires 300 m3

g. Appliances (White Goods) 400 m3

h. Construction Waste 400 m3

i. *WEEE* 30 m3

j. *MHSW* 50 m3

k. Hard Plastics 60 m3

3.6 Further to Condition 3.5 (j), the 50 m 3 approved quantity of *MHSW* shall be further restricted as follows:

a. a maximum of 50 vehicular batteries;
b. a maximum of one 250 litres drum of lithium, dry cell and rechargeable batteries;
c. a maximum of one 250 litres capacity container for the bulk collection of empty motor oil containers;
d. a maximum of 50 units of fluorescent light bulbs.

3.7 All incoming waste shall be inspected by a *Trained Personnel* prior to being received at the *Transfer Station* to ensure that the *Transfer Station* is approved to accept such waste.

3.8 The amount of tires stored at the *Transfer Station*shall not exceed either 5,000 tire units or 300 cubic metres, at any one time.

Waste Handling, Storage, Recycling and Disposal

3.9. All recycling bins, roll-off containers and segregated waste storage areas shall be clearly marked

showing the type of waste they are to contain. The areas shall be kept in a neat and tidy manner.

3.10 All storage containers/bins used to store waste and/or recyclable materials shall be maintained in good condition to prevent leakage. The *Owner* shall immediately remove from service any leaking container.

3.11 Containers/bins used to store clean scrap metal shall be equipped with drainage holes to permit the drainage of rainwater.

3.12 The *Owner* shall remove all scrap metal and appliances from the *Transfer Station* at an interval not to exceed six (6) months.

3.13 The *Owner* shall monitor segregated waste and reuse areas daily to remove unauthorized materials.

3.14 The *Owner*shall ensure that waste is stored in the following manner:

a. waste (non-segregated) shall be stored in designated bins;

b. recyclable materials shall be stored in designated bins;
c. *construction and demolition waste, clean wood,*bulky waste (including but not limited to furniture), tires, white goods and metal shall be stored in the designated areas , as specified in Item 9 of Schedule "A";
d. *leaf and yard waste*shall be stored in the designated area as shown on the Map, as specified in Item 9 of Schedule "A";

3.15 The *Owner* shall ensure that *MHSW* is stored as follows:
a. vehicles batteries shall be stored on pallets in a manner which protects them from the elements;
b. lithium, dry cell and rechargeable batteries shall be bulked into a 250 L plastic or metal drum, either bagged or with the terminal ends of each battery taped over or otherwise stored in a manner which prevents the terminal ends from touching;
c. empty motor oil containers shall be bulked into a 250 L plastic or metal drum;
d. fluorescent bulbs shall be stored in a rigid container in a manner which prevents the breakage of bulbs during storage and transport.

3.16 a. The *Owner* shall ensure that *WEEE* is stored in accordance with the *OES-Approved*

Collection Site Guidebook: Organizing & Operating Waste Electrical and Electronic
Equipment (WEEE), November 2012 or the most updated version of the Guidebook.
b. The waste shall only be transported by an approved carrier to an approved facility for recycling, reuse, refurbishment or disposal in accordance with the WEEE program plan.

c. All MHSW and WEEE waste received at the Site shall be stored for a maximum of 90 days.

3.17 White goods received at the *Transfer Station*which contain refrigerants shall:

a. be drained of any refrigerants, and have the appropriate paperwork (current ODP card) demonstrating that the refrigerants have been removed.

b. be stored in an upright position and in such a manner to allow for the safe handling and removal from the *Site*for removal of refrigerants as required by *Ontario Regulation 463/10 and Ontario Regulation 189/94;* and

c. If refrigerants have not been removed, it shall be removed by a licensed technician in accordance with *Ontario Regulation 463/10 and Ontario Regulation 189/94,*or as amended prior to be transferred from the *Site;*

d. refrigerants shall only be transferred to facilities where the refrigerants can removed by a licensed technician in accordance with *Ontario Regulation 463/10 and Ontario Regulation 189/94.*

e. a detailed log shall be maintained of all *white goods containing refrigerants*received at the Site and shall include the following information:

(i) date of the record;

(ii) types and quantities of *white goods which contain refrigerants* received;

(iii) destination of the *white goods which contain refrigerants* ; or

(iv) the details on removal of refrigerants, if conducted on *Site* , and the quantities and

destination of the refrigerants transferred from the *Site* .

3.18 a. The organics collection program shall be operated and maintained in such a manner that does not pose a danger or health risk to the environment or public.

b. The *Owner*shall ensure that all bins used for emptying the underground containers, as described in Item 5 of Schedule "A", properly contain all organic material placed inside.

Disposal

3.19 The *Owner*shall ensure that all wastes at the *Transfer Station*are managed and disposed in accordance with *Regulation 347,*and the *EPA.*

3.20 Disposal of waste from the *Transfer Station*shall be to a licensed waste disposal site.

3.21 Scavenging of waste at the *Transfer Station*shall not be permitted.

Prohibited Waste

3.22 The *Site* is prohibited from accepting the following:
i. liquid non-hazardous waste;
ii. solid or liquid hazardous waste;
iii. biomedical waste (excluding sharps and pharmaceuticals);
iv. PCB waste; and
v. explosive waste.

3.23 The *Site* shall be maintained under lock and key, and in a secure manner, such that unauthorized

persons cannot enter the *Transfer Station* when the *Transfer Station* is closed.

3.24 No waste shall be received at the *Transfer Station* except during operating hours when the *Transfer Station* is under the supervision of a *Trained Personnel* .

3.25 The *Owner* shall remove disposable waste at an interval not to exceed two weeks during the months of May to September inclusive and on a monthly basis for the remainder of the year.

Nuisance Control

3.26 The *Owner*shall ensure that the *Transfer Station*is operated in a safe and secure manner which minimizes the impacts of dust, odour, noise and litter to the general public, site personnel, and the natural environment.

Inspections

3.27 The *Owner*shall conduct daily inspections of the equipment and facilities at the *Transfer Station*to ensure that they are maintained in good working condition at all times. Any deficiencies, which might negatively impact the environment, detected during these inspections shall be recorded in a log, and promptly corrected.

Complaints

3.28 Complaints related to adverse effects received from the public or adjacent neighbours shall be

recorded in a log book created and maintained for the purpose, and the *Owner*shall contact the *District Manager* forthwith, notifying him of the nature of the complaint and within seven (7) days of the receipt of the complaint, provide him with a written description of the complaint and the actions taken to address the concern(s).

PART 4 - TRAINING AND EMERGENCY RESPONSE

Training

4.1 The *Owner*shall ensure that all operating personnel are trained in the following at a minimum:

a. an outline of the responsibilities of the *Site*personnel;

b. terms, conditions and operating requirements of this *Approval;*

c. receiving and recording procedures (including recording procedures of wastes which are refused at the *Site);*

d. storage, handling, sorting and shipping procedures;

e. operation of equipment, equipment inspection and maintenance procedures and procedures to be followed in the event of equipment malfunction / process upset;

f. housekeeping and nuisance control procedures;

g. *Site*inspection procedures;

h. occupational health and safety concerns pertaining to the wastes received and handled;

i. procedures for recording and responding to public complaints; and

j. procedures to be followed in the event of a spill, fire, medical or other emergency.

Emergency Response and Procedures

4.2 The Owner shall prepare an updated copy of the Transfer Station Safety and Emergency Response Procedures , Item 5 of Schedule A and the Municipality of Trent Lakes Emergency Management Program (By-law B2016-138 dated December 20, 2016) shall be kept on the *Site*at all times, in a central location available to all staff.

4.3 The *Owner*shall review the Transfer Station Safety and Emergency Response Procedures on an annual basis, at a minimum, and update the document as required.

4.4 The *Owner*shall ensure that the contingency equipment and materials outlined in the Transfer Station Safety and Emergency Response Procedures and Emergency Management Program are immediately available on the *Site*at all times, in a good state of repair, and fully operational.

4.5 The *Owner*shall immediately take all measures necessary to contain and clean up any spill or leak which may result from the operation at this *Transfer Station,*including the operation of the organic collection system. All spills, as defined in the *EPA,* shall be immediately reported to the *Ministry's*Spills Action Centre at 416-325-3000 or 1-800-268-6060.

4.6 All waste material resulting from a spill or process upset, shall be managed and disposed of in accordance with *Regulation 347.*

4.7 The *Owner*shall submit to the *District Manager*a written report within 3 days of the spill or

incident, outlining the nature of the incident, remedial measures taken and measures taken to prevent future occurrences at the *Site* .

4.8 The *Owner* shall ensure that adequate fire fighting and contingency spill clean up equipment is available and that emergency response personnel are familiar with its use and location.

PART 5 - DOCUMENTATION

5.1 The *Owner*shall establish and maintain a written record of daily operations at the *Site*. This

record shall be in the form of a log or a dedicated electronic file and it shall include as a minimum the following information:

a. date and time of inspection;

b. name, title and signature of trained personnel supervising the inspection;

c. a listing of all equipment, fencing, gates, etc. inspected and any deficiencies observed;

d. any maintenance conducted as a result of these inspections;

e. recommendations for remedial action and date remedial action, if necessary, was completed;

f. date and time of any complaints received at the *Site* and their nature; and

g. date and time of any environmentally significant incidents.

h. records of refrigerant removal as required by Condition 3.17 d.

5.2 The *Owner*shall maintain a daily written record of the waste received at the *Transfer Station,*

and the waste transferred from the *Transfer Station.* This record shall be in the form of a daily log(s) and shall include as a minimum the date, quantity and source of waste received and date, quantity and the destination of material removed/transferred from the *Site.*

5.3 The *Owner* shall maintain a daily written record of the *recyclable materials* received at the *Transfer Station,* and the *recyclable material* transferred from the *Transfer Station.* This record shall be in the form of a daily log(s) and shall include as a minimum the date, quantity and source of *recyclable material* received and date, quantity and the destination of *recyclable material* removed/transferred from the *Site.*

5.4 The *Owner* shall maintain a written record of the *MHSW* received at the *Transfer Station,* and transferred from the *Transfer Station.* This record shall be in the form of daily log(s) and shall include as a minimum date, waste type/s, quantity, and source of *MHSW,* date, quantity and the destination of *MHSW* transferred from the *Site.*

5.5 For white goods which contain refrigerants, the *Owner*shall record the following additional information:

a. date of the record;

b. types, quantities and source of white goods which contain refrigerants received;

c. destination of the white goods; or

d. the details on removal of refrigerants, if conducted on *Site,* and the quantities and destination of the refrigerants transferred from the *Site.*

5.6 For organic waste, the *Owner*shall retain a record of the following information at the County

Office or at a location approved by the District Manager:

i) Date the containers are emptied;
ii) Approximate volume transferred to the collection truck per load; and
iii) A record of any spills that occur during emptying and a description outlining any remediation measures that were implemented.

5.7 The *Owner* shall establish and maintain a written record of all complaints received about the site and any environmental emergency situations that occur at the *Site* . This record shall be in the form of a log or a dedicated electronic file and it shall include, as a minimum, the following information:

a) date and time of occurrence;
b) type of the environmental emergency situation and the resulting environmental impact;
c) name, address and telephone number of the complainant;
d) actions taken to address the impact;
e) actions taken to prevent the re-occurrence of a similar emergency situation in the future; and
f) method of reporting the incident to the MOE District Office.

5.8 The *Owner* shall establish and maintain a written record of the *Site* inspections. This record shall be in the form of a log or a dedicated electronic file and it shall include, as a minimum, the following information:

a) date and time of inspection;
b) name, title and signature of trained personnel conducting the inspection;
c) a listing of all equipment, fencing, signs, etc. inspected and any deficiencies observed; and
d) recommendations for remedial action and the completion date of such action.

5.9 The *Owner* shall establish and maintain a written record of all occurrences of receipt of unacceptable waste at the *Site* . This record shall be in the form of a log or a dedicated electronic file and it shall include, as a minimum, the following information:

a) waste generator;
b) type of unacceptable waste;
c) an estimate on the amount of unacceptable waste;
d) nature of unacceptable waste;
e) steps taken to remove waste; and
f) actions taken by the *Owner* to prevent recurrence.

5.10 The *Owner* shall retain at the Owner's Office for a minimum of three (3) years from the date of their creation, or longer if requested in writing by the *District Manager* , all records and information relating to or resulting from the activities approved under this *Approval* , and shall make all records and information available at all times for inspection by a Provincial Officer.

PART 6 - REPORTING REQUIREMENT

Annual Report - Landfill Site

6.1 By June 30th of each year, the *Owner* shall submit an annual report to the *District Manager* concerning the status of the *Landfill Site* during the preceding calendar year. The report shall include groundwater monitoring and surface water monitoring results and shall be prepared by an qualified professional engineer, Hydrogeologist and surface

water specialist. The annual report shall contain, but is not limited to, the following information:
a. the results, and an interpretive analysis of the results, of the surface waste, groundwater and landfill gas monitoring;
b. a summary of the inspections of the *Landfill Site* undertaken;
c. a location map illustrating the site relative to nearby potentially sensitive groundwater and surface water features;
d. a site plan indicating the location of all the surface water and groundwater sampling locations;
e. a site plan illustrating the approved landfill footprint and currently filled area;
f. a water table contour map;
g. stratigraphic cross-sections which clearly illustrate the subsurface distribution of geological materials;
h. the report shall document the ground and surface water sampling protocols, and describe any problems encountered during the sampling runs which may have impacted the reliability of analytical results;
i. the report shall identify the "Reasonable Use" (Guideline B-7) of the ground water that is to be impacted. The report should also identify expected and worst-case impacts;
j. the report shall include a comparison of the results of surface water sampling to the PWQOs or Interim PWQOs described in Water Management, MOEE, July 1994, as amended from time to time;
k. QA/QC protocol must be described;
l. the report must have the conclusions and recommendations of the author(s), especially as they concern future sampling parameters, frequency and protocol.
m. the report shall include recommendations on the requirements for any remedial work or contingency activities based on the monitoring results;
n. the report shall include the status of all monitoring wells and a statement as to compliance with Ontario Regulation 903– R.R.O. 1990, Wells, amended to Ontario Regulation 128/03, made under the *OWRA;* and
o. any other information with respect to the *Site* which the *District Manager* may require from time to time. 6.2 In the event that the results of the monitoring program are such that an off-site exceedance of *Guideline B-7 – Incorporation of the Reasonable Use Concept Into MOEE Groundwater Management Activities (MOE, 1994),* or background groundwater chemistry for the *Site,* can reasonably be predicted to occur, the *Owner* shall include in the annual report:

a. the details of any such predicted off-site exceedance, including the assumptions upon which the prediction is based;

b. a discussion of the modifications, if any, to intended operations which would be necessary to prevent the predicted off-site exceedance;

c. a discussion of the modifications, if any, which should be made to the monitoring program; and

d. a discussion of other mitigation measures or contingency actions, if any, which may be necessary to prevent off-site impacts.

Annual Report - Transfer Station

6.3 By June 30th of each year, the *Owner* shall submit to the *District Manager,* an annual report that reports on the previous calendar year, which shall include, but not be limited to, the following:

a. a summary of type and quantity of incoming waste accepted and transferred from the *Transfer Station*;

b. a summary of the site's operation procedure and compliance;

c. a summary of recycling operations;
d. a summary of any rejected wastes;
e. a summary of any incidents;
f. a summary of complaints received;

g. any changes to the Site Operations and Maintenance Manual and/or the Transfer Station Safety and Emergency Response Procedures since the last annual report;

h. a statement as to compliance with all conditions of this *Approval,* a description of any operational changes and/or *Transfer Station*improvements undertaken and all other operational issues;

i. any recommendations to minimize environmental impacts from the operation of the

Site and to improve *Site* operations and monitoring programs in this regard.

PART 7 - **TRANSFER STATION CLOSURE PLAN**

7.1 The *Owner* shall submit, for approval by the *Director* , a written closure plan four (4) months prior to the permanent closure of the *Transfer Station* . This plan must include, as a minimum, a description of the work that will be completed to facilitate closure and a schedule for completion of that work.

7.2 Within ten (10) days of closure of the *Transfer Station* , the *Owner* must notify the *Director* , in writing, that the *transfer station* is closed and the closure plan has been implemented.

Schedule "A"

The following Items are hereby added to Schedule "A":

1. Report entitled "Cavendish Landfill - Closure Plan and Transfer Station Application" prepared for the Township of Galway-Cavendish and Harvey by TSH dated July 2006.

2. Letter dated November 29, 2006 addressed to Ms. Pat Kemp, Deputy Clerk, Township of Galway-Cavendish and Harvey from Mr. Dale Gable, Ministry of the Environment requesting additional information on the closure plan and transfer station operations.

3. Letter and supporting documentation dated December 14, 2006 addressed to Mr. Dale Gable, Ministry of the Environment from Mr. Chris Visser, TSH providing additional information on the final contours, FBAL, closure plan and waste storage/transfer operations. The supporting documentation included the following:

    i. Drawing No. 3R entitled "Final Contours and Transfer Station Layout" prepared by TSH (Project No. 52-27854) dated December 17, 2006. Scale 1:500.

4. Letter dated March 1, 2007 addressed to the Director (EAAB), Ministry of the Environment from Mr.

Chris Visser, TSH providing a plan and schedule to address the FBAL.

5. Letter dated June 9, 2008 requesting an amendment to an existing Approval, signed by Catrina Switzer, Environmental Services, County of Peterborough, including all supporting information

6. Application for an Approval for a Waste Disposal Site dated March 12, 2007 and signed by Chris Visser, Manager, Solid Waste Services, R.J.Burnside & Associates Ltd.

7. Document entitled “GroundWater monitoring program, Cavendish Landfill, Township of Galway-Cavendish and Harvey”, Hydroterra Ltd., dated February 2007, describing the groundwater monitoring of the Cavendish Landfill site.

8. Memorandum dated March 25, 2008, from Dana Cruikshank, Surface Water Specialist of Eastern Region, to Mr.Chris Johnston, Senior Enviornmental Officer of Peterborough District Office.

9. Environmental Compliance Approval Application, with Design and Operations Report, Maps and other supporting documentation to amend ECA, dated May 10, 2016 and signed by Lois O'Neill-Jackson, CAO/Economic Development Officer., Municipality of Trent Lakes

Schedule "B"

This Schedule "B" forms part of Certificate of Approval No: A341206

Groundwater Monitoring

PARAMETER	FREQUENCY	LOCATIONS	PARAMETERS
Ground Water Levels	**Twice per year** (April/May and October/November)	DP-1, DP-4, DP-5, DP-6	Water Levels
Ground Water Quality	**Twice per year** (April/May and October/November)	DP-1, DP-4, DP-5, DP-6	Field: pH, conductivity, temperature, turbidity, D.O., ORP
			Lab: **SPRING: Column 2**, Schedule 5, Reg.232/98, Hardness , Manganese
			Lab: **FALL: Column 1**, Schedule 5, Reg.232/98, Hardness, Manganese

Surface Water Monitoring

PARAMETER	FREQUENCY	LOCATIONS	PARAMETERS
Surface Water Flow Rates	Twice per year (April/May and October/November)	SW1, SW2, SW-3, SW-4, SW-5, SW-6	Flow Rates: Manual
Surface Water Quality	Twice per year (April/May and October/November)	SW1, SW2, SW-3, SW-4, SW-5, SW-6	Field: pH, conductivity, temperature, turbidity, D.O., ORP
			Lab: **SPRING: Column4**, Schedule 5, Reg.232/98, Hardness , Manganese
			Lab: **FALL: Column 3**, Schedule 5, Reg.232/98,

			Hardness, Manganese

Notes: VOC's in Fall

The reasons for the imposition of these terms and conditions are as follows:

1. The reason for Condition 1.1 is to clarify that the previously issued Approval No. A341206 issued on August 12, 1980, and subsequent Notices of Amendment issued February 12, 2007, May 8, 2007, May 28, 2009 and December 8, 2009, are no longer in effect and has been replaced and superseded by the Terms and Conditions stated in this Approval.

2. The reason for Condition 1.2, 1.3, 1.12 and 1.13 is to ensure that subsequent owners of the Site are informed of the terms and conditions of this Approval. This also applies to all supporting documentation listed in Schedule "A".

3. The reason for Condition 1.4 is to ensure the Site is designed, developed, built, operated ana maintained in accordance with the information submitted to the Ministry.

4. The reason for Condition 1.5, 1.6, 1.7 and 1.8 is to clarify how to interpret this Approval in relation to the application and supporting documentation submitted by the Owner.

5. The reason for Condition 1.9 is to clarify the legal rights and responsibilities of the Owner.

6. The reason for Conditions 1.14, 1.15 and 1.16 is because Section 46 of the EPA prohibits any use being made of the lands after they cease to be used for waste disposal purposes within a period of twenty-five years from the year in which such land ceased to be used, unless the approval of the Minister for the proposed use has been given. The purpose of this prohibition is to protect future occupants of the land and the environment from any hazards which might occur as a result of waste being disposed of on the site. This prohibition and potential hazard should be drawn to the attention of future owners and occupants by the Approval being registered on title.

7. The reasons for Condition No. 1.10 and 1.11 is to ensure the Owner take all the necessary

steps to protect any adverse effect on the environment.

8 . *The reason for Condition No.1.17 is to ensure that appropriate Ministry staff have ready access to the Site for inspection of facilities, equipment, practices and operations required by the conditions in this Certificate of Approval. This condition is supplementary to the powers of entry afforded a Provincial Officer pursuant to the EPA and OWRA.*

9. The reason for Condition 1.18 and 1.19 is to ensure the availability of records and drawings for inspection and information purposes.

10. The reasons for Condition 2.1 is to ensure the Owner closes the Landfill Site in accordance with the submitted information in Schedule "A". This is to ensure the long-term health and safety of the public and the environment.

11. The reason for Conditions 2.2 is to ensure that landfilling of waste at the Site is discontinued.

12. The reason for Condition 2.3, 2.4 and 2.5 is to ensure the Owner installs the environmental monitoring wells as indicated in the closure plan and conducts environmental monitoring at the Landfill Site in accordance with the Ministry's recommendations. This is to ensure the long-term health and safety of the public and the environment.

13. The reason for condition 2.6 is to ensure that storm water does not become contaminated

by past or present uses.

14. The reason for Condition 3.1 is to ensure that the Transfer Site is operated in accordance with the application and supporting documentation submitted by the Company, and not in a manner which the Director has not been asked to consider.

15. The reasons for Condition 3.2 is to specify the hours of operation for the Transfer Station and to provide a mechanism for amendment of the hours of operation, as required.

16. The reason for Conditions 3.3, 3.4, 3.5, 3.6, 3.7 and 3.8 is to ensure that the types and amounts of waste received at the Transfer Station are in accordance with that considered by the Director.

17. The reason for Conditions 3.9, 3.10, 3.11, 3.12, 3.13, and 3.14 is to ensure that waste storage is done in a manner and duration which does not result in a nuisance or a hazard to the health and safety of the environment or people.

18. The reason for Conditions 3.15, 3.16, 3.17 and 3.18 is to ensure the MHSW, WEEE and White Goods materials approved for the Site are handled, stored and managed in accordance with this Approval and does not result in a nuisance or a hazard to the health and safety of the environment or people.

19. The reason for Conditions 3.19, 3.20 and 3.21 is to ensure that waste materials are managed and disposed of in accordance with Reg. 347 and this Approval and an approved end disposal site is available for the waste stored at the Transfer Station.

20. The reason for Condition 3.22 is to ensure the Site does not accept materials for which approval has not been granted and the Director was not asked to consider.

21. The reason for Condition 3.23 is to ensure adequate security is provided at the Site.

22. The reason for Condition 3.24 is to ensure the Site operates only during operating hours under a Trained Personnel.

23. The reason for Condition 3.25 is to specify the timeline for the storage and removal of disposal waste at the Site.

24. The reason for Condition 3.26 is to ensure that the Transfer Station is operated in a manner which does not result in a nuisance or a hazard to the health and safety of the environment or people.

25. The reason for Condition 3.27 is to ensure that the Transfer Station is operated in a manner which does not result in a nuisance or a hazard to the health and safety of any person or the natural environment.

26. The reason for Condition 3.28 is to ensure that complaints are properly and quickly resolved and that complaints and follow-up actions have been documented.

27. The reason for Condition 4.1 is to ensure that the Owner's staff are properly trained in the operation of the equipment used at the Site ad emergency response procedures.

28. The reason for Conditions 4.2, 4.3, 4.4, 4.5, 4.6,4.6, 4.7 and 4.8 is to ensure that the Owner is prepared and properly equipped to take action in the event of a spill, fire or other operation upset.

29. The reason for Conditions 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8. 5.9 and 5.10 is to ensure that accurate records are maintained to ensure compliance with the conditions in this Approval, the EPA and its regulations.

30. The reason for Conditions 6.1, 6.2 and 6.3 is to ensure that the Site is operated and operating

as approved.

31. The reasons for Conditions 7.1 and 7.2 is to ensure the Owner has an established and approved closure plan for the FBAL at the site and to ensure no additional waste is placed in the FBAL areas. This is to ensure the long-term health and safety of the public and the environment.

Upon issuance of the environmental compliance approval, I hereby revoke Approval No(s). A341206 issued on August 12, 1980.

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

1. The portions of the environmental compliance approval or each term or condition in the environmental compliance approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

Pursuant to subsection 139(3) of the Environmental Protection Act, a hearing may not be required with respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The environmental compliance approval number;
6. The date of the environmental compliance approval;
7. The name of the Director, and;
8. The municipality or municipalities within which the project is to be engaged in.

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*****
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Director appointed for the
purposes of Part II.1 of the
Environmental Protection Act
Ministry of the Environment and
Climate Change
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca**

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 2nd day of October, 2017

Dale Gable, P.Eng.
Director
appointed for the purposes of Part II.1 of
the *Environmental Protection Act*

CJ/
c: District Manager, MOECC Peterborough
Dave Bucholtz, Cambium Inc.

Appendix B
Correspondence

Ministry of the Environment, Conservation and Parks
Eastern Region
1259 Gardiners Road, Unit 3
Kingston ON K7P 3J6
Phone: 613.549.4000
or 800.267.0974

Ministère de l'Environnement, de la Protection de la nature et des Parcs
Région de l'Est
1259, rue Gardiners, unité 3
Kingston (Ontario) K7P 3J6
Tél: 613 549-4000
ou 800 267-0974

Ontario

M E M O R A N D U M

November 27, 2018

TO: Ian Oosting
Sr. Environmental Officer
Peterborough District Office
Eastern Region

FROM: Dana Cruikshank
Surface Water Scientist
Water Resources Group
Eastern Region

RE: Biannual Report 2016-2017
Cavendish Landfill, Geographic Twp of Cavendish
Twp. of Galway-Cavendish-Harvey
C of A 341206
IDS Ref #: 0725-B3NR5N

I have reviewed the *Cavendish Waste Disposal Site, 2016-2017 Biannual Report* dated June 2018 prepared by Cambium Inc (CI) with respect to surface water concerns.

Project Overview:

CI reports for 2016-2017;

- Site closed in 2008. In 2015 final grading and closure activities were completed.
- Site now operates as waste transfer station for non-hazardous waste.
- Surface water samples were collected in April and October in 2016 and July and October in 2015 at six sampling stations.
- SW2 was dry in both 2016 and 2017 except during the July 2017 event
- SW3 was dry in the autumn of 2016 and 2017
- SW4 was dry in the autumn of 2016
- SW1 was dry in the fall of 2017..
- Leachate contaminated groundwater is interpreted to flow towards the south in the overburden and discharges to the surface.
- Leachate indicator parameters (LIPs) are chloride, alkalinity, TDS, DOC, manganese, calcium, sodium, COD, conductivity, iron and hardness.
- SW5 is 1 km south of the site and CI has recommended retaining this stations as background.
- SW2 south of the waste mound has elevated concentrations for all the LIPs and PWQO exceedances for boron, iron, lead and zinc.

- SW1 is located at the northern end of the waste mound and has moderate concentrations of most LIPs but better water quality than SW2. Concentrations are variable.
- Sw6 which is at the northern property limit has PWQO exceedances for iron and TP which are interpreted not to be site related. Trends indicate stable concentrations since closure.
- Numerous parameters exceeded the trigger values for all six stations. Trigger exceedances at SW4 and SW6 are interpreted no to be impacted by the site but by local wetland conditions.
- Concludes that no adverse impacts are expected to occur to Miskawaa (Squaw) River in the north and to Mississauga Lake to the south and east.
- Recommends removal of cadmium, barium lead and chromium from the surface water program.

Reviewer's Comments

The reviewer is appreciative of the data for surface water that was provided in Excel format via email upon request.

There is a major problem regarding sampling on this site. During 2016-2017 as well as other years there were inconsistencies between sampling events where some parameters were analyzed one time and not the next. The time trend figures for surface water also have inconsistent dates. i.e manganese data ends in 2014 but samples were taken in 2016-2017, other plots show the 2016-17 time frame.

In addition some of the leachate indicator parameters like DOC were not analyzed in surface water. The groundwater and surface water parameter needs to be harmonized.

Average concentrations for 2016-2017 were calculated and percentage differences between SW5 (background) and the other stations were calculated. For parameters reported as less than their MDL, the MDL was selected for the calculations (e.g. <0.02 became 0.02). Table 1 summarizes the 2016-17 average concentrations and percentage differences. Differences greater than 25% are deemed significant and are highlighted yellow. Leachate indicator parameters are shaded.

The analysis indicates that background has significantly better water quality than all the other stations. All the leachate indicator parameters where data is available show up as significantly higher concentrations than background (SW5). Leachate impacts appear to be occurring as far downstream as SW4 compared to SW5. SW6 shows a large number of parameters with elevated concentrations compared to background. However when you compare SW1 to SW6, SW1 has a significant number of parameters with elevated concentrations compared to SW6. Many of these are not leachate parameters so other influences are affecting the water quality leaving the north part of the site.

Table 1: 2016-17 Average Concentrations and Percentage Differences.

Parameter	Average Concentrations							Percentage Differences					
	SW1	SW2	SW3	SW4	SW5	SW6		5 vs1	5 vs 2	5 vs 3	5 vs 4	5 vs 6	4 vs 3
Alkalinity	62.3	488	44	39	27.5	51		-127	-1675	-60	-42	-85	-13
Ammonia-N	0.043	4.37	0.025	0.027	0.045	0.055		4	-9611	44	40	-22	7
BOD	4	6	17.5	3	3.5	3.5		-14	-71	-400	14	0	-483
COD	54.7	91	86	58.7	32	64.5		-71	-184	-169	-83	-102	-47
COD	2.68	78.3	2.41	49.8	14.64	95.95		82	-435	84	-240	-555	95
Conductivity	316	1190	120.5	263	121	442		-161	-883	0	-117	-265	54
DOC													
Hardness	148	407	54	58	35	78		-323	-1065	-55	-67	-123	7
Nitrate-N	0.05	0.12	0.05	0.05	0.0725	0.05		31	-66	31	31	31	0
Nitrite-N	0.05	0.05	0.05	0.05	0.05	0.05		0	0	0	0	0	0
pH	7.20	7.48	7.24	7.06	7.39	7.33		2	-1	2	4	1	-3
Phenols	0.005	0.024	0.009	0.003	0.002	0.003		-150	-1100	-350	-50	-50	-200
Sulphate	93.1	1.0	11.0	1.9	2.5	4.7		-3564	61	-331	24	-86	-469
TDS	216	653	83	148	68	259		-220	-867	-23	-120	-284	44
TKN	1.02	5.90	5.29	0.72	0.63	1.62		-61	-833	-736	-13	-155	-638
TSS	19	42	382	8	7	37		-186	-522	-5559	-23	-452	-4484
Arsenic	0.0030	-		0.0004	0.0017	0.0017		-82		100	76	0	100
Boron	0.295	-		0.029	0.027	0.022		-1013		100	-9	19	100
Calcium													
Cobalt													
Copper	0.0070	-		0.0064	0.0043	0.0013		-63		100	-49	70	100
Iron	6.68	5.95	2.76	0.37	0.32	1.16		-2003	-1773	-767	-16	-266	-649
Magnesium													
Manganese	0.72	6.06	4.59	0.03	0.02	0.09		-3232	-28086	-21249	-24	-330	-17113
Phosphorus	0.14	0.06	0.57	0.03	0.03	0.12		-447	-140	-2180	-33	-390	-1610
Sodium													
Strontium													
Vanadium													
Zinc	0.064	-		0.04	0.005	0.009		-1180		100	-700	-80	100

The averages for the 2016-17 data were compared to the historical averages up to and including 2015. Table 2 shows the percentage differences between the recent data and historical. Yellow highlighted cells are where the 2016-17 average concentrations were higher than the historical average. Leachate indicator parameters are shaded.

Table 2: Percentage Comparison of 2016-17 Averages to Historical

PARAMETER	SW1	SW2	SW3	SW4	SW5	SW6	PARAMETER	SW1	SW2	SW3	SW4	SW5	SW6
Alkalinity	-120	20	-194	-18	1	2	TSS	-254	-13210	33	-81	-330	-82
Ammonia-N	-792	12	-478	-145	-497	-62	Arsenic	-2985			-30200	-7245	-6715
BOD	-94	17	45	-28	3	-7	Boron	-6			-145	-26	-235
COD	-47	-423	-164	0	-20	39	Calcium						
COD	-570	-79	-2801	16	-56	8	Cobalt						
Conductivity	-37	-11	-377	4	-20	0	Copper	-17			-36	-90	-750
DOC							Iron	64	-1231	-160	-89	-65	-50
Hardness	-21	-10	-233	-13	-15	3	Magnesium						
Nitrate-N	-284	-493	-107	-59	-100	-89	Manganese	11	-13	64	-172	-76	-15
Nitrite-N	4	-360	18	27	21	15	Phosphorus	1	-280	52	-142	-158	-37
pH	-5	-2	0	-2	4	1	Sodium						
Phenols	50	86	85	18	-69	61	Strontium						
Sulphate	39	-7306	-296	-428	-137	-168	Vanadium						
TDS	-58	-13	-253	-7	-40	7	Zinc	52			76	-554	-63
TKN	-104	-118	-48	-16	-73	1							

Table 2 shows that for the majority of parameters water quality in 2016-17 had significantly improved compared to historical data up to 2015.

Summary

Only one sample was collected from SW2 in 2016 and 2017. It therefore appears to be little flow from SW2 off-site.

The fact that SW3 downstream of SW2 has many leachate indicator parameters with elevated concentrations compared to background indicates that it may be impacted by landfill leachate. There is a significant drop to the wetland below SW2 so SW3 may be impacted by leachate contaminated groundwater. The validity of that theory should be reviewed by groundwater staff. Previous data for DP1 showed elevated concentrations of leachate parameters in the groundwater. Many of the elevated parameters that are also leachate parameters can also be a result of wetland chemistry through natural processes. This may be why SW4 which has better water quality than SW3 but is located downstream of another wetland has elevated parameters compared to SW5.

The 2016-2017 data indicates that water quality in general has improved over historical water quality with the exception of SW6 which appears to show poorer water quality in 2016-17.

The reviewer agrees with CI's assessment that there is extreme variability over time for some parameters. There is also significant variability between stations which is common in water quality stations associated with wetlands.

The surface water data indicates leachate impacts at surface water stations located on or near the landfill site (SW2 and SW1). Off-site impacts at SW4, SW5 and SW6 while having some elevated concentrations of leachate parameters are unlikely to result in harm to aquatic life. Wetland chemistry is complicated and some of the elevated parameters at SW4 and SW5 could be related to natural processes.

Recommendations:

1. In my previous review memo a number of recommendations were made to be included in the 2014-2015 report. The following still need to be completed;
    a. An updated trigger mechanism. The old mechanism triggers Tier II sampling on almost every year which involves an ecological impact assessment that is not likely needed. It does not appear to the reviewer that there is a strong relationship between SW2 and SW3 mainly due to lack of data over the last few years at SW2. The new trigger may need to be based on DP1.

2. Municipal staff likely visits the site on a regular basis and therefore some monitoring/observations for flows at SW2 could be recorded. Alternatively a datalogger could be installed. This would determine if surface water runoff from the site at SW2 is an issue.

4. Some of the samples show extremely elevated TSS concentrations which affects the water quality analyses and possible misrepresentation of the actual water chemistry. If surface water sites contain shallow water then sampling should be conducted with a pump so that the surface water can be skimmed off instead of disturbing sediment using a hand sampler or scooping of water.

5. The site is sampled only twice a year and therefore it is important to collect samples from each station during each sampling event. All samples should be analyzed for the entire suite of samples

6. In addition all leachate indicator parameters like DOC need to be analyzed at all stations for all sampling events.

7. The groundwater and surface water parameter needs to be harmonized.

If you have any questions regarding the above comments or recommendations I would be pleased to discuss them with you.

Dana Cruikshank

c: Shawn Trimper
Courtney Redmond
SW-07-02-11-02-02 (unnamed stream)
SW-PB-GC-06-03 (Cavendish LFS, Twp. of Galway-Cavendish-Harvey

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Ontario

March 27, 2019

The Corporation of the Municipality of Trent Lakes
Ms. Chelsea Carpenter, Waste Management Coordinator
760 County Road 36
Trent Lakes, ON K0M 1A0

Dear Ms. Carpenter:

RE: Technical Support Section Comments - Groundwater
Cavendish Closed Waste Disposal Site
Environmental Compliance Approval Number A341206
3405 507 Hwy, former Cavendish Township
Trent Lakes, County of Peterborough
Reference Number 7806-B3NR3M

Staff from the ministry's Eastern Region Technical Support Section have completed a review of the 2016/2017 Biennial Monitoring Report for the Cavendish Waste Disposal Site, produced by Cambium Inc., dated June 2018. Ministry staff have reviewed this report from a hydrogeological perspective. Please find attached for your review and information, a copy of technical support section comments, dated March 27, 2019.

Please ensure that the recommendations made in the attached are implemented at the site and documented in the next environmental monitoring report for this facility.

Should you have any questions or concerns regarding the attached, please do not hesitate to contact me at (705)755-4331.
Yours truly,

Gary Muloin

Gary Muloin
Senior Environmental Officer
Peterborough District Office

File Storage Number: SI PB TL CORD 610 - 3405 County Road 507, Cavendish
Ms. Stephanie Reeder, P.Geo., C.E.T., Cambium Inc., 52 Hunter Street East, Peterborough, ON K9H 1G5

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Ontario

M E M O R A N D U M

March 27, 2019

TO: Gary Muloin
Senior Environmental Officer
Peterborough District Office
Eastern Region

FROM: Shawn Trimper
Hydrogeologist
Technical Support Section
Eastern Region

RE: 2016/2017 Biennial Monitoring Report
Cavendish Waste Disposal Site & Waste Transfer Station
Part of Lot 15, Concession 3
Geographic Township of Cavendish
Municipality of Trent Lakes
County of Peterborough
Environmental Compliance Approval A341206

The Ministry of the Environment, Conservation, and Parks (MECP) Peterborough District Office (PDO) provided the 2016/2017 Biennial Monitoring Report (BMR) for the Cavendish Waste Disposal Site (WDS) prepared by Cambium and dated June 21, 2018. I have reviewed the hydrogeological aspects of the report and offer the following comments for your consideration.

Environmental Compliance Approval (ECA)

The Cavendish WDS is located on part of Lot 15, Concession 3, within the Geographic Township of Cavendish, now the Municipality of Trent Lakes (the municipality). The site is located on crown land and is operated by the municipality. The site is licensed for the operation of a 0.8 hectare landfill area within a total site area of 2.0 hectares by ECA No. A341206. Landfilling operations are understood to have occurred at the site from 1972 until 2007. A waste transfer station (WTS) was subsequently developed and continues to operate at the site. The landfill was approved to accept domestic, commercial and solid non-hazardous industrial waste. Landfill grading and closure activities were completed in 2015. An area of fill beyond approved limits (FBAL) was historically identified at the site to the southeast of the waste mound. The FBAL was capped in place and is formally recognised in the closure plan and ECA. The site has no engineered controls and is a natural attenuation site.

Physical Setting

The Cavendish WDS is located approximately 18 kilometres northeast of the community of Buckhorn at 3405 County Road 507. The land surrounding the site is composed primarily of forest and wetlands. Mississauga Lake is located approximately 600 metres east of the site. The area generally consists of undulating bedrock overlain by little to no soil. Numerous small lakes and ponds have formed in the bedrock depressions throughout the surrounding area.

The site is located between two north south trending granitic ridges and is bordered to the north and south by wetland features. Drainage on the site is expected to occur primarily toward the south; however, localised flow is expected to occur radially to the surrounding low lying areas.

The nearest residential properties are located approximately 500 metres southeast of the site along the shore of Mississauga Lake.

Geology

The geology on and surrounding the site consists of intermittent overburden of variable compositions overlying bedrock. Overburden on the site is reported to consist of silty fine sand and extends to a maximum depth of 2.5 metres below ground surface (mbgs). Underlying bedrock is reported to consist of carbonate metasedimentary rocks of Precambrian age.

The waste mound is located in a bedrock depression located between the two north-south trending bedrock ridges.

Hydrogeology

Groundwater monitoring at the site is limited to four (4) drive point monitors completed within the thin overburden deposits.

Groundwater flow in the overburden unit is controlled by the bedrock topography and is primarily toward the south and is expected to discharge to the wetland located south of the site. Mounding effects are expected to result in localised radial flow toward the north. Overburden flow toward the north is expected to discharge to the wetland located north of the waste mound. Groundwater conditions identified in 2016/2017 were generally similar to previous years.

Groundwater conditions within the bedrock have not been investigated; however, it has previously been reported that the bedrock unit is expected to be intact and highly impermeable. Regional groundwater flow in the bedrock unit is expected to occur toward the south and/or east toward Mississauga Lake.

Background Groundwater Quality

Background groundwater quality at the site is characterised using drive point monitor DP4. DP4 is located near the wetland located north of the waste mound near the northern property boundary. Groundwater quality at drive point monitor DP4 is generally characterised by relatively low concentrations of most parameters, with the exception of iron, and is interpreted to be representative of background conditions. Groundwater quality reported at DP4 during 2016/2017 is generally consistent with previous years.

Leachate

Leachate at the site is currently characterised using drive point monitor DP5 which is located at the northern toe of the waste mound and exhibits the greatest leachate impacts. Cambium reports that most parameters are elevated in groundwater at drive point DP5; however, the most prominent leachate indicator parameters (LIPs) are: alkalinity, calcium, chemical oxygen demand (COD), chloride, conductivity, dissolved organic carbon (DOC), hardness, iron, manganese, sodium, sulphate, and total dissolved solids (TDS).

Based on my assessment, additional LIPs associated with the site also include barium, boron, magnesium, and potassium. Minor detections of multiple volatile organic compounds (VOCs) have also been detected at drive point monitors DP1 and/or DP5 and should also be considered LIPs. Those VOCs previously detected include acetone, benzene, chlorobenzene, 1,1-dichloroethane, cis-1,2-dichloroethylene, methyl ethyl ketone, and toluene.

A discussion of leachate quality trends has not been provided in the report; however, based on my assessment it appears that many LIPs have improved since landfilling ceased (2002) and final closure was completed (2015).

Down-gradient Groundwater Quality

Down-gradient groundwater quality is assessed within the overburden unit to the north and south of the waste mound.

The primary direction of leachate migration is expected to be toward the south and drive point monitors DP1 and DP6 are used to assess groundwater quality to the south. Monitoring well DP1 is located in the primary flow path in the vicinity of the area where leachate impacted groundwater is expected to discharge to the southern wetland. Relatively significant leachate impacts have historically been identified at monitor DP1; however, the concentration of most LIPs show decreasing or steady trends since landfilling ceased (2002) and site closure occurred (2015). Monitor DP6 is located south of the landfills southern property boundary. Cambium indicates that DP6 is not leachate impacted; however, based on my assessment DP6 likely contains minor leachate impacts. I note that the location of DP6 is less than ideal; however, leachate impacted groundwater is expected to discharge to the southern wetland.

To the north of the waste mound groundwater quality is assessed using drive point monitors DP5 (leachate monitor) and DP4 (background monitor). Drive point monitor DP5 is completed within the northern toe of the waste mound and leachate impacted groundwater is interpreted to discharge to the wetland in the vicinity of this monitor. Groundwater quality at DP5 is discussed above in the leachate characterisation section. Drive point monitor DP4 is not interpreted to be impacted by the site and acts as a background monitor and also confirms that leachate impacts do not extend beyond the northern property boundary.

The following parameters were reported to exceed the applicable Ontario Drinking Water Standard (ODWS) on one or more occasions during 2016/2017:

- DP1: Chloride, DOC, hardness, iron, manganese, TDS, zinc
- DP4: DOC, iron
- DP5: DOC, hardness, iron, manganese, TDS, zinc
- DP6: DOC, iron, manganese

I conclude that leachate impacted groundwater associated with the site is generally well delineated in the overburden and is expected to discharge onsite.

Regulatory Evaluation

Reasonable Use Guideline B-7 applies to all operating WDS and those WDS closed after 1986, thus Guideline B-7 applies to the Cavendish WDS.

Leachate impacted groundwater is interpreted to discharge to the wetland areas located north and south of the waste mound. Given that leachate impacted groundwater is interpreted to discharge to surface water onsite, the intent of Guideline B-7 is met.

Trigger Mechanisms and Contingency Plans

Given that leachate impacted groundwater is interpreted to discharge to surface water onsite, trigger mechanisms and contingency action plans should be developed with respect to surface water management practices.

Groundwater-Surface Water Interactions

Leachate impacted groundwater is expected to discharge to the wetland areas located south and north of the waste mound. As such, leachate impacted groundwater has the potential to impair surface water quality. An MECP Surface Water Specialist should be consulted with respect to surface water monitoring and management associated with the site.

Residential Supply Wells

No residential supply wells are located within 500 metres of the site and the site is not interpreted to represent a risk to domestic supply. Residential well sampling is not currently conducted at the site and is not currently warranted.

Landfill Gas

Based on the relatively small and remote nature of the site, I conclude that the site does not pose an off-site risk due to landfill gas migration.

Groundwater Monitoring Program

The currently approved groundwater monitoring program consists of semi-annual (spring and fall) groundwater elevation monitoring and groundwater sampling at the four (4) existing drive point monitors. Groundwater samples are to be analysed for those parameters listed in schedule B of the ECA. The approved reporting frequency is every two years. The groundwater monitoring program conducted in 2016/2017 generally complies with the approved groundwater monitoring program.

No changes to the groundwater monitoring program were recommended by Cambium.

Conclusions and Recommendations

- The Cavendish WDS is a closed natural attenuation landfill; however, the site continues to operate as a WTS.

- Leachate impacted groundwater is expected to be primarily limited to the overburden unit, and is expected to discharge to onsite the wetland features located north and south of the waste mound. The primary direction of groundwater migration is toward the south.

- Leachate impacted groundwater is interpreted to be contained onsite and is not interpreted to represent a risk to off-site groundwater users.

- Guideline B-7 applies to the Cavendish WDS; however, given that leachate impacted groundwater is expected to discharge to surface water onsite, the intent of Guideline B-7 is met.

- The groundwater monitoring program conducted in 2016/2017 generally complied with the approved groundwater monitoring program.

- No changes to the groundwater monitoring program were recommended by Cambium; however, I recommend the following changes to the monitoring program:

    - I recommend that VOC sampling be conducted for a more robust suite of parameters. The current list does not include most of the VOC parameters previously detected in groundwater at the site.
    - I support the recommendation provided by the MECP Surface Water Specialist that the groundwater and surface water parameter lists be harmonized.

- An MECP Surface Water Specialist should be consulted with respect to surface water management at the site.

Shawn Trimper, P.Eng.
SAT

ec: Greg Faaren
Peter Taylor
Courtney Redmond

c: Dana Cruikshank
File GW PB GC 01 02 (Cavendish WDS/WTS; ECA No. A341206)
SAT/IDS#7806-B3NR3M

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Ontario

March 28, 2019

The Corporation of the Municipality of Trent Lakes
760 County Road 36
Trent Lakes, ON K0M 1A0

Attn: Ms. Chelsea Carpenter, Waste Management Coordinator

Dear Ms. Carpenter:

Re: Request for Amendment of Monitoring Requirements
Cavendish Waste Disposal Site (closed)
Environmental Compliance Approval Number A341206
3405 Highway 507, Municipality of Trent Lakes (Cavendish)

This will follow-up the e-mail submitted to this office by Cambium Inc. (dated March 28, 2019), requesting amendments to surface water and groundwater monitoring requirements for the Cavendish waste disposal site. The e-mail request was submitted to this office in follow-up to comments produced by staff from the ministry's water resources section (dated November 27, 2018 and March 27, 2019) related to environmental monitoring at the site.

Condition 2.5 of Environmental Compliance Approval Number A341206 (the ECA) indicates the owner may request changes to the environmental monitoring program for the site to the District Manager. Ministry staff have reviewed the request and I can advise that this office has no objections to the monitoring changes proposed by your consultant.

Should you have any questions or concerns regarding this letter, please do not hesitate to contact Gary Muloin at 705-755-4331 or the undersigned at 705-755-4307.

Sincerely,

David Bradley
District Manager

File SI PB TL CORD 610 – 3405 Highway 507, Cavendish
c: Ms. Stephanie Reeder, P.Geo., C.E.T., Cambium Inc., 52 Hunter Street East, Peterborough, ON K9H 1G5

Stephanie Reeder

From: Stephanie Reeder
Sent: March 28, 2019 9:10 AM
To: Muloin, Gary (MECP)
Cc: Chelsea Carpenter
Subject: Request for Revised Monitoring Program - Cavendish Waste Disposal Site (8640-002)
Attachments: 2018-11-27 MECP TSS SW Cavendish 2016-2017 rpt.pdf; CavendishWDS groundwater-mar2019.pdf

Hi Gary,

Thank you for the call this morning. Please accept this a formal request to the District Manager, as required by Condition 2.5 of ECA No. A341206, to approve the following harmonized monitoring program for the Cavendish waste disposal site, in the Municipality of Trent Lakes. Note that we have incorporated all volatile organic compounds previously detected at the Site, as requested by Mr. Trimper in his recent memo dated March 27, 2019. For reference purposes, we have attached recent correspondence between the Ministry and Cambium regarding this proposal. We look forward to receiving approval and/or comments on the proposed program.

Location	Task	Frequency	Parameters
GROUNDWATER			
DP-1, DP-4, DP-5, DP-6 1 QA/QC Duplicate	• Measure groundwater levels • Groundwater sampling • Field Measurements (pH, temperature, conductivity, dissolved oxygen, ORP)	Once (Spring)	Alkalinity, Ammonia, Boron, Calcium, Chloride, Conductivity, Iron, Magnesium, Manganese, Nitrate, Nitrite, pH, Sodium, TDS, Sulphate, COD, DOC, Hardness
DP-1, DP-4, DP-5, DP-6 1 QA/QC Duplicate	• Measure groundwater levels • Groundwater sampling Field Measurements (pH, temperature, conductivity, dissolved oxygen, ORP)	Once (Autumn)	Alkalinity, Ammonia, Arsenic, Boron, Calcium, Chloride, Conductivity, COD, DOC, Copper, Iron, Magnesium, Manganese, Mercury, Nitrate, Nitrite, pH, Potassium, Sodium, TDS, Sulphate, Zinc, Hardness Benzene, 1,4- Dichlorobenzene, Dichloromethane, Toluene, Vinyl Chloride, Acetone, Benzene, Chlorobenzene, 1,1-dichloroethane, cis-1,2-dichloroethylene, Methyl Ethyl Ketone, and Toluene
DP-1		Twice (Spring and Autumn)	BOD, TSS
SURFACE WATER			
SW1, SW2, SW3, SW4, SW5, SW6 1 QA/QC Duplicate	• Surface water sampling • Flow estimates • Field measurements (pH, temperature, conductivity, dissolved oxygen and ORP)	Once (Spring)	Alkalinity, Ammonia, Boron, Calcium, Chloride, Conductivity, Iron, Magnesium, Manganese, Nitrate, Nitrite, pH, Sodium, TDS, Sulphate, COD, DOC, Hardness, Total Phosphorous, TSS, BOD, Phenols, TKN
SW1, SW2, SW3, SW4, SW5, SW6 1 QA/QC Duplicate	• Surface water sampling • Flow estimates • Field measurements (pH, temperature, conductivity, dissolved oxygen and ORP)	Once (Autumn)	Alkalinity, Ammonia, Arsenic, Boron, Calcium, Chloride, Conductivity, COD, DOC, Copper, Iron, Magnesium, Manganese, Mercury, Nitrate, Nitrite, pH, Potassium, Sodium, TDS, Sulphate, Zinc, Hardness, Total Phosphorous, TSS, BOD, Phenols, TKN

Take care,
Stephanie

Stephanie Reeder, P.Geo., CET
Project Manager

Cambium Inc. - Peterborough
Environmental | Building Sciences | Geotechnical | Construction Monitoring
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From: Stephanie Reeder
Sent: March-28-19 8:42 AM
To: Muloin, Gary (MECP) <Gary.Muloin@ontario.ca>
Cc: Chelsea Carpenter <ccarpenter@trentlakes.ca>
Subject: FW: Comments on 2016/2017 biannual report for Cavendish Landfill (7205-002, 8640-002)

Hi Gary,

Thank you for forwarding the most recent comments from the Groundwater Unit regarding the Cavendish site. Mr. Trimper is supportive of a harmonized parameter suite, as recommended by the Surface Water reviewer; however, it seems he may not have reviewed the attached email that was forwarded to his attention in January.

Do you mind following up with Mr. Trimper on the attached? As noted, we would appreciate direction prior to spring sampling, if possible.

We also note, should Mr. Trimper agree to the proposed parameter suite, as required by Condition 2.5 of the ECA, written consent from the District Manager is required prior to implementing the change. Let us know if we can do anything on our end to expedite the above request.

Thanks in advance.
Stephanie

Stephanie Reeder, P.Geo., CET
Project Manager

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From: Stephanie Reeder
Sent: March-26-19 10:41 AM
To: Muloin, Gary (MECP) <Gary.Muloin@ontario.ca>

Cc: Chelsea Carpenter <ccarpenter@trentlakes.ca>
Subject: RE: Comments on 2016/2017 biannual report for Cavendish Landfill (7205-002, 8640-002)

Hi Gary,

We are following up on the attached parameter list for the Cavendish site. At this point in time, we have scheduled the sampling of the Cavendish site in late May to provide as much time as possible to receive feedback from the Groundwater unit.

Let us know if you need anything further from us.

Thanks Gary.
Stephanie

Stephanie Reeder, P.Geo., CET
Project Manager

Cambium Inc. - Peterborough
p: 705.742.7900 x 204 | **c:** 705.872.8797 | **toll:** 866.217.7900 | **w:** cambium-inc.com

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From: Muloin, Gary (MECP) [mailto:Gary.Muloin@ontario.ca]
Sent: January-16-19 11:22 AM
To: Stephanie Reeder <Stephanie.Reeder@cambium-inc.com>
Cc: Chelsea Carpenter <ccarpenter@trentlakes.ca>; Cruikshank, Dana (MECP) <Dana.Cruikshank@ontario.ca>; Trimper, Shawn (MECP) <Shawn.Trimper@ontario.ca>; Muloin, Gary (MECP) <Gary.Muloin@ontario.ca>
Subject: RE: Comments on 2016/2017 biannual report for Cavendish Landfill (7205-002)

Hi Stephanie & Chelsea

At this point I can advise that your proposed sampling parameters are acceptable from a surface water perspective; please note that groundwater comments are pending (I'll send them to you as soon as they are received).

Please let me know if you have any questions in the interim.

GM

From: Stephanie Reeder [mailto:Stephanie.Reeder@cambium-inc.com]
Sent: January-16-19 9:45 AM

To: Muloin, Gary (MECP)
Cc: Chelsea Carpenter
Subject: FW: Comments on 2016/2017 biannual report for Cavendish Landfill (7205-002)

Good Morning Gary,

I was catching up on some outstanding correspondence and came across the attached. I believe from our conversation you will be taking care of Trent Lakes now. See the attached we sent to Aaron in December. We aren't in a huge panic for a response, but we are hoping to have the parameters sorted out before the spring sampling event in May.

Let us know if you would you like to discuss the file.

Thanks.
Stephanie

Stephanie Reeder, P.Geo., CET
Project Manager

Cambium Inc. - Peterborough
p: 705.742.7900 x 204 | **c:** 705.872.8797 | **toll:** 866.217.7900 | **w:** cambium-inc.com

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From: Stephanie Reeder
Sent: December-19-18 3:19 PM
To: Gordon, Aaron (MECP) <Aaron.Gordon@ontario.ca>
Cc: Chelsea Carpenter <ccarpenter@trentlakes.ca>
Subject: FW: Comments on 2016/2017 biannual report for Cavendish Landfill (7205-002)

Good Afternoon Aaron,

We were forwarded the attached comments from the Municipality of Trent Lakes regarding the Cavendish waste disposal site. In the attached, the Surface Water Reviewer Dana Cruikshank made a number of recommendations.

We provide the following comments/response to each of his recommendations.

1. The reviewer recommended that an updated trigger mechanism be developed for the site. This will be completed in conjunction with the 2018-2019 Biennial Report, to be submitted to the Ministry for review prior to June 30, 2020.
2. The reviewer requested additional flow information for surface station SW2. This will be completed in 2019.
4. For shallow surface water sites, a pump should be used for sampling to prevent sediment from entering the sampling. This will be completed beginning in spring 2019.
5. As the site is only sampled twice per year, it is important to collect samples from each station. This is acknowledged.
6. In addition all leachate indicator parameters like DOC need to be analyzed at all stations of all sampling events. This is acknowledged.
7. The groundwater and surface water parameter needs to be harmonized. Cambium has reviewed the groundwater and surface water parameters and recommends the following monitoring program be implemented moving forward. Of note are the following changes:
   - Parameters cadmium, barium, lead, and chromium were removed from the program as previously recommended.
   - Groundwater and surface water parameters were harmonized, including the analysis of all leachate indicator parameters in both the groundwater and surface water.

We would appreciate comments and/or approval on the following monitoring program from the Ministry, such that it can be implemented beginning in the spring of 2019.

We look forward to hearing from you.
Stephanie

Location	Task	Frequency	Parameters
GROUNDWATER			
DP-1, DP-4, DP-5, DP-6 1 QA/QC Duplicate	• Measure groundwater levels • Groundwater sampling • Field Measurements (pH, temperature, conductivity, dissolved oxygen, ORP)	Once (Spring)	Alkalinity, Ammonia, Boron, Calcium, Chloride, Conductivity, Iron, Magnesium, Manganese, Nitrate, Nitrite, pH, Sodium, TDS, Sulphate, COD, DOC, Hardness
DP-1, DP-4, DP-5, DP-6 1 QA/QC Duplicate	• Measure groundwater levels • Groundwater sampling Field Measurements (pH, temperature, conductivity, dissolved oxygen, ORP)	Once (Autumn)	Alkalinity, Ammonia, Arsenic, Boron, Calcium, Chloride, Conductivity, COD, DOC, Copper, Iron, Magnesium, Manganese, Mercury, Nitrate, Nitrite, pH, Potassium, Sodium, TDS, Sulphate, Zinc, Hardness Benzene, 1,4- Dichlorobenzene, Dichloromethane, Toluene, Vinyl Chloride
DP-1		Twice (Spring and Autumn)	BOD, TSS
SURFACE WATER			
SW1, SW2, SW3, SW4, SW5, SW6 1 QA/QC Duplicate	• Surface water sampling • Flow estimates • Field measurements (pH, temperature, conductivity, dissolved oxygen and ORP)	Once (Spring)	Alkalinity, Ammonia, Boron, Calcium, Chloride, Conductivity, Iron, Magnesium, Manganese, Nitrate, Nitrite, pH, Sodium, TDS, Sulphate, COD, DOC, Hardness, Total Phosphorous, TSS, BOD, Phenols, TKN
SW1, SW2, SW3, SW4, SW5, SW6 1 QA/QC Duplicate	• Surface water sampling • Flow estimates • Field measurements (pH, temperature, conductivity, dissolved oxygen and ORP)	Once (Autumn)	Alkalinity, Ammonia, Arsenic, Boron, Calcium, Chloride, Conductivity, COD, DOC, Copper, Iron, Magnesium, Manganese, Mercury, Nitrate, Nitrite, pH, Potassium, Sodium, TDS, Sulphate, Zinc, Hardness, Total Phosphorous, TSS, BOD, Phenols, TKN

Stephanie Reeder, P.Geo., CET
Project Manager

Cambium Inc. - Peterborough
p: 705.742.7900 x 204 | **c:** 705.872.8797 | **toll:** 866.217.7900 | **w:** cambium-inc.com

Cambium's offices will close at 4:30pm on Friday, December 21, 2018, and will reopen at 8:30am on Wednesday, January 2, 2019. Have a wonderful holiday season!

From: Chelsea Carpenter [mailto:ccarpenter@trentlakes.ca]
Sent: December-03-18 2:30 PM
To: Stephanie Reeder <Stephanie.Reeder@cambium-inc.com>
Subject: FW: Comments on 2016/2017 biannual report for Cavendish Landfill

Good Afternoon Stephanie,

Below you will find email correspondence from the MOE. Can you please review the attached from Aaron and provide back to Trent Lakes a briefing report as requested by my CAO.

Thank you in advance.

Chelsea Carpenter
Human Resources/Waste Management Coordinator
Municipality of Trent Lakes
760 Peterborough County Road 36
Trent Lakes, ON. K0M 1A0
T: (705) 738-3800/1-800-374-4009 Ext. 226

To view our website please visit www.trentlakes.ca
Like us on Facebook - www.facebook.com/TrentLakesOnt
Follow us on Twitter - www.twitter.com/TrentLakesOnt

From: Gordon, Aaron (MECP) <Aaron.Gordon@ontario.ca>
Sent: December 3, 2018 12:03 PM
To: Chelsea Carpenter <ccarpenter@trentlakes.ca>
Cc: Peter Avgoustis <PAvgoustis@trentlakes.ca>
Subject: Comments on 2016/2017 biannual report for Cavendish Landfill

Hello,

My name is Aaron Gordon and I am an Environmental Officer with the Ministry of the Environment. I am currently filling in for Ian Oosting, who was previously the EO for Peterborough County, for the remainder of the year. I am reaching out to share comments from our surface water scientist on the 2016/2017 biannual report you submitted for the Cavendish Landfill. Please note the

recommendations made in the memo, share them with your consultant, and ensure that they are implemented for the upcoming year.

If you have any questions please let me know.

Thanks,

Aaron Gordon
Senior Environmental Officer
Badge # 1864
Ministry of Environment, Conservation & Parks
Peterborough District Office
300 Water Street
2nd Floor, South Tower
Peterborough, Ontario
K9J 3C7
705-755-4309
aaron.gordon@ontario.ca

Appendix C
Field Sheets

CAMBIUM

FIELD SHEET - GROUND WATER DEVELOPMENT & SAMPLING

Sample Location	Water Level	B.H. Depth (m)	B.H. Dia. (mm)	Stick - Up (m)	Purge Volumes (L)		Temp (°C)	pH (units)	Cond. (mS)	DO (mg/L)	ORP (mV)	Observations				
					Needed	Actual						Clarity	Colour	Odour	Sheen	Other
DP1	1.36	2.59	32.1	1.35	3	Dry x1 1.25	13.5	7.34	1210	9.70	89	Cloudy	Grey	None	None	
DP4	1.75	2.80	32.1	0.97	2.5	1.25	9.5	6.57	300	9.41	7	Opaque	Yellow	None	None	QA/QC
DP5	1.20	2.80	32.1	0.13	3.75	Dry x1 1.75	10.6	6.86	2300	5.84	62	Opaque	Brown	None	None	
DP6	1.07	2.35	32.1	0.90	3	Dry x1 1.25	12.1	6.85	550	2.80	59	Opaque	Brown	None	None	

LOCATION: Cavendish Waste Disposal Site

DATE: 30-May-18

WEATHER (SAMPLE DAY): 15°C Sun 28°C

PROJECT NUMBER: 7205-002

SAMPLED BY: M. Pion + K. Connell

WEATHER (PREVIOUS DAY): 24°C Sun

LOCATION: Cavendish WDS DATE: 2018-11-13 WEATHER (SAMPLE DAY): 1°C Snow

PROJECT NUMBER: 7205-002 SAMPLED BY: M. Pion + A. Krishnan WEATHER (PREVIOUS DAY): 4°C Overcast

FIELD SHEET – GROUND WATER DEVELOPMENT & SAMPLING

Sample Location	Water Level	B.H. Depth (m)	B.H. Dia. (mm)	Stick – Up (m)	Purge Volumes (L)		Temp (°C)	pH (units)	Cond. (mS)	DO (mg/L)	ORP (mV)	LFG	Observations				
					Needed	Actual							Clarity	Colour	Odour	Sheen	Other
DP1	1.37	2.59	32.1	1.35	3	Dry x 1 1.25	6.1	6.65	1320	10.35	150	-	Cloudy	Brown	None	None	
DP4	1.75	2.8	32.1	0.97	2.50	Dry x 1 1.25	7.1	6.84	490	7.88	108	-	Opaque	Grey	None	None	
DP5	1.05	2.8	32.1	0.13	4	Dry x 1 1.25	8.6	6.61	1340	2.39	118	-	Opaque	Grey	None	None	QA/QC
DP6	1.07	2.35	32.1	0.90	3	Dry x 1 1.5	4.3	7.33	680	9.81	96	-	Opaque	Brown	None	None	

LOCATION: Cavendish WDS DATE: April 17, 2019 WEATHER (SAMPLE DAY): -3°C Sun 13°C

PROJECT NUMBER: 8640-002 SAMPLED BY: M. Pion and C. Johnson WEATHER (PREVIOUS DAY): 10°C Sun

FIELD SHEET – GROUNDWATER DEVELOPMENT & SAMPLING

Sample Location	Water Level	B.H. Depth (m)	B.H. Dia. (mm)	Stick – Up (m)	Purge Volumes (L)		Temp (°C)	pH (units)	Cond. (mS)	DO (mg/L)	ORP (mV)	LFG (ppm)	Observations				
					Needed	Actual							Clarity	Colour	Odour	Sheen	Other
DP1	1.67	2.59	32.1	1.35	2.25	Dry x 1 1.50	3.0	6.77	1220	6.13	150	-	Opaque	Brown	None	None	
DP4	1.80	2.80	32.1	0.97	2.50	Dry x 1 1.50	3.0	7.51	120	8.21	96	-	Opaque	Brown	None	None	
DP5	0.95	2.80	32.1	0.13	4.50	4.50	5.0	6.92	1480	8.69	145	-	Opaque	Brown	None	None	QA/QC
DP6	0.83	2.35	32.1	0.90	3.50	Dry x 1 1.50	1.0	7.02	310	2.29	106	-	Opaque	Brown	Swampy	None	

LOCATION: Cavendish WDS DATE: November 12, 2019 WEATHER (SAMPLE DAY): -11°C Sun -6°C

PROJECT NUMBER: 8640-002 SAMPLED BY: M. Pion and T. Jamieson WEATHER (PREVIOUS DAY): Overcast + Snow -4C

FIELD SHEET – GROUNDWATER DEVELOPMENT & SAMPLING

Sample Location	Water Level	B.H. Depth (m)	B.H. Dia. (mm)	Stick – Up (m)	Purge Volumes (L)		Temp (°C)	pH (units)	Cond. (mS)	DO (mg/L)	ORP (mV)	LFG (ppm)	Observations				
					Needed	Actual							Clarity	Colour	Odour	Sheen	Other
DP1	-	2.59	32.1	1.35	-	-	-	-	-	-	-	-	-	-	-	-	Well Frozen at 1.69 m
DP4	1.85	2.80	32.1	0.97	2.25	Dry x 1 0.75	7.2	7.68	460	4.95	-2	-	Opaque	Brown	None	None	
DP5	1.07	2.80	32.1	0.13	4	Dry x 1 2	8.0	6.78	1360	3.32	-13	-	Opaque	Grey	Swampy	None	QA/QC
DP6	1.10	2.35	32.1	0.90	3	Dry x 1 1.25	5.3	7.40	880	3.79	-29	-	Cloudy	Brown	Swampy	None	Casing Leaning upon arrival.

CAMBIUM

FIELD SHEET - SURFACE WATER SAMPLING

Sample Station	Depth (m)	Width (m)	Distance (m)	Time (s)	Velocity (m/s)	Discharge (m^3/s)	D.O. (mg/L)	Temp. (^oC)	pH (units)	Cond. (mS)	ORP (mV)	Observations				
												Clarity	Colour	Odour	Sheen	Other
SW1	0.10	1.50	-	-	<0.1	<0.02	1.53	17.4	7.11	620	18	Opaque	Dark Brown	None	None	
SW2	0.05	Ponded- Wetland					3.85	20.7	7.13	1470	69	Opaque	Brown	None	None	
SW3	0.15	Ponded- Wetland					2.23	14.9	6.84	430	55	Cloudy	Yellow	None	Yes	
SW4- Culvert	0.09	0.60	Ponded- No Observable Flow				4.07	17.8	6.56	360	25	Cloudy	Yellow	None	None	QA/QC
SW5	0.22	Approx. 2 m	Ponded- No Observable Flow				6.17	20.9	7.01	180	23	Clear	None	None	None	
SW6	0.20	Ponded- No Observable Flow					5.75	20.9	6.88	600	15	Clear	None	None	None	

LOCATION: Cavendish Waste Disposal Site

DATE: 30-May-18

WEATHER (SAMPLE DAY): 22°C Sun 28°C

PROJECT NUMBER: 7205-002

SAMPLED BY: M. Pion + K. Connell

WEATHER (PREVIOUS DAY): 24°C Sun

LOCATION: Cavendish WDS DATE: 2018-11-13 WEATHER (SAMPLE DAY): 1°C Snow

PROJECT NUMBER: 7205-002 SAMPLED BY: M. Pion + A. Krishnan WEATHER (PREVIOUS DAY): 4°C Overcast

FIELD SHEET – SURFACE WATER DEVELOPMENT & SAMPLING

Sample Location	Depth (m)	Width (m)	Velocity (m/s)	Discharge (m^3/s)	Temp (°C)	pH (units)	Cond. (mS)	DO (mg/L)	ORP (mV)	Observations				
										Clarity	Colour	Odour	Sheen	Other
SW1	0.05	3.00	Ponded - No Observable Flow		0.8	6.85	360	9.43	105	Cloudy	Red-brown	None	None	
SW2	-	-	-	-	-	-	-	-	-	-	-	-	-	Slush Insufficient Volume
SW3	-	-	-	-	-	-	-	-	-	-	-	-	-	Slush Insufficient Volume
SW4	0.05	0.60	0.1	0.001	0.5	7.19	330	8.72	113	Clear	Yellow	None	None	QA/QC
SW5	0.34	2.00	0.1	0.07	2.5	7.29	230	10.23	108	Clear	Yellow	None	None	
SW6	Ponded - No Observable Flow				3.1	6.66	640	3.65	117	Clear	None	None	None	Frozen in areas

LOCATION: Cavendish WDS DATE: April 17, 2019 WEATHER (SAMPLE DAY): -3°C Sun 13°C

PROJECT NUMBER: 8640-002 SAMPLED BY: M. Pion and C. Johnson WEATHER (PREVIOUS DAY): 10°C Sun

FIELD SHEET – SURFACE WATER SAMPLING

Sample Location	Depth (m)	Width (m)	Velocity (m/s)	Discharge (m^3/s)	Temp (°C)	pH (units)	Cond. (mS)	DO (mg/L)	ORP (mV)	Observations				
										Clarity	Colour	Odour	Sheen	Other
SW1	0.10	3.50	Ponded - No Observable Flow		5.5	6.69	110	6.30	96	Cloudy	Yellow	None	None	
SW2	0.07	Ponded - No Observable Flow			1.5	7.43	360	6.28	123	Clear	None	Swampy	None	
SW3	0.14	Ponded - No Observable Flow			1.4	7.35	270	5.13	120	Clear	None	None	None	
SW4	0.14	0.60	< 0.10	<0.005	1.0	6.93	240	7.43	134	Clear	Yellow	None	None	QA/QC
SW5	0.38	2.00	0.05	0.038	1.8	6.91	170	10.49	125	Clear	Yellow	None	None	
SW6	0.15	Ponded - No Observable Flow			5.2	7.00	120	7.02	94	Clear	None	None	None	

LOCATION: Cavendish WDS DATE: November 12, 2019 WEATHER (SAMPLE DAY): -11°C Sun -6°C

PROJECT NUMBER: 8640-002 SAMPLED BY: M. Pion and T. Jamieson WEATHER (PREVIOUS DAY): Overcast + Snow -4C

FIELD SHEET – SURFACE WATER SAMPLING

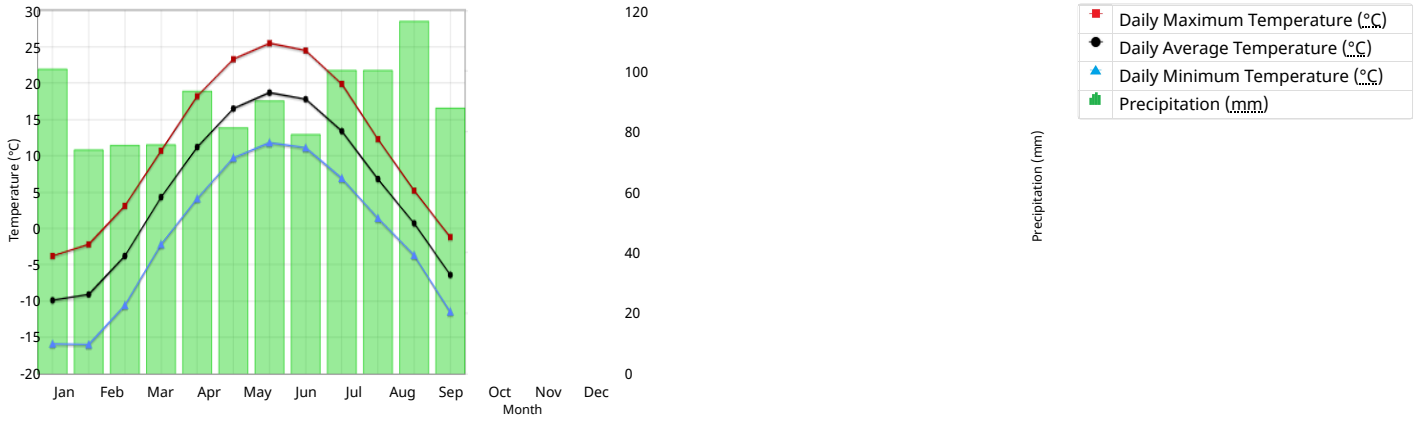
Sample Location	Depth (m)	Width (m)	Velocity (m/s)	Discharge (m^3/s)	Temp (°C)	pH (units)	Cond. (mS)	DO (mg/L)	ORP (mV)	Observations				
										Clarity	Colour	Odour	Sheen	Other
SW1	-	-	-	-	-	-	-	-	-	-	-	-	-	Frozen
SW2	-	-	-	-	-	-	-	-	-	-	-	-	-	Dry
SW3	-	-	-	-	-	-	-	-	-	-	-	-	-	Frozen
SW4	0.03	0.60	< 0.10	<0.001	0.7	7.53	70	7.38	11	Clear	Yellow	None	None	QA/QC
SW5	Too Wide / Deep for Accurate Flow Measure				2.5	7.92	180	9.58	14	Clear	Yellow	None	None	
SW6	-	-	-	-	-	-	-	-	-	-	-	-	-	Frozen

Government of Canada / Gouvernement du Canada

Canadian Climate Normals 1981-2010 Station Data

▼ Temperature and Precipitation Graph

Temperature and Precipitation Graph for 1981 to 2010 Canadian Climate Normals
HALIBURTON 3



▼ Normals Data

The minimum number of years used to calculate these Normals is indicated by a code for each element. A "+" beside an extreme date indicates that this date is the first occurrence of the extreme value. Values and dates in bold indicate all-time extremes for the location.

Data used in the calculation of these Normals may be subject to further quality assurance checks. This may result in minor changes to some values presented here.

HALIBURTON 3
ONTARIO
Current Station Operator: CCN

Latitude:	45°01'56.094" N	**Longitude:**	78°31'52.014" W	**Elevation:**	330.00 m
Climate ID:	6163171	**WMO ID:**		**TC ID:**	

▼ Temperature

Temperature

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Code
Daily Average (°C)	-9.9	-9.1	-3.8	4.3	11.2	16.5	18.7	17.8	13.4	6.8	0.7	-6.4	5.0	D
Standard Deviation	3.7	2.8	2.2	1.5	1.9	1.3	1.4	1.2	1.7	1.3	1.9	3.6	1.5	D
Daily Maximum (°C)	-3.8	-2.2	3.1	10.7	18.2	23.3	25.5	24.5	19.9	12.3	5.2	-1.2	11.3	D
Daily Minimum (°C)	-15.9	-16.0	-10.6	-2.2	4.1	9.7	11.8	11.1	6.9	1.4	-3.7	-11.5	-1.2	D
Extreme Maximum (°C)	11.5	13.0	22.5	29.5	32.0	33.0	**38.0**	34.5	32.5	28.5	19.0	14.5		
Date (yyyy/dd)	1995/ 14	1994/ 19	1998/ 30	1990/ 28	2006/ 30	1994/ 17	**1988/ 08**	2001/ 09	2005/ 12	2005/ 04	1999/ 09	2001/ 05		
Extreme Minimum (°C)	**-43.5**	-39.0	-34.5	-18.0	-9.5	-2.5	2.0	-0.5	-6.0	-11.5	-25.5	-38.5		
Date (yyyy/dd)	**1994/ 16**	1996/ 03	2003/ 03	1992/ 13	1992/ 04	1998/ 06	1992/ 22	1989/ 25	1989/ 27	1992/ 20	1995/ 29	1993/ 27		

▼ Precipitation

Precipitation

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Code
Rainfall (mm)	33.7	21.2	37.4	56.1	90.8	81.2	90.1	79.0	100.2	93.1	83.4	27.7	793.9	D
Snowfall (cm)	66.9	52.7	37.9	19.4	2.5	0.0	0.0	0.0	0.1	7.1	32.9	60.1	279.6	D
Precipitation (mm)	100.6	73.9	75.4	75.6	93.3	81.2	90.1	79.0	100.2	100.2	116.4	87.7	1073.5	D
Snow Depth at Month-end (cm)	32	42	16	0	0	0	0	0	0	1	8	22	10	D

Precipitation

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Code
Extreme Daily Rainfall (mm)	37.2	51.6	42.4	40.1	33.4	**69.2**	50.6	57.0	64.2	43.4	51.2	20.8		
Date (yyyy/dd)	1995/ 15	1997/ 21	1998/ 30	1998/ 16	2004/ 23	**2005/ 13**	2002/ 22	1997/ 16	1989/ 22	1999/ 13	1995/ 11	2000/ 16		
Extreme Daily Snowfall (cm)	20.6	34.6	20.2	24.6	14.8	0.0	0.0	0.0	1.2	21.0	**41.2**	37.2		
Date (yyyy/dd)	1995/ 03	2003/ 22	1989/ 17	1992/ 10	1994/ 26	1988/ 01	1988/ 01	1988/ 01	1989/ 23	1997/ 26	**1992/ 13**	2000/ 11		
Extreme Daily Precipitation (mm)	37.2	53.4	42.4	40.1	33.6	**69.2**	50.6	57.0	64.2	43.4	55.6	37.2		
Date (yyyy/dd)	1995/ 15	1997/ 21	1998/ 30	1998/ 16	2004/ 02	**2005/ 13**	2002/ 22	1997/ 16	1989/ 22	1999/ 13	1995/ 11	2000/ 11		
Extreme Snow Depth (cm)	58	72	**82**	68	5	0	0	0	0	23	41	62		
Date (yyyy/dd)	2001/ 31	2001/ 25	**1997/ 22**	1997/ 01	2002/ 14	1991/ 01	1991/ 31	1991/ 01	1991/ 30	1997/ 28	1995/ 28	2004/ 24		

▶ Days with Maximum Temperature

▶ Days with Minimum Temperature

▶ Days with Rainfall

▶ Days With Snowfall

▶ Days with Precipitation

▶ Degree Days

▶ Frost-Free

Legend

- A = WMO "3 and 5 rule" (i.e. no more than 3 consecutive and no more than 5 total missing for **either** temperature **or** precipitation)
- B = At least 25 years
- C = At least 20 years
- D = At least 15 years

▼ Station / Element Metadata

Statistics listed below are provided as a guide to determine the validity of Normals and Extremes calculations. For example, a station with 30 years of record between 1981 and 2010 with no missing years would be a more reliable normal than a station with 15 years of record and 2 missing years. Less than 100% possible observations indicates that out of the total number of observations used, some records were missing.

HALIBURTON 3

Province/Territory	ON	**Latitude (dd mm):**	45 02 N
Country	CAN	**Longitude (ddd mm):**	78 32 W
Time Zone	EST	**Latitude (decimal degrees):**	45.03 N
Climate ID:	6163171	**Longitude (decimal degrees):**	78.53 W
WMO ID:		**Elevation (m):**	330
TC ID:			

▼ Temperature

Temperature

	Begin Year	End Year	Total Number of Years	Missing Years	Total Count of Observations	% of Possible Observations
Daily Average (°C)	1987	2006	20	1	6998	99.1
Standard Deviation	1987	2006	20	1	6998	99.1
Daily Maximum (°C)	1987	2006	20	1	6999	99.1
Daily Minimum (°C)	1987	2006	20	1	6999	99.1
Extreme Maximum (°C)	1987	2006			7046	99.8
Extreme Minimum (°C)	1987	2006			7046	99.8

▼ Precipitation

Precipitation

	Begin Year	End Year	Total Number of Years	Missing Years	Total Count of Observations	% of Possible Observations
Rainfall (mm)	1987	2006	20	0	7032	99.6
Snowfall (cm)	1987	2006	20	0	7032	99.6
Precipitation (mm)	1987	2006	20	0	7032	99.6
Snow Depth at Month-end (cm)	1987	2006	20	2	208	97
Extreme Daily Rainfall (mm)	1987	2006			7060	100
Extreme Daily Snowfall (cm)	1987	2006			7062	100
Extreme Daily Precipitation (mm)	1987	2006			7060	100
Extreme Snow Depth (cm)	1987	2006			6027	92.3

▶ Days with Maximum Temperature

▶ Days with Minimum Temperature

▶ Days with Rainfall

▶ Days With Snowfall

▶ Days with Precipitation

▶ Degree Days

▶ Frost-Free

Date modified:
2019-12-04

Government of Canada / Gouvernement du Canada

Daily Data Report for May 2018

HALIBURTON 3
ONTARIO
Current Station Operator: CCN

Latitude:	45°01'56.094" N	**Longitude:**	78°31'52.014" W	**Elevation:**	330.00 m
Climate ID:	6163171	**WMO ID:**		**TC ID:**	

DAY	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days	Cool Deg Days	Total Rain mm	Total Snow cm	Total Precip mm	Snow on Grnd cm	Dir of Max Gust 10's deg	Spd of Max Gust km/h
01 †	25.0	-3.5	10.8	7.2	0.0	0.0	0.0	0.0	0		
02 †	23.5	5.5	14.5	3.5	0.0	6.0	0.0	6.0	0		
03 †	15.0	7.5	11.3	6.7	0.0	4.0	0.0	4.0	0		
04 †	22.0	4.5	13.3	4.7	0.0	4.6	0.0	4.6	0		
05 †	22.0	6.5	14.3	3.7	0.0	0.0	0.0	0.0	0		
06 †	17.0	0.5	8.8	9.2	0.0	0.0	0.0	0.0	0		
07 †	16.5	-1.5	7.5	10.5	0.0	0.0	0.0	0.0	0		
08 †	22.5	-1.5	10.5	7.5	0.0	0.0	0.0	0.0	0		
09 †	25.5	2.5	14.0	4.0	0.0	13.6	0.0	13.6	0		
10 †	16.0	9.5	12.8	5.2	0.0	1.6	0.0	1.6	0		
11 †	12.5	-1.5	5.5	12.5	0.0	0.0	0.0	0.0	0		
12 †	18.5	-3.5	7.5	10.5	0.0	0.0	0.0	0.0	0		
13 †	22.0	0.0	11.0	7.0	0.0	0.0	0.0	0.0	0		
14 †	24.0	1.5	12.8	5.2	0.0	T	0.0	T	0		
15 †	20.0	13.5	16.8	1.2	0.0	T	0.0	T	0		
16 †	22.5	1.5	12.0	6.0	0.0	0.0	0.0	0.0	0		
17 †	20.5	5.5	13.0	5.0	0.0	0.0	0.0	0.0	0		
18 †	20.0	1.5	10.8	7.2	0.0	0.0	0.0	0.0	0		
19 †	14.0	7.5	10.8	7.2	0.0	14.2	0.0	14.2	0		
20 †	18.5	10.5	14.5	3.5	0.0	0.0	0.0	0.0	0		
21 †	24.5	0.5	12.5	5.5	0.0	T	0.0	T	0		
22 †	16.5	10.5	13.5	4.5	0.0	7.0	0.0	7.0	0		
23 †	24.0	8.5	16.3	1.7	0.0	0.0	0.0	0.0	0		
24 †	27.5	4.5	16.0	2.0	0.0	T	0.0	T	0		
25 †	27.5	8.5	18.0	0.0	0.0	T	0.0	T	0		
26 †	26.0	13.5	19.8	0.0	1.8	2.6	0.0	2.6	0		
27 †	26.5	14.5	20.5	0.0	2.5	0.0	0.0	0.0	0		
28 †	30.5	18.0	24.3	0.0	6.3	0.0	0.0	0.0	0		
29 †	27.0	13.5	20.3	0.0	2.3	0.0	0.0	0.0	0		
30 †	30.5	10.5	20.5	0.0	2.5	0.0	0.0	0.0	0		
31 †	27.5	19.0	23.3	0.0	5.3	25.8	0.0	25.8	0		
Sum				141.2	20.7	79.4	0.0	79.4			
Avg	22.1	6.1	14.1								
Xtrm	30.5	-3.5									

Summary, average and extreme values are based on the data above.

Legend

- A = Accumulated
- C = Precipitation occurred, amount uncertain
- E = Estimated
- F = Accumulated and estimated
- L = Precipitation may or may not have occurred
- M = Missing
- N = Temperature missing but known to be > 0
- S = More than one occurrence
- T = Trace
- Y = Temperature missing but known to be < 0
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- † = Data that is not subject to review by the National Climate Archives

Date modified:
2019-12-04

Government of Canada / Gouvernement du Canada

Daily Data Report for November 2018

HALIBURTON 3
ONTARIO
Current Station Operator: CCN

Latitude:	45°01'56.094" N	**Longitude:**	78°31'52.014" W	**Elevation:**	330.00 m
Climate ID:	6163171	**WMO ID:**		**TC ID:**	

DAY	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days	Cool Deg Days	Total Rain mm	Total Snow cm	Total Precip mm	Snow on Grnd cm	Dir of Max Gust 10's deg	Spd of Max Gust km/h
01 †	7.5	3.0	5.3	12.7	0.0	12.6	T	12.6	0		
02 †	4.5	1.5	3.0	15.0	0.0	4.4	T	4.4	0		
03 †	3.5	0.5	2.0	16.0	0.0	1.0	2.0	3.0	0		
04 †	6.5	-2.0	2.3	15.7	0.0	T	0.0	T	0		
05 †	9.0	2.0	5.5	12.5	0.0	5.0	0.0	5.0	0		
06 †	13.5	6.0	9.8	8.2	0.0	8.0	0.0	8.0	0		
07 †	7.5	3.5	5.5	12.5	0.0	3.2	0.0	3.2	0		
08 †	5.5	-0.5	2.5	15.5	0.0	4.4	T	4.4	0		
09 †	1.0	-2.5	-0.8	18.8	0.0	0.0	5.8	5.8	0		
10 †	-1.0	-4.0	-2.5	20.5	0.0	0.0	T	T	4		
11 †	0.0	-11.5	-5.8	23.8	0.0	0.0	1.6	1.6	4		
12 †	2.5	-2.5	0.0	18.0	0.0	0.0	2.8	2.8	4		
13 †	-0.5	-6.5	-3.5	21.5	0.0	0.0	1.6	1.6	4		
14 †	-9.5	-12.5	-11.0	29.0	0.0	0.0	0.0	0.0	5		
15 †	-3.5	-16.5	-10.0	28.0	0.0	0.0	12.0	12.0	5		
16 †	2.0	-6.0	-2.0	20.0	0.0	0.4	5.6	6.0	15		
17 †	1.0	-10.5	-4.8	22.8	0.0	0.0	T	T	18		
18 †	-1.0	-16.5	-8.8	26.8	0.0	0.0	T	T	17		
19 †	0.5	-4.5	-2.0	20.0	0.0	0.0	2.6	2.6	16		
20 †	-4.0	-9.5	-6.8	24.8	0.0	0.0	5.4	5.4	17		
21 †	-7.5	-17.0	-12.3	30.3	0.0	0.0	T	T	22		
22 †	-7.5	-25.0	-16.3	34.3	0.0	0.0	0.0	0.0	21		
23 †	-4.0	-25.5	-14.8	32.8	0.0	0.0	0.0	0.0	21		
24 †	3.5	-11.5	-4.0	22.0	0.0	3.0	0.0	3.0	20		
25 †	4.5	1.5	3.0	15.0	0.0	7.4	0.4	7.8	14		
26 †	2.0	0.0	1.0	17.0	0.0	6.6	5.4	12.0	7		
27 †	2.0	-2.0	0.0	18.0	0.0	T	5.8	5.8	10		
28 †	-1.0	-4.5	-2.8	20.8	0.0	0.0	T	T	13		
29 †	0.5	-2.5	-1.0	19.0	0.0	0.0	T	T	13		
30 †	1.5	-2.5	-0.5	18.5	0.0	0.0	T	T	12		
Sum				609.8	0.0	56.0	51.0	107.0			
Avg	1.3	-5.9	-2.3								
Xtrm	13.5	-25.5									

Summary, average and extreme values are based on the data above.

Legend

- A = Accumulated
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Date modified:
2019-12-04

Government of Canada / Gouvernement du Canada

Daily Data Report for April 2019

HALIBURTON 3
ONTARIO
Current Station Operator: CCN

Latitude:	45°01'56.094" N	**Longitude:**	78°31'52.014" W	**Elevation:**	330.00 m
Climate ID:	6163171	**WMO ID:**		**TC ID:**	

DAY	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days	Cool Deg Days	Total Rain mm	Total Snow cm	Total Precip mm	Snow on Grnd cm	Dir of Max Gust 10's deg	Spd of Max Gust km/h
01 †	1.5	-15.0	-6.8	24.8	0.0	0.0	0.0	0.0	53		
02 †	5.0	-7.5	-1.3	19.3	0.0	0.0	0.0	0.0	52		
03 †	5.0	-1.0	2.0	16.0	0.0	0.0	0.0	0.0	48		
04 †	2.5	-7.5	-2.5	20.5	0.0	0.0	0.0	0.0	45		
05 †	3.5	-10.5	-3.5	21.5	0.0	0.2	0.4	0.6	43		
06 †	9.5	-0.5	4.5	13.5	0.0	0.0	0.0	0.0	39		
07 †	10.5	0.0	5.3	12.7	0.0	3.2	0.0	3.2	35		
08 †	4.5	3.5	4.0	14.0	0.0	6.4	0.0	6.4	31		
09 †	4.0	0.0	2.0	16.0	0.0	4.4	0.8	5.2	30		
10 †	3.5	-2.5	0.5	17.5	0.0	0.0	0.0	0.0	28		
11 †	4.5	-7.5	-1.5	19.5	0.0	T	0.0	T	27		
12 †	12.0	0.0	6.0	12.0	0.0	2.8	0.0	2.8	27		
13 †	10.0	-0.5	4.8	13.2	0.0	0.0	0.0	0.0	19		
14 †	1.5	-5.5	-2.0	20.0	0.0	8.4	4.8	13.2	15		
15 †	6.5	-0.5	3.0	15.0	0.0	0.0	T	T	17		
16 †	12.5	-6.5	3.0	15.0	0.0	0.0	0.0	0.0	14		
17 †	14.5	-6.5	4.0	14.0	0.0	13.4	0.0	13.4	5		
18 †	16.0	3.5	9.8	8.2	0.0	35.0	0.0	35.0	T		
19 †	5.0	3.0	4.0	14.0	0.0	13.2	T	13.2	T		
20 †	7.0	2.5	4.8	13.2	0.0	10.8	0.0	10.8	T		
21 †	13.0	3.5	8.3	9.7	0.0	0.0	0.0	0.0	0		
22 †	19.5	0.0	9.8	8.2	0.0	0.0	0.0	0.0	0		
23 †	15.5	5.5	10.5	7.5	0.0	7.0	0.0	7.0	0		
24 †	6.5	1.5	4.0	14.0	0.0	T	0.0	T	0		
25 †	17.5	-2.5	7.5	10.5	0.0	1.8	0.0	1.8	0		
26 †	12.5	6.5	9.5	8.5	0.0	23.8	4.6	28.4	0		
27 †	3.5	-1.5	1.0	17.0	0.0	0.0	1.0	1.0	3		
28 †	9.0	-1.5	3.8	14.2	0.0	0.0	0.0	0.0	T		
29 †	8.5	-6.5	1.0	17.0	0.0	0.0	0.0	0.0	0		
30 †	12.5	1.5	7.0	11.0	0.0	T	0.0	T	0		
Sum				437.5	0.0	130.4	11.6	142.0			
Avg	8.6	-1.8	3.4								
Xtrm	19.5	-15.0									

Summary, average and extreme values are based on the data above.

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Date modified:
2019-12-04

Government of Canada / Gouvernement du Canada

Daily Data Report for November 2019

HALIBURTON 3
ONTARIO
Current Station Operator: CCN

Latitude:	45°01'56.094" N	**Longitude:**	78°31'52.014" W	**Elevation:**	330.00 m
Climate ID:	6163171	**WMO ID:**		**TC ID:**	

DAY	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days	Cool Deg Days	Total Rain mm	Total Snow cm	Total Precip mm	Snow on Grnd cm	Dir of Max Gust 10's deg	Spd of Max Gust km/h
01 †	1.0	-1.5	-0.3	18.3	0.0	2.8	T	2.8	1		
02 †	3.0	-0.5	1.3	16.7	0.0	4.4	1.0	5.4	T		
03 †	3.5	-0.5	1.5	16.5	0.0	0.2	1.2	1.4	T		
04 †	7.0	-1.5	2.8	15.2	0.0	6.4	T	6.4	T		
05 †	7.5	0.0	3.8	14.2	0.0	0.6	4.4	5.0	0		
06 †	1.5	-3.0	-0.8	18.8	0.0	0.0	1.0	1.0	3		
07 †	0.5	-5.0	-2.3	20.3	0.0	0.0	T	T	2		
08 †	-0.5	-11.0	-5.8	23.8	0.0	0.0	T	T	2		
09 †	2.0	-9.5	-3.8	21.8	0.0	T	T	T	1		
10 †	2.5	-1.0	0.8	17.2	0.0	0.0	0.0	0.0	T		
11 †	-6.0	-8.5	-7.3	25.3	0.0	0.0	3.0	3.0	T		
12 †	-7.0	-14.0	-10.5	28.5	0.0	0.0	0.0	0.0	3		
13 †	-5.0	-21.5	-13.3	31.3	0.0	0.0	2.8	2.8	3		
14 †	-1.5	-9.5	-5.5	23.5	0.0	T	0.4	0.4	6		
15 †	1.0	-7.5	-3.3	21.3	0.0	T	T	T	6		
16 †	-3.0	-18.5	-10.8	28.8	0.0	0.0	0.0	0.0	5		
17 †	1.5	-16.5	-7.5	25.5	0.0	0.0	1.8	1.8	5		
18 †	1.5	-3.0	-0.8	18.8	0.0	0.0	11.4	11.4	7		
19 †	3.0	-3.0	0.0	18.0	0.0	0.0	0.0	0.0	18		
20 †	4.5	-1.5	1.5	16.5	0.0	0.0	0.0	0.0	13		
21 †	6.0	-6.5	-0.3	18.3	0.0	10.2	T	10.2	10		
22 †	1.0	-4.5	-1.8	19.8	0.0	0.0	1.0	1.0	6		
23 †	2.5	-7.5	-2.5	20.5	0.0	0.0	0.0	0.0	6		
24 †	1.0	-7.5	-3.3	21.3	0.0	0.0	T	T	6		
25 †	4.5	-4.5	0.0	18.0	0.0	0.0	0.0	0.0	6		
26 †	8.5	-2.0	3.3	14.7	0.0	3.4	0.0	3.4	5		
27 †	5.0	-4.0	0.5	17.5	0.0	19.4	T	19.4	T		
28 †	-1.5	-5.5	-3.5	21.5	0.0	0.0	T	T	T		
29 †	-2.5	-6.5	-4.5	22.5	0.0	0.0	0.0	0.0	T		
30 †	-3.0	-11.5	-7.3	25.3	0.0	0.0	0.0	0.0	T		
Sum				619.7	0.0	47.4	28.0	75.4			
Avg	1.3	-6.6	-2.7								
Xtrm	8.5	-21.5									

Summary, average and extreme values are based on the data above.

Legend

- A = Accumulated
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Date modified:
2019-12-04

Appendix D
Laboratory Certificates of Analysis

CADUCEON ENVIRONMENTAL LABORATORIES
Client committed. Quality assured.

CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G71195 **REPORT No. B18-15048**

Report To:

Cambium Environmental
PO Box 325, 52 Hunter Street East
Peterborough ON K9H 1G5 Canada
Attention: Stephanie Reeder

Caduceon Environmental Laboratories
285 Dalton Ave
Kingston Ontario K7K 6Z1
Tel: 613-544-2001
Fax: 613-544-2770

DATE RECEIVED: 31-May-18
DATE REPORTED: 13-Jun-18
SAMPLE MATRIX: Surface Water

JOB/PROJECT NO.: Cavendish WDS
P.O. NUMBER: 7205-002
WATERWORKS NO.

			Client I.D.		SW1	SW2	SW3	SW4
			Sample I.D.		B18-15048-1	B18-15048-2	B18-15048-3	B18-15048-4
			Date Collected		30-May-18	30-May-18	30-May-18	30-May-18
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	05-Jun-18/O	229	503	163	52
Conductivity @25°C	µmho/cm	1	SM 2510B	05-Jun-18/O	523	1490	380	310
pH @25°C	pH Units		SM 4500H	05-Jun-18/O	7.33	7.67	7.42	7.09
Total Dissolved Solids	mg/L	3	SM 2540D	07-Jun-18/O	271	812	196	159
Total Suspended Solids	mg/L	3	SM2540D	31-May-18/K	900	1400	330	< 3
BOD(5 day)	mg/L	2	SM 5210B	31-May-18/K	69	16	9	2
COD	mg/L	5	SM 5220D	06-Jun-18/O	622	286	95	86
Phenolics	mg/L	0.001	MOEE 3179	05-Jun-18/O	0.013	< 0.001	< 0.001	< 0.001
Chloride	mg/L	0.5	SM4110C	01-Jun-18/O	26.0	194	20.9	67.9
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	01-Jun-18/K	0.41	4.75	0.06	0.05
Sulphate	mg/L	1	SM4110C	01-Jun-18/O	1	< 1	2	< 1
Nitrite (N)	mg/L	0.05	SM4110C	01-Jun-18/O	< 0.05	< 0.05	< 0.05	< 0.05
Nitrate (N)	mg/L	0.05	SM4110C	01-Jun-18/O	< 0.05	< 0.05	< 0.05	< 0.05
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	05-Jun-18/K	24.9	8.3	1.4	1.0
Hardness (as CaCO3)	mg/L	1	SM 3120	11-Jun-18/O	275	758	167	82
Iron	mg/L	0.005	SM 3120	11-Jun-18/O	197	65.1	3.98	3.32
Manganese	mg/L	0.001	SM 3120	11-Jun-18/O	2.63	8.32	5.36	0.737
Phosphorus-Total	mg/L	0.01	E3199A.1	05-Jun-18/K	7.29	1.17	0.13	0.08

Michelle Dubien
Lab Manager

R.L. = Reporting Limit
Test methods may be modified from specified reference method unless indicated by an *
Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

CADUCEON ENVIRONMENTAL LABORATORIES
Client committed. Quality assured.

CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G71195 **REPORT No. B18-15048**

Report To:

Cambium Environmental
PO Box 325, 52 Hunter Street East
Peterborough ON K9H 1G5 Canada
Attention: Stephanie Reeder

Caduceon Environmental Laboratories
285 Dalton Ave
Kingston Ontario K7K 6Z1
Tel: 613-544-2001
Fax: 613-544-2770

DATE RECEIVED: 31-May-18
DATE REPORTED: 13-Jun-18
SAMPLE MATRIX: Surface Water

JOB/PROJECT NO.: Cavendish WDS
P.O. NUMBER: 7205-002
WATERWORKS NO.

			Client I.D.		SW5	SW6	SW QA/QC	
			Sample I.D.		B18-15048-5	B18-15048-6	B18-15048-7	
			Date Collected		30-May-18	30-May-18	30-May-18	
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	05-Jun-18/O	27	59	51	
Conductivity @25°C	µmho/cm	1	SM 2510B	05-Jun-18/O	156	495	309	
pH @25°C	pH Units		SM 4500H	05-Jun-18/O	7.34	7.48	7.15	
Total Dissolved Solids	mg/L	3	SM 2540D	07-Jun-18/O	79	256	159	
Total Suspended Solids	mg/L	3	SM2540D	31-May-18/K	< 3	5	22	
BOD(5 day)	mg/L	2	SM 5210B	31-May-18/K	< 2	< 2	< 2	
COD	mg/L	5	SM 5220D	06-Jun-18/O	39	34	83	
Phenolics	mg/L	0.001	MOEE 3179	05-Jun-18/O	< 0.001	< 0.001	< 0.001	
Chloride	mg/L	0.5	SM4110C	01-Jun-18/O	29.5	125	67.6	
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	01-Jun-18/K	0.08	0.02	0.04	
Sulphate	mg/L	1	SM4110C	01-Jun-18/O	1	3	< 1	
Nitrite (N)	mg/L	0.05	SM4110C	01-Jun-18/O	< 0.05	< 0.05	< 0.05	
Nitrate (N)	mg/L	0.05	SM4110C	01-Jun-18/O	0.09	< 0.05	< 0.05	
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	05-Jun-18/K	0.5	0.6	1.0	
Hardness (as CaCO3)	mg/L	1	SM 3120	11-Jun-18/O	50	95	79	
Iron	mg/L	0.005	SM 3120	11-Jun-18/O	0.586	1.13	3.16	
Manganese	mg/L	0.001	SM 3120	11-Jun-18/O	0.055	0.094	0.704	
Phosphorus-Total	mg/L	0.01	E3199A.1	05-Jun-18/K	0.04	0.03	0.06	

Michelle Dubien
Lab Manager

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Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

CADUCEON™ ENVIRONMENTAL LABORATORIES
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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G71195 **REPORT No. B18-15051**

Report To:

Cambium Environmental
PO Box 325, 52 Hunter Street East
Peterborough ON K9H 1G5 Canada
Attention: Stephanie Reeder

Caduceon Environmental Laboratories
285 Dalton Ave
Kingston Ontario K7K 6Z1
Tel: 613-544-2001
Fax: 613-544-2770

DATE RECEIVED: 31-May-18
DATE REPORTED: 12-Jun-18
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Cavendish WDS
P.O. NUMBER: 7205-002
WATERWORKS NO.

			Client I.D.		DP1	DP5	DP4	DP6
			Sample I.D.		B18-15051-1	B18-15051-2	B18-15051-3	B18-15051-4
			Date Collected		30-May-18	30-May-18	30-May-18	30-May-18
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	05-Jun-18/O	356	401	26	143
Conductivity @25°C	µmho/cm	1	SM 2510B	05-Jun-18/O	1230	2460	175	547
pH @25°C	pH Units		SM 4500H	05-Jun-18/O	7.79	7.52	7.47	7.52
Total Dissolved Solids	mg/L	3	SM 2540D	07-Jun-18/O	664	1370	89	283
Dissolved Organic Carbon	mg/L	0.2	EPA 415.1	05-Jun-18/O	16.8	5.5	2.5	15.7
COD	mg/L	5	SM 5220D	06-Jun-18/O	110	130	62	1550
Chloride	mg/L	0.5	SM4110C	01-Jun-18/O	203	621	42.0	32.6
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	01-Jun-18/K	2.88	0.91	0.02	0.51
Sulphate	mg/L	1	SM4110C	01-Jun-18/O	1	26	3	118
Nitrate (N)	mg/L	0.05	SM4110C	01-Jun-18/O	0.33	< 0.05	0.09	0.06
Hardness (as CaCO3)	mg/L	1	SM 3120	11-Jun-18/O	343	1030	63	225
Barium	mg/L	0.001	SM 3120	11-Jun-18/O	0.467	0.657	0.057	0.118
Boron	mg/L	0.005	SM 3120	11-Jun-18/O	0.510	0.365	0.010	0.085
Calcium	mg/L	0.02	SM 3120	11-Jun-18/O	102	364	18.8	71.1
Iron	mg/L	0.005	SM 3120	11-Jun-18/O	10.6	27.6	0.037	4.38
Magnesium	mg/L	0.02	SM 3120	11-Jun-18/O	21.4	29.4	3.99	11.4
Manganese	mg/L	0.001	SM 3120	11-Jun-18/O	0.542	11.7	0.002	0.420
Sodium	mg/L	0.2	SM 3120	11-Jun-18/O	92.3	78.9	19.7	8.1

Michelle Dubien
Lab Manager

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G71195 **REPORT No. B18-15051**

Report To:

Cambium Environmental
PO Box 325, 52 Hunter Street East
Peterborough ON K9H 1G5 Canada
Attention: Stephanie Reeder

Caduceon Environmental Laboratories
285 Dalton Ave
Kingston Ontario K7K 6Z1
Tel: 613-544-2001
Fax: 613-544-2770

DATE RECEIVED: 31-May-18
DATE REPORTED: 12-Jun-18
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Cavendish WDS
P.O. NUMBER: 7205-002
WATERWORKS NO.

			Client I.D.		GW QA/QC			
			Sample I.D.		B18-15051-5			
			Date Collected		30-May-18			
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	05-Jun-18/O	25			
Conductivity @25°C	µmho/cm	1	SM 2510B	05-Jun-18/O	185			
pH @25°C	pH Units		SM 4500H	05-Jun-18/O	7.45			
Total Dissolved Solids	mg/L	3	SM 2540D	07-Jun-18/O	94			
Dissolved Organic Carbon	mg/L	0.2	EPA 415.1	05-Jun-18/O	2.4			
COD	mg/L	5	SM 5220D	06-Jun-18/O	65			
Chloride	mg/L	0.5	SM4110C	01-Jun-18/O	42.3			
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	01-Jun-18/K	0.02			
Sulphate	mg/L	1	SM4110C	01-Jun-18/O	3			
Nitrate (N)	mg/L	0.05	SM4110C	01-Jun-18/O	0.06			
Hardness (as CaCO3)	mg/L	1	SM 3120	11-Jun-18/O	66			
Barium	mg/L	0.001	SM 3120	11-Jun-18/O	0.060			
Boron	mg/L	0.005	SM 3120	11-Jun-18/O	0.009			
Calcium	mg/L	0.02	SM 3120	11-Jun-18/O	19.7			
Iron	mg/L	0.005	SM 3120	11-Jun-18/O	0.035			
Magnesium	mg/L	0.02	SM 3120	11-Jun-18/O	4.10			
Manganese	mg/L	0.001	SM 3120	11-Jun-18/O	0.001			
Sodium	mg/L	0.2	SM 3120	11-Jun-18/O	20.1			

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Michelle Dubien
Lab Manager

CADUCEON ENVIRONMENTAL LABORATORIES
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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G72699 **REPORT No. B18-35312**

Report To:

Cambium Environmental
PO Box 325, 52 Hunter Street East
Peterborough ON K9H 1G5 Canada
Attention: Stephanie Reeder

Caduceon Environmental Laboratories
285 Dalton Ave
Kingston Ontario K7K 6Z1
Tel: 613-544-2001
Fax: 613-544-2770

DATE RECEIVED: 15-Nov-18
DATE REPORTED: 26-Nov-18
SAMPLE MATRIX: Surface Water

JOB/PROJECT NO.: Cavendish WDS
P.O. NUMBER: 7205-002
WATERWORKS NO.

			Client I.D.		SW1	SW6	SW4	SW QA/QC
			Sample I.D.		B18-35312-1	B18-35312-2	B18-35312-3	B18-35312-4
			Date Collected		13-Nov-18	13-Nov-18	13-Nov-18	13-Nov-18
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	16-Nov-18/O	68	34	36	37
Conductivity @25°C	µmho/cm	1	SM 2510B	16-Nov-18/O	254	518	291	293
pH @25°C	pH Units		SM 4500H	16-Nov-18/O	6.87	6.77	7.16	7.19
Total Dissolved Solids	mg/L	3	SM 2540D	19-Nov-18/O	130	268	149	150
Total Suspended Solids	mg/L	3	SM2540D	19-Nov-18/K	8	5	< 3	< 3
BOD(5 day)	mg/L	3	SM 5210B	15-Nov-18/K	5	4	4	4
COD	mg/L	5	SM 5220D	19-Nov-18/O	87	23	60	63
Phenolics	mg/L	0.002	MOEE 3179	20-Nov-18/K	0.004	< 0.002	0.002	< 0.002
Chloride	mg/L	0.5	SM4110C	19-Nov-18/O	3.1	129	59.1	59.2
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	19-Nov-18/K	0.16	0.04	0.02	0.03
Sulphate	mg/L	1	SM4110C	19-Nov-18/O	46	5	6	6
Nitrite (N)	mg/L	0.05	SM4110C	19-Nov-18/O	< 0.05	< 0.05	< 0.05	< 0.05
Nitrate (N)	mg/L	0.05	SM4110C	19-Nov-18/O	< 0.05	< 0.05	< 0.05	< 0.05
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	16-Nov-18/K	1.3	0.3	0.6	0.6
Mercury	mg/L	0.00002	SM 3112 B	22-Nov-18/O	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Hardness (as CaCO3)	mg/L	1	SM 3120	21-Nov-18/O	133	105	65	64
Arsenic	mg/L	0.0001	EPA 200.8	16-Nov-18/O	0.0009	< 0.0001	0.0002	0.0002
Barium	mg/L	0.001	SM 3120	21-Nov-18/O	0.048	0.104	0.036	0.035
Boron	mg/L	0.005	SM 3120	21-Nov-18/O	0.095	0.008	0.040	0.041
Cadmium	mg/L	).000015	EPA 200.8	16-Nov-18/O	0.000051	< 0.000015	< 0.000015	< 0.000015
Chromium	mg/L	0.001	EPA 200.8	16-Nov-18/O	< 0.001	< 0.001	< 0.001	< 0.001
Copper	mg/L	0.0001	EPA 200.8	16-Nov-18/O	0.0020	0.0005	0.0010	0.0010
Iron	mg/L	0.005	SM 3120	21-Nov-18/O	8.09	1.27	0.291	0.243
Lead	mg/L	0.00002	EPA 200.8	16-Nov-18/O	0.00034	0.00004	0.00009	0.00008
Manganese	mg/L	0.001	SM 3120	21-Nov-18/O	1.15	0.095	0.004	0.003
Phosphorus-Total	mg/L	0.01	E3199A.1	16-Nov-18/K	0.11	0.03	0.02	0.02
Zinc	mg/L	0.005	SM 3120	21-Nov-18/O	0.045	0.018	0.020	0.017

Michelle Dubien
Lab Manager

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Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G72699 **REPORT No. B18-35312**

Report To:

Cambium Environmental
PO Box 325, 52 Hunter Street East
Peterborough ON K9H 1G5 Canada
Attention: Stephanie Reeder

Caduceon Environmental Laboratories
285 Dalton Ave
Kingston Ontario K7K 6Z1
Tel: 613-544-2001
Fax: 613-544-2770

DATE RECEIVED: 15-Nov-18
DATE REPORTED: 26-Nov-18
SAMPLE MATRIX: Surface Water

JOB/PROJECT NO.: Cavendish WDS
P.O. NUMBER: 7205-002
WATERWORKS NO.

			Client I.D.		SW1	SW6	SW4	SW QA/QC
			Sample I.D.		B18-35312-1	B18-35312-2	B18-35312-3	B18-35312-4
			Date Collected		13-Nov-18	13-Nov-18	13-Nov-18	13-Nov-18
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				

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Michelle Dubien
Lab Manager

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Caduceon Environmental Laboratories
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Kingston Ontario K7K 6Z1
Tel: 613-544-2001
Fax: 613-544-2770

DATE RECEIVED: 15-Nov-18
DATE REPORTED: 26-Nov-18
SAMPLE MATRIX: Surface Water

JOB/PROJECT NO.: Cavendish WDS
P.O. NUMBER: 7205-002
WATERWORKS NO.

			Client I.D.		SW5			
			Sample I.D.		B18-35312-5			
			Date Collected		13-Nov-18			
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	16-Nov-18/O	29			
Conductivity @25°C	µmho/cm	1	SM 2510B	16-Nov-18/O	202			
pH @25°C	pH Units		SM 4500H	16-Nov-18/O	7.29			
Total Dissolved Solids	mg/L	3	SM 2540D	19-Nov-18/O	103			
Total Suspended Solids	mg/L	3	SM2540D	19-Nov-18/K	< 3			
BOD(5 day)	mg/L	3	SM 5210B	15-Nov-18/K	4			
COD	mg/L	5	SM 5220D	19-Nov-18/O	46			
Phenolics	mg/L	0.002	MOEE 3179	20-Nov-18/K	0.003			
Chloride	mg/L	0.5	SM4110C	19-Nov-18/O	39.5			
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	19-Nov-18/K	0.04			
Sulphate	mg/L	1	SM4110C	19-Nov-18/O	< 1			
Nitrite (N)	mg/L	0.05	SM4110C	19-Nov-18/O	< 0.05			
Nitrate (N)	mg/L	0.05	SM4110C	19-Nov-18/O	< 0.05			
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	16-Nov-18/K	0.6			
Mercury	mg/L	0.00002	SM 3112 B	22-Nov-18/O	< 0.00002			
Hardness (as CaCO3)	mg/L	1	SM 3120	21-Nov-18/O	51			
Arsenic	mg/L	0.0001	EPA 200.8	16-Nov-18/O	0.0002			
Barium	mg/L	0.001	SM 3120	21-Nov-18/O	0.035			
Boron	mg/L	0.005	SM 3120	21-Nov-18/O	0.019			
Cadmium	mg/L	0.000015	EPA 200.8	16-Nov-18/O	< 0.000015			
Chromium	mg/L	0.001	EPA 200.8	16-Nov-18/O	< 0.001			
Copper	mg/L	0.0001	EPA 200.8	16-Nov-18/O	0.0005			
Iron	mg/L	0.005	SM 3120	21-Nov-18/O	0.330			
Lead	mg/L	0.00002	EPA 200.8	16-Nov-18/O	0.00004			
Manganese	mg/L	0.001	SM 3120	21-Nov-18/O	0.011			
Phosphorus-Total	mg/L	0.01	E3199A.1	16-Nov-18/K	0.02			
Zinc	mg/L	0.005	SM 3120	21-Nov-18/O	0.013			

Michelle Dubien
Lab Manager

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Final Report

C.O.C.: G72699 **REPORT No. B18-35312**

Report To:

Cambium Environmental
PO Box 325, 52 Hunter Street East
Peterborough ON K9H 1G5 Canada
Attention: Stephanie Reeder

Caduceon Environmental Laboratories
285 Dalton Ave
Kingston Ontario K7K 6Z1
Tel: 613-544-2001
Fax: 613-544-2770

DATE RECEIVED: 15-Nov-18
DATE REPORTED: 26-Nov-18
SAMPLE MATRIX: Surface Water

JOB/PROJECT NO.: Cavendish WDS
P.O. NUMBER: 7205-002
WATERWORKS NO.

			Client I.D.		SW5			
			Sample I.D.		B18-35312-5			
			Date Collected		13-Nov-18			
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				

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Michelle Dubien
Lab Manager

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G72699 **REPORT No. B18-35313**

Report To:

Cambium Environmental
PO Box 325, 52 Hunter Street East
Peterborough ON K9H 1G5 Canada
Attention: Stephanie Reeder

Caduceon Environmental Laboratories
285 Dalton Ave
Kingston Ontario K7K 6Z1
Tel: 613-544-2001
Fax: 613-544-2770

DATE RECEIVED: 15-Nov-18
DATE REPORTED: 22-Nov-18
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Cavendish WDS
P.O. NUMBER: 7205-002
WATERWORKS NO.

			Client I.D.		DP4	DP5	GW QA/QC	DP1
			Sample I.D.		B18-35313-1	B18-35313-2	B18-35313-3	B18-35313-4
			Date Collected		13-Nov-18	13-Nov-18	13-Nov-18	13-Nov-18
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	16-Nov-18/O	26	502	499	334
Conductivity @25°C	µmho/cm	1	SM 2510B	16-Nov-18/O	465	1490	1500	1330
pH @25°C	pH Units		SM 4500H	16-Nov-18/O	7.15	7.60	7.55	7.63
Total Dissolved Solids	mg/L	3	SM 2540D	19-Nov-18/O	240	812	818	721
Dissolved Organic Carbon	mg/L	0.2	EPA 415.1	16-Nov-18/O	2.3	10.1	10.4	8.4
COD	mg/L	5	SM 5220D	19-Nov-18/O	32	330	544	129
Phenolics	mg/L	0.002	MOEE 3179	20-Nov-18/K	0.002	0.005	0.006	0.003
Chloride	mg/L	0.5	SM4110C	19-Nov-18/O	117	174	178	213
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	19-Nov-18/K	0.03	0.93	0.96	3.12
Sulphate	mg/L	1	SM4110C	19-Nov-18/O	4	5	8	1
Nitrite (N)	mg/L	0.05	SM4110C	19-Nov-18/O	< 0.05	< 0.05	< 0.05	< 0.05
Nitrate (N)	mg/L	0.05	SM4110C	19-Nov-18/O	< 0.05	< 0.05	< 0.05	0.16
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	16-Nov-18/K	0.3	14.5	17.3	4.4
Hardness (as CaCO3)	mg/L	1	SM 3120	21-Nov-18/O	115	598	595	390
Arsenic	mg/L	0.0001	EPA 200.8	16-Nov-18/O	< 0.0001	0.0015	0.0016	0.0007
Barium	mg/L	0.001	SM 3120	21-Nov-18/O	0.107	0.380	0.377	0.543
Boron	mg/L	0.005	SM 3120	21-Nov-18/O	< 0.005	0.382	0.386	0.659
Cadmium	mg/L	).000015	EPA 200.8	16-Nov-18/O	0.000015	< 0.000015	< 0.000015	< 0.000015
Calcium	mg/L	0.02	SM 3120	21-Nov-18/O	34.4	213	212	117
Chromium	mg/L	0.001	EPA 200.8	16-Nov-18/O	0.003	< 0.001	< 0.001	< 0.001
Copper	mg/L	0.0001	EPA 200.8	16-Nov-18/O	0.0006	0.0008	0.0008	0.0010
Iron	mg/L	0.005	SM 3120	21-Nov-18/O	< 0.005	< 0.005	< 0.005	< 0.005
Lead	mg/L	0.00002	EPA 200.8	16-Nov-18/O	< 0.00002	< 0.00002	< 0.00002	0.00017
Magnesium	mg/L	0.02	SM 3120	21-Nov-18/O	6.94	15.9	15.8	23.7
Manganese	mg/L	0.001	SM 3120	21-Nov-18/O	0.008	6.44	6.42	0.654
Mercury	mg/L	0.00002	SM 3112 B	22-Nov-18/O	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Phosphorus-Total	mg/L	0.01	E3199A.1	16-Nov-18/K	0.50	14.4	21.1	0.09

Michelle Dubien
Lab Manager

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G72699 **REPORT No. B18-35313**

Report To:

Cambium Environmental
PO Box 325, 52 Hunter Street East
Peterborough ON K9H 1G5 Canada
Attention: Stephanie Reeder

Caduceon Environmental Laboratories
285 Dalton Ave
Kingston Ontario K7K 6Z1
Tel: 613-544-2001
Fax: 613-544-2770

DATE RECEIVED: 15-Nov-18
DATE REPORTED: 22-Nov-18
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Cavendish WDS
P.O. NUMBER: 7205-002
WATERWORKS NO.

	Client I.D.				DP4	DP5	GW QA/QC	DP1
	Sample I.D.				B18-35313-1	B18-35313-2	B18-35313-3	B18-35313-4
	Date Collected				13-Nov-18	13-Nov-18	13-Nov-18	13-Nov-18
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Potassium	mg/L	0.1	SM 3120	21-Nov-18/O	< 0.1	< 0.1	< 0.1	< 0.1
Sodium	mg/L	0.2	SM 3120	21-Nov-18/O	37.6	99.3	98.9	106
Zinc	mg/L	0.005	SM 3120	21-Nov-18/O	0.005	0.011	0.009	51.8
Benzene	µg/L	0.5	EPA 8260	16-Nov-18/R	< 0.5	< 0.5	< 0.5	< 0.5
Dichlorobenzene,1,4-	µg/L	0.5	EPA 8260	16-Nov-18/R	< 0.5	< 0.5	< 0.5	< 0.5
Dichloromethane (Methylene Chloride)	µg/L	0.3	EPA 8260	16-Nov-18/R	< 0.3	< 0.3	< 0.3	< 0.3
Toluene	µg/L	0.5	EPA 8260	16-Nov-18/R	< 0.5	< 0.5	< 0.5	< 0.5
Vinyl Chloride	µg/L	0.5	EPA 8260	16-Nov-18/R	< 0.5	< 0.5	< 0.5	< 0.5

1 Results unavailable for some requested parameters due to low sample volumes

Michelle Dubien
Lab Manager

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Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G72699 **REPORT No. B18-35313**

Report To:

Cambium Environmental
PO Box 325, 52 Hunter Street East
Peterborough ON K9H 1G5 Canada
Attention: Stephanie Reeder

Caduceon Environmental Laboratories
285 Dalton Ave
Kingston Ontario K7K 6Z1
Tel: 613-544-2001
Fax: 613-544-2770

DATE RECEIVED: 15-Nov-18
DATE REPORTED: 22-Nov-18
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Cavendish WDS
P.O. NUMBER: 7205-002
WATERWORKS NO.

			Client I.D.		DP6			
			Sample I.D.		B18-35313-5			
			Date Collected		13-Nov-18			
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	16-Nov-18/O	203			
Conductivity @25°C	µmho/cm	1	SM 2510B	16-Nov-18/O	804			
pH @25°C	pH Units		SM 4500H	16-Nov-18/O	7.55			
Total Dissolved Solids	mg/L	3	SM 2540D	19-Nov-18/O	422			
Dissolved Organic Carbon	mg/L	0.2	EPA 415.1	16-Nov-18/O	9.3			
COD	mg/L	5	SM 5220D	19-Nov-18/O	381			
Phenolics	mg/L	0.002	MOEE 3179	20-Nov-18/K	< 0.002			
Chloride	mg/L	0.5	SM4110C	19-Nov-18/O	44.5			
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	19-Nov-18/K	0.84			
Sulphate	mg/L	1	SM4110C	19-Nov-18/O	150			
Nitrite (N)	mg/L	0.05	SM4110C	19-Nov-18/O	< 0.05			
Nitrate (N)	mg/L	0.05	SM4110C	19-Nov-18/O	0.13			
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	16-Nov-18/K	5.6			
Hardness (as CaCO3)	mg/L	1	SM 3120	21-Nov-18/O	401			
Arsenic	mg/L	0.0001	EPA 200.8	16-Nov-18/O	0.0003			
Barium	mg/L	0.001	SM 3120	21-Nov-18/O	0.251			
Boron	mg/L	0.005	SM 3120	21-Nov-18/O	0.126			
Cadmium	mg/L	).000015	EPA 200.8	16-Nov-18/O	< 0.000015			
Calcium	mg/L	0.02	SM 3120	21-Nov-18/O	135			
Chromium	mg/L	0.001	EPA 200.8	16-Nov-18/O	< 0.001			
Copper	mg/L	0.0001	EPA 200.8	16-Nov-18/O	0.0002			
Iron	mg/L	0.005	SM 3120	21-Nov-18/O	< 0.005			
Lead	mg/L	0.00002	EPA 200.8	16-Nov-18/O	< 0.00002			
Magnesium	mg/L	0.02	SM 3120	21-Nov-18/O	15.4			
Manganese	mg/L	0.001	SM 3120	21-Nov-18/O	0.748			
Mercury	mg/L	0.00002	SM 3112 B	22-Nov-18/O	< 0.00002			
Phosphorus-Total	mg/L	0.01	E3199A.1	16-Nov-18/K	2.39			

Michelle Dubien
Lab Manager

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G72699 **REPORT No. B18-35313**

Report To:

Cambium Environmental
PO Box 325, 52 Hunter Street East
Peterborough ON K9H 1G5 Canada
Attention: Stephanie Reeder

Caduceon Environmental Laboratories
285 Dalton Ave
Kingston Ontario K7K 6Z1
Tel: 613-544-2001
Fax: 613-544-2770

DATE RECEIVED: 15-Nov-18
DATE REPORTED: 22-Nov-18
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Cavendish WDS
P.O. NUMBER: 7205-002
WATERWORKS NO.

			Client I.D.		DP6			
			Sample I.D.		B18-35313-5			
			Date Collected		13-Nov-18			
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Potassium	mg/L	0.1	SM 3120	21-Nov-18/O	< 0.1			
Sodium	mg/L	0.2	SM 3120	21-Nov-18/O	9.3			
Zinc	mg/L	0.005	SM 3120	21-Nov-18/O	0.021			
Benzene	µg/L	0.5	EPA 8260	16-Nov-18/R	< 0.5			
Dichlorobenzene,1,4-	µg/L	0.5	EPA 8260	16-Nov-18/R	< 0.5			
Dichloromethane (Methylene Chloride)	µg/L	0.3	EPA 8260	16-Nov-18/R	< 0.3			
Toluene	µg/L	0.5	EPA 8260	16-Nov-18/R	< 0.5			
Vinyl Chloride	µg/L	0.5	EPA 8260	16-Nov-18/R	< 0.5			

1 . Results unavailable for some requested parameters due to low sample volumes

Michelle Dubien
Lab Manager

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Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G77356 **REPORT No. B19-10175**

Report To:

Cambium Environmental
PO Box 325, 52 Hunter Street East
Peterborough ON K9H 1G5 Canada
Attention: Stephanie Reeder

Caduceon Environmental Laboratories
285 Dalton Ave
Kingston Ontario K7K 6Z1
Tel: 613-544-2001
Fax: 613-544-2770

DATE RECEIVED: 18-Apr-19
DATE REPORTED: 29-Apr-19
SAMPLE MATRIX: Surface Water

JOB/PROJECT NO.: Cavendish WDS
P.O. NUMBER: 8640-002
WATERWORKS NO.

			Client I.D.		SW4	SW QA/QC	SW5	SW2
			Sample I.D.		B19-10175-1	B19-10175-2	B19-10175-3	B19-10175-4
			Date Collected		16-Apr-19	16-Apr-19	16-Apr-19	16-Apr-19
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	22-Apr-19/O	29	30	16	95
Conductivity @25°C	µmho/cm	1	SM 2510B	22-Apr-19/O	192	193	135	274
pH @25°C	pH Units		SM 4500H	22-Apr-19/O	6.83	6.88	6.78	7.22
TDS (Calc. from Cond.)	mg/L	1	Calc.	23-Apr-19	98	98	68	140
Total Suspended Solids	mg/L	3	SM2540D	24-Apr-19/K	3	< 3	< 3	12
Dissolved Organic Carbon	mg/L	0.2	EPA 415.1	24-Apr-19/O	9.1	9.6	9.4	14.2
BOD(5 day)	mg/L	3	SM 5210B	22-Apr-19/K	< 3	< 3	< 3	6
COD	mg/L	5	SM 5220D	24-Apr-19/O	23	13	21	42
Phenolics	mg/L	0.002	MOEE 3179	24-Apr-19/K	< 0.002	< 0.002	< 0.002	0.005
Chloride	mg/L	0.5	SM4110C	24-Apr-19/O	35.1	34.7	24.7	22.4
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	24-Apr-19/K	0.04	0.03	0.04	0.63
Sulphate	mg/L	1	SM4110C	24-Apr-19/O	4	4	3	< 1
Nitrite (N)	mg/L	0.05	SM4110C	24-Apr-19/O	< 0.05	< 0.05	< 0.05	< 0.05
Nitrate (N)	mg/L	0.05	SM4110C	24-Apr-19/O	< 0.05	< 0.05	< 0.05	< 0.05
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	23-Apr-19/K	0.4	0.3	0.3	1.2
Hardness (as CaCO3)	mg/L	1	SM 3120	23-Apr-19/O	42	40	31	106
Boron	mg/L	0.005	SM 3120	23-Apr-19/O	0.024	0.023	0.011	0.110
Calcium	mg/L	0.02	SM 3120	23-Apr-19/O	13.0	12.5	9.65	32.3
Iron	mg/L	0.005	SM 3120	23-Apr-19/O	0.201	0.193	0.284	1.25
Magnesium	mg/L	0.02	SM 3120	23-Apr-19/O	2.29	2.21	1.58	6.16
Manganese	mg/L	0.001	SM 3120	23-Apr-19/O	0.010	0.009	0.018	1.52
Phosphorus-Total	mg/L	0.01	E3199A.1	23-Apr-19/K	< 0.01	0.02	0.02	0.07
Sodium	mg/L	0.2	SM 3120	23-Apr-19/O	21.6	21.0	13.7	11.1

Michelle Dubien
Lab Manager

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Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G77356 **REPORT No. B19-10175**

Report To:

Cambium Environmental
PO Box 325, 52 Hunter Street East
Peterborough ON K9H 1G5 Canada
Attention: Stephanie Reeder

Caduceon Environmental Laboratories
285 Dalton Ave
Kingston Ontario K7K 6Z1
Tel: 613-544-2001
Fax: 613-544-2770

DATE RECEIVED: 18-Apr-19
DATE REPORTED: 29-Apr-19
SAMPLE MATRIX: Surface Water

JOB/PROJECT NO.: Cavendish WDS
P.O. NUMBER: 8640-002
WATERWORKS NO.

			Client I.D.		SW3	SW1	SW6	
			Sample I.D.		B19-10175-5	B19-10175-6	B19-10175-7	
			Date Collected		16-Apr-19	16-Apr-19	16-Apr-19	
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	22-Apr-19/O	93	27	25	
Conductivity @25°C	µmho/cm	1	SM 2510B	22-Apr-19/O	234	74	115	
pH @25°C	pH Units		SM 4500H	22-Apr-19/O	7.11	6.49	6.56	
TDS (Calc. from Cond.)	mg/L	1	Calc.	23-Apr-19	120	37	58	
Total Suspended Solids	mg/L	3	SM2540D	24-Apr-19/K	< 3	< 3	< 3	
Dissolved Organic Carbon	mg/L	0.2	EPA 415.1	24-Apr-19/O	9.8	9.5	3.2	
BOD(5 day)	mg/L	3	SM 5210B	22-Apr-19/K	< 3	< 3	< 3	
COD	mg/L	5	SM 5220D	24-Apr-19/O	14	25	< 5	
Phenolics	mg/L	0.002	MOEE 3179	24-Apr-19/K	< 0.002	< 0.002	< 0.002	
Chloride	mg/L	0.5	SM4110C	24-Apr-19/O	5.4	0.9	14.8	
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	24-Apr-19/K	0.04	0.08	0.05	
Sulphate	mg/L	1	SM4110C	24-Apr-19/O	13	6	4	
Nitrite (N)	mg/L	0.05	SM4110C	24-Apr-19/O	< 0.05	< 0.05	< 0.05	
Nitrate (N)	mg/L	0.05	SM4110C	24-Apr-19/O	< 0.05	< 0.05	< 0.05	
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	23-Apr-19/K	0.3	0.4	0.2	
Hardness (as CaCO3)	mg/L	1	SM 3120	23-Apr-19/O	104	34	27	
Boron	mg/L	0.005	SM 3120	23-Apr-19/O	0.170	0.021	< 0.005	
Calcium	mg/L	0.02	SM 3120	23-Apr-19/O	31.0	10.4	7.67	
Iron	mg/L	0.005	SM 3120	23-Apr-19/O	0.434	1.67	0.583	
Magnesium	mg/L	0.02	SM 3120	23-Apr-19/O	6.47	1.85	1.92	
Manganese	mg/L	0.001	SM 3120	23-Apr-19/O	0.403	0.234	0.011	
Phosphorus-Total	mg/L	0.01	E3199A.1	23-Apr-19/K	0.02	0.05	0.05	
Sodium	mg/L	0.2	SM 3120	23-Apr-19/O	7.4	1.7	12.2	

Michelle Dubien
Lab Manager

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: ---

REPORT No. B19-10200

Report To:

Cambium Environmental
PO Box 325, 52 Hunter Street East
Peterborough ON K9H 1G5 Canada
Attention: Stephanie Reeder

Caduceon Environmental Laboratories
285 Dalton Ave
Kingston Ontario K7K 6Z1
Tel: 613-544-2001
Fax: 613-544-2770

DATE RECEIVED: 18-Apr-19
DATE REPORTED: 25-Apr-19
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Cavendish WDS
P.O. NUMBER: 8640-002
WATERWORKS NO.

			Client I.D.		DP1	DP6	DP4	DP5
			Sample I.D.		B19-10200-1	B19-10200-2	B19-10200-3	B19-10200-4
			Date Collected		16-Apr-19	16-Apr-19	16-Apr-19	16-Apr-19
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	22-Apr-19/O	366	40	31	543
Conductivity @25°C	µmho/cm	1	SM 2510B	22-Apr-19/O	1440	141	77	1780
pH @25°C	pH Units		SM 4500H	22-Apr-19/O	7.48	6.93	7.01	7.65
TDS (Calc. from Cond.)	mg/L	1	Calc.	23-Apr-19	738	72	39	977
Dissolved Organic Carbon	mg/L	0.2	EPA 415.1	24-Apr-19/O	7.8	21.6	4.3	10.5
COD	mg/L	5	SM 5220D	24-Apr-19/O	125	1020	69	276
Chloride	mg/L	0.5	SM4110C	25-Apr-19/O	227	5.5	4.9	243
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	24-Apr-19/K	3.06	0.50	0.03	0.85
Sulphate	mg/L	1	SM4110C	25-Apr-19/O	2	15	4	11
Nitrite (N)	mg/L	0.05	SM4110C	25-Apr-19/O	< 0.05	< 0.05	< 0.05	< 0.05
Nitrate (N)	mg/L	0.05	SM4110C	25-Apr-19/O	0.07	< 0.05	< 0.05	< 0.05
Hardness (as CaCO3)	mg/L	1	SM 3120	24-Apr-19/O	368	76	27	689
Boron	mg/L	0.005	SM 3120	24-Apr-19/O	0.535	0.049	< 0.005	0.289
Calcium	mg/L	0.02	SM 3120	24-Apr-19/O	109	21.6	7.92	245
Iron	mg/L	0.005	SM 3120	24-Apr-19/O	29.2	13.5	0.134	22.4
Magnesium	mg/L	0.02	SM 3120	24-Apr-19/O	23.2	5.43	1.70	18.5
Manganese	mg/L	0.001	SM 3120	24-Apr-19/O	0.594	0.239	0.002	7.00
Sodium	mg/L	0.2	SM 3120	24-Apr-19/O	93.8	8.1	11.4	133

Michelle Dubien
Lab Manager

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: ---

REPORT No. B19-10200

Report To:

Cambium Environmental
PO Box 325, 52 Hunter Street East
Peterborough ON K9H 1G5 Canada
Attention: Stephanie Reeder

Caduceon Environmental Laboratories
285 Dalton Ave
Kingston Ontario K7K 6Z1
Tel: 613-544-2001
Fax: 613-544-2770

DATE RECEIVED: 18-Apr-19
DATE REPORTED: 25-Apr-19
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Cavendish WDS
P.O. NUMBER: 8640-002
WATERWORKS NO.

			Client I.D.		GW QA/QC			
			Sample I.D.		B19-10200-5			
			Date Collected		16-Apr-19			
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	22-Apr-19/O	517			
Conductivity @25°C	µmho/cm	1	SM 2510B	22-Apr-19/O	1750			
pH @25°C	pH Units		SM 4500H	22-Apr-19/O	7.68			
TDS (Calc. from Cond.)	mg/L	1	Calc.	23-Apr-19	960			
Dissolved Organic Carbon	mg/L	0.2	EPA 415.1	24-Apr-19/O	11.0			
COD	mg/L	5	SM 5220D	24-Apr-19/O	233			
Chloride	mg/L	0.5	SM4110C	25-Apr-19/O	242			
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	24-Apr-19/K	0.99			
Sulphate	mg/L	1	SM4110C	25-Apr-19/O	14			
Nitrite (N)	mg/L	0.05	SM4110C	25-Apr-19/O	< 0.05			
Nitrate (N)	mg/L	0.05	SM4110C	25-Apr-19/O	< 0.05			
Hardness (as CaCO3)	mg/L	1	SM 3120	24-Apr-19/O	685			
Boron	mg/L	0.005	SM 3120	24-Apr-19/O	0.286			
Calcium	mg/L	0.02	SM 3120	24-Apr-19/O	244			
Iron	mg/L	0.005	SM 3120	24-Apr-19/O	21.6			
Magnesium	mg/L	0.02	SM 3120	24-Apr-19/O	18.2			
Manganese	mg/L	0.001	SM 3120	24-Apr-19/O	6.86			
Sodium	mg/L	0.2	SM 3120	24-Apr-19/O	134			

Michelle Dubien
Lab Manager

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Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G94252 **REPORT No. B19-36852**

Report To:

Cambium Environmental
PO Box 325, 52 Hunter Street East
Peterborough ON K9H 1G5 Canada
Attention: Stephanie Reeder

Caduceon Environmental Laboratories
285 Dalton Ave
Kingston Ontario K7K 6Z1
Tel: 613-544-2001
Fax: 613-544-2770

DATE RECEIVED: 13-Nov-19
DATE REPORTED: 06-Dec-19
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Cavendish WDS
P.O. NUMBER: 8640-002
WATERWORKS NO.

			Client I.D.		DP6	DP4	DP5	GW QA/QC
			Sample I.D.		B19-36852-1	B19-36852-2	B19-36852-3	B19-36852-4
			Date Collected		12-Nov-19	12-Nov-19	12-Nov-19	12-Nov-19
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	13-Nov-19/O	86	26	548	570
Conductivity @25°C	µmho/cm	1	SM 2510B	13-Nov-19/O	469	423	1370	1370
pH @25°C	pH Units		SM 4500H	13-Nov-19/O	7.22	6.97	7.56	7.49
TDS (Calc. from Cond.)	mg/L	1	Calc.	14-Nov-19	242	218	744	742
Dissolved Organic Carbon	mg/L	0.2	EPA 415.2	05-Dec-19/O	12.5	1.2	13.9	14.1
COD	mg/L	5	SM 5220D	20-Nov-19/O	460	42	124	79
Chloride	mg/L	0.5	SM4110C	30-Nov-19/O	31.8	110	106	106
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	18-Nov-19/K	0.37	0.03	1.19	1.20
Sulphate	mg/L	1	SM4110C	30-Nov-19/O	92	< 1	3	2
Nitrite (N)	mg/L	0.05	SM4110C	30-Nov-19/O	< 0.05	< 0.05	< 0.05	< 0.05
Nitrate (N)	mg/L	0.05	SM4110C	30-Nov-19/O	< 0.05	< 0.05	< 0.05	< 0.05
Hardness (as CaCO3)	mg/L	1	SM 3120	19-Nov-19/O	268	95	469	466
Arsenic	mg/L	0.0001	EPA 200.8	18-Nov-19/O	0.0004	< 0.0001	0.0017	0.0018
Boron	mg/L	0.005	SM 3120	19-Nov-19/O	0.123	0.007	0.295	0.294
Calcium	mg/L	0.02	SM 3120	19-Nov-19/O	85.9	28.4	168	167
Copper	mg/L	0.0001	EPA 200.8	18-Nov-19/O	0.0023	0.0015	0.0004	< 0.0001
Iron	mg/L	0.005	SM 3120	19-Nov-19/O	9.81	0.031	22.0	21.5
Magnesium	mg/L	0.02	SM 3120	19-Nov-19/O	13.0	5.80	11.9	11.9
Manganese	mg/L	0.001	SM 3120	19-Nov-19/O	0.720	0.003	4.30	4.25
Mercury	mg/L	0.00002	SM 3112 B	15-Nov-19/O	0.00006	0.00005	0.00005	< 0.00002
Potassium	mg/L	0.1	SM 3120	19-Nov-19/O	0.8	1.7	10.1	10.1
Sodium	mg/L	0.2	SM 3120	19-Nov-19/O	8.3	39.9	125	125
Zinc	mg/L	0.005	SM 3120	19-Nov-19/O	0.008	< 0.005	0.010	0.005
Acetone	µg/L	30	EPA 8260	18-Nov-19/R	< 30	< 30	< 30	< 30
Benzene	µg/L	0.5	EPA 8260	18-Nov-19/R	< 0.5	< 0.5	< 0.5	< 0.5
Dichlorobenzene,1,4-	µg/L	0.5	EPA 8260	18-Nov-19/R	< 0.5	< 0.5	< 0.5	< 0.5
Dichloroethane,1,1-	µg/L	0.5	EPA 8260	18-Nov-19/R	< 0.5	< 0.5	< 0.5	< 0.5

R.L. = Reporting Limit
Test methods may be modified from specified reference method unless indicated by an *
Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Michelle Dubien
Lab Manager

CADUCEON™ ENVIRONMENTAL LABORATORIES
Client committed. Quality assured.

CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G94252 **REPORT No. B19-36852**

Report To:

Cambium Environmental
PO Box 325, 52 Hunter Street East
Peterborough ON K9H 1G5 Canada
Attention: Stephanie Reeder

Caduceon Environmental Laboratories
285 Dalton Ave
Kingston Ontario K7K 6Z1
Tel: 613-544-2001
Fax: 613-544-2770

DATE RECEIVED: 13-Nov-19
DATE REPORTED: 06-Dec-19
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Cavendish WDS
P.O. NUMBER: 8640-002
WATERWORKS NO.

			Client I.D.		DP6	DP4	DP5	GW QA/QC
			Sample I.D.		B19-36852-1	B19-36852-2	B19-36852-3	B19-36852-4
			Date Collected		12-Nov-19	12-Nov-19	12-Nov-19	12-Nov-19
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Dichloroethene, cis-1,2-	µg/L	0.5	EPA 8260	18-Nov-19/R	< 0.5	< 0.5	< 0.5	< 0.5
Dichloromethane (Methylene Chloride)	µg/L	5	EPA 8260	18-Nov-19/R	< 5	< 5	< 5	< 5
Methyl Ethyl Ketone	µg/L	20	EPA 8260	18-Nov-19/R	< 20	< 20	< 20	< 20
Monochlorobenzene (Chlorobenzene)	µg/L	0.5	EPA 8260	18-Nov-19/R	< 0.5	< 0.5	< 0.5	< 0.5
Toluene	µg/L	0.5	EPA 8260	18-Nov-19/R	< 0.5	< 0.5	< 0.5	< 0.5
Vinyl Chloride	µg/L	0.2	EPA 8260	18-Nov-19/R	< 0.2	< 0.2	< 0.2	< 0.2

Michelle Dubien
Lab Manager

R.L. = Reporting Limit
Test methods may be modified from specified reference method unless indicated by an *
Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

CADUCEON™ ENVIRONMENTAL LABORATORIES
Client committed. Quality assured.

CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: ---

REPORT No. B19-36859

Report To:

Cambium Environmental
PO Box 325, 52 Hunter Street East
Peterborough ON K9H 1G5 Canada
Attention: Stephanie Reeder

Caduceon Environmental Laboratories
285 Dalton Ave
Kingston Ontario K7K 6Z1
Tel: 613-544-2001
Fax: 613-544-2770

DATE RECEIVED: 13-Nov-19
DATE REPORTED: 06-Dec-19
SAMPLE MATRIX: Surface Water

JOB/PROJECT NO.: Cavendish WDS
P.O. NUMBER: 8640-002
WATERWORKS NO.

			Client I.D.		SW4	SW QAQC	SW5	
			Sample I.D.		B19-36859-1	B19-36859-2	B19-36859-3	
			Date Collected		12-Nov-19	12-Nov-19	12-Nov-19	
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	13-Nov-19/O	21	22	30	
Conductivity @25°C	µmho/cm	1	SM 2510B	13-Nov-19/O	344	344	213	
pH @25°C	pH Units		SM 4500H	13-Nov-19/O	6.89	6.93	7.36	
TDS (Calc. from Cond.)	mg/L	1	Calc.	14-Nov-19	177	177	109	
Total Suspended Solids	mg/L	3	SM2540D	13-Nov-19/K	< 3	< 3	< 3	
Dissolved Organic Carbon	mg/L	0.2	EPA 415.2	05-Dec-19/O	20.6	21.2	14.4	
BOD(5 day)	mg/L	3	SM 5210B	14-Nov-19/K	< 3	< 3	< 3	
COD	mg/L	5	SM 5220D	20-Nov-19/O	65	65	33	
Phenolics	mg/L	0.002	MOEE 3179	14-Nov-19/K	< 0.002	< 0.002	< 0.002	
Chloride	mg/L	0.5	SM4110C	01-Dec-19/O	67.6	66.9	40.8	
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	18-Nov-19/K	0.05	0.04	0.06	
Sulphate	mg/L	1	SM4110C	01-Dec-19/O	32	31	< 1	
Nitrite (N)	mg/L	0.05	SM4110C	01-Dec-19/O	< 0.05	< 0.05	< 0.05	
Nitrate (N)	mg/L	0.05	SM4110C	01-Dec-19/O	< 0.05	< 0.05	< 0.05	
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	15-Nov-19/K	0.7	0.7	0.6	
Hardness (as CaCO3)	mg/L	1	SM 3120	18-Nov-19/O	71	70	45	
Arsenic	mg/L	0.0001	EPA 200.8	19-Nov-19/O	0.0003	0.0003	0.0001	
Boron	mg/L	0.005	SM 3120	18-Nov-19/O	0.077	0.076	0.014	
Calcium	mg/L	0.02	SM 3120	18-Nov-19/O	21.7	21.3	14.0	
Copper	mg/L	0.0001	EPA 200.8	19-Nov-19/O	0.0019	0.0020	0.0010	
Iron (Total)	mg/L	0.005	SM 3120	18-Nov-19/O	0.204	0.201	0.326	
Magnesium	mg/L	0.02	SM 3120	18-Nov-19/O	4.19	4.15	2.45	
Manganese (Total)	mg/L	0.001	SM 3120	18-Nov-19/O	0.005	0.006	0.016	
Mercury	mg/L	0.00002	SM 3112 B	15-Nov-19/O	0.00007	0.00009	0.00007	
Phosphorus-Total	mg/L	0.01	E3199A.1	15-Nov-19/K	0.02	0.02	0.01	
Potassium	mg/L	0.1	SM 3120	18-Nov-19/O	1.8	1.7	1.1	
Sodium	mg/L	0.2	SM 3120	18-Nov-19/O	38.8	38.7	22.6	

R.L. = Reporting Limit
Test methods may be modified from specified reference method unless indicated by an *
Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Michelle Dubien
Lab Manager

CADUCEON™ ENVIRONMENTAL LABORATORIES
Client committed. Quality assured.

CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: ---

REPORT No. B19-36859

Report To:

Cambium Environmental
PO Box 325, 52 Hunter Street East
Peterborough ON K9H 1G5 Canada
Attention: Stephanie Reeder

Caduceon Environmental Laboratories
285 Dalton Ave
Kingston Ontario K7K 6Z1
Tel: 613-544-2001
Fax: 613-544-2770

DATE RECEIVED: 13-Nov-19
DATE REPORTED: 06-Dec-19
SAMPLE MATRIX: Surface Water

JOB/PROJECT NO.: Cavendish WDS
P.O. NUMBER: 8640-002
WATERWORKS NO.

	Client I.D.				SW4	SW QAQC	SW5	
	Sample I.D.				B19-36859-1	B19-36859-2	B19-36859-3	
	Date Collected				12-Nov-19	12-Nov-19	12-Nov-19	
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Zinc	mg/L	0.005	SM 3120	18-Nov-19/O	0.009	0.007	< 0.005	

Michelle Dubien
Lab Manager

R.L. = Reporting Limit
Test methods may be modified from specified reference method unless indicated by an *
Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Appendix E
Site Photographs

Photograph 1: Monitor DP1, June 2017

Photograph 2: Monitor DP1, June 2017

Photograph 3: Monitor DP4, June 2017

Photograph 4: Monitor DP4, April 2019

Photograph 5: Monitor DP5, June 2017

Photograph 6: Monitor DP5, June 2017

Photograph 7: Monitor DP6, June 2017

Photograph 8: Monitor DP6, April 2019

Photograph 9: Surface water monitoring station SW1, May 2018

Photograph 10: Surface water monitoring station SW1, November 2018

Photograph 11: Surface water monitoring station SW1, April 2019

Photograph 12: Frozen - Surface water monitoring station SW1, November 2019

Photograph 13: Surface water monitoring station SW2, May 2018

Photograph 14: Surface water monitoring station SW2, May 2018

Photograph 15: Surface water monitoring station SW2, April 2019

Photograph 16: Frozen - Surface water monitoring station SW2, November 2019

Photograph 17: Surface water monitoring station SW3, May 2018

Photograph 18: Frozen - Surface water monitoring station SW3, November 2018

Photograph 19: Surface water monitoring station SW3, April 2019

Photograph 20: Frozen - Surface water monitoring station SW3, November 2019

Photograph 21: Surface water monitoring station SW4, May 2018

Photograph 22: Surface water monitoring station SW4, November 2018

Photograph 23: Surface water monitoring station SW4, April 2019

Photograph 24: Surface water monitoring station SW4, November 2019

Photograph 25: Surface water monitoring station SW5, May 2018

Photograph 26: Surface water monitoring station SW5, November 2018

Photograph 27: Surface water monitoring station SW5, April 2019

Photograph 28: Surface water monitoring station SW5, November 2019

Photograph 29: Surface water monitoring station SW6, May 2018

Photograph 30: Surface water monitoring station SW6, November 2018

Photograph 31: Surface water monitoring station SW6, April 2019

Photograph 32: Frozen - Surface water monitoring station SW6, November 2019

Appendix F
Well Records

Ontario Ministry of the Environment

Measurements recorded in: [X] Metric [ ] Imperial

Well Tag No. (Place Sticker and/or Print Below)
A 089053 A089053

679 A089?

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	[ ] Well Constructed by Well Owner
TOWNSHIP OF GALWAY CAVENDISH AND HARVEY			

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
		ON		

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
Catchacoma Landfill			

County/District/Municipality	City/Town/Village	Province	Postal Code
	Catchacoma	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	710707	4935157		WKQ-001857

A 0 - A 02

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	To
BRN	ORGANICS	SAND.	LOOSE.	0	1.83

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	0.3	CONCRETE.	
0.3	0.6	BENTONITE.	
0.6	1.83	SAND.	

Results of Well Yield Testing

After test of well yield, water was: [ ] Clear and sand free [ ] Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft)

Pumping rate (l/min / GPM)

Duration of pumping ___ hrs + ___ min

Final water level end of pumping (m/ft)

If flowing give rate (l/min / GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min / GPM)

Well production (l/min / GPM)

Disinfected? [ ] Yes [ ] No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level			
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
50		50	
60		60	

Method of Construction

[ ] Cable Tool [ ] Rotary (Conventional) [ ] Rotary (Reverse) [ ] Boring [ ] Air percussion [X] Other, specify Direct Push [ ] Diamond [ ] Jetting [ ] Driving [ ] Digging

Well Use

[ ] Public [ ] Domestic [ ] Livestock [ ] Irrigation [ ] Industrial [ ] Other, specify [ ] Commercial [ ] Municipal [X] Test Hole [ ] Cooling & Air Conditioning [ ] Not used [ ] Dewatering [X] Monitoring

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
3.43	PLASTIC	.356	0	0.6

Status of Well

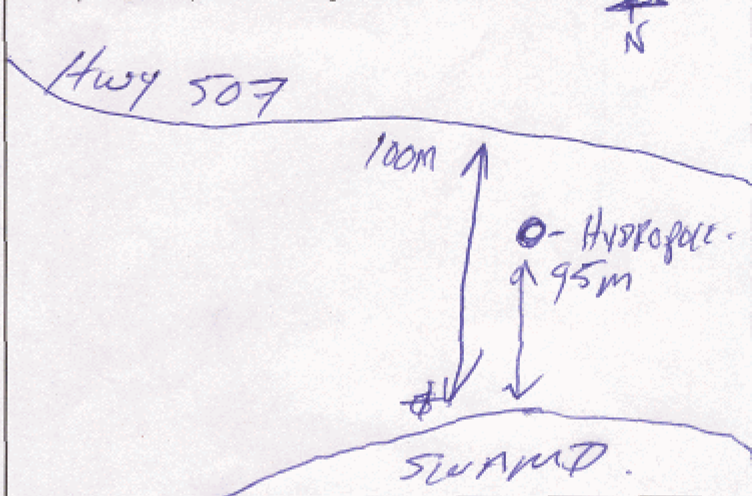
[ ] Water Supply [ ] Replacement Well [X] Test Hole [ ] Recharge Well [ ] Dewatering Well [X] Observation and/or Monitoring Hole [ ] Alteration (Construction) [ ] Abandoned, Insufficient Supply [ ] Abandoned, Poor Water Quality [ ] Abandoned, other, specify [ ] Other, specify

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To
~~3.56~~ 4.71	PLASTIC	10	0.6	1.83

Map of Well Location

Please provide a map below following instructions on the back.



Water Details

Water found at Depth ___ (m/ft) Kind of Water: [ ] Fresh [ ] Untested [ ] Gas [ ] Other, specify

Water found at Depth ___ (m/ft) Kind of Water: [ ] Fresh [ ] Untested [ ] Gas [ ] Other, specify

Water found at Depth ___ (m/ft) Kind of Water: [ ] Fresh [ ] Untested [ ] Gas [ ] Other, specify

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	1.83	5.71

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Strata Soil Sampling Inc.	7241

Business Address (Street Number/Name)	Municipality
147-2 West Beaver Creek Road	Richmond Hill

Province	Postal Code	Business E-mail Address
Ontario	L4B 1C6	wrecords@stratasoil.com

Bus.Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
905-764-9304	Robinson Travis

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
3154		20091105

Comments: General contractor: [redacted]

Well owner's information package delivered [ ] Yes [X] No

Date Package Delivered: YYYYMMDD

Date Work Completed: 2009/6/30

Ministry Use Only

Audit No. Z104764

NOV 13 2009 Received

Ministry's Copy

2

Ontario Ministry of the Environment

Measurements recorded in: ☑ Metric ☐ Imperial

A 092407 (and/or Print Below) A092407

6797

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
	TOWNSHIP OF GALWAY CAVENDISH AND HARVEY.		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
		ON		

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
Catchacoma Landfill			

County/District/Municipality	City/Town/Village	Province	Postal Code
	Catchacoma	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 8 3	17	708389955080			WKQ-001857 A 0 - A 02

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
BRN	ORGANICS	SAND	SOFT.	0	1.83

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	0.3	CONCRETE.	
0.3	0.6	BENTONITE.	
0.6	1.83	SAND.	

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☒ Other, specify Direct Push

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☒ Test Hole ☒ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
3.45	PLASTIC	.356	0	0.6

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To
~~3.96~~ .356	PLASTIC	10	0.6	1.83
4.71				

Status of Well

☐ Water Supply
☐ Replacement Well
☒ Test Hole
☐ Recharge Well
☐ Dewatering Well
☒ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, specify
☐ Other, specify

Water Details

Water found at Depth (m/ft)	Kind of Water	Gas	Other, specify
	☐ Fresh ☐ Untested	☐	
	☐ Fresh ☐ Untested	☐	
	☐ Fresh ☐ Untested	☐	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	1.83	5.7

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft)

Pumping rate (l/min / GPM)

Duration of pumping ____ hrs + ____ min

Final water level end of pumping (m/ft)

If flowing give rate (l/min / GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min / GPM)

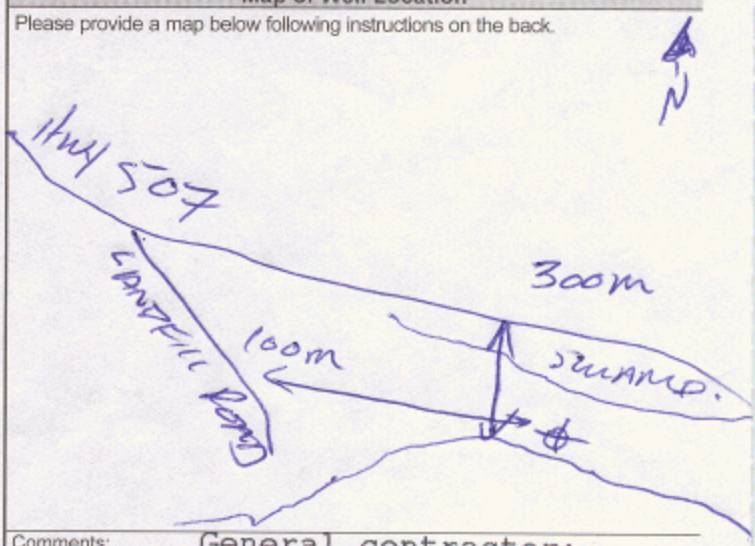
Well production (l/min / GPM)

Disinfected? ☐ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1			1	
2			2	
3			3	
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments: General contractor: [redacted]

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Strata Soil Sampling Inc.	7241

Business Address (Street Number/Name)	Municipality
147-2 West Beaver Creek Road	Richmond Hill

Province	Postal Code	Business E-mail Address
Ontario	L4B 1C6	wrecords@stratasoil.com

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
905+764-9304	Queen Lewis

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
3159		2009/10/05

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☐ Yes ☒ No		2009/10/30

Ministry Use Only

Audit No. Z 104765

NOV 13 2009 Received

0506E (12/2007)

Ministry's Copy

Ontario Ministry of the Environment

Measurements recorded in: ☑ Metric ☐ Imperial

Well Tag No. (Place Sticker and/or Print Below) A 092412 A092412

6797

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
TOWNSHIP OF	GALWAY CAVENDISH AND HARVEY		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
		ON		

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
Catchacoma Landfill			

County/District/Municipality	City/Town/Village	Province	Postal Code
	Catchacoma	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 8 3	17	710897	4954811		WKQ-001857 A0 - A02

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
BRN	ORGANICS	SAND.	SOFT.	0	1.5

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	0.3	CONCRETE.	
0.3	0.61	BENTONITE.	
0.61	1.5	SAND	

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☒ Other, specify Direct Push

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☒ Test Hole ☒ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
3.45	PLASTIC	.356	0	0.6

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To
~~3.5~~ 4.21	PLASTIC	10	0.6	1.5

Status of Well

☐ Water Supply
☐ Replacement Well
☒ Test Hole
☐ Recharge Well
☐ Dewatering Well
☒ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, specify
☐ Other, specify

Water Details

Water found at Depth (m/ft)	Kind of Water	Gas	Other, specify
	☐ Fresh ☐ Untested	☐	
	☐ Fresh ☐ Untested	☐	
	☐ Fresh ☐ Untested	☐	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	1.5	5.71

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft)

Pumping rate (l/min / GPM)

Duration of pumping ____ hrs + ____ min

Final water level end of pumping (m/ft)

If flowing give rate (l/min / GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min / GPM)

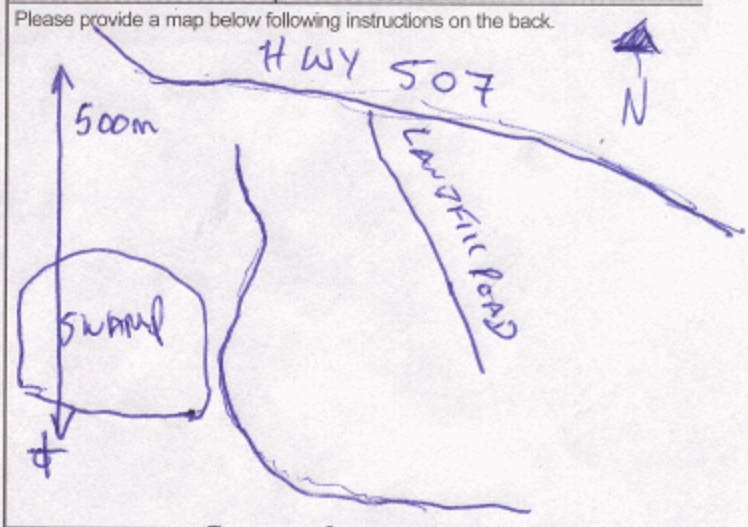
Well production (l/min / GPM)

Disinfected? ☐ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1			1	
2			2	
3			3	
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments: General contractor: [redacted]

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Strata Soil Sampling Inc.	7241

Business Address (Street Number/Name)	Municipality
147-2 West Beaver Creek Road	Richmond Hill

Province	Postal Code	Business E-mail Address
Ontario	L4B 1C6	wrecords@stratasoil.com

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
905-764-9304	Dawson Travis

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
3159		2009/11/05

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☐ Yes ☒ No		2009/10/30

Ministry Use Only

Audit No. Z104766

Received NOV 13 2009

0506E (12/2007)

Ministry's Copy

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 5114736 51005 CON
SUBLOT 37, PLAN 45R3148 03

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON. BLOCK, TRACT, SURVEY, ETC.	LOT
PETERBOROUGH	CAVANDISH	CONC. 03	16,17

[redacted] PAISLEY STREET, LONDON, ONTARIO M5X 3T3

DATE COMPLETED: DAY 11 MO 07 YR 90

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
BROWN	SAND			0	1
GREY	GRANITE		SOFT	1	122

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
108	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
6¼"	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC	.188	0	20
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET

MATERIAL AND TYPE | DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	DEPTH SET AT - FEET TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
10-13	14-17	
18-21	22-25	
26-29	30-33	

71 PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
1 ☒ PUMP 2 ☐ BAILER	8 GPM	1 HOURS 0 MINS

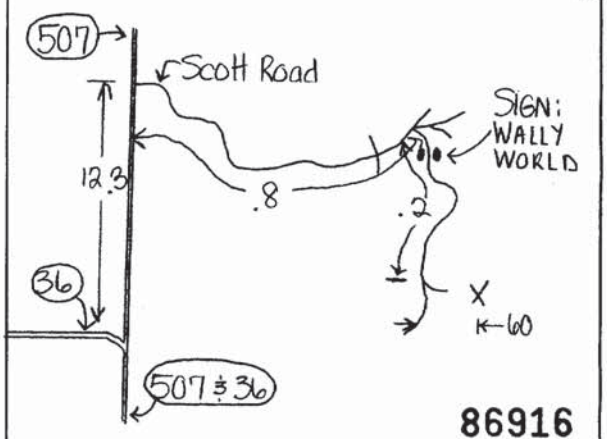
STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING (1 ☐ PUMPING 2 ☐ RECOVERY)	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
15 FEET	100 FEET		FEET	FEET	FEET	FEET

IF FLOWING, GIVE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST
GPM	115 FEET	1 ☐ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
☐ SHALLOW ☒ DEEP	115 FEET	8 GPM

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



86916

DRILLERS REMARKS

FINAL STATUS OF WELL	1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED ☐ DEWATERING
WATER USE	1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED
METHOD OF CONSTRUCTION	1 ☐ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☒ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING ☐ DIGGING ☐ OTHER

CONTRACTOR

NAME OF WELL CONTRACTOR: FAULKNER WELL DRILLING CO. LTD.
WELL CONTRACTOR'S LICENCE NUMBER: 2104
ADDRESS: 789 Erskine Avenue, Peterborough
NAME OF WELL TECHNICIAN: BRIAN MCMURRAY
WELL TECHNICIAN'S LICENCE NUMBER:
SIGNATURE OF TECHNICIAN/CONTRACTOR:
SUBMISSION DATE: DAY 11 MO 07 YR 90

OFFICE USE ONLY

DATA SOURCE | CONTRACTOR 2104 | DATE RECEIVED JUL 17 1990
DATE OF INSPECTION | INSPECTOR
REMARKS

CSS.ES

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FORM NO. 0506 (11/86) FORM 9