

Water Treatment Plant Annual Report 2018



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This report was completed in March 2019 in accordance with the requirements of the Ministry of Health Services and the Interior Health Authority.

1.0 Water Treatment History

In 1986 the City of Penticton experienced an outbreak of Giardia that was determined to have originated from the Penticton Creek water source. Engineering studies were conducted in 1987-1988 and a dual source, water treatment plant was determined to be the best solution for the future of Penticton. The plant was commissioned in the spring of 1996 and is located at the East end of Penticton Avenue next to Penticton Creek. In January of 1997 the City placed its new water treatment facility online and the Penticton Creek source was returned to service. Since 1997 the City has used only Okanagan Lake and Penticton Creek for its domestic water usage. The two sources are used in variable proportions from year to year. This is determined by source water quality, quantity and plant operational considerations. The Warren Avenue well has been removed from active service and is now a dedicated emergency water source.

In 2005 the City awarded a contract to Earth Tech Engineering Consultants to review the current water system and address any anticipated issues likely to arise over the next 5-year, 10-year and 15-year terms. A preliminary recommendation of this study was that Penticton Creek could be used as an alternate summer peak demand water source. Pilot studies were completed in the fall of 2007 and a high rate dissolved aeration process was identified as the preferred option to meet increased summer demands. Final design was completed in early 2008 and construction began in the fall of 2008. The project was completed in November 2009 and has allowed the City to operate a dual source variable conventional water plant.

2.0 Water Supply System

Penticton's water supply system was initially designed in the 1920's to use water from Penticton Creek. Okanagan Lake water was pumped into the system during the spring freshet due to high colour and organics in the creek water. Water is supplied to the treatment plant from two sources – Penticton Creek, through a gravity system, and Okanagan Lake, by means of pumps and a dedicated raw water main.

Penticton Creek

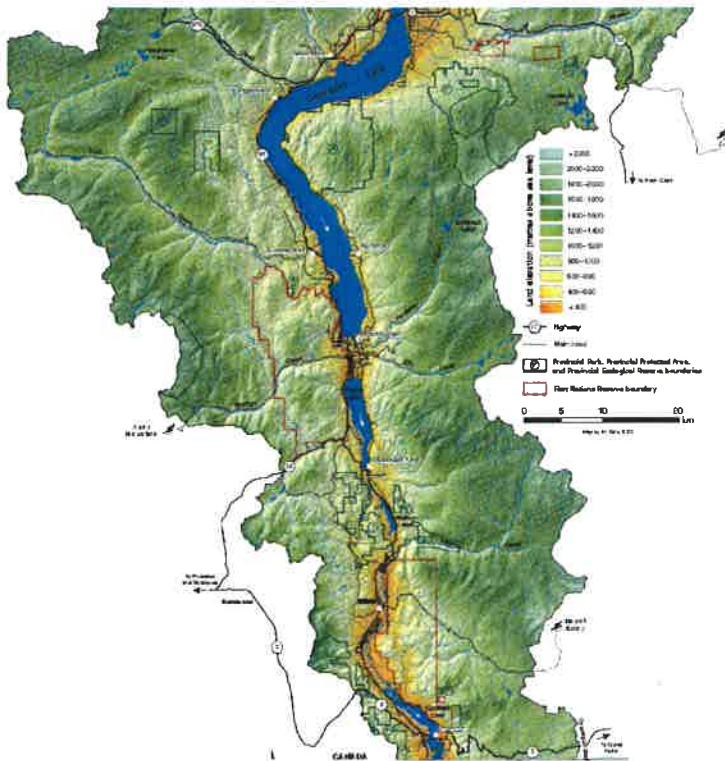
Penticton Creek originates from Greyback Mountain Dam approximately 10 km east of Penticton at an elevation of 1,649 meters. Many small tributaries and creeks also feed Penticton Creek, which allows water to be used at times without depleting storage. The City of Penticton maintains Greyback Lake and Dam, which has a maximum storage volume of 10,000-acre feet, or 12.3 million cubic meters. The dam was built in 1967 under the A.R.D.A. (Agricultural Rural Development Act) program. Untreated water is diverted from Penticton Creek at the Campbell Mountain Diversion for agricultural irrigation. Penticton Creek

continues west towards the Water Treatment Plant where there is a dam, small reservoir and intake located just east of the plant. Without the untreated Penticton Creek irrigation system, the Water Treatment Plant would have been twice the capacity and more costly to construct. This feature has served the citizens of Penticton well.

Okanagan Lake

Okanagan Lake is situated in south central British Columbia. It has a catchment area of over 6,000 km² and is the largest of the five main and interconnected lakes in the Okanagan valley. The Okanagan valley is U-shaped with mountains rising on both sides to 1,000-2,500 m. Okanagan Lake in general is a deep, nutrient deficient water body with two shallower reaches with poorer water circulation, higher nutrient levels, and greater plankton abundance. The lake in profile is composed of three basins, a large north basin, mid basin and a southern basin. It is joined to Kalamalka Lake in the north by Vernon Creek and at the south end to Skaha Lake by the Okanagan River. This river flows south through Skaha Lake, Vaseux Lake and Osoyoos Lake; it joins the Columbia River near Brewster, Washington. Three major population centres are located along lake Okanagan shores: Vernon at the north end, Kelowna at the mid-point and Penticton at the south end. The major industrial development in the valley is associated with agriculture and forestry. Tourism is also a major economic factor in the local economy. These facts coupled with the arid nature of the region have resulted in a very high economic value being given to water quality and quantity.

Figure 1: Okanagan Lake Water Shed Schematic



Warren Avenue Well

Warren Avenue Well was installed by the City of Penticton in 1982, and is 92.9 m (304.5 ft) deep, completed in a confined and flowing artesian aquifer encountered at a depth between 52.1 and 87.5 m (171 and 287 ft). The City of Penticton maintains the Warren Avenue Well as a backup source that can provide 12 mega liters per day if required in an emergency.

At present this source of water is used strictly as an emergency source and has not been called into use since 1995. In 2018, no water from the Warren Avenue Well was pumped into the distribution system.

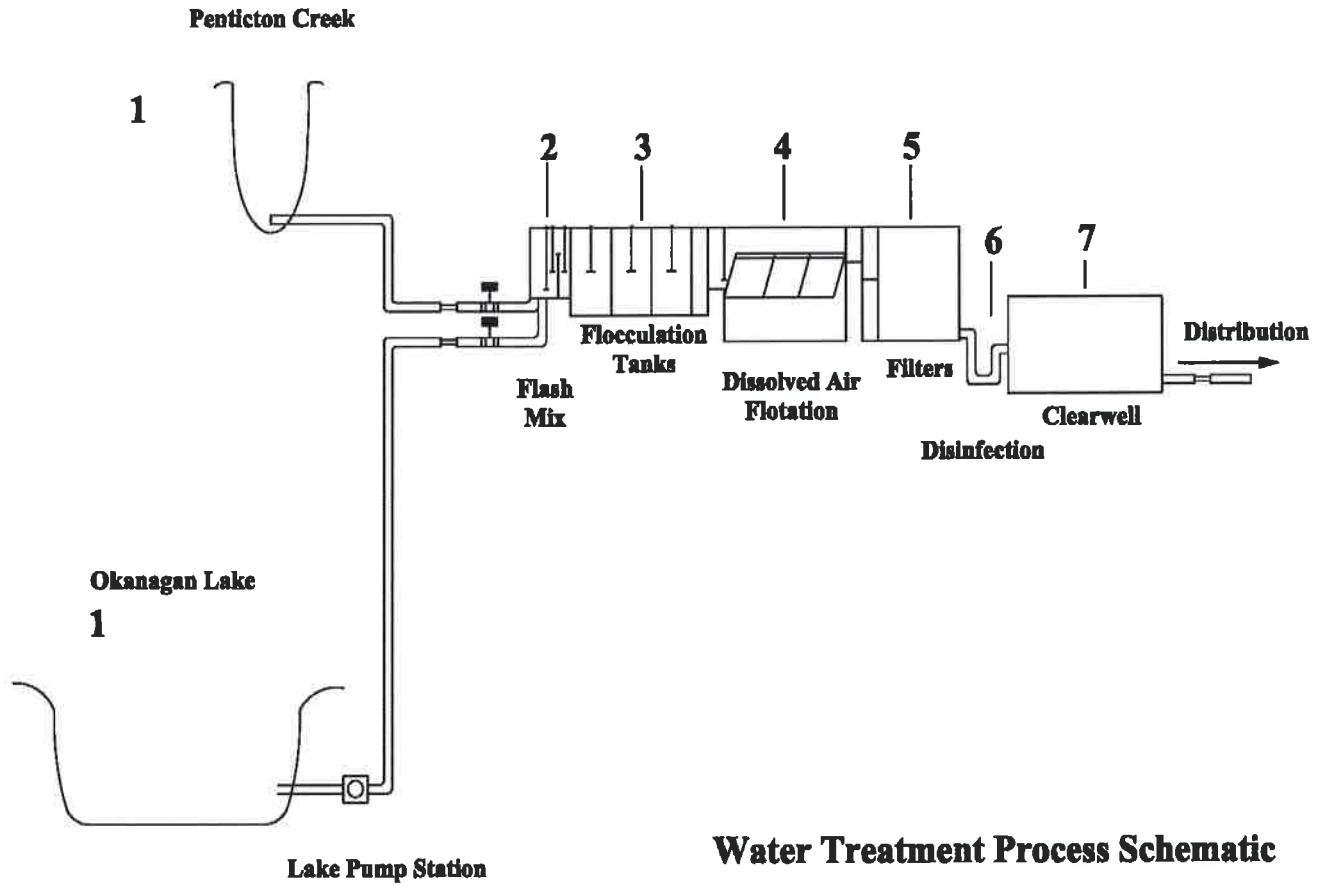
Raw Water Use

In 2018 the City of Penticton pumped 5.7 Billion liters from the Okanagan Lake Pump Station to the Penticton Water Treatment Plant. In addition to the lake volume, 885 million liters of creek water was treated at the Water Treatment Plant. The total intake into the treatment plant was 6.6 billion liters during 2018, a decrease of 291 million liters from 2017.

3.0 Water Treatment

The City of Penticton's Water Treatment Plant is an 88 million litre per day plant that uses a multi-barrier system designed to treat water in a single or blended format from two sources; Okanagan Lake and Penticton Creek. The water quality of the two sources is distinctly different and requires different protocols for successful treatment. The objectives of treatment for the two sources are to meet Guidelines for Canadian Drinking Water Quality on a consistent basis. The Water Treatment Plant was commissioned in 1996 and upgraded in 2008 which included the installation of the following processes; high rate dissolved air flotation, new pump station and dedicated main for the 1650 pressure zone, gravity thickeners for the residuals process and increased clear well storage.

Figure 2: Water Treatment Process Schematic



Water Treatment Process Schematic

Okanagan Lake Pump Station and Penticton Creek Dam 2 Intake

Large objects such as logs and plants are screened out as the water is drawn to the treatment plant from Penticton Creek by gravity or pumped from Okanagan Lake. Penticton Creek water is fed to the treatment plant from a reservoir behind the treatment plant. Okanagan Lake water is pumped to the treatment plant from the lakeshore pump station via a dedicated main.

Figure 3: Okanagan Lake Pump Station



Figure 4: Penticton Creek Dam 2



Blend Chamber

The water arrives at the treatment plant into the blend chamber, water from a single source or from both sources is blended together and coagulants (chemicals that cause fine particles to clump together, forming “floc”) are added. This mixing disperses the coagulants throughout the water and starts the coagulation process.

Figure 5: Water Treatment Plant Blend Chamber



Coagulation & Flocculation

Water passes through the flocculation tanks where it is gently mixed. Tapered energy mixing is employed in the flocculation process. The particles will come in contact with each other and form larger floc. It is in this stage of the process that the majority of the impurities and harmful bacteria are captured within the floc particles and will later be captured in the DAF float or the filter.

Chart 1: Coagulant Chemical Record 2018

Month	Flow	PAC	Floc Aid	Filter Aid
2018	Million Litres			
January	320.3	6.8	0.07	1.60
February	302.5	6.8	0.07	1.60
March	330.0	7.0	0.07	1.60
April	379.9	7.2	0.08	1.76
May	740.0	9.5	0.09	1.94
June	823.4	13.9	0.14	2.08
July	1027.5	29.4	0.19	2.23
August	991.6	27.9	0.16	1.90
September	653.1	22.7	0.12	1.90
October	404.7	10.9	0.09	1.91
November	319.5	6.8	0.05	1.84
December	310.7	6.9	0.06	2.00
Average	550.3	13.0	0.1	1.9
Total	6603.2	155.8	1.2	22.4

- Poly aluminum chloride (PAC), floc aid and filter aid weights are calculated using an average of the lake and creek dosages when separate water sources are being treated.
- Average poly-aluminum chloride (PAC) dosage for the year 13.00 mg/L
- Average floc aid polymer dosage for the year 1.86 mg/L
- Average filter polymer dosage for the year 0.10 mg/L

Figure 6: Flocculation Tank Mixers



Dissolved Air Flotation

The water enters the dissolve air flotation basin where a saturated dissolved air/water stream is mixed with the process stream allowing the floc particles that have formed in the previous process to rise. The float rises to the top of the basin removing impurities from the water. This float is processed by the onsite centrifuge or diverted to the sewer system to aid in the wastewater treatment process. The water then proceeds to the filtration stage.

Figure 7: Dissolved Air Flotation



Filtration

Six deep bed, mono medium filters are utilized at the Penticton Water Treatment Plant. The filter material used is anthracite coal at a depth of 1.80 meters. As the water passes through the filter, impurities are removed. The number of filter washes required is directly related to the amount of water processed through the filter and its quality. Filter backwashes are regulated by three different factors. They are; the time the filter has been online, turbidity or particle counts and head loss. The number of filter washes increases dramatically in the months of May - August. This is related to the amount of water processed during the increased summer water demands.

Figure 8: Anthracite Coal Filters



Residuals Handling

There were no unauthorized discharges to Penticton Creek during 2018. The City of Penticton is constantly evaluating and making improvements to its treatment of the backwash stream. Ministry of Environment permit # PE-13491 which monitored the discharge was cancelled in 2011 due to changes in regulations. Capital upgrades to the residuals process were constructed in 2009 as part of the Water Treatment Capacity Upgrade. These upgrades consisted of a new pump station and two new gravity thickeners to process backwash residuals. Testing of the backwash water indicates that the improvements made to the backwash handling system have considerably improved the discharge quality in comparison to pre-upgrade results.

Figure 9: Residual Handling Building



Disinfection

Once impurities have been removed from the water, chlorine is added as a disinfectant. This ensures the water is safe and prevents bacteria from developing as it travels from the treatment plant to the customer. The water treatment plant has chlorinators that can inject chlorine at the pretreatment stage, post filtration stage, and post clearwell. Chlorine dose includes approximately 0.5 – 0.7 mg/L of pre chlorination. Chlorine gas injection process will be removed and replaced with a liquid sodium hypochlorite system in 2019.

Chart 2: 2018 Chlorine Dose and Residual

Month	Flow	Chlorine	Chlorine Dose	Clearwell Average Residual
2018	Million Litres	Kg.	mg/L	mg/L
January	320.3	784	2.60	1.30
February	302.5	764	2.60	1.30
March	330.0	809	2.60	1.30
April	379.9	938	2.60	1.30
May	740.0	1785	2.60	1.40
June	823.4	1961	2.50	1.40
July	1027.5	2308	2.40	1.40
August	991.6	2076	2.20	1.20
September	653.1	1487	2.40	1.20
October	404.7	1024	2.60	1.30
November	319.5	850	2.80	1.30
December	310.7	856	2.90	1.40
Average	550.27	1,303.50	2.56	1.32
Total	6,603.20	15,642.00		

- Average chlorine dosage for the year including pre chlorination is 2.56 mg/L
- Average distribution chlorine residual at the clearwell discharge is 1.32 mg/L

4.0 Water Distribution System

The City of Penticton water system consists of six reservoirs, five pressure zones, two pump stations, three booster stations, 255 km of distribution mains, 1,052 fire hydrants and approximately 9,714 water service connections serving a population of 33,761 people.

These reservoirs establish different pressure zones to service a particular area of the distribution system. The reservoirs are filled during periods of decreased water usage and are used to buffer the system when water demands are high. Total reservoir capacity excluding the treatment plant clearwell is 13.72 ML and (22.22 ML including water plant clear well). All reservoirs are remotely controlled via the SCADA system located at the Water Treatment Plant.

In 2014 an extension of the distribution system was constructed to supply domestic city water to the West Bench Irrigation System. This system is owned and operated by the regional district and is supplied water by a bulk purchase water agreement. In 2018, 298 million liters of water was supplied to the West Bench Irrigation System.

Water System Pressure Zones

- **1420 zone.** The supply reservoir for this zone is the **Duncan Avenue Reservoir**, which has a capacity of 5.9 ML and the Water Treatment Plant clearwell. Water to fill this reservoir originates at the Treatment Plant and is controlled via automatic valve located near the reservoir. This zone supplies the lower areas of Penticton.
- **1620 zone.** The supply reservoir for this zone is the **Evergreen Reservoir**, which has a capacity of 2.3 ML. This zone supplies the southern middle bench lands of Penticton. The water to fill this reservoir is gravity fed from the 1650 Ridgedale Reservoir via an automatic control valve.
- **1650 zone.** The supply for this zone is the **Ridgedale Reservoir**, which has a capacity of 2.35 ML. Water for this reservoir is pumped from the Penticton Avenue water treatment plant clearwell. This zone supplies the middle bench lands of Penticton.
- **1820 zone.** The supply for this zone is the two **Carmi Reservoirs** and the **Gordon Avenue Reservoir**, which have a capacity of 1.135, 1.35 and 0.53 ML respectively. This zone supplies the upper level areas of Penticton and is aided by the addition of two pumping stations, one supplied by the Carmi Reservoir and the other supplied by the Gordon Avenue Reservoir.
- **2020 zone.** The supply for this zone is the **Sendero Reservoir**, which has a capacity of 1.5 ML. This zone supplies the new subdivision located in the upper Carmi region. Water to fill this reservoir is supplied from the Ridgedale Reservoir via two 125 Hp vertical turbine pumps.

5.0 Water Plant Staffing

The water plant is staffed by Environmental Operators Certification Program (EOCP) certified operators seven days per week, 365 days per year. The current compliment of staff is:

Chart 3: 2018 Staff Compliment

Name	Position	Certification Level	Years of Experience
Micheal Firlotte	Water Quality Supervisor	EOCP IV	22
Brian Edge	Shift Operator	EOCP IV	27
Robert Phillips	Shift Operator	EOCP III	8
Don Mortimer	Non Shift Operator	EOCP II	11
Anika Engel	Non Shift Operator	EOCP II	4
Joel Bourgeois	Non Shift Operator	EOCP I	2
Alf Wewetzer	Operations Electrician/Instrumentation	Journeyman	30

All operators have been trained in sample collection, preservation and documentation via an assortment of training courses. Training has been provided by Okanagan College Water Engineering programs, EOCP accredited courses and Sacramento State University correspondence courses. All certified operators are mandated to receive annual 2.4 continuing education units of training to maintain their certified operator certification.

6.0 Water Quality Monitoring

The raw water quality program is designed to compare seasonal trends that may impact treatment parameters and economic outcomes of using the source. The program includes parameters that are easily tested and linked to changes such as turbidity, temperature, pH, conductivity and microbiological results. The source monitoring program is conducted daily for each water source at the water treatment laboratory. In addition to the common laboratory tests conducted daily on each water source, the city samples both raw water sources weekly for Total Coliform and E.coli using the Colilert test method. An extensive evaluation via Exova Environmental Division is performed three times a year. All source water analysis results from internal and external laboratories are included in Appendix B.

The treated water quality program is designed to evaluate and compare water quality of the distribution water related to operational and source variances, ensuring that guidelines are consistently met. The City of Penticton maintains and operates four dedicated sample stations located within the distribution system. The treated water within each pressure zone is continuously monitored for chlorine residual by an online residual analyzer connected to the water treatment SCADA via our fibre optic or radio network. Chlorine dosage is seasonally adjusted at the treatment plant to maintain free chlorine residuals within the

distribution system. The Works Department maintains the distribution system and performs an annual flushing and service program.

Microbiological Testing

Four hundred forty six microbiological tests were sampled for Ecoli and Total Coliform in the treated water supply in 2018. Biological tests were collected from 47 different locations within the city distribution boundaries. The results from the bacteriological tests indicated that all samples were negative for bacteriological contamination.

In 2018, a commercial lab tested the treated water and source waters 3 times annually. These scans test for trihalomethane's, metals, nutrients, total organic carbon and other nutrients. Samples are collected at the PRV Station, Okanagan Lake sample tap, Penticton Creek sample tap, and treated water after filtration. All commercial lab tests performed on the distribution water met the Guidelines for Canadian Drinking Water Quality and are available in Appendix B.

7.0 Water Use and Licenses

Domestic

The City of Penticton holds water licenses for Penticton Creek, Ellis Creek and Okanagan Lake water sources for the purpose of Waterworks Local Authority. Penticton Creek (license C014229), (licence C005729), Ellis Creek (licence C005731), licence (C005732), and licence (C025234) and Okanagan Lake (license C116809), (C116810), (C116811) are issued for local authorized water works. The total yearly capacity of these licences is 34.7 billion litres. In 2018 the City pumped or diverted 6.6 Billion litres for domestic waterworks use. This figure includes water plant operations.

Irrigation

The City also holds licences for local authorized irrigation on Penticton Creek and Ellis creek. Licence's C005729 and C035678 on Penticton Creek authorizes 55,412 ML/yr. withdrawal. Licence's C005731 and C005732 on Ellis Creek authorizes 2,558 ML/yr. withdrawal. In 2018 the City diverted 1.3 billion litres from Penticton Creek and 752 million litres from Ellis Creek for the purpose of irrigation totaling 2.1 billion Litres.

These licenses are renewed each year and reviewed by the Water Stewardship Division within the Ministry of Environment.

Chart 4: 2018 Raw Water Diversion for Domestic and Irrigation

Month	Penticton Cr.	Ellis Cr.	Ok Lake	Total
2018	Million Litres	Million Litres	Million Litres	Million Litres
Domestic	884.0	0	5,728.0	6,612.0
Irrigation	1,318.0	764	0.0	2,082.0

8.0 Water Use Monitoring

The volume of water pumped from the Okanagan Lake Pump Station and Penticton Creek is continuously monitored by flow meters located at the Water Treatment Plant. Treated plant discharge water into the distribution system is also continuously monitored to determine peak days and unusual usage. Over the past ten years the City of Penticton’s water usage has remained fairly consistent. The population of Penticton has grown slightly over these years and consumption has risen moderately. This would indicate that the citizens of Penticton are practicing water conservation. In 2018, total distribution was 6.6 billion litres.

Chart 5: Raw Water Usage 2008 – 2018

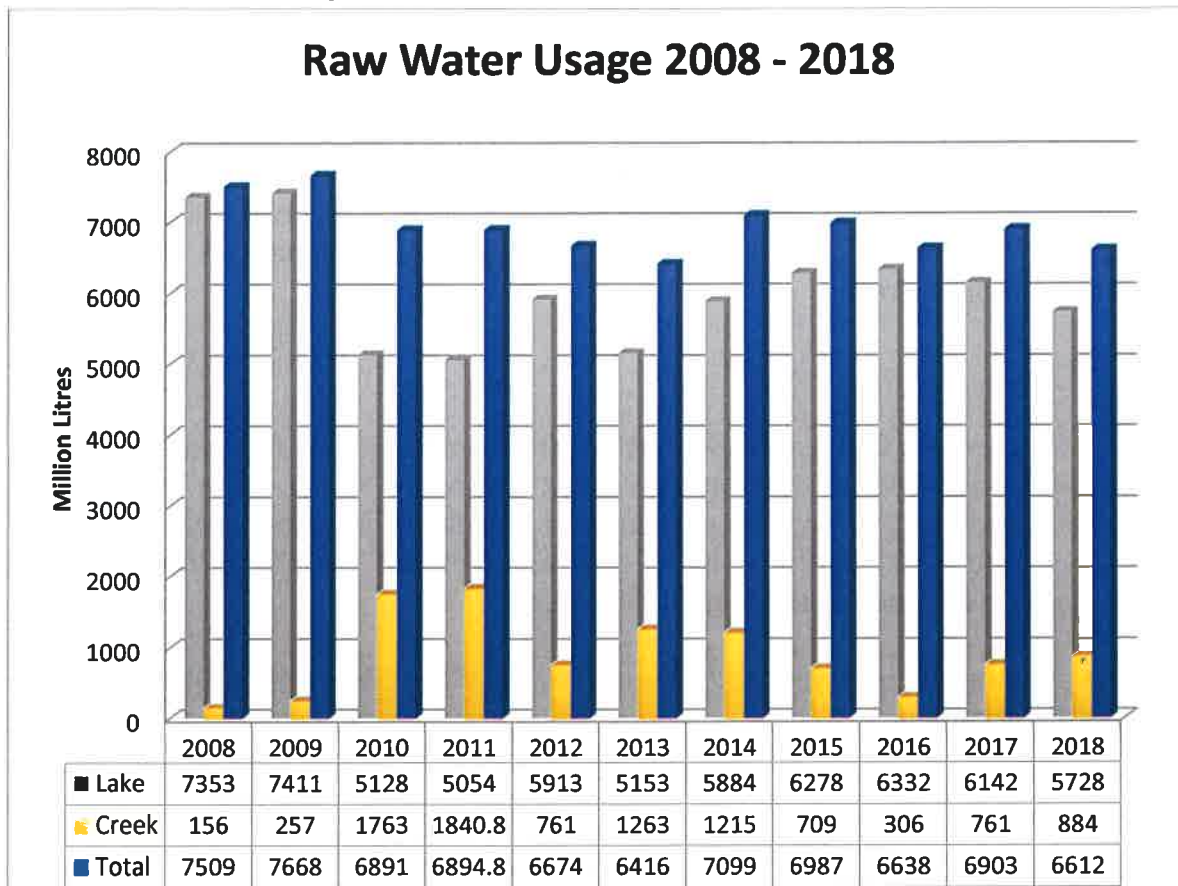


Chart 6: Average Daily Demand 2008-2018 based on 33,761 population

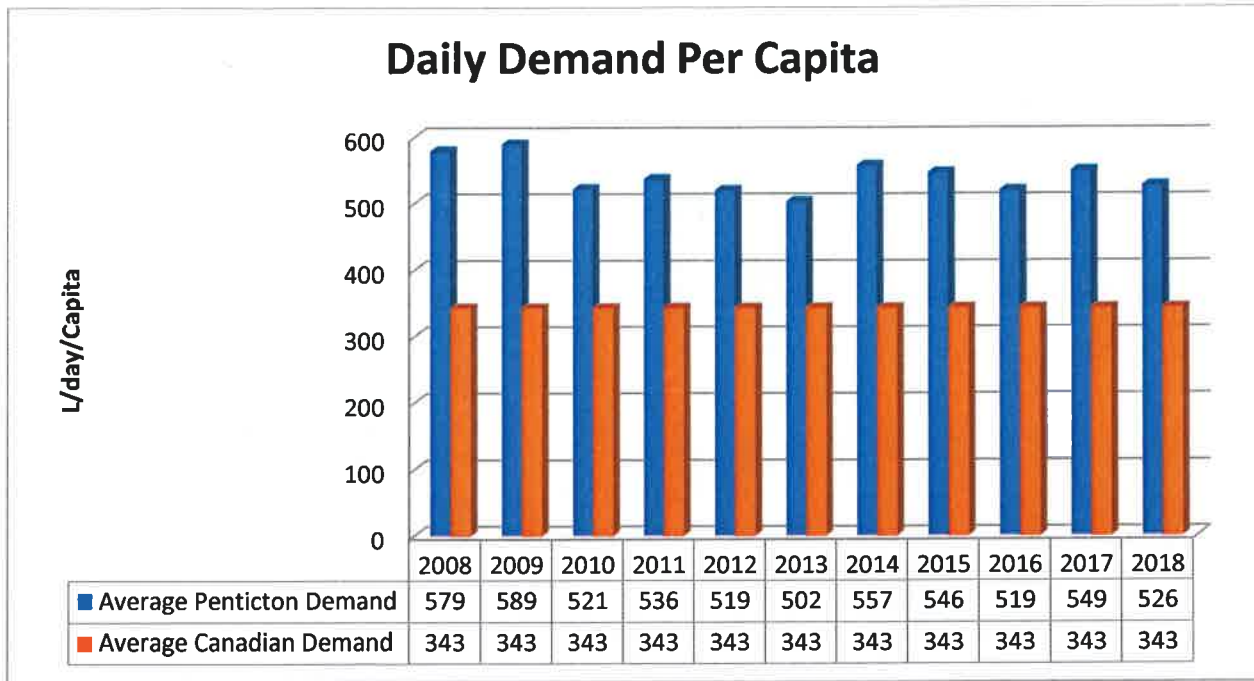


Chart 7: Maximum Daily Demand ML 2008-2018

Year	Population	Max Daily Demand	Max Day	Date
		Liters/Day/Capita	Million Litres	
2008	33761.0	1224	42.8	July 22/08
2009	33761.0	1176	41.2	July 23/09
2010	33761.0	1130	39.6	July 26/10
2011	33761.0	1087	38.1	July 6/11
2012	33761.0	1041	36.4	Aug 20/12
2013	33761.0	1114	39.0	July 29/13
2014	33761.0	1200	42.3	July 14/14
2015	33761.0	1190	41.7	July 6/15
2016	33761.0	1063	37.2	June 6/16
2017	33761.0	1198	41.9	July 4, 2017
2018	33761.0	1177	41.2	July 25, 2018

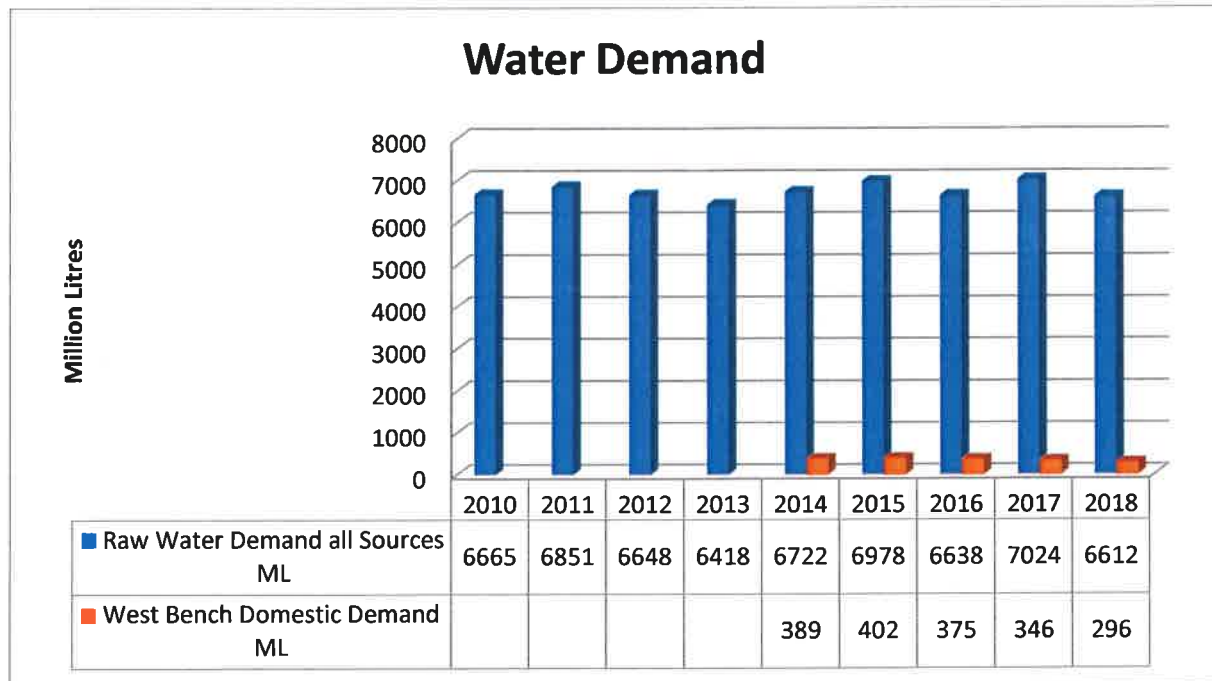
Chart 8: Water Consumption City of Penticton 2018

Month	Lake Supply	Creek Supply	Warren Ave Supply	Total Intake	Total Distribution
	Million Litres	Million Litres	Million Litres	Million Litres	Million Litres
2018					
January	299.2	0.0	0.0	299.2	333.9
February	291.6	0.0	0.0	291.6	299.9
March	309.0	0.0	0.0	309.0	322.1
April	357.0	0.0	0.0	357.0	372.1
May	688.3	0.0	0.0	688.3	698.1
June	737.1	11.9	0.0	749.0	801.1
July	673.8	283.0	0.0	956.8	959.4
August	667.9	281.4	0.0	949.3	951.0
September	464.6	172.8	0.0	637.4	647.0
October	344.0	44.8	0.0	388.8	401.2
November	308.8	0.0	0.0	308.8	322.5
December	300.1	0.0	0.0	300.1	313.8
Daily Average	15.1	2.2	0.0	17.3	17.8
Monthly Average	453.5	66.2	0.0	519.6	535.2
Total	5,441.4	793.9	0.0	6,235.3	6,422.1
	Date	Flow	Population	Per Capita Flow	
		Million Litres		Million Litres/Capital/Day	
Max Day 2018		41.2	33,760.0	1,177.14	25-Jul-18
Min Day 2018		7.3	33,760.0	209.71	14-Dec-18

9.0 Water Demand and Water Conservation

In 2014 the City started to supply the West Bench water system under a bulk water purchase agreement. Domestic volumes supplied to the West Bench water system are noted above. The West Bench Irrigation demand is included in the raw water demand and the plant domestic demand data.

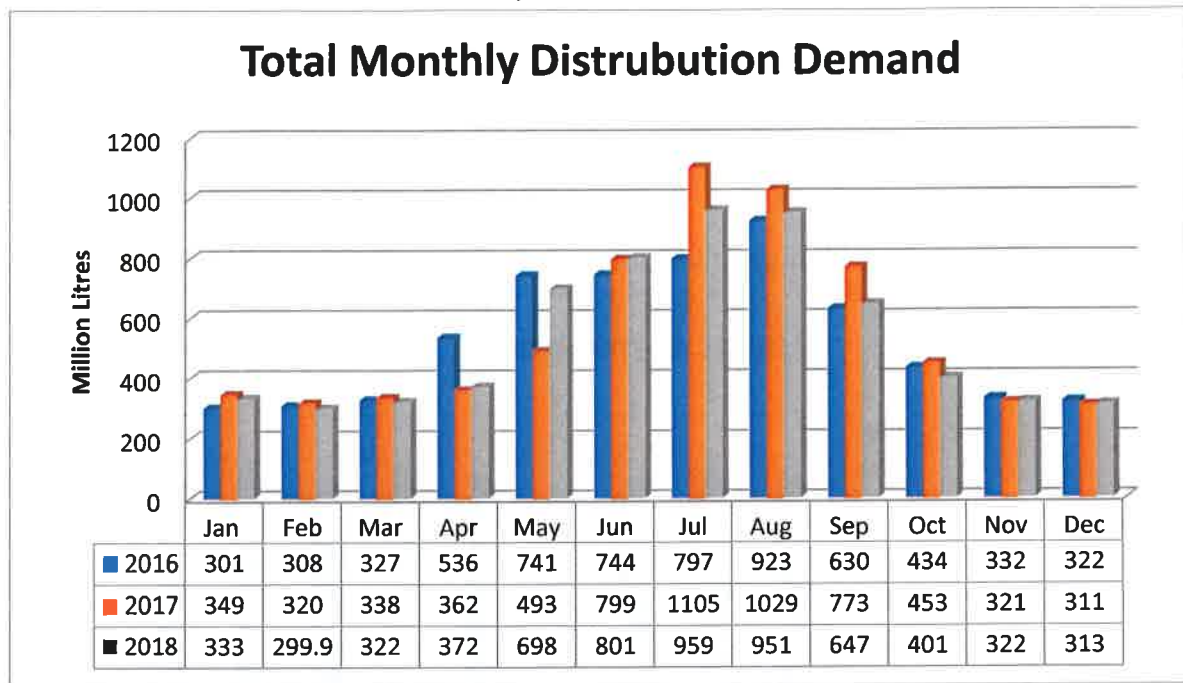
Chart 9: 2010 – 2018 Raw Water Demand / Including West Bench Irrigation District



Demand has a direct impact on existing water infrastructure as well as community planning. In 2018 peak day was 41.2 million litres which occurred on July 25, 2018. This includes water supply to the West Bench Irrigation System.

Average Yearly Daily Demand per person was 526 liters per capita per day based upon a population of 33,760. Demands are based on distribution flow meter records thereby excluding backwash and other operational uses of water within the treatment process.

Chart 10: Total Distribution Demand by Month 2016 – 2018



2018 Water Conservation Goal and Objectives

1. Reduce Peak Day Demand and Average Daily Demand.

Purpose – minimize the impact of our growing community on water resources. Effectively develop programs which aim at reducing Peak Day Demand and Average Daily Demand. We were successful in meeting this goal in 2018. Peak day demand was lower 41.2 ML from the previous year of 41.9 ML.

2. Update Water Conservation Webpage

Purpose – provide relevant solutions to reducing water waste as well as timely information on water consumption in order to promote the cause and effect of turning off the tap. Every drop counts! The City web page has links to the Okanagan Basin Water Board and valley wide information supporting water conservation.

3. Promote Canadian Drinking Water Week and BC Drinking Water Week

Purpose – distribute posters and information regarding local activities including contests thru OBWB and BCWWA. Numerous posters and handout information was available for the public at city buildings. This material is developed and supplied by the Okanagan Basin Water Board Make Water Work Campaign.

4. Collaborate with OBWB and RDOS regarding public messaging

Purpose – cost sharing initiative promoting similar messages. The City is a member of the Okanagan Basin Water Board and uses promotional material developed by the board. This information is based on a valley wide model to reduce costs and provide consistent messaging.

10.0 Drought Management

No drought declarations for the southern interior were issued by the provincial government in 2018. The City's response to the drought declaration in 2015 was to review our drought management strategies. As a result of this review the City is working with a consulting engineer to develop a drought management plan. This work started in 2016 and phase one was completed in 2018 with phase two to be completed in 2019. The purpose of the plan is to provide the city with a professional report that identifies our water supply and looks at water demands historically and for the future. The report will identify drought resilience for each source and the requirements to mitigate an extended drought. The end report will identify trigger points and provide decision making guidelines for each level of drought. A communications protocol will be clearly defined for each level of drought.

Irrigation Systems

Two creeks within the City of Penticton boundaries are used as sources of water for irrigation systems. The South Okanagan Development Company initially developed the Penticton Creek irrigation system in 1906. Ellis Creek irrigation system was developed in the late 1960's. Penticton Creek Irrigation System is of high significance to the City as we also hold licences for domestic water works on this source.

Penticton Creek Irrigation System

Records indicate that Penticton #1 Dam was built prior to 1921, although the exact year of construction is not known. It is located approximately 22 km northeast of Penticton. The dam has a live storage capacity of 1200-acre feet (1.48 million m³) and empties into the reservoir of Greyback Dam. A dam safety study identified seepage and stability issues and recommended the structure be updated or decommissioned. In September of 2006, upon final review of the Knight and Piesold dam study, Penticton #1 dam was breached and removed from service.

The Greyback Dam is located at the head of the Penticton Creek watershed, approximately 19-km northeast of Penticton. The dam is used by the City of Penticton to supply and control water for their domestic water and north irrigation system. The dam has a live storage capacity of approximately 10,000 acre-feet (12.33 million m³) Greyback Dam is a zoned earthfill embankment designed by the Canadian Department of Regional Economic Expansion with construction completed in 1967. The dam is approximately 35 meters in height and 610 meters in length. An emergency spillway is located on the east abutment.

Greyback Reservoir covers an area of approximately 300 acres and empties into Pentiction Creek flowing into Campbell Mountain Diversion Dam followed by Pentiction #2 dam.

A.C. McEachern Ltd. of Vancouver constructed the Campbell Mountain Diversion Dam in 1966-1967. The purpose of this project was to divert water from Pentiction Creek via a tunnel to the north irrigation system. The diversion dam has a storage capacity of 25-acre feet (31,000 m³) of water. Method of construction is earth filled embankment with a side discharge concrete channel spillway and chute located on the right abutment. Previous to the construction of this diversion, irrigation water for farms and orchards located on the north bench was via flume and open ditch. Water that is not diverted flows into Pentiction Creek and Pentiction #2 dam.

Pentiction # 2 Dam is a concrete arch dam originally constructed in about 1930 and raised by 3 meters in 1939. The current dam is approximately 16 meters in height and spans 22 meters between abutments. The dam has a storage capacity of 58-acre feet (71500 m³) of water. The flooded area behind the dam is approximately 5 acres. Current use of the dam is to supply water to the Water Treatment Plant located immediately downstream. The Knight and Piesold dam study indicated that this dam required significant upgrades. These upgrades were completed in January 2013 as part of the 2012 capital works plan.

Total daily City allotted capacity for irrigation from Pentiction Creek is calculated to be 46.26 MLd. Peak day for Pentiction Creek irrigation system was 14.92 MLd recorded at the Randolph Rd flow meter. Peak day demand for 2018 is calculated to be 32 % of allotted daily capacity. Total demand on Pentiction Creek Irrigation system in 2018 was 1318 ML (1068 acre feet).

Ellis Creek Irrigation System

The Ellis Creek Diversion dam was constructed in 1966 by Interior Contracting Ltd. of Pentiction, and has been in operation since the spring of 1967. The diversion dam is a small earthfill embankment with a concrete channel weir that spills over the crest and downstream face of the dam. The dam has a relatively minor storage capacity of approximately 5-acre feet (6200 m³) of water. The flooded area behind the dam is less than 1 acre. The diversion dam receives water from the Ellis #2 and Ellis #4 dams. Maintenance of the diversion dam is the responsibility of the City Works Division.

Total daily city allotted capacity for irrigation from Ellis Creek is calculated to be 9.99 MLd. Peak day for Ellis Creek irrigation system occurred on Aug09, 2018 when 10.9 MLd demand was recorded by the Ellis Creek Irrigation flow meter. Peak day demand for 2018 is calculated to be 109% of allotted daily capacity. Total demand on Ellis Creek Irrigation system for 2018 was 764 ML (619 acre feet).

Chart 11: Irrigation Water Use 2008 -2018

Year	Penticton Creek Irrigation	Ellis Creek Irrigation
	Million Litres	Million Litres
2008	1532.0	331
2009	2687.0	356
2010	2908.0	496
2011	2755.0	215
2012	3126.0	330
2013	3015.0	263
2014	3208.0	297
2015	3228.0	397
2016	3113.0	754
2017	3340.0	886
2018	1318.0	764

11.0 Cross Connection Control

A cross connection refers to any actual or potential physical connection between a potable water line and any pipe, vessel or machine containing or possibly containing a non-potable fluid, gas or solid, such that it is possible for the contaminant to enter the water system by backflow.

The City of Penticton’s Cross Connection Control program has approximately 1,871 testable assemblies. These testable assemblies refer to Double Check Valve Assemblies and Reduced Pressure Backflow Assemblies isolating moderate and high hazards. The program is managed by the Building Department.

A secondary component of the Cross Connection Control Program entails performing site surveys which identify actual or potential cross connections and their remedies. In some cases, the solution incorporated a non-testable device such as a Hose Bib Vacuum Breaker, an approved air gap or the elimination of the backflow hazard altogether. And in other circumstances, testable assemblies isolated the hazard. These measures are in place as a means of providing safe drinking water and meeting one of the City of Penticton’s conditions on the Permit to Operate.

12.0 Water Capital Improvements

Capital projects completed in 2018

1. Hydrant maintenance program
2. Irrigation system upgrades
3. Rural meter pit program (completed all, funds reallocated to operating account for residential meter pit installations for unmetered accounts)
4. Installation of 5 new hydrants as per spacing requirements (remaining funds redirected to engineering for capital works)
5. Campbell Mountain Diversion upgrades as per Dam Safety Review
6. Howard Lake Decommission
7. Complete Drought Management Plan Phase I
8. WTP Plant – Programmable logic controller upgrade
9. Carmi Reservoir Cell Two Expansion
10. Carmi 1820 Zone Valve Chamber Installation
11. Ellis and Penticton Creek Flow monitoring

Capital projects anticipated for 2019

1. Hydrant maintenance program
2. Installation of 15 new hydrants as per spacing and development plan
3. Irrigation Meter program
4. Ellis #4 pre-construction design(as per 2014 DSR)
5. Ok Lake pump station electrical upgrade
6. WTP Chlorine gas to liquid hypochlorite conversion
7. WTP Filter valve and actuator replacement
8. Complete Drought Management Plan Phase II

Contact the Water Treatment Plant at wtp@penticton.ca

Appendix A Quick Facts 2018

Lake				
	Min	Max	Average	Units
Alkalinity	115.0	110.0	112.5	Mg/l CaCO ₃
Colour Apparent	16.6	5.1	10.9	Colour Units
Colour True	4.7	2.9	3.8	Colour Units
Hardness	123.0	119.4	121.2	Mg/l CaCO ₃
pH	8.2	7.9	8.1	pH Units
Turbidity	1.5	0.2	0.8	NTU
Creek				
Alkalinity	34.0	12.0	23.0	Mg/l CaCO ₃
Colour Apparent	123.0	33.0	78.0	Colour Units
Colour True	80.0	27.0	53.5	Colour Units
Hardness	31.0	11.0	21.0	Mg/l CaCO ₃
pH	7.8	7.1	7.4	pH Units
Turbidity	4.8	0.5	2.6	NTU
Blend 70/30				
Alkalinity	88.5	81.5	85.0	Mg/l CaCO ₃
Colour Apparent	28.0	18.0	23.0	Colour Units
Colour True	18.5	13.8	16.1	Colour Units
Hardness	90.0	88.8	89.4	Mg/l CaCO ₃
pH	8.0	7.9	7.9	pH Units
Turbidity	0.7	0.3	0.5	NTU

Raw Source Water Volumes

Flows			
		Million Litres	
Ellis Creek Irrigation		764.0	
Penticton Creek Irrigation		1318.0	
Penticton Creek Domestic		884.0	
Okanagan Lake		5728.5	
Warren Ave Well		0.0	
Total Plant Intake		6612.5	

Distribution Quick Facts

Parameter	Result	Unit	Date
Total Distribution	6699.0	ML	2018
Maximum Day	41.2	ML/d	July 25/18
Minimum Day	7.4	ML/d	Dec 14/18
Average Daily	18.4	ML/d	2018 Average
Average Daily / Capita	526.0	L/d/c	2018 Average
Maximum Daily / Capita	1177.0	L/d/c	July 25/18
Minimum Daily / Capita	211.1	L/d/c	Dec 14/18
Average Alkalinity	81.5	mg/l CaOH3	2018 Average
Chlorine Avg. @ Plant	1.3	mg/l	2018 Average
Hardness Average	112.0	mg/l CaOH3	2018 Average
Temp Average	6.0	Celcius	2018 Average
pH Average	7.87		2018 Average
Turbidity Avg.	0.07	NTU	2018 Average

Appendix B – Water Quality Lab Reports

- **April 12, 2018 – City Wide Sampling**
- **Aug 16, 2018 – City Wide Sampling**
- **Nov 29, 2018 – City Wide Sampling**





Analytical Report

Bill To: City of Penticton 616 Okanagan Avenue East Penticton, BC, Canada V2A 3K6	Project ID: PE 13491 + Quarterly Project Name: City of Penticton Project Location: LSD: P.O.: S18-0005 Proj. Acct. code:	Lot ID: 1264426 Control Number: Date Received: Apr 12, 2018 Date Reported: Apr 20, 2018 Report Number: 2277411
Attn: Accounts Payable Sampled By: DM/RP Company: C.O.P		

	Reference Number	1264426-1	1264426-2	1264426-8	
	Sample Date	Apr 11, 2018	Apr 11, 2018	Apr 11, 2018	
	Sample Time	NA	NA	NA	
	Sample Location				
	Sample Description	Smythe Drive / 6.1 °C	PRV Station / 6.1 °C	Randolph Rd Station / 6.1 °C	
	Matrix	Water	Water	Water	
Analyte	Units	Results	Results	Results	Nominal Detection Limit
Trihalomethanes Screen - Water					
Chloroform	mg/L	0.073	0.038	0.058	0.001
Bromodichloromethane	mg/L	0.010	0.005	0.008	0.001
Dibromochloromethane	mg/L	<0.001	<0.001	<0.001	0.001
Bromoform	mg/L	<0.001	<0.001	<0.001	0.001
Total Trihalomethanes	mg/L	0.083	0.043	0.066	0.001
Trihalomethanes - Surrogate Recovery					
Dibromofluoromethane	EPA Surrogate %	121	121	117	50-140
Toluene-d8	EPA Surrogate %	97	93	96	50-140
Bromofluorobenzene	EPA Surrogate %	94	96	104	50-140





Analytical Report

Bill To: City of Pentiction 616 Okanagan Avenue East Pentiction, BC, Canada V2A 3K6	Project ID: PE 13491 + Quarterly Project Name: City of Pentiction Project Location: LSD:	Lot ID: 1264426 Control Number: Date Received: Apr 12, 2018 Date Reported: Apr 20, 2018 Report Number: 2277411
Attn: Accounts Payable	P.O.: S18-0005	
Sampled By: DM/RP	Proj. Acct. code:	
Company: C.O.P		

	Reference Number	1264426-2	1264426-3	1264426-4		
	Sample Date	Apr 11, 2018	Apr 11, 2018	Apr 11, 2018		
	Sample Time	NA	NA	NA		
	Sample Location					
	Sample Description	PRV Station / 6.1 °C	Filter #6 Post Filtration / 6.1 °C	O.K Lake Sample Tap / 6.1 °C		
	Matrix	Water	Water	Water		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Inorganic Nonmetallic Parameters						
Organic Carbon	Total Nonpurgeable	mg/L	3.5	3.7	4.0	0.5
Cyanide	Dissolved	mg/L	<0.002		<0.002	0.002
Ammonia - N		mg/L	<0.01		<0.01	0.01
Orthophosphate-P	Dissolved	mg/L	<0.002		<0.002	0.002
Phosphorus	Total	mg/L	<0.003		0.005	0.003



Analytical Report

Bill To: City of Penticton 616 Okanagan Avenue East Penticton, BC, Canada V2A 3K6	Project ID: PE 13491 + Quarterly Project Name: City of Penticton Project Location: LSD:	Lot ID: 1264426 Control Number: Date Received: Apr 12, 2018 Date Reported: Apr 20, 2018 Report Number: 2277411
Attn: Accounts Payable	P.O.: S18-0005	
Sampled By: DM/RP	Proj. Acct. code:	
Company: C.O.P		

		Reference Number	1264426-2	1264426-4	1264426-6	
		Sample Date	Apr 11, 2018	Apr 11, 2018	Apr 11, 2018	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	PRV Station / 6.1 °C	O.K Lake Sample Tap / 6.1 °C	Penticton Creek Upstream / 6.1 °C	
		Matrix	Water	Water	Water	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Metals Total						
Calcium	Total	mg/L	36	36	12	0.01
Magnesium	Total	mg/L	9.7	9.8	2.9	0.02
Potassium	Total	mg/L	2.5	2.6	1.7	0.04
Silicon	Total	mg/L	3.6	3.7	9.1	0.005
Sulfur	Total	mg/L	10	9.8	2.1	0.02
Sodium	Total	mg/L	12	12	7.4	0.1
Titanium	Total	mg/L	0.004	0.005	0.012	0.002
Digestion	Preparation		Field Pres, digest as total Hg	Field Pres, digest as total Hg	Field Pres, digest as total Hg	
Mercury	Total	mg/L	<0.00001	<0.00001	<0.00001	0.00001
Physical and Aggregate Properties						
Colour	True	Colour units	<5	<5	46	5
Solids	Total Suspended	mg/L	<2	<2	<2	2
Solids	Total Dissolved	mg/L	170	170	100	5
Routine Water						
pH - Holding Time			Exceeded	Exceeded	Exceeded	
pH	at 25 °C		7.71	7.88	7.45	0.01
Electrical Conductivity		µS/cm at 25 °C	290	283	112	1
Bicarbonate		mg/L	128	134	44	5
Carbonate		mg/L	<6	<6	<6	6
Hydroxide		mg/L	<5	<5	<5	5
P-Alkalinity	as CaCO3	mg/L	<5	<5	<5	5
T-Alkalinity	as CaCO3	mg/L	105	110	36	5
Chloride	Dissolved	mg/L	8.10	4.53	5.88	0.05
Fluoride	Dissolved	mg/L	0.10	0.11	0.09	0.01
Nitrate - N	Dissolved	mg/L	0.06	0.06	0.01	0.01
Nitrite - N	Dissolved	mg/L	<0.01	<0.01	<0.01	0.01
Sulfate (SO4)	Dissolved	mg/L	27.7	27.6	5.3	0.1
Hardness	Total	mg CaCO3/L	129	130	42	1
Trace Metals Total						
Aluminum	Total	mg/L	0.17	0.005	0.27	0.001
Antimony	Total	mg/L	0.00013	0.00010	0.00007	0.00002
Arsenic	Total	mg/L	0.0004	0.0005	0.0002	0.0001
Barium	Total	mg/L	0.021	0.021	0.014	0.0001
Beryllium	Total	mg/L	<0.00005	<0.00005	<0.00005	0.00005
Bismuth	Total	mg/L	<0.0001	<0.0001	<0.0001	0.0001
Boron	Total	mg/L	0.0098	0.010	0.002	0.002
Cadmium	Total	mg/L	<0.00001	<0.00001	<0.00001	0.00001



Analytical Report

Bill To: City of Penticton 616 Okanagan Avenue East Penticton, BC, Canada V2A 3K6	Project ID: PE 13491 + Quarterly Project Name: City of Penticton Project Location: LSD: P.O.: S18-0005 Proj. Acct. code:	Lot ID: 1264426 Control Number: Date Received: Apr 12, 2018 Date Reported: Apr 20, 2018 Report Number: 2277411
Attn: Accounts Payable Sampled By: DM/RP Company: C.O.P		

Reference Number	1264426-2	1264426-4	1264426-6
Sample Date	Apr 11, 2018	Apr 11, 2018	Apr 11, 2018
Sample Time	NA	NA	NA
Sample Location			
Sample Description	PRV Station / 6.1 °C	O.K Lake Sample Tap / 6.1 °C	Penticton Creek Upstream / 6.1 °C
Matrix	Water	Water	Water

Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Trace Metals Total - Continued						
Chromium	Total	mg/L	<0.00005	0.00008	0.00027	0.00005
Cobalt	Total	mg/L	0.00002	0.00003	0.00012	0.00002
Copper	Total	mg/L	0.0007	0.0051	0.0018	0.0002
Iron	Total	mg/L	<0.002	0.005	0.34	0.002
Lead	Total	mg/L	<0.00001	0.00014	0.00006	0.00001
Lithium	Total	mg/L	0.0033	0.0032	0.0025	0.0005
Manganese	Total	mg/L	<0.001	<0.001	0.006	0.001
Molybdenum	Total	mg/L	0.0034	0.0035	0.0015	0.00002
Nickel	Total	mg/L	0.0005	0.0006	0.00097	0.0002
Selenium	Total	mg/L	0.0004	0.0003	<0.0002	0.0002
Silver	Total	mg/L	<0.00001	<0.00001	<0.00001	0.00001
Strontium	Total	mg/L	0.27	0.28	0.094	0.0001
Tellurium	Total	mg/L	<0.00005	<0.00005	<0.00005	0.00005
Thallium	Total	mg/L	<0.00001	<0.00001	<0.00001	0.00001
Thorium	Total	mg/L	<0.00005	<0.00005	0.00012	0.00005
Tin	Total	mg/L	<0.0001	<0.0001	<0.0001	0.0001
Uranium	Total	mg/L	0.0022	0.0024	0.0014	0.00001
Vanadium	Total	mg/L	0.00057	0.00064	0.0013	0.00005
Zinc	Total	mg/L	0.00099	0.0070	0.0011	0.0005
Zirconium	Total	mg/L	0.0002	0.0002	0.0011	0.0001



Analytical Report

Bill To: City of Penticton
 616 Okanagan Avenue East
 Penticton, BC, Canada
 V2A 3K6
 Attn: Accounts Payable
 Sampled By: DM/RP
 Company: C.O.P

Project ID: PE 13491 + Quarterly
 Project Name: City of Penticton
 Project Location:
 LSD:
 P.O.: S18-0005
 Proj. Acct. code:

Lot ID: **1264426**
 Control Number:
 Date Received: Apr 12, 2018
 Date Reported: Apr 20, 2018
 Report Number: 2277411

	Reference Number	1264426-2	1264426-5	1264426-6
	Sample Date	Apr 11, 2018	Apr 11, 2018	Apr 11, 2018
	Sample Time	NA	NA	NA
	Sample Location			
	Sample Description	PRV Station / 6.1 °C	Backwash Pond / 6.1 °C	Penticton Creek Upstream / 6.1 °C
	Matrix	Water	Water	Water

Analyte	Units	Results	Results	Results	Nominal Detection Limit
Trace Metals Dissolved					
Digestion	Dissolved	Field filtered and Pres Dissol	Field filtered and Pres Dissol	Field filtered and Pres Dissol	
Aluminum	Dissolved	mg/L	0.080	0.045	0.181
					0.001



Analytical Report

Bill To: City of Penticton
 616 Okanagan Avenue East
 Penticton, BC, Canada
 V2A 3K6
 Attn: Accounts Payable
 Sampled By: DM/RP
 Company: C.O.P

Project ID: PE 13491 + Quarterly
 Project Name: City of Penticton
 Project Location:
 LSD:
 P.O.: S18-0005
 Proj. Acct. code:

Lot ID: **1264426**
 Control Number:
 Date Received: Apr 12, 2018
 Date Reported: Apr 20, 2018
 Report Number: 2277411

Reference Number 1264426-6
Sample Date Apr 11, 2018
Sample Time NA
Sample Location
Sample Description Penticton Creek
 Upstream / 6.1 °C

Matrix Water

Analyte	Units	Results	Results	Results	Nominal Detection Limit
Inorganic Nonmetallic Parameters					
Organic Carbon	Total Nonpurgeable	mg/L	11.3		0.5
Cyanide	Dissolved	mg/L	<0.002		0.002
Ammonia - N		mg/L	<0.01		0.01
Orthophosphate-P	Dissolved	mg/L	0.003		0.002
Phosphorus	Total	mg/L	0.026		0.003

Analytical Report

Bill To: City of Penticton
616 Okanagan Avenue East
Penticton, BC, Canada
V2A 3K6
Attn: Accounts Payable
Sampled By: DM/RP
Company: C.O.P

Project ID: PE 13491 + Quarterly
Project Name: City of Penticton
Project Location:
LSD:
P.O.: S18-0005
Proj. Acct. code:

Lot ID: **1264426**
Control Number:
Date Received: Apr 12, 2018
Date Reported: Apr 20, 2018
Report Number: 2277411

Reference Number 1264426-7
Sample Date Apr 11, 2018
Sample Time NA
Sample Location
Sample Description Penticton Creek
Downstream / 6.1 °C

Matrix Water

Analyte	Units	Results	Results	Results	Nominal Detection Limit
Trace Metals Dissolved					
Digestion	Dissolved		Field filtered and Pres Dissol		
Aluminum	Dissolved	mg/L	0.145		0.001

Approved by: 
Benjamin Morris, B.Sc
Client Services Team Leader

Methodology and Notes

Bill To: City of Penticton 616 Okanagan Avenue East Penticton, BC, Canada V2A 3K6	Project ID: PE 13491 + Quarterly Project Name: City of Penticton Project Location: LSD:	Lot ID: 1264426 Control Number: Date Received: Apr 12, 2018 Date Reported: Apr 20, 2018 Report Number: 2277411
Attn: Accounts Payable	P.O.: S18-0005	
Sampled By: DM/RP	Proj. Acct. code:	
Company: C.O.P		

Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
Alk, pH, EC, Turb in water (BC)	APHA	* Alkalinity - Titration Method, 2320 B	Apr 12, 2018	Exova Surrey
Alk, pH, EC, Turb in water (BC)	APHA	* Conductivity, 2510 B	Apr 12, 2018	Exova Surrey
Alk, pH, EC, Turb in water (BC)	APHA	* pH - Electrometric Method, 4500-H+ B	Apr 12, 2018	Exova Surrey
Ammonia-N in Water (Surrey)	APHA	* Flow Injection Analysis, 4500-NH3 H	Apr 13, 2018	Exova Surrey
Anions by IEC in water (Surrey)	APHA	* Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	Apr 12, 2018	Exova Surrey
Carbon Organic (Total) in water (TOC)	APHA	High-Temperature Combustion Method, 5310 B	Apr 16, 2018	Exova Edmonton
Cyanide (Dissolved) in water	Alta. Env. Method	* Cyanide, Simple Extractable (Automated Pyridine-Barbituric Acid Colorimetric Method), 06608L	Apr 20, 2018	Exova Edmonton
Mercury Low Level (Total) in water (Surrey)	EPA	* Mercury in Water by Cold Vapor Atomic Fluorescence Spectrometry, 245.7	Apr 13, 2018	Exova Surrey
Metals SemiTrace (Total) in Water (Surrey)	US EPA	* Metals & Trace Elements by ICP-AES, 6010C	Apr 16, 2018	Exova Surrey
Phosphorus - orthophosphate by Smartchem (Surrey)	APHA	Ascorbic Acid Reduction Method, 4500-P E	Apr 13, 2018	Exova Surrey
Phosphorus - total by Smartchem (Surrey)	APHA	* Persulfate digestion method, 4500-P B5	Apr 18, 2018	Exova Surrey
Solids Dissolved (Total, Fixed and Volatile) - Surrey	APHA	* Total Dissolved Solids Dried at 180 C, 2540 C	Apr 13, 2018	Exova Surrey
Solids Suspended (Total, Fixed and Volatile) - Surrey	APHA	* Total Suspended Solids Dried at 103-105°C, 2540 D	Apr 13, 2018	Exova Surrey
THM - Water	US EPA	* US EPA method, 8260B/5035	Apr 13, 2018	Exova Calgary
Trace Metals (dissolved) in Water (Surrey)	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Apr 12, 2018	Exova Surrey
Trace Metals (Total) in Water (Surrey)	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Apr 16, 2018	Exova Surrey
True Color in water (Surrey)	APHA	* Spectrophotometric - Single Wavelength Method, 2120 C	Apr 13, 2018	Exova Surrey

* Reference Method Modified

References

Alta. Env. Method	Alberta Environment Method
APHA	Standard Methods for the Examination of Water and Wastewater
EPA	Environmental Protection Agency Test Methods - US
US EPA	US Environmental Protection Agency Test Methods



Methodology and Notes

Bill To:	City of Penticton	Project ID:	PE 13491 + Quarterly	Lot ID:	1264426
	616 Okanagan Avenue East	Project Name:	City of Penticton	Control Number:	
	Penticton, BC, Canada	Project Location:		Date Received:	Apr 12, 2018
	V2A 3K6	LSD:		Date Reported:	Apr 20, 2018
Attn:	Accounts Payable	P.O.:	S18-0005	Report Number:	2277411
Sampled By:	DM/RP	Proj. Acct. code:			
Company:	C.O.P				

Please direct any inquiries regarding this report to our Client Services Group or to the Operations Manager at the coordinates indicated at the top left of this page.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.

Appendix B – Water Quality Lab Reports

- **April 12, 2018 – City Wide Sampling**
- **Aug 16, 2018 – City Wide Sampling**
- **Nov 29, 2018 – City Wide Sampling**





Analytical Report

Bill To: City of Penticton 616 Okanagan Avenue East Penticton, BC, Canada V2A 3K6	Project ID: PE 13491 + Quarterly Project Name: City of Penticton Project Location: LSD: P.O.: S18-0005 Proj. Acct. code:	Lot ID: 1292021 Control Number: B06896 Date Received: Aug 16, 2018 Date Reported: Aug 23, 2018 Report Number: 2315015
Attn: Accounts Payable		
Sampled By: DM/AE		
Company: City of Penticton		

Reference Number	1292021-1	1292021-2	1292021-3
Sample Date	Aug 15, 2018	Aug 15, 2018	Aug 15, 2018
Sample Time	NA	NA	NA
Sample Location			
Sample Description	Penticton Creek Upstream	Penticton Creek Downstream	PRV Station
Matrix	Water	Water	Water

Analyte	Units	Results	Results	Results	Nominal Detection Limit
Trace Metals Dissolved					
Digestion	Dissolved	Field filtered and Pres Dissol	Field filtered and Pres Dissol	Field filtered and Pres Dissol	
Aluminum	Dissolved mg/L	0.081	0.065	0.026	0.001



Analytical Report

Bill To: City of Penticton 616 Okanagan Avenue East Penticton, BC, Canada V2A 3K6	Project ID: PE 13491 + Quarterly Project Name: City of Penticton Project Location: LSD: P.O.: S18-0005 Proj. Acct. code:	Lot ID: 1292021 Control Number: B06896 Date Received: Aug 16, 2018 Date Reported: Aug 23, 2018 Report Number: 2315015
Attn: Accounts Payable Sampled By: DM/AE Company: City of Penticton		

		Reference Number	1292021-1	1292021-3	1292021-4	
		Sample Date	Aug 15, 2018	Aug 15, 2018	Aug 15, 2018	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	Penticton Creek Upstream	PRV Station	Okanagan Lake	
		Matrix	Water	Water	Water	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Inorganic Nonmetallic Parameters						
Organic Carbon	Total Nonpurgeable	mg/L	6.6	3.4	4.2	0.5
Cyanide	Dissolved	mg/L	<0.002	<0.002	<0.002	0.002
Ammonia - N		mg/L	<0.01	<0.01	<0.01	0.01
Nitrate - N		mg/L	<0.01	0.09	0.12	0.01
Nitrite - N		mg/L	0.005	<0.003	0.004	0.003
Orthophosphate-P	Dissolved	mg/L	<0.002	<0.002	<0.002	0.002
Phosphorus	Total	mg/L	0.007	0.007	0.010	0.003
Metals Total						
Calcium	Total	mg/L	4.1	25	34	0.01
Magnesium	Total	mg/L	1.1	6.8	9.3	0.02
Potassium	Total	mg/L	0.59	1.9	2.4	0.04
Silicon	Total	mg/L	5.1	4.1	4.0	0.005
Sulfur	Total	mg/L	0.68	6.9	9.8	0.02
Sodium	Total	mg/L	2.0	9.1	12	0.1
Titanium	Total	mg/L	<0.002	0.002	0.004	0.002
Digestion	Preparation		Field Pres, digest as total Hg	Field Pres, digest as total Hg	Field Pres, digest as total Hg	
Mercury	Total	mg/L	<0.00001	<0.00001	<0.00001	0.00001
Physical and Aggregate Properties						
Colour	True	Colour units	33	<5	<5	5
Solids	Total Suspended	mg/L	<2	<2	<2	2
Solids	Total Dissolved	mg/L	48	140	170	5
Routine Water						
pH - Holding Time			Exceeded	Exceeded	Exceeded	
pH	at 25 °C		7.14	7.60	7.90	0.01
Electrical Conductivity		µS/cm at 25 °C	39	227	292	1
Bicarbonate		mg/L	16	83	134	5
Carbonate		mg/L	<6	<6	<6	6
Hydroxide		mg/L	<5	<5	<5	5
P-Alkalinity	as CaCO3	mg/L	<5	<5	<5	5
T-Alkalinity	as CaCO3	mg/L	13	68	110	5
Chloride	Dissolved	mg/L	0.78	12.8	5.29	0.05
Fluoride	Dissolved	mg/L	0.02	0.05	0.12	0.01
Sulfate (SO4)	Dissolved	mg/L	1.9	22.1	31.3	0.1
Hardness	Total	mg CaCO3/L	15	90	123	1
Trace Metals Total						
Aluminum	Total	mg/L	0.11	0.033	0.014	0.001
Antimony	Total	mg/L	0.00003	0.00005	0.00006	0.00002



Analytical Report

Bill To: City of Penticton 616 Okanagan Avenue East Penticton, BC, Canada V2A 3K6	Project ID: PE 13491 + Quarterly Project Name: City of Penticton Project Location: LSD: P.O.: S18-0005 Proj. Acct. code:	Lot ID: 1292021 Control Number: B06896 Date Received: Aug 16, 2018 Date Reported: Aug 23, 2018 Report Number: 2315015
Attn: Accounts Payable Sampled By: DM/AE Company: City of Penticton		

		Reference Number	1292021-1	1292021-3	1292021-4	
		Sample Date	Aug 15, 2018	Aug 15, 2018	Aug 15, 2018	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	Penticton Creek Upstream	PRV Station	Okanagan Lake	
	Matrix		Water	Water	Water	
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Trace Metals Total - Continued						
Arsenic	Total	mg/L	<0.0001	0.0001	0.0005	0.0001
Barium	Total	mg/L	0.0061	0.015	0.020	0.0001
Beryllium	Total	mg/L	<0.00005	<0.00005	<0.00005	0.00005
Bismuth	Total	mg/L	<0.0001	<0.0001	<0.0001	0.0001
Boron	Total	mg/L	0.003	0.009	0.011	0.002
Cadmium	Total	mg/L	<0.00001	<0.00001	<0.00001	0.00001
Chromium	Total	mg/L	0.00012	<0.00005	<0.00005	0.00005
Cobalt	Total	mg/L	0.00005	<0.00002	<0.00002	0.00002
Copper	Total	mg/L	0.0012	0.0002	0.0040	0.0002
Iron	Total	mg/L	0.26	0.003	0.015	0.002
Lead	Total	mg/L	0.00009	<0.00001	0.00007	0.00001
Lithium	Total	mg/L	<0.0005	0.0022	0.0028	0.0005
Manganese	Total	mg/L	0.007	0.001	0.001	0.001
Molybdenum	Total	mg/L	0.00045	0.0023	0.0032	0.00002
Nickel	Total	mg/L	0.0003	0.0003	0.0006	0.0002
Selenium	Total	mg/L	<0.0002	0.0002	0.0004	0.0002
Silver	Total	mg/L	<0.00001	<0.00001	<0.00001	0.00001
Strontium	Total	mg/L	0.043	0.19	0.26	0.0001
Tellurium	Total	mg/L	<0.00005	<0.00005	<0.00005	0.00005
Thallium	Total	mg/L	<0.00001	<0.00001	<0.00001	0.00001
Thorium	Total	mg/L	0.00007	<0.00005	<0.00005	0.00005
Tin	Total	mg/L	<0.0001	<0.0001	0.0001	0.0001
Uranium	Total	mg/L	0.00056	0.00043	0.0022	0.00001
Vanadium	Total	mg/L	0.00061	0.00028	0.00055	0.00005
Zinc	Total	mg/L	0.0016	0.0008	0.0050	0.0005
Zirconium	Total	mg/L	0.0004	<0.0001	<0.0001	0.0001



Analytical Report

Bill To: City of Penticton 616 Okanagan Avenue East Penticton, BC, Canada V2A 3K6	Project ID: PE 13491 + Quarterly Project Name: City of Penticton Project Location: LSD:	Lot ID: 1292021 Control Number: B06896 Date Received: Aug 16, 2018 Date Reported: Aug 23, 2018 Report Number: 2315015
Attn: Accounts Payable Sampled By: DM/AE Company: City of Penticton	P.O.: S18-0005 Proj. Acct. code:	

Reference Number 1292021-3
Sample Date Aug 15, 2018
Sample Time NA
Sample Location
Sample Description PRV Station

Matrix Water

Analyte	Units	Results	Results	Results	Nominal Detection Limit
Multiresidue Pesticides in Water					
Bifenox	µg/L	<0.5			0.5
Carboxin	µg/L	<0.5			0.5
Chlorobenzilate	µg/L	<0.5			0.5
Coumaphos	µg/L	<0.5			0.5
Crotoxyphos	µg/L	<0.5			0.5
Deltamethrin	µg/L	<0.5			0.5
Diphenamid	µg/L	<0.5			0.5
Fenamiphos	µg/L	<0.5			0.5
Fenson	µg/L	<0.5			0.5
Fenvalerate	µg/L	<0.5			0.5
Leptophos	µg/L	<0.5			0.5
Methoprene	µg/L	<0.5			0.5
Norflurazon	µg/L	<0.5			0.5
Pebulate	µg/L	<0.5			0.5
Prometon	µg/L	<0.5			0.5
Propargite	µg/L	<0.5			0.5
Propiconazole	µg/L	<0.5			0.5
Prothiofos	µg/L	<0.5			0.5
Tebuconazole	µg/L	<0.5			0.5
Terbacil	µg/L	<0.5			0.5
Vernolate	µg/L	<0.5			0.5
Multiresidue Pesticides - Water - Surrogate Rec.					
TPP	Surrogate	%	92		50-140
Organochlorine Pesticides in Water					
Aldrin	µg/L	<0.5			0.5
BHC (alpha isomer)	µg/L	<0.5			0.5
BHC (beta isomer)	µg/L	<0.5			0.5
BHC (delta isomer)	µg/L	<0.5			0.5
Captan	µg/L	<3.0			3.0
Chlorbenside	µg/L	<0.5			0.5
Chlordane-cis	µg/L	<0.5			0.5
Chlordane-trans	µg/L	<0.5			0.5
Chlorfenson	µg/L	<0.5			0.5
Chlorothalonil	µg/L	<0.5			0.5
Chlorthal-dimethyl	µg/L	<0.5			0.5
DDD-o,p'	µg/L	<0.5			0.5
DDD-p,p'	µg/L	<0.5			0.5
DDE-o,p'	µg/L	<0.5			0.5
DDE-p,p'	µg/L	<0.5			0.5

Analytical Report

Bill To: City of Penticton 616 Okanagan Avenue East Penticton, BC, Canada V2A 3K6	Project ID: PE 13491 + Quarterly Project Name: City of Penticton Project Location: LSD:	Lot ID: 1292021 Control Number: B06896 Date Received: Aug 16, 2018 Date Reported: Aug 23, 2018 Report Number: 2315015
Attn: Accounts Payable	P.O.: S18-0005	
Sampled By: DM/AE	Proj. Acct. code:	
Company: City of Penticton		

Reference Number 1292021-3
Sample Date Aug 15, 2018
Sample Time NA
Sample Location
Sample Description PRV Station

Matrix Water

Analyte	Units	Results	Results	Results	Nominal Detection Limit
Organochlorine Pesticides in Water - Continued					
DDT-o,p'	µg/L	<0.5			0.5
DDT-p,p'	µg/L	<0.5			0.5
Dichlofluanid	µg/L	<0.5			0.5
Dieldrin	µg/L	<0.5			0.5
Endosulfan I	µg/L	<0.5			0.5
Endosulfan II	µg/L	<0.5			0.5
Endosulfan sulfate	µg/L	<0.5			0.5
Endrin	µg/L	<0.5			0.5
Folpet	µg/L	<3.0			3.0
Heptachlor	µg/L	<0.5			0.5
Heptachlor Epoxide	µg/L	<0.5			0.5
Hexachlorobenzene	µg/L	<0.5			0.5
Lindane	µg/L	<0.5			0.5
Methoxychlor	µg/L	<0.5			0.5
Mirex	µg/L	<0.5			0.5
Permethrin-cis	µg/L	<0.5			0.5
Permethrin-trans	µg/L	<0.5			0.5
Procymidone	µg/L	<0.5			0.5
Propachlor	µg/L	<0.5			0.5
Quintozene	µg/L	<0.5			0.5
Tecnazene	µg/L	<0.5			0.5
Tetradifon	µg/L	<0.5			0.5
Tolyfluanid	µg/L	<0.5			0.5
Triadimefon	µg/L	<0.5			0.5
Vinclozolin	µg/L	<0.5			0.5
Organochlorine Pesticides -Water- Surrogate Rec.					
TPP	Surrogate	%	92		50-140
Organophosphate Pesticides in Water					
Aspon	µg/L	<0.5			0.5
Azinphos-ethyl	µg/L	<0.5			0.5
Azinphos-methyl	µg/L	<0.5			0.5
Bromophos	µg/L	<0.5			0.5
Bromophos-ethyl	µg/L	<0.5			0.5
Carbophenothion	µg/L	<0.5			0.5
Chlorfenvinphos	µg/L	<0.5			0.5
Chlormephos	µg/L	<0.5			0.5
Chlorpyrifos	µg/L	<0.5			0.5
Chlorpyrifos-methyl	µg/L	<0.5			0.5
Chlorthiophos	µg/L	<0.5			0.5



Analytical Report

Bill To: City of Penticton 616 Okanagan Avenue East Penticton, BC, Canada V2A 3K6	Project ID: PE 13491 + Quarterly Project Name: City of Penticton Project Location: LSD:	Lot ID: 1292021 Control Number: B06896 Date Received: Aug 16, 2018 Date Reported: Aug 23, 2018 Report Number: 2315015
Attn: Accounts Payable Sampled By: DM/AE Company: City of Penticton	P.O.: S18-0005 Proj. Acct. code:	

Reference Number 1292021-3
Sample Date Aug 15, 2018
Sample Time NA
Sample Location
Sample Description PRV Station

Matrix Water

Analyte	Units	Results	Results	Results	Nominal Detection Limit
Organophosphate Pesticides in Water - Continued					
Cyanophos	µg/L	<0.5			0.5
Demeton	µg/L	<0.5			0.5
Diazinon	µg/L	<0.10			0.10
Dichlofenthion	µg/L	<0.5			0.5
Dimethoate	µg/L	<0.5			0.5
Disulfoton	µg/L	<0.5			0.5
Ethion	µg/L	<0.5			0.5
Fenclorophos	µg/L	<0.5			0.5
Fenitrothion	µg/L	<0.5			0.5
Fenthion	µg/L	<0.5			0.5
Fonofos	µg/L	<0.5			0.5
Isofenphos	µg/L	<0.5			0.5
Malaaxon	µg/L	<0.5			0.5
Malathion	µg/L	<0.1			0.1
Methyl Parathion	µg/L	<0.5			0.5
Mevinphos	µg/L	<0.5			0.5
Parathion	µg/L	<0.5			0.5
Phorate	µg/L	<0.5			0.5
Phosalone	µg/L	<0.5			0.5
Phosmet	µg/L	<0.5			0.5
Phosphamidon	µg/L	<0.5			0.5
Pirimiphos-ethyl	µg/L	<0.5			0.5
Pirimiphos-methyl	µg/L	<0.5			0.5
Pyrazophos	µg/L	<0.5			0.5
Quinalophos	µg/L	<0.5			0.5
Sulfotep	µg/L	<0.5			0.5
Terbufos	µg/L	<0.5			0.5
Tetrachlorvinphos	µg/L	<0.5			0.5
Organophosphate Pesticides -Water- Surrogate Rec.					
TPP	Surrogate	%	92		50-140
Neutral Herbicides in Water					
Alachlor	µg/L	<0.5			0.5
Benfluralin	µg/L	<0.5			0.5
Butylate	µg/L	<0.5			0.5
Chlorpropham	µg/L	<0.5			0.5
Diallate	µg/L	<0.5			0.5
Dichlobenil	µg/L	<0.5			0.5
Diclofop-methyl	µg/L	<0.2			0.2
Diphenylamine	µg/L	<0.5			0.5



Analytical Report

Bill To: City of Pentiction
 616 Okanagan Avenue East
 Pentiction, BC, Canada
 V2A 3K6
 Attn: Accounts Payable
 Sampled By: DM/AE
 Company: City of Pentiction

Project ID: PE 13491 + Quarterly
 Project Name: City of Pentiction
 Project Location:
 LSD:
 P.O.: S18-0005
 Proj. Acct. code:

Lot ID: **1292021**
 Control Number: B06896
 Date Received: Aug 16, 2018
 Date Reported: Aug 23, 2018
 Report Number: 2315015

Reference Number 1292021-3
Sample Date Aug 15, 2018
Sample Time NA
Sample Location
Sample Description PRV Station

Matrix Water

Analyte	Units	Results	Results	Results	Nominal Detection Limit
Neutral Herbicides in Water - Continued					
Eptam (EPTC)	µg/L	<0.5			0.5
Ethalfuralin	µg/L	<0.5			0.5
Fenoxaprop-ethyl	µg/L	<0.5			0.5
Fluazifop-p-butyl	µg/L	<0.5			0.5
Hexazinone	µg/L	<0.5			0.5
Metalaxyl	µg/L	<0.5			0.5
Metolachlor	µg/L	<0.5			0.5
Metribuzin	µg/L	<0.5			0.5
Pirimicarb	µg/L	<0.5			0.5
Profluralin	µg/L	<0.5			0.5
Prometryn	µg/L	<0.5			0.5
Propazine	µg/L	<0.5			0.5
Propyzamide	µg/L	<0.5			0.5
Quizalofop-ethyl	µg/L	<0.5			0.5
Simetryn	µg/L	<0.5			0.5
Terbuthylazine	µg/L	<0.5			0.5
Terbutryn	µg/L	<0.5			0.5
Triallate	µg/L	<0.10			0.10
Trifluralin	µg/L	<0.1			0.1
Neutral Herbicides - Water - Surrogate Recovery					
TPP	Surrogate	%	92		50-140
Carbamates in Water					
3-Hydroxycarbofuran	µg/L	<0.1			0.1
Aldicarb	µg/L	<0.1			0.1
Aldicarb sulfone	µg/L	<0.1			0.1
Aldicarb sulfoxide	µg/L	<0.1			0.1
Bendiocarb	µg/L	<0.1			0.1
BPMC	µg/L	<0.1			0.1
Carbaryl	µg/L	<0.1			0.1
Carbofuran	µg/L	<0.1			0.1
Imidacloprid	µg/L	<0.1			0.1
Methiocarb	µg/L	<0.1			0.1
Methomyl	µg/L	<0.1			0.1
Oxaryl	µg/L	<0.1			0.1
Promecarb	µg/L	<0.1			0.1
Propoxur	µg/L	<0.1			0.1
Carbamates in Water - Surrogate Recovery					
BDMC	Surrogate	%	46.9		50-140



Analytical Report

Bill To: City of Penticton 616 Okanagan Avenue East Penticton, BC, Canada V2A 3K6	Project ID: PE 13491 + Quarterly Project Name: City of Penticton Project Location: LSD:	Lot ID: 1292021 Control Number: B06896 Date Received: Aug 16, 2018 Date Reported: Aug 23, 2018 Report Number: 2315015
Attn: Accounts Payable	P.O.: S18-0005	
Sampled By: DM/AE	Proj. Acct. code:	
Company: City of Penticton		

	Reference Number	1292021-3	1292021-6	1292021-7	
	Sample Date	Aug 15, 2018	Aug 15, 2018	Aug 15, 2018	
	Sample Time	NA	NA	NA	
	Sample Location				
	Sample Description	PRV Station	Randolph Rd. Station	Smythe Dr. Sample Stn.	
	Matrix	Water	Water	Water	
Analyte	Units	Results	Results	Results	Nominal Detection Limit
Trihalomethanes Screen - Water					
Chloroform	mg/L	0.037	0.051	0.058	0.001
Bromodichloromethane	mg/L	0.002	0.004	0.005	0.001
Dibromochloromethane	mg/L	<0.001	<0.001	<0.001	0.001
Bromoform	mg/L	<0.001	<0.001	<0.001	0.001
Total Trihalomethanes	mg/L	0.039	0.055	0.063	0.001
Trihalomethanes - Surrogate Recovery					
Dibromofluoromethane	EPA Surrogate %	126	117	120	50-140
Toluene-d8	EPA Surrogate %	96	95	93	50-140
Bromofluorobenzene	EPA Surrogate %	99	98	94	50-140



Analytical Report

Bill To: City of Penticton 616 Okanagan Avenue East Penticton, BC, Canada V2A 3K6	Project ID: PE 13491 + Quarterly Project Name: City of Penticton Project Location: LSD:	Lot ID: 1292021 Control Number: B06896 Date Received: Aug 16, 2018 Date Reported: Aug 23, 2018 Report Number: 2315015
Attn: Accounts Payable Sampled By: DM/AE Company: City of Penticton	P.O.: S18-0005 Proj. Acct. code:	

Reference Number	1292021-5
Sample Date	Aug 15, 2018
Sample Time	NA
Sample Location	
Sample Description	Post Filter #1
Matrix	Water

Analyte	Units	Results	Results	Results	Nominal Detection Limit
Inorganic Nonmetallic Parameters					
Organic Carbon	Total Nonpurgeable	mg/L	3.4		0.5

Analytical Report

Bill To: City of Penticton 616 Okanagan Avenue East Penticton, BC, Canada V2A 3K6	Project ID: PE 13491 + Quarterly Project Name: City of Penticton Project Location: LSD: P.O.: S18-0005 Proj. Acct. code:	Lot ID: 1292021 Control Number: B06896 Date Received: Aug 16, 2018 Date Reported: Aug 23, 2018 Report Number: 2315015
Attn: Accounts Payable Sampled By: DM/AE Company: City of Penticton		

Reference Number	1292021-8
Sample Date	Aug 15, 2018
Sample Time	NA
Sample Location	
Sample Description	Backwash Pond
Matrix	Water

Analyte	Units	Results	Results	Results	Nominal Detection Limit
Trace Metals Dissolved					
Digestion	Dissolved		Field filtered and Pres Dissol		
Aluminum	Dissolved	mg/L	0.032		0.001

Approved by: 
Murray Klutz
Senior Agronomist

Methodology and Notes

Bill To: City of Penticton 616 Okanagan Avenue East Penticton, BC, Canada V2A 3K6	Project ID: PE 13491 + Quarterly Project Name: City of Penticton Project Location: LSD:	Lot ID: 1292021 Control Number: B06896 Date Received: Aug 16, 2018 Date Reported: Aug 23, 2018 Report Number: 2315015
Attn: Accounts Payable Sampled By: DM/AE Company: City of Penticton	P.O.: S18-0005 Proj. Acct. code:	

Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
Alk, pH, EC, Turb in water (BC)	APHA	* Alkalinity - Titration Method, 2320 B	Aug 17, 2018	Exova Surrey
Alk, pH, EC, Turb in water (BC)	APHA	* Conductivity, 2510 B	Aug 17, 2018	Exova Surrey
Alk, pH, EC, Turb in water (BC)	APHA	* pH - Electrometric Method, 4500-H+ B	Aug 17, 2018	Exova Surrey
Ammonia-N in Water (Surrey)	APHA	* Flow Injection Analysis, 4500-NH3 H	Aug 17, 2018	Exova Surrey
Anions by IEC in water (Surrey)	APHA	* Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	Aug 16, 2018	Exova Surrey
Carbamates - Water	US EPA	* N-methylcarbamates by High Performance Liquid Chromatography (HPLC), 8318	Aug 20, 2018	Exova Calgary
Carbon Organic (Total) in water (TOC)	APHA	High-Temperature Combustion Method, 5310 B	Aug 17, 2018	Exova Edmonton
Cyanide (Dissolved) in water	Alta. Env. Method	* Cyanide, Simple Extractable (Automated Pyridine-Barbituric Acid Colorimetric Method), 06608L	Aug 23, 2018	Exova Edmonton
FV2 Pesticides - Water	JAOAC	* Multi-Res Determination of Pesticides in FV by GC-MSD & LC, vol78	Aug 23, 2018	Exova Calgary
Mercury Low Level (Total) in water (Surrey)	EPA	* Mercury in Water by Cold Vapor Atomic Fluorescence Spectrometry, 245.7	Aug 17, 2018	Exova Surrey
Metals SemiTrace (Total) in Water (Surrey)	US EPA	* Metals & Trace Elements by ICP-AES, 6010C	Aug 20, 2018	Exova Surrey
Neutral Herbicides - Water	US EPA	* OC Pesticides by Gas Chromatography, 8081B	Aug 20, 2018	Exova Calgary
Nitrite + Nitrate-N in Water - Smartchem (Surrey)	APHA	* Automated Cadmium Reduction Method, 4500-NO3- F	Aug 17, 2018	Exova Surrey
Organochlorine Pesticides - Water	US EPA	* OC Pesticides by Gas Chromatography, 8081B	Aug 20, 2018	Exova Calgary
Organophosphate Pesticides - Water	US EPA	* OP Compounds by GC: Capillary Column Technique, 8141B	Aug 20, 2018	Exova Calgary
Phosphorus - orthophosphate by Smartchem (Surrey)	APHA	Ascorbic Acid Reduction Method, 4500-P E	Aug 17, 2018	Exova Surrey
Phosphorus - total by Smartchem (Surrey)	APHA	* Persulfate digestion method, 4500-P B5	Aug 21, 2018	Exova Surrey
Solids Dissolved (Total, Fixed and Volatile) - Surrey	APHA	* Total Dissolved Solids Dried at 180 C, 2540 C	Aug 17, 2018	Exova Surrey
Solids Suspended (Total, Fixed and Volatile) - Surrey	APHA	* Total Suspended Solids Dried at 103-105°C, 2540 D	Aug 17, 2018	Exova Surrey
THM - Water	US EPA	* Volatile Organic Compounds by GCMS / Purge and Trap for Aqueous Samples, 8260B/5030B	Aug 17, 2018	Exova Calgary
Trace Metals (dissolved) in Water (Surrey)	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Aug 21, 2018	Exova Surrey
Trace Metals (Total) in Water (Surrey)	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Aug 20, 2018	Exova Surrey
True Color in water (Surrey)	APHA	* Spectrophotometric - Single Wavelength	Aug 17, 2018	Exova Surrey

Methodology and Notes

Bill To: City of Penticton 616 Okanagan Avenue East Penticton, BC, Canada V2A 3K6	Project ID: PE 13491 + Quarterly Project Name: City of Penticton Project Location: LSD: P.O.: S18-0005 Proj. Acct. code:	Lot ID: 1292021 Control Number: B06896 Date Received: Aug 16, 2018 Date Reported: Aug 23, 2018 Report Number: 2315015
Attn: Accounts Payable Sampled By: DM/AE Company: City of Penticton		

Method Name	Reference	Method	Date Analysis Started	Location
-------------	-----------	--------	-----------------------	----------

True Color in water (Surrey)	APHA	Method, 2120 C		
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** Reference Method Modified*

References

Alta. Env. Method	Alberta Environment Method
APHA	Standard Methods for the Examination of Water and Wastewater
EPA	Environmental Protection Agency Test Methods - US
JAOAC	J. Assoc. Off. Anal. Chem.
US EPA	US Environmental Protection Agency Test Methods

Comments:

- Aug 21, 2018 - Surrogate BDMC assigned to method Carbamates - Water in sample number 3 does not meet acceptance criteria (50-140 %) due to possible matrix interference. The analytes in this method should be qualified.

Please direct any inquiries regarding this report to our Client Services Group or to the Operations Manager at the coordinates indicated at the top left of this page.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.



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Company:	City of Penticton	Company:	City of Penticton	Upon filling out this section, client accepts that surcharges will be applied to the analysis	
Address:	Water Treatment Plant 1900 Penticton, BC V2A 2N5	Address:	Water Treatment Plant 1900 Penticton, BC V2A 2N5	Date Required	
Attention:	Brent Edge	Attention:	Brent Edge	As Indicated	All Analysis
Phone:	(250) 490-2560	Phone:	(250) 490-2560	When "ASAP" is requested, turn around will default to a 100% RUSH priority, with pricing and turn around time to match. Please contact the lab prior to submitting RUSH samples.	
Cell:		Cell:		Signature	
Fax:	(250) 490-2561	Fax:	(250) 490-2561	Sample Custody (please print)	
E-mail:	wtp@penticton.ca	E-mail:	wtp@penticton.ca	Sampled by: <u>DM. A.E.</u>	
Agreement ID:	8325	Copy of invoice:	X	Company: <u>CITY OF PENTICTON</u>	
Copy of report:	X			I authorize Exova to proceed with the work indicated on this form:	

Report Results	E-mail	Online	PDF	QA/QC Report
	Mail	Fax	Excel	
Special Instructions/Comments (please include contact information including ph. # if different from above).				Include Regulatory Requirements Below:
				Number of Containers
				DIS A-1
				TS, TO, P, S, CONC
				HML, AMK
				COB, HCB, OFF, F, IT
				NO, NO, M, M, P, P, P
				SO, CU, T, T, U
				THINK
				TOC
				TURK. MEANS
				Date/Time stamp: AUG 16 13:38:44

Sample Identification	Location	Depth IN CM M	Date/Time sampled	Matrix	Sampling Method	Enter tests above (√ relevant samples below)	Indicate below any deficiencies in the condition of samples:
1 PENTICTON CREEK UPSTREAM	LAB		AUG 15, 2018	W	GRAB	8 ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓	Were Exova supplies used?
2 PENTICTON CREEK DOWNSTREAM	DOWNSTREAM		"	"	"	1 ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓	Was there any damage to the shipping container?
3 PLY STATION			"	"	"	3 ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓	Were the containers packaged well?
4 OKANAGAN LAKE	LAB		"	"	"	7 ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓	Were any extra samples received (document below)?
5 POST FILTER # 1			"	"	"	1 ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓	Are samples within recommended holding times/temp?
6 RANDOLPH RD STATION			"	"	"	3 ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓	
7 SMITHING R. STATION			"	"	"	3 ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓	
8 BACKWASH POND			"	"	OMP.	1 ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓	
9							
10							
11							
12							
13							
14							
15							

Environmental Sample Information Sheet		Lot: 1292021 COC		Shipping:	# and size of coolers received:
Note: Proper completion of this form is required in order to proceed with analysis				COD Y/N	
Please indicate any potentially hazardous samples:				Cooler temp:	Delivery Method:
Page of		Control # B06896		14.2°C	Waybill:
					Received by:

ED 129-00

Appendix B – Water Quality Lab Reports

- **April 12, 2018 – City Wide Sampling**
- **Aug 16, 2018 – City Wide Sampling**
- **Nov 29, 2018 – City Wide Sampling**





Analytical Report

Bill To: City of Penticton 616 Okanagan Avenue East Penticton, BC, Canada V2A 3K6	Project ID: PE 13491 + Quarterly Project Name: City of Penticton Project Location: LSD: P.O.: S18-0005 Proj. Acct. code:	Lot ID: 1320145 Control Number: Date Received: Nov 29, 2018 Date Reported: Dec 7, 2018 Report Number: 2360236
Attn: Accounts Payable Sampled By: DM/AE Company: City of Penticton		

	Reference Number	1320145-1	1320145-2	1320145-8	
	Sample Date	Nov 28, 2018	Nov 28, 2018	Nov 28, 2018	
	Sample Time	NA	NA	NA	
	Sample Location				
	Sample Description	Smythe Drive / 6.5 °C	PRV Station / 6.5 °C	Randolph Rd Station / 6.5 °C	
	Matrix	Water	Water	Water	
Analyte	Units	Results	Results	Results	Nominal Detection Limit
Trihalomethanes Screen - Water					
Chloroform	mg/L	0.070	0.040	0.054	0.001
Bromodichloromethane	mg/L	0.009	0.005	0.007	0.001
Dibromochloromethane	mg/L	<0.001	<0.001	<0.001	0.001
Bromoform	mg/L	<0.001	<0.001	<0.001	0.001
Total Trihalomethanes	mg/L	0.079	0.045	0.061	0.001
Trihalomethanes - Surrogate Recovery					
Dibromofluoromethane	EPA Surrogate %	113	118	117	50-140
Toluene-d8	EPA Surrogate %	105	101	107	50-140
Bromofluorobenzene	EPA Surrogate %	99	109	98	50-140
Haloacetic Acids - Water					
Monochloroacetic Acid	µg/L	<2.0	<2.0	<2.0	2.0
Monobromoacetic Acid	µg/L	<2.0	<2.0	<2.0	2.0
Dichloroacetic Acid	µg/L	16.3	20.0	24.5	2.0
Bromochloroacetic Acid	µg/L	<2.0	<2.0	<2.0	2.0
Dibromoacetic Acid	µg/L	<2.0	<2.0	<2.0	2.0
Trichloroacetic Acid	µg/L	19.3	13.3	18.7	2.0
Total Haloacetic Acids (HAA6)	µg/L	35.6	33.3	43.2	2.0





Analytical Report

Bill To: City of Penticton 616 Okanagan Avenue East Penticton, BC, Canada V2A 3K6	Project ID: PE 13491 + Quarterly Project Name: City of Penticton Project Location: LSD:	Lot ID: 1320145 Control Number: Date Received: Nov 29, 2018 Date Reported: Dec 7, 2018 Report Number: 2360236
Attn: Accounts Payable Sampled By: DM/AE Company: City of Penticton	P.O.: S18-0005 Proj. Acct. code:	

	Reference Number	1320145-2	1320145-3	1320145-4		
	Sample Date	Nov 28, 2018	Nov 28, 2018	Nov 28, 2018		
	Sample Time	NA	NA	NA		
	Sample Location					
	Sample Description	PRV Station / 6.5 °C	Filter #6 Post Filtration / 6.5 °C	O.K Lake Sample Tap / 6.5 °C		
	Matrix	Water	Water	Water		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Inorganic Nonmetallic Parameters						
Organic Carbon	Total Nonpurgeable	mg/L	3.6	3.6	4.1	0.5
Cyanide	Dissolved	mg/L	<0.002		<0.002	0.002
Ammonia - N		mg/L	<0.01		<0.01	0.01
Orthophosphate-P	Dissolved	mg/L	<0.002		<0.002	0.002
Phosphorus	Total	mg/L	<0.003		0.004	0.003

Analytical Report

Bill To: City of Penticton 616 Okanagan Avenue East Penticton, BC, Canada V2A 3K6	Project ID: PE 13491 + Quarterly Project Name: City of Penticton Project Location: LSD: P.O.: S18-0005 Proj. Acct. code:	Lot ID: 1320145 Control Number: Date Received: Nov 29, 2018 Date Reported: Dec 7, 2018 Report Number: 2360236
Attn: Accounts Payable Sampled By: DM/AE Company: City of Penticton		

		Reference Number	1320145-2	1320145-4	1320145-6	
		Sample Date	Nov 28, 2018	Nov 28, 2018	Nov 28, 2018	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	PRV Station / 6.5 °C	O.K Lake Sample Tap / 6.5 °C	Penticton Creek Upstream / 6.5 °C	
		Matrix	Water	Water	Water	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Metals Total						
Calcium	Total	mg/L	32	33	4.7	0.01
Magnesium	Total	mg/L	8.8	8.8	1.2	0.02
Potassium	Total	mg/L	2.4	2.4	0.53	0.04
Silicon	Total	mg/L	3.4	3.4	5.2	0.005
Sulfur	Total	mg/L	9.4	9.4	0.76	0.02
Sodium	Total	mg/L	11	11	2.3	0.1
Titanium	Total	mg/L	0.004	0.005	0.002	0.002
Digestion	Preparation		Field Pres, digest as total Hg	Field Pres, digest as total Hg	Field Pres, digest as total Hg	
Mercury	Total	mg/L	<0.00001	<0.00001	<0.00001	0.00001
Physical and Aggregate Properties						
Colour	True	Colour units	<5	<5	22	5
Solids	Total Suspended	mg/L	<2	<2	4	2
Solids	Total Dissolved	mg/L	220	140	40	5
Routine Water						
pH - Holding Time			Exceeded	Exceeded	Exceeded	
pH	at 25 °C		7.98	8.03	7.36	0.01
Electrical Conductivity		µS/cm at 25 °C	291	285	46	1
Bicarbonate		mg/L	120	120	20	5
Carbonate		mg/L	<6	<6	<6	6
Hydroxide		mg/L	<5	<5	<5	5
P-Alkalinity	as CaCO3	mg/L	<5	<5	<5	5
T-Alkalinity	as CaCO3	mg/L	99	100	17	5
Chloride	Dissolved	mg/L	9.24	5.00	0.70	0.05
Fluoride	Dissolved	mg/L	0.11	0.10	0.02	0.01
Nitrate - N	Dissolved	mg/L	0.10	0.10	<0.01	0.01
Nitrite - N	Dissolved	mg/L	<0.01	<0.01	<0.01	0.01
Sulfate (SO4)	Dissolved	mg/L	29.8	29.8	2.1	0.1
Hardness	Total	mg CaCO3/L	117	118	17	1
Trace Metals Total						
Aluminum	Total	mg/L	0.068	0.003	0.092	0.001
Antimony	Total	mg/L	0.00005	0.00005	<0.00002	0.00002
Arsenic	Total	mg/L	0.0003	0.0005	<0.0001	0.0001
Barium	Total	mg/L	0.021	0.022	0.0071	0.0001
Beryllium	Total	mg/L	<0.00005	<0.00005	<0.00005	0.00005
Bismuth	Total	mg/L	<0.0001	<0.0001	<0.0001	0.0001
Boron	Total	mg/L	0.009	0.009	<0.002	0.002
Cadmium	Total	mg/L	<0.00001	<0.00001	<0.00001	0.00001



Analytical Report

Bill To: City of Penticton 616 Okanagan Avenue East Penticton, BC, Canada V2A 3K6	Project ID: PE 13491 + Quarterly Project Name: City of Penticton Project Location: LSD:	Lot ID: 1320145 Control Number: Date Received: Nov 29, 2018 Date Reported: Dec 7, 2018 Report Number: 2360236
Attn: Accounts Payable	P.O.: S18-0005	
Sampled By: DM/AE	Proj. Acct. code:	
Company: City of Penticton		

	Reference Number	1320145-2	1320145-4	1320145-6		
	Sample Date	Nov 28, 2018	Nov 28, 2018	Nov 28, 2018		
	Sample Time	NA	NA	NA		
	Sample Location					
	Sample Description	PRV Station / 6.5 °C	O.K Lake Sample Tap / 6.5 °C	Penticton Creek Upstream / 6.5 °C		
	Matrix	Water	Water	Water		
Analyte	Units	Results	Results	Results	Nominal Detection Limit	
Trace Metals Total - Continued						
Chromium	Total	mg/L	<0.00005	<0.00005	0.00006	0.00005
Cobalt	Total	mg/L	<0.00002	<0.00002	0.00004	0.00002
Copper	Total	mg/L	<0.0002	0.0053	0.0002	0.0002
Iron	Total	mg/L	0.002	0.007	0.20	0.002
Lead	Total	mg/L	<0.00001	<0.00001	<0.00001	0.00001
Lithium	Total	mg/L	0.0030	0.0031	0.0005	0.0005
Manganese	Total	mg/L	<0.001	<0.001	0.005	0.001
Molybdenum	Total	mg/L	0.0033	0.0033	0.00055	0.00002
Nickel	Total	mg/L	<0.0002	0.0004	<0.0002	0.0002
Selenium	Total	mg/L	0.0003	0.0003	<0.0002	0.0002
Silver	Total	mg/L	<0.00001	<0.00001	<0.00001	0.00001
Strontium	Total	mg/L	0.31	0.32	0.062	0.0001
Tellurium	Total	mg/L	<0.00005	<0.00005	<0.00005	0.00005
Thallium	Total	mg/L	0.00002	<0.00001	<0.00001	0.00001
Thorium	Total	mg/L	<0.00005	<0.00005	0.00005	0.00005
Tin	Total	mg/L	<0.0001	0.0002	0.0001	0.0001
Uranium	Total	mg/L	0.0020	0.0024	0.00076	0.00001
Vanadium	Total	mg/L	<0.00005	<0.00005	0.00035	0.00005
Zinc	Total	mg/L	0.0007	0.0057	<0.0005	0.0005
Zirconium	Total	mg/L	<0.0001	<0.0001	0.0005	0.0001



Analytical Report

Bill To: City of Penticton 616 Okanagan Avenue East Penticton, BC, Canada V2A 3K6	Project ID: PE 13491 + Quarterly Project Name: City of Penticton Project Location: LSD:	Lot ID: 1320145 Control Number: Date Received: Nov 29, 2018 Date Reported: Dec 7, 2018 Report Number: 2360236
Attn: Accounts Payable	P.O.: S18-0005	
Sampled By: DM/AE	Proj. Acct. code:	
Company: City of Penticton		

	Reference Number	1320145-2	1320145-5	1320145-6	
	Sample Date	Nov 28, 2018	Nov 28, 2018	Nov 28, 2018	
	Sample Time	NA	NA	NA	
	Sample Location				
	Sample Description	PRV Station / 6.5 °C	Backwash Pond / 6.5 °C	Penticton Creek Upstream / 6.5 °C	
	Matrix	Water	Water	Water	
Analyte	Units	Results	Results	Results	Nominal Detection Limit
Trace Metals Dissolved					
Digestion	Dissolved	Field filtered and Pres Dissol	Field filtered and Pres Dissol	Field filtered and Pres Dissol	
Aluminum	Dissolved	mg/L 0.030	0.008	0.043	0.001



Analytical Report

Bill To: City of Penticton 616 Okanagan Avenue East Penticton, BC, Canada V2A 3K6	Project ID: PE 13491 + Quarterly Project Name: City of Penticton Project Location: LSD:	Lot ID: 1320145 Control Number: Date Received: Nov 29, 2018 Date Reported: Dec 7, 2018 Report Number: 2360236
Attn: Accounts Payable Sampled By: DM/AE Company: City of Penticton	P.O.: S18-0005 Proj. Acct. code:	

Reference Number 1320145-6
Sample Date Nov 28, 2018
Sample Time NA
Sample Location
Sample Description Penticton Creek
 Upstream / 6.5 °C

Matrix Water

Analyte	Units	Results	Results	Results	Nominal Detection Limit
Inorganic Nonmetallic Parameters					
Organic Carbon	Total Nonpurgeable	mg/L	5.9		0.5
Cyanide	Dissolved	mg/L	<0.002		0.002
Ammonia - N		mg/L	<0.01		0.01
Orthophosphate-P	Dissolved	mg/L	<0.002		0.002
Phosphorus	Total	mg/L	0.005		0.003



Analytical Report

Bill To: City of Penticton
616 Okanagan Avenue East
Penticton, BC, Canada
V2A 3K6
Attn: Accounts Payable
Sampled By: DM/AE
Company: City of Penticton


Project ID: PE 13491 + Quarterly
Project Name: City of Penticton
Project Location:
LSD:
P.O.: S18-0005
Proj. Acct. code:

Lot ID: **1320145**
Control Number:
Date Received: Nov 29, 2018
Date Reported: Dec 7, 2018
Report Number: 2360236

Reference Number: 1320145-7
Sample Date: Nov 28, 2018
Sample Time: NA
Sample Location:
Sample Description: Penticton Creek
Downstream / 6.5 °C

Matrix: Water

Analyte	Units	Results	Results	Results	Nominal Detection Limit
Trace Metals Dissolved					
Digestion	Dissolved	Field filtered and Pres Dissol			
Aluminum	Dissolved	mg/L	0.038		0.001

Approved by: 
Matthew Norman, BSc, PChem
Operations Chemist

Methodology and Notes

Bill To: City of Pentiction 616 Okanagan Avenue East Pentiction, BC, Canada V2A 3K6	Project ID: PE 13491 + Quarterly Project Name: City of Pentiction Project Location: LSD:	Lot ID: 1320145 Control Number: Date Received: Nov 29, 2018 Date Reported: Dec 7, 2018 Report Number: 2360236
Attn: Accounts Payable	P.O.: S18-0005	
Sampled By: DM/AE Company: City of Pentiction	Proj. Acct. code:	

Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
Alk, pH, EC, Turb in water (BC)	APHA	* Alkalinity - Titration Method, 2320 B	Nov 30, 2018	Exova Surrey
Alk, pH, EC, Turb in water (BC)	APHA	* Conductivity, 2510 B	Nov 30, 2018	Exova Surrey
Alk, pH, EC, Turb in water (BC)	APHA	* pH - Electrometric Method, 4500-H+ B	Nov 30, 2018	Exova Surrey
Ammonia-N in Water (Surrey)	APHA	* Flow Injection Analysis, 4500-NH3 H	Dec 5, 2018	Exova Surrey
Anions by IEC in water (Surrey)	APHA	* Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	Nov 30, 2018	Exova Surrey
Carbon Organic (Total) in water (TOC)	APHA	High-Temperature Combustion Method, 5310 B	Dec 4, 2018	Exova Edmonton
Cyanide (Dissolved) in water	Alta. Env. Method	* Cyanide, Simple Extractable (Automated Pyridine-Barbituric Acid Colorimetric Method), 06608L	Dec 4, 2018	Exova Edmonton
Haloacetic Acids - Water	US EPA	* US EPA method, 552.3	Dec 7, 2018	Eurofins Scientific - Ottawa
Mercury Low Level (Total) in water (Surrey)	EPA	* Mercury in Water by Cold Vapor Atomic Fluorescence Spectrometry, 245.7	Dec 3, 2018	Exova Surrey
Metals SemiTrace (Total) in Water (Surrey)	US EPA	* Metals & Trace Elements by ICP-AES, 6010C	Dec 3, 2018	Exova Surrey
Phosphorus - orthophosphate by Smartchem (Surrey)	APHA	Ascorbic Acid Reduction Method, 4500-P E	Dec 1, 2018	Exova Surrey
Phosphorus - total by Smartchem (Surrey)	APHA	* Persulfate digestion method, 4500-P B5	Dec 3, 2018	Exova Surrey
Solids Dissolved (Total, Fixed and Volatile) - Surrey	APHA	* Total Dissolved Solids Dried at 180 C, 2540 C	Dec 5, 2018	Exova Surrey
Solids Suspended (Total, Fixed and Volatile) - Surrey	APHA	* Total Suspended Solids Dried at 103-105°C, 2540 D	Dec 5, 2018	Exova Surrey
THM - Water	US EPA	* Volatile Organic Compounds by GCMS / Purge and Trap for Aqueous Samples, 8260B/5030B	Dec 3, 2018	Exova Calgary
Trace Metals (dissolved) in Water (Surrey)	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Dec 3, 2018	Exova Surrey
Trace Metals (Total) in Water (Surrey)	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Dec 3, 2018	Exova Surrey
True Color in water (Surrey)	APHA	* Spectrophotometric - Single Wavelength Method, 2120 C	Nov 30, 2018	Exova Surrey

* Reference Method Modified

References

Alta. Env. Method	Alberta Environment Method
APHA	Standard Methods for the Examination of Water and Wastewater
EPA	Environmental Protection Agency Test Methods - US
US EPA	US Environmental Protection Agency Test Methods

Methodology and Notes

Bill To:	City of Penticton	Project ID:	PE 13491 + Quarterly	Lot ID:	1320145
	616 Okanagan Avenue East	Project Name:	City of Penticton	Control Number:	
	Penticton, BC, Canada	Project Location:		Date Received:	Nov 29, 2018
	V2A 3K6	LSD:		Date Reported:	Dec 7, 2018
Attn:	Accounts Payable	P.O.:	S18-0005	Report Number:	2360236
Sampled By:	DM/AE	Proj. Acct. code:			
Company:	City of Penticton				

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