2017 Annual Water Report

EXECUTIVE SUMMARY

The Town of Oliver operates an extensive Municipal and Rural water system that consists of seven ground water well sites, two surface water sources, and three reservoirs. The water system covers the Town of Oliver itself and a substantial portion of area 'C; of the Regional District of Okanagan-Similkameen. The Town provides domestic water to approximately 2,393 residential and 174 commercial/ industrial connections, which are all metered. Irrigation water is also provided to 601 connections irrigating approximately 5,200 acres of farmland with 1,025 acres of that pumping their own water from the Town's irrigation canal, excluding 455 acres of non-farm land that is also irrigated from this system.

TABLE OF CONTENTS

1.0 INTRODUCTION

The British Columbia Drinking Water Protection Act requires that each municipal government that supplies or distributes domestic drinking water must provide a water quality report that is reviewed by the local Drinking Water Officer, and published for public access. This report has been prepared for the community of the Town of Oliver, and in accordance with the requirement in the Drinking Water Protection Act.

1.1 HISTORY

In 1918, the Provincial Government, led by "Honest John Oliver", the Premier at this time, purchased over 22,000 acres of land in the South Okanagan to develop an irrigation canal system to convert 8,000 acres of desert land on each side of the Okanagan River into viable agricultural land. This land would then be for sale, at a reasonable cost, designated to the soldiers returning from World War I. This land arrangement was known as the "The Soldiers' Land Act." This project then became SOLP (South Okanagan Lands Project)

Construction of the irrigation system, including the intake dam at the base of McIntyre Bluff, began in 1918. Over the next seven years, the canal, known as "The Ditch", had an overall length of approximately 40 concrete-lined kilometres measuring 5.6m across the top, and 1.5m deep, delivering 6.5m^3 of water per second. The SOLP designed the canal to transport irrigation water from one side of the Valley to the other. To accomplish this, a 2.1m diameter siphon made out of wood stave pipe had to be built underground, which ran approximately 590m long directly beneath the center of Oliver, connecting the North and South parts of the canal.

Over the next forty years, the canal was maintained and run by the provincial government employees (SOLP), until the spring of 1964, as the province decided it was removing itself from the irrigation business. Premiere W.A.C. Bennet passed the canal to the Oliver and Osoyoos Fruit Growers' Association, which volunteered itself to become the cornerstone of the South Okanagan Lands and Irrigation District (SOLID). The district operated and maintained the canal system until 1989 when it was divided into two municipal governments: the Town of Oliver and the Town of Osoyoos. The Town of Oliver was given the responsibility to maintain and operate the canal, which is still a major contributor to the rest of the 100 billion liters of water that Oliver and Osoyoos delivers annually to the parched desert area of the valley.

Today, the Town of Oliver provides domestic water to approximately 2,393 residential (including rural), and 174 commercial and industrial connections. Irrigation water is provided to 601 connections, irrigating approximately 5,200 acres of farmland with 1,025 acres of that pumping their own water from the Town's irrigation canal. 455 acres of non-farm land is also

irrigated from this system. The change in the non-farm arable area from previous years is due to a change in the new Water Regulations Bylaw 1351 where customers previously received a half acre with the payment of their parcel tax.

2.0 WATER SYSTEM OVERVIEW

The Town of Oliver's water system is broken down into seven individual systems, which over time have been inter-connected to provide a more sustainable water supply system as a whole. Each system is defined, or known by, the area and the wells that support it:

(Please See Appendix A: Town of Oliver Water System Map)

- System 1 – also referred to as Rural North – Buchanan Road Pumphouse
- System 2 and 2B – Black Sage Area – Black Sage and Miller Rd Pumphouses
- Municipal System – also referred to as System 3 – Rockcliffe and Tucelnuit Pumphouses
- System 4-7 – also referred to as Rural South – Fairview and Miller Rd 13 Pumphouses

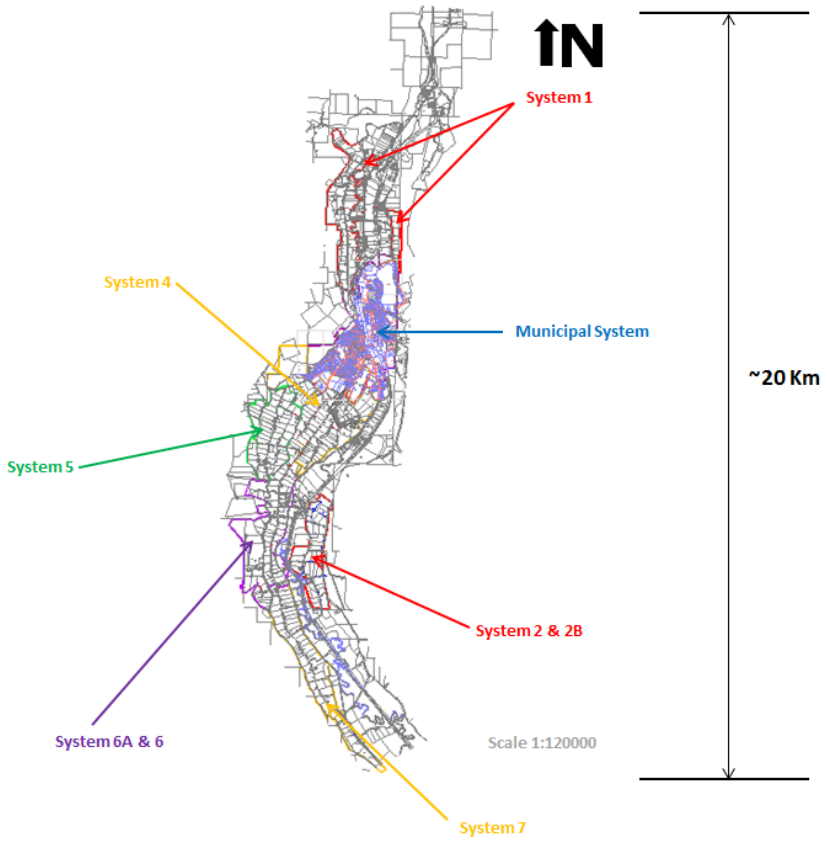


Figure 1: Town of Oliver's 7 Water System Overview

As of 2014, the Town of Oliver uses groundwater for all of its domestic water connections. Therefore, the canal surface water system is providing irrigation only, with the addition of low-pressure users who pump out of the canal using their own private pump houses. Each system is twinned with the exception of System 2 (Black Sage). This system is groundwater only, and there are no current plans to complete the twinning of System 2.

As part of the water distribution system, the Town maintains approximately 143 kilometres of water main. The distribution system is made up of Asbestos Concrete (AC), Polyvinyl Chloride (PVC), Cast Iron (CI), and High Density Polyethylene (HDPE) material, with pipe sizes ranging from 50mm to 600mm in diameter.

The age of the water mains range from new to approximately 50 years old. The age of the pipe does not necessarily reflect the need to replace it as the various material types and installation conditions make for different average life expectancies. Normal operating pressures range from 60psi to 120psi for standard pressurized services.

2.1 DOMESTIC SYSTEM

The domestic water system storage capacity is 1,025,000 US gallons (US GAL) (3880 cubic metres (m^3)) between four reservoirs. Existing Municipal reservoirs consist of a 360,000 US GAL (1360m^3) reservoir and a newer (constructed in 2010) 500,000 US GAL (2470m^3) reservoir. The other two reservoirs still in use are located in System 6a; Road 13 reservoir at 150,000 US gallons (568m^3) and Hester Creek reservoir at 15,000 US gallons (57m^3).

2.1.1 SYSTEM 1 DOMESTIC

System 1, also known as “Rural North,” supplies domestic water to approximately 161 accounts. System 1 has an irrigation main, and a domestic main that runs approximately 4.5km from the edge of town N. to the end of Sportsman Bowl Road. Buchanan pump station, which is located adjacent to 1748 Buchanan Road and near the east side of the Okanagan River, supplies both irrigation surface water and domestic ground water to System 1. Buchanan pump station has one domestic ground water pump having a total 125 horsepower (hp) that has a pumping capacity of 1,000 gallons per minute (gpm).

2.1.2 SYSTEM 2&2B DOMESTIC

System 2, also known as “Black Sage” area, supplies domestic and irrigation water to approximately 52 accounts. System 2 is unique having separated into two areas, System 2, and 2B. System 2B, along with every other system, is twinned. Whereas System 2 is the only system

that does not have separate water sources for both irrigation and domestic water. System 2 and 2B have two pump stations within its boundary; Black Sage pump station, and Miller well pump station. The Black Sage pump station is located approximately 154m W. from Ryegrass Road between Miller Road and Watters Road. The Black Sage well supplies groundwater to both domestic and irrigation services in System 2 and 2B utilizing three pumps having a total 235hp, and a pumping capacity of 2,600gpm. The Miller Well, located on the west end of Miller Road, approximately 67m E. of the Okanagan River, supplements up to 500gpm of domestic groundwater to System 2 and 2B during the peak demand season, along with Systems 4-7, and Reservoir 13.

2.1.3 MUNICIPAL SYSTEM DOMESTIC

The Municipal System, also known as System 3, supplies domestic groundwater to approximately 2400 accounts. Municipal System utilizes two pump stations, and one booster station to supply its users within the Town boundary; Rockcliffe pump station, Tucelnuit pump station, and the Airport Booster station. Rockcliffe is located between the parcels of 781 and 715 Skagit Avenue. Rockcliffe has one pump at 150hp, and a pumping capacity of 1,500gpm. Tucelnuit pump station is located on the SE corner of Merlot Avenue, and Lakeside Drive; W of the Tucelnuit elementary school. Tucelnuit utilizes two pumps having a pumping capacity of 1,750gpm. The Airport Booster station is located on the NE corner of the intersection of Airport Street, and Road 1. The Airport Booster is typically set to supply water from within the Municipal boundaries to the rural area south, but can also be used to intake water from the rural area south, and supply the Municipal System depending on demands or if there was a maintenance malfunction of another pump.

2.1.4 SYSTEM 4-7 DOMESTIC

System 4-7, also known as “Rural South,” supplies domestic ground water to approximately 483 accounts. The Systems utilize the Miller Well pump station, 6A Domestic Booster station, and the Airport Booster station. Miller Well pump station also aids in a supplement supply of domestic groundwater to System 2 during peak demands, and the Road 13 Reservoir. The Miller Well pump has 125hp, and a pumping capacity of 1,000gpm. 6A Domestic Booster feeds Hester Creek Reservoir, while the Airport Booster has the option to alternate between the Municipal System and the Rural South to have a continuous loop in the system, and so that each pump is working in its most efficient phase.

2.2 IRRIGATION SYSTEM

Surface water, specifically Okanagan River, is still the primary source for the irrigation water system, but also includes Buchannan well, Fairview well and Black Sage oxbow. The canal system runs from McIntyre Dam (where the diversion is complete with a fish screen to divert fish back to the Okanagan River) north of Town to Road 18, south of Town, where it continues past Road 22 as a piped system. The irrigation system in System 2B is supplied by the Black Sage oxbow, with the remainder of System 2 not being twinned. The Town maintains multiple water licences to allow these surface water diversions. There are five additional irrigation pump stations that pump along the canal: Mud Lake, Rockcliffe, Fairview, Hester Creek, and Mount Kobau.

In January 2016, the irrigation canal siphon located at Gallagher Lake was damaged by a large rock fall event. Following the rock fall, the Town of Oliver engaged Golder Associates to conduct a geotechnical assessment of the area to determine the actions required to enable safe access to the site for repair of the siphon. Rock scaling was carried out by T&A Rockworks. A pipe repair was then completed from within the pipe, during which time a 1.2 meter (outer diameter) pipe was grouted into place. This allowed the siphon to operate during the irrigation season with a 32% reduction in supply capacity. While this flow was sufficient in 2016, due to lower temperatures and higher precipitation, it will not be adequate during warmer, drier seasons. The Canal restoration project is currently under review.

2016 irrigation season started on April 18th and ended October 11th. Crews began filling the canal and turning on spray fillers April 13st. The canal diversion was shut down on October 28th. All Town irrigation systems were shut down and winterized by the end of October.

This repair was still in affect for the duration of the 2017 season and the irrigation system seemed to just get by with the amount of volume demands during the peak irrigation season. The Town is still working on re-routing this portion of the canal (damaged siphon) with the help of Provincial and Federal funding. There are hopes that this project could be completed by late 2019 or early 2020 once funding is in place.

Town staff starting seeing heavier creek flows on many creeks on the west side of the valley in the spring of 2017 (April) which included; Testalinda, Hester, Tinhorn, Reid & Park Rill creeks. Staff were starting to spend extra time doing checks and periodically removing extra material in creeks or keeping culverts clear that could potentially damage the Town's infrastructure.

Then the Town experienced another disaster/emergency that started on May 20, 2017 with mudflow/debris breaching the banks of Tinhorn Creek and overflowing into the Irrigation canal system between Road 7 and Road 8. Operators required the shutdown of pump intakes and shut the distribution system off for the whole southern (lower) portion of the canal system which affected customers in systems; 4, 5, 6, 6a & 7. Two days later on May 23, 2017 another debris flow came down Hester Creek at Road 11 and plugged all culverts and overflowed into the canal system.

Having two areas breaching the open canal irrigation system posed a challenge for clean up because of the canal's minimal slope which had debris extending north and south for over 2 km's. With the help of contractors, Town staff cleared all debris, repaired any damages and started some of the irrigation systems by May 26th and the remainder of the systems by May 27th. Because of temperatures and lack of precipitation during this week of 'shut-down', farmers were informing the Town that some crops, green houses and orchards could soon be in a critical situation with no water available. Clean up worked out before we reached this critical stage for some farmers. Some contractors were kept on stand-by into June and until the creeks starting receding and bringing down minimal amounts of material.

2.2.1 SYSTEM 1 IRRIGATION

System 1 utilizes two pump stations for its irrigation; Mud Lake and Buchanan. Mud Lake pump station intakes water from the canal utilizing two pump units at a combined 200hp, and having a pumping capacity of 5,000gpm. Mud Lake is located 90m W of Buchanan Drive. Buchanan irrigation pump is 50hp, and has a capacity of 500gpm. System 1 covers 420 acres of agriculture that is pressurized irrigated. This result is excluding the number of low-pressure users in the area.

2.2.2 SYSTEM 2&2B IRRIGATION

As mentioned earlier, System 2 is the only system that is not twinned, having pumps that supply groundwater for both domestic and irrigation uses with a combined 235hp, and having a pumping capacity of 2,600gpm. However, System 2B has its own irrigation pump which is called Black Sage Irrigation Pump that intakes from the Black Sage oxbow located 65m S of Road #9, and 100m E of the Okanagan River. This pump has 150hp with a capacity of 1,540gpm. System 2 and 2B provide pressurized irrigation water to approximately 405 acres of agriculture land.

2.2.3 SYSTEM 4-7 IRRIGATION

The second canal pump station is Rockcliffe Irrigation in System 4. This station utilizes three pumps having a combined 500hp, and a pump capacity of 9,100gpm. Rockcliffe supplies pressurized irrigation to approximately 916 acres of agriculture. This pump station is located between the properties of 824 and 760 of Road 2. System 4 also includes a 25,000 US GAL ($94m^3$) irrigation water reservoir, called System 4 Irrigation Reservoir.

The third canal pump station along the system is Fairview irrigation pump station, which is located in System 5 on the NE corner of Road 5 and the canal intersection. Fairview utilizes two pumping units with a combined horsepower of 300hp, and having a pumping capacity of 4,400gpm. There is also another Fairview Irrigation well in System 5, which used to be part of the domestic water system but was switched over to the irrigation system when the nitrate levels exceeded the Canadian Drinking Water Standards. Its primary use now is to supply water in the shoulder seasons or low demand portions in the irrigation year but it can also help supplement peak demands. System 5 includes a 50,000 US GAL ($189m^3$) irrigation water reservoir, called Fairview Irrigation Reservoir.

Hester Creek irrigation pump station is located in System 6 at the NE corner of the W end of Road 11 and the canal intersection. Hester Creek pump station utilizes two pumping units having a combined horsepower of 175hp, and a pumping capacity of 4,000gpm. Hester Creek Irrigation pump station delivers pressurized irrigation to approximately 426 acres of land. System 6 also contains a booster pump station that has two 15hp pumps, and is utilized during the peak season.

Mt Kobau irrigation pump station is the most southern in the water system, in System 7, located at the west end of Road 18. Mt Kobau has two pumping units that have a combined total of 150hp, with a capacity of 4,000gpm. Mt Kobau provides pressurized irrigation to approximately 545 acres of land.

3.0 WATER QUALITY, SAMPLING, AND MONITORING PROGRAM

The Town of Oliver has utilized two sources of water: surface water (Okanagan River) and groundwater (well water). The surface water is now restricted to irrigation water only. Groundwater is the ONLY source of water used for domestic purposes, and the only source that is thoroughly monitored and sampled for quality purposes.

3.1 SAMPLING AND MONITORING

The Town of Oliver works closely with CARO Analytical Services out of Kelowna, BC to monitor drinking water quality in accordance with the BC Drinking Water Protection Act, and Guidelines for Canadian Drinking Water Quality (GCDWQ). The Town's staff submits weekly samples for bacteriological testing for Total Coliforms, and E-Coli Bacteria at various sampling sites throughout the system. In congruence with the submittals, the Town also conducts their own in house presence/absence tests. The Town also monitors the Nitrate levels in the drinking water sampling six times a year in February, April, June, August, October, and December. Once a year, and usually mid-summer, the Town will commence a full spectrum test on the domestic water system. The spectrum analyzes all physical parameters and characteristics of The Town of Oliver's drinking water. The results are then compared to the GCDWQ.

- *(Please See Appendix A: The Town of Oliver Water System Map for Sampling Sites)*
- *(Please See Appendix B: 2015 Full Spectrum Results and GCDWQ)*
- *(Please See Appendix C: 2015 Weekly Water Sampling Result Table)*

There are seven test stations located in the Municipal boundaries. The rural area north of Town has one test station and there are six testing sites (excluding wells) south of Town. When any sample shows the presence of Total Coliform or E-Coli, the Interior Health Environmental Health Officer is consulted and standard protocols are initiated with a flushing of the contaminated system and a resample of water where contamination was located. The sample is then immediately resubmitted for testing by the lab.

4.0 WATER CONSUMPTION

4.1 TOTAL CONSUMPTION

The water works system again is twinned in Oliver, meaning that the groundwater used for domestic purposes has its own pipe network along with the surface water, used for irrigation purposes, also has its own pipe network except for System 2, which is using groundwater for both irrigation and domestic purposes. The Town of Oliver consumed 3,221,470,193US GAL of water in 2017. That is 12,194,591,230 liters (L) of water or 12,194,591m^3 of water.

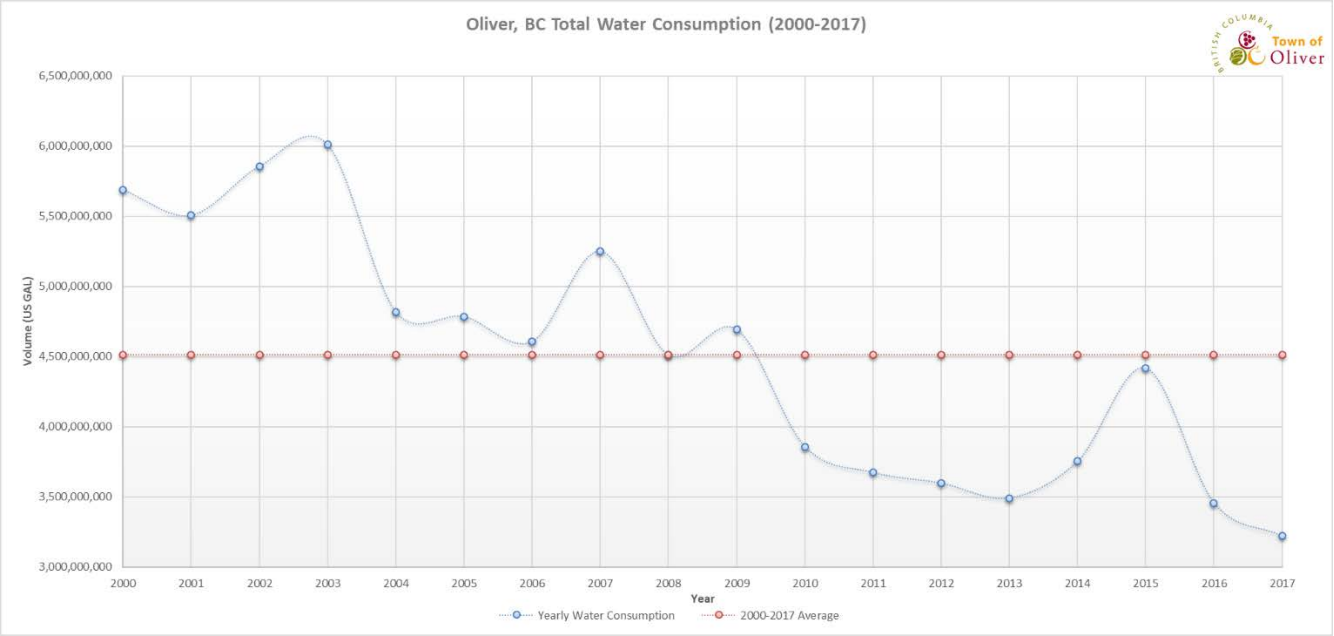


Figure 2: Total Water Consumption 6 Year Trend

As we can see in *Figure 2,* Oliver consumed 7% less water than the previous year in 2016. The seventeen-year average is 4,511,217,290 US GAL. In 2017, Oliver consumed 29% less than the seventeen-year average. The demand is influenced by the population and irrigation usage, and population has been slightly increasing each year in Oliver. The 2016 Census reported Oliver having a new population of 5,279. Irrigation has seen improvements over the year as crop changes from Orchards to Vineyards continue to happen throughout the years, which have had a significant change on the water demand and peak demand decreases. Irrigation practices and water conservation through these practices have been the major influence of the change in water demand, and also the final twinning stages of the water system in 2014. The other major contributing factor is weather and precipitation. The South Okanagan was declared, by the government of BC, a drought level of 4 in 2015. In 2016, the South Okanagan did not reach a drought level of four, instead it had a normal snowpack season, and was considered a "dry" year, but did not see the same level of drought as 2015. In 2017, the Okanagan was in a valley wide emergency state due to flooding. The snow back in March was 85% above normal, and then April rains came along with high temperatures. The melt increased and creeks that have been dry for years started flowing again. Agriculture development over the years had changed the lay of the land and the natural watercourses, causing the spring runoff to flow through vineyards and orchards damaging crops. The spring flooding caused Oliver's agriculture to be a wet one, and the large amount of precipitation influenced the irrigation demand. Oliver's max residential domestic water demand was on August 02, 2017. *See Figure 3.* Oliver had a maximum daily water demand peak at 4,033,207 US GAL, while minimum daily demand occurred on April 06, 2017 at 606,654 US GAL.

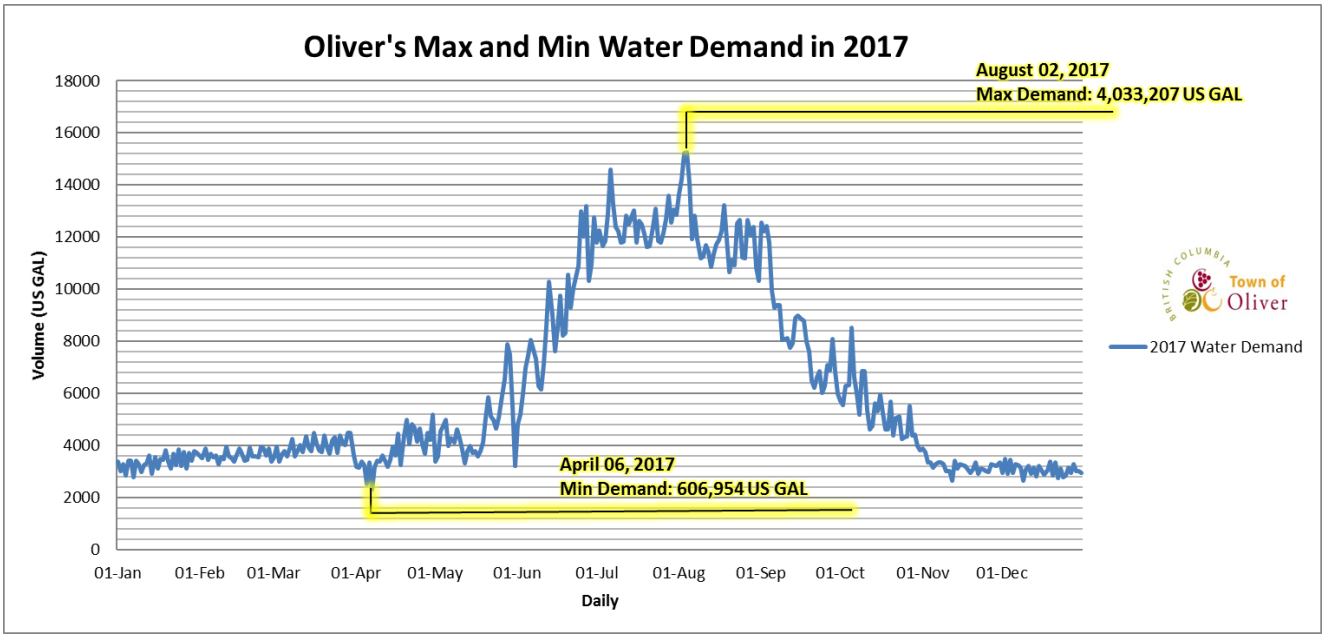


Figure 3: Oliver's 2017 Max and Min Domestic Water Demand

4.2 BREAKDOWN OF CONSUMPTION

The Town of Oliver consumed 807,143,242 US GAL (3,055,368m^3, 3,055,368,099L) of groundwater in 2017. This amount is 25% of the total consumption. The remaining 75% is surface water, which is primarily used for irrigation, having a total consumption of 2,414,326,951 US GAL (9,139,217m^3, 9,139,217,384L). *See Table 1 below for the breakdown of percentages*.

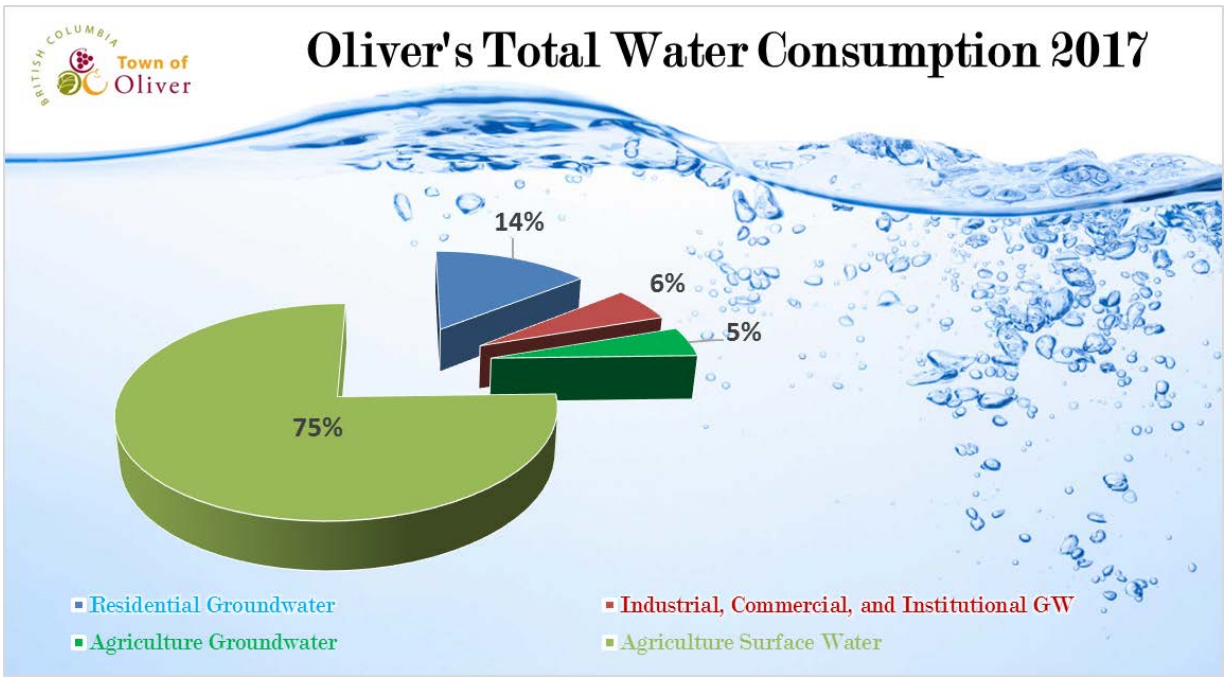


Figure 4: Oliver's Total Water Consumption 2017

WURC CALCULATIONS	US GAL	CUBIC METERS	PERCENTAGE
TOTAL GW USED	807143241.87	3055368.10	25.06%
TOTAL SW USED	2414326951.04	9139217.38	74.94%
TOTAL RES GW	464940780.29	1759991.48	14.43%
TOTAL RES SW	0.00	0.00	0.00%
TOTAL ICI GW	180099042.70	681748.72	5.59%
TOTAL ICI SW	0.00	0.00	0.00%
TOTAL AG GW	162104295.74	613631.22	5.03%
TOTAL AG SW	2414326951.04	9139217.38	74.94%
TOTAL WATER	3221470192.91	12194585.48	100.00%

Table 1: Oliver's Groundwater Breakdown: Groundwater (GW), Surface Water (SW), Residential (RES), Industrial, Commercial, Institutional (ICI), and Agriculture (AG).

According to the OBWB, an average person in the Okanagan uses 675L of water each day. That is twice more water than the Canadian average of 329L per day. On average, Oliver residents used approximately 913L of water per person per day in 2017, which is 584L above the Canadian average. *See Figure 5.*

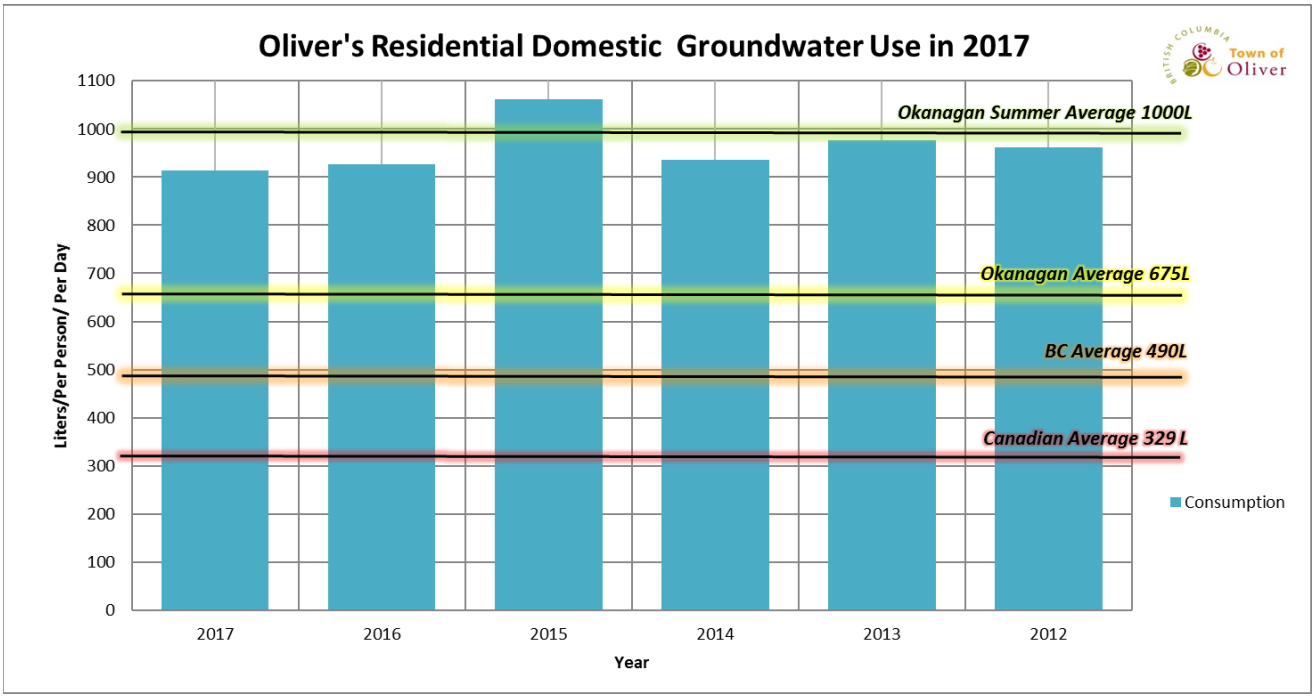


Figure 5: Oliver (2012-2017) vs OBWB Estimated Averages (1996-2006)

During the summer months the average consumption rate exceeds the Okanagan summer average of 1,000L (1m^3) with Oliver using 1264L per person per day while the pumps are in Summer Mode (April to October). However, when the pumps are in Winter Mode (November-March), Oliver used 417L per person per day, which is below the Okanagan average of 675L. These numbers are approximate values and estimates; if a person would like to know their household usage from year to year, all you need to do is take the volume consumed on your monthly water bill, convert it to liters, and divide it by the number of people in the household and the number of days in the month, and you will get your answer in liters per person per day. Once you have your results, you can compare your usage of each year to your previous years along with the Canadian, BC, Okanagan, and Okanagan Summer Averages. *See Below and Figures 5-7*.

1. $Total\ Volume\ of\ Water\ used\ from\ Water\ Bill\ (cubic\ meters) = x(m^3)$

2. $Convert\ x(m^3)\ to\ \big(liters\ (l)\big) = x(m^3) \times 1000 = x(l)$

3. $Divide\ x(l) by\ number\ of\ persons\ in\ household\ (pp) = \dfrac{x(l)}{(\#\ of persons)}$

4. $Then\ Divide\ that\ result\ \left(\dfrac{x(l)}{(pp)}\right)\ by\ the\ number\ of\ days\ the\ water\ bill\ is\ accounting\ for\ (pd) = \dfrac{(x(l/pp\ )}{(\#\ of\ days\ )}$

5. $This\ answer\ is\ your\ final\ result = x(l/pp/pd)$

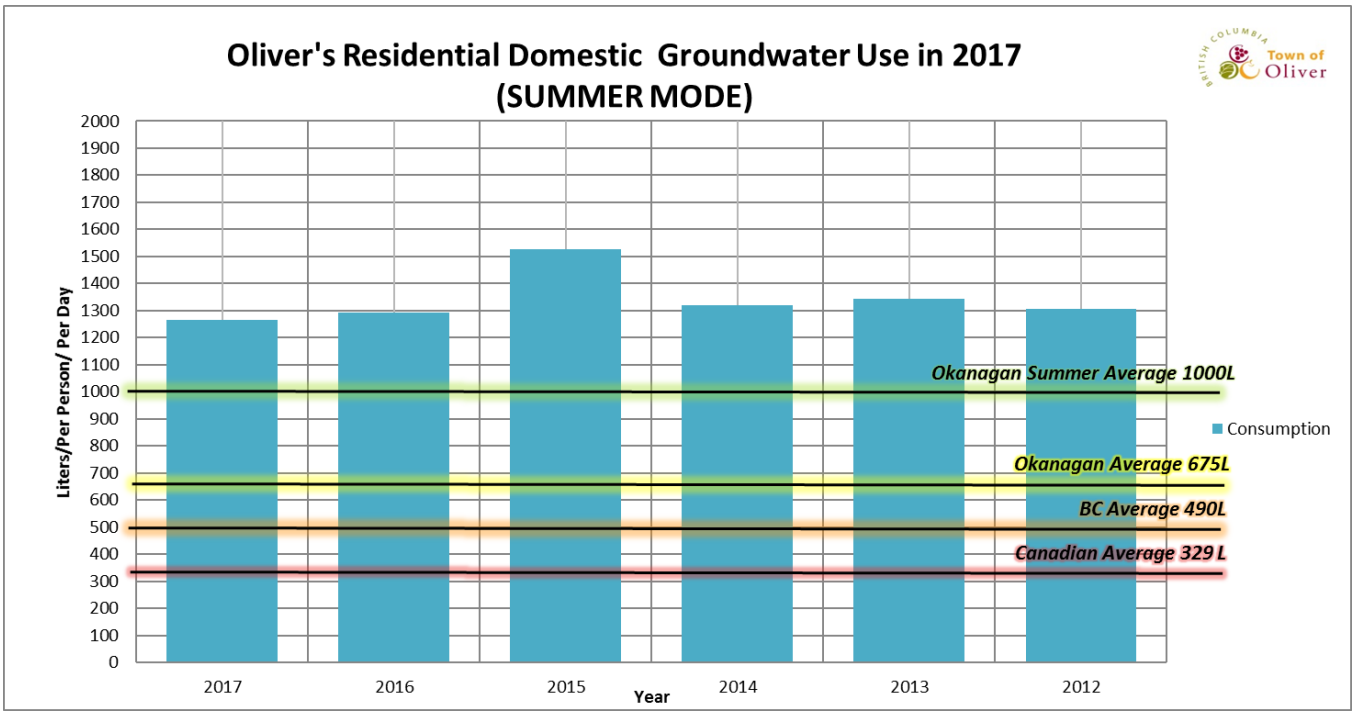


Figure 6: Oliver's (April-October 2012-2017) average vs OBWB Estimated Averages (1996-2006)

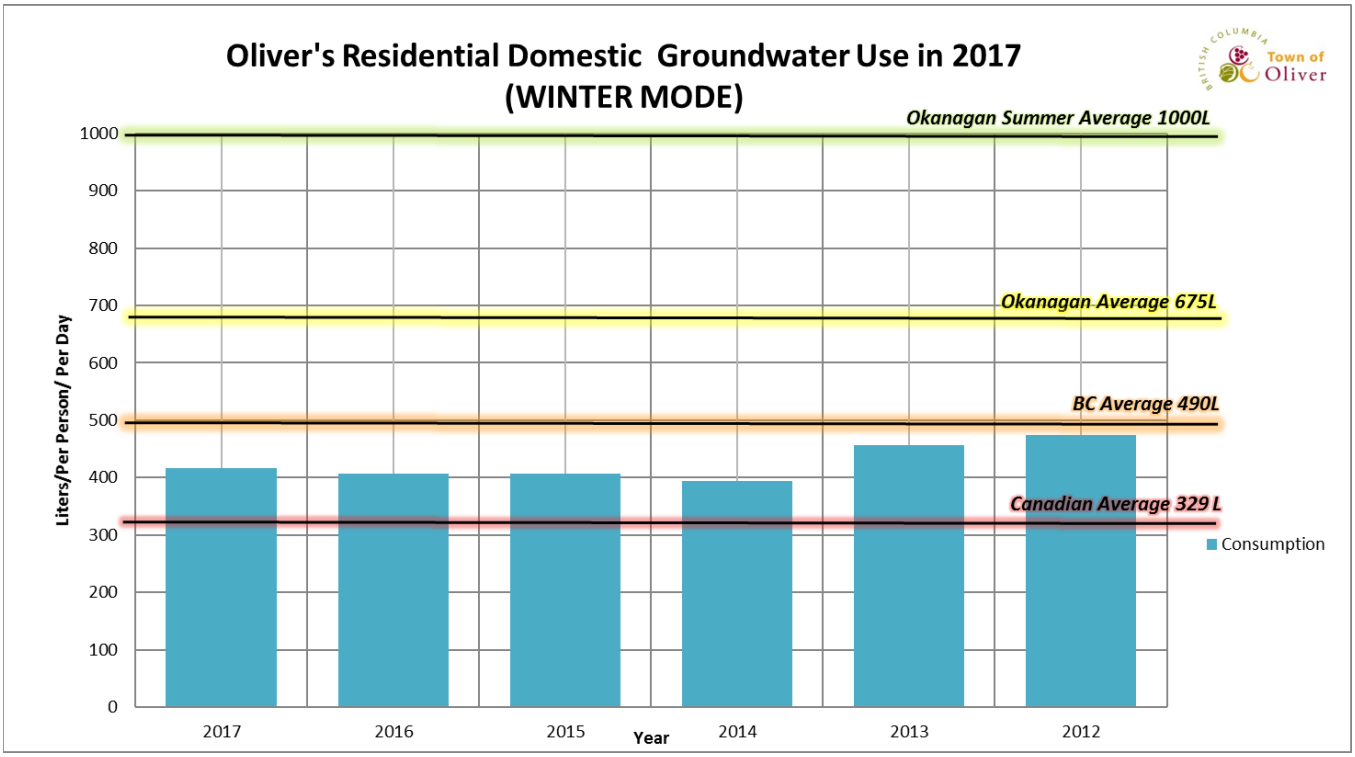


Figure 7: Oliver's (November - March 2012-2017) average vs OBWB Estimate Averages (1996-2006)

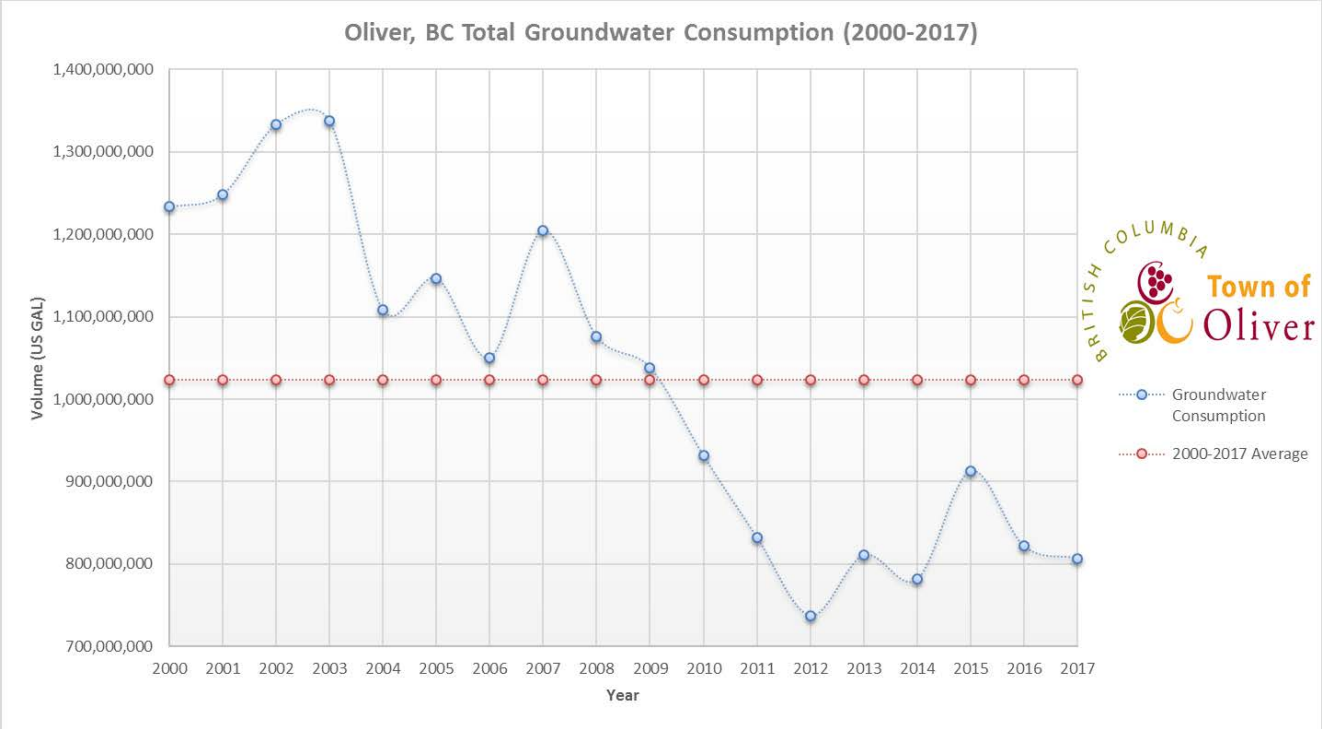


Figure 8: Oliver's Total Groundwater Consumption Trend (2000-2017)

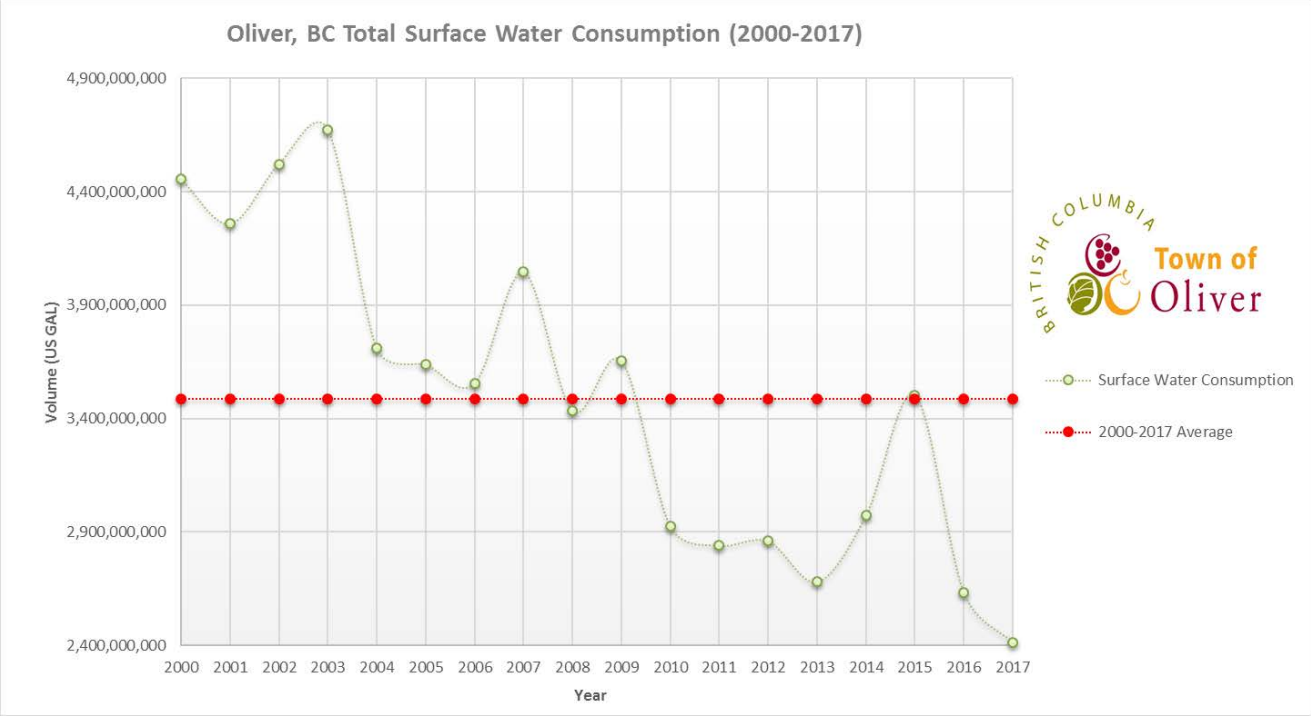


Figure 9: Oliver's Total Surface Water Consumption Trend (2000-2017)

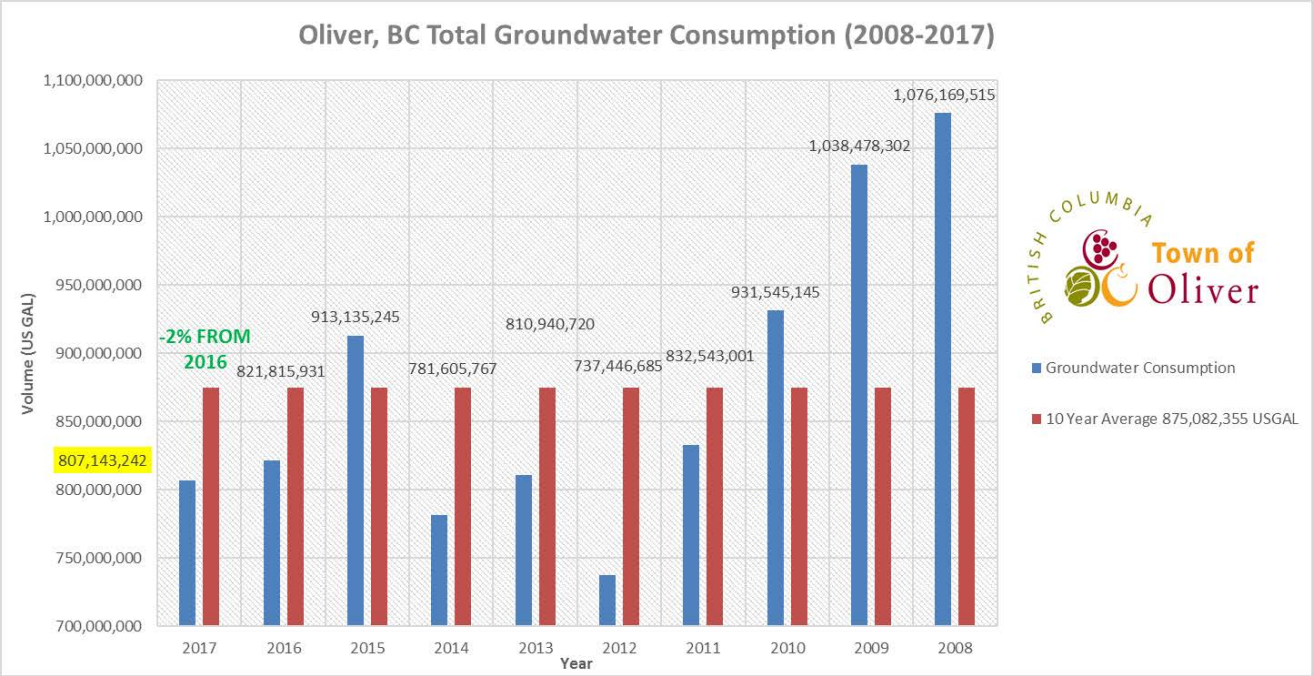


Figure 10: Oliver's Groundwater Consumption (2008-2017)

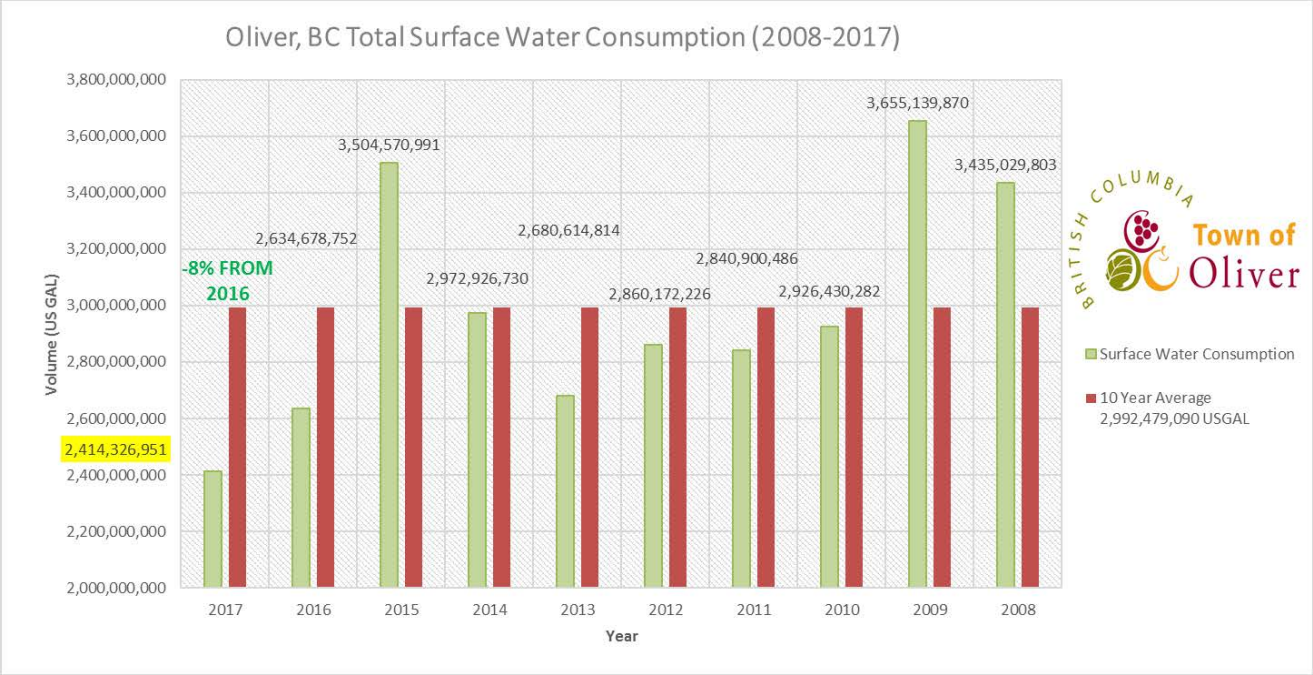


Figure 11: Oliver's Surface Water Consumption (2008-2017)

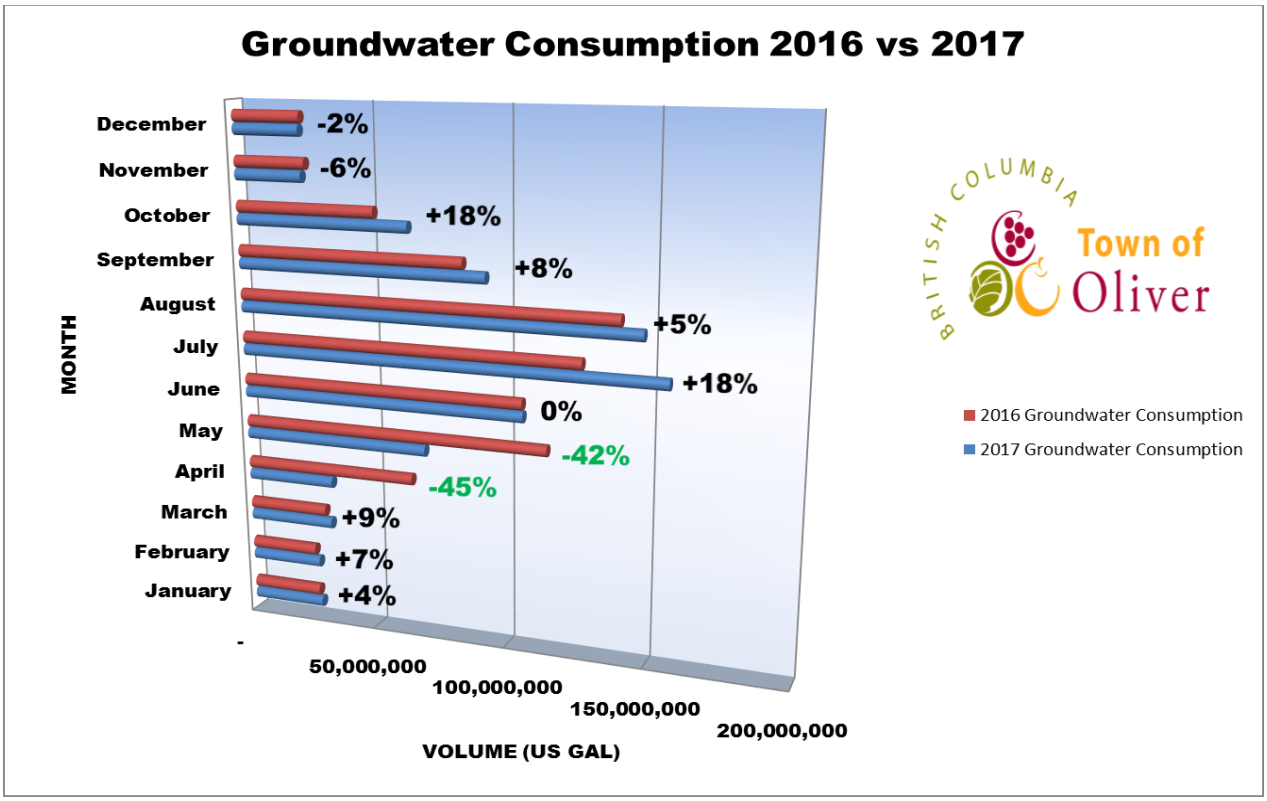


Figure 12: Groundwater Demand Percentages in 2017 Compared to the Previous Year 2016

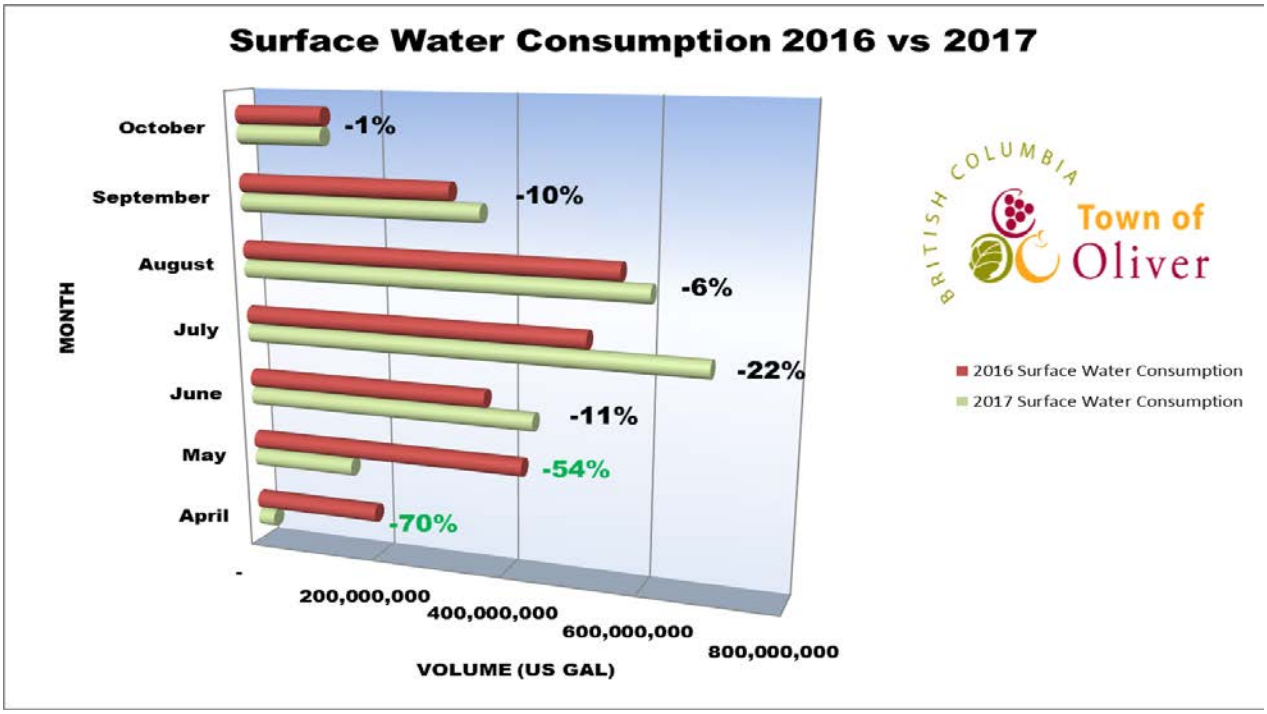


Figure 13: Surface Water Demand Percentages in 2017 Compared to the Previous Year 2016

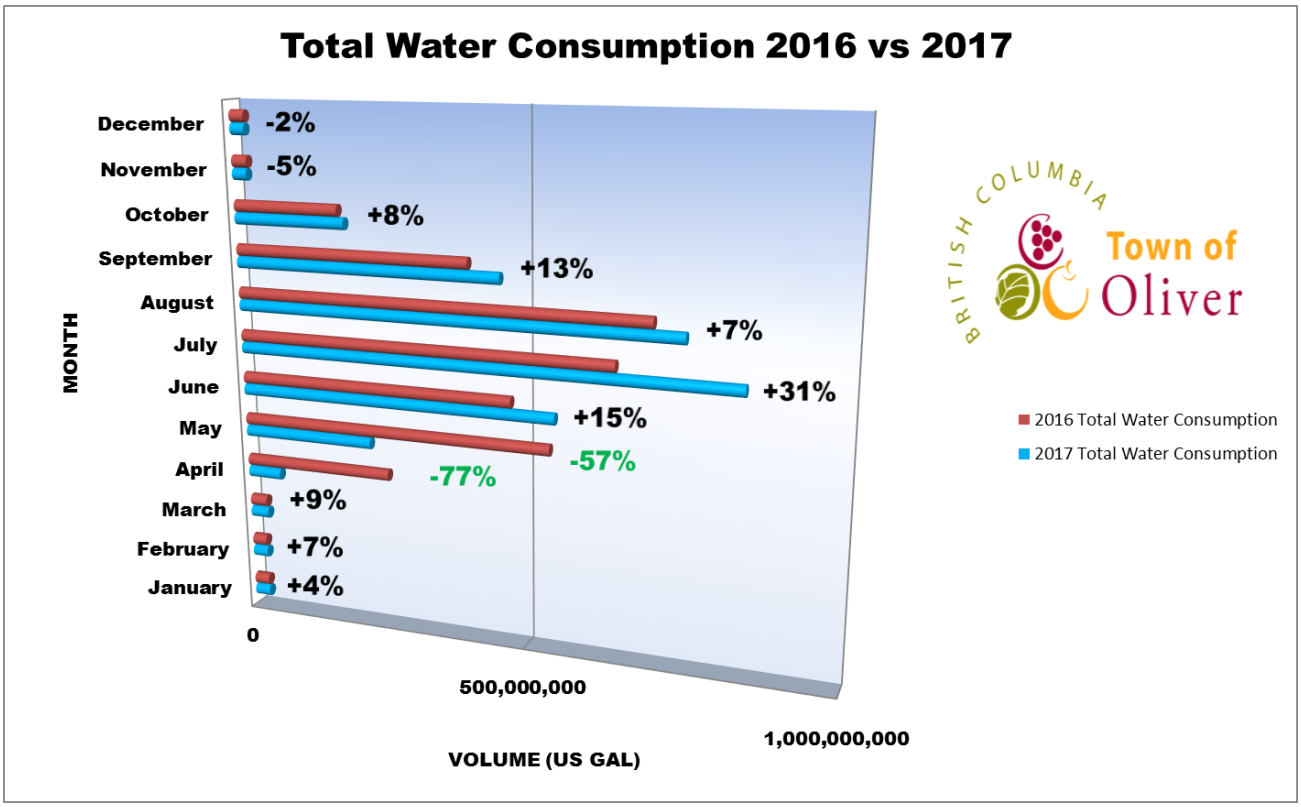


Figure 14: Total Water Demand Percentages in 2017 Compared to the Previous Year 2016

- *(Please See Appendix D: 2017 Pumping Data Table)*
- *(Please See Appendix E: Groundwater and Surface Water Consumption Data Tables)*

4.3 WATER CONSERVATION

The Town of Oliver works closely with the OBWB and its Okanagan Water Wise program called "Make Water Work", to spread a valley wide awareness on water conservation in the Okanagan. The program acts as a campaign where residents take water conservation survey pledges. OBWB will bring awareness in 2018 with more Radio Ads, Facebook Ads, Billboards, other social media support, yard signs, posters, and magnets linking the Make Water Work website. www.makewaterwork.ca.

5.0 STAFF

According to EOCP (Environmental Operator Certification Program), Oliver's Water Distribution System is a Class III. In 2017 Oliver's operations has five certified Water Distribution Operators on staff, four of these are full-time regular Operators; one Level I, two Level II, and one Level IV. One staff member has been a Water Operator in training since April 2015 at Public Works.

All Operators are required to keep up with their education and to maintain 2.4 certified education units (CEU's) every two years and are monitored by the EOCP. Various accredited courses were put on at the Town regarding safe work practices.

6.0 CAPITAL PROJECTS AND IMPROVEMENTS

6.1 PROJECTS COMPLETED IN 2017

The Town of Oliver continues to make minor and major improvements to the Town's water system every year and works with the Interior Health Authority (IHA) to prioritize some of these goals. Here are the main projects that were completed and started in 2016:

Canal Rehabilitation Study

Allnorth was hired, through an RFP process, to study the Town's irrigation canal system. This project came to a close in 2017 and gives the Town a document that will help prioritize projects, costs and give solutions to some of the problems on maintaining the canal system that was built in the early 1920's.

Fairview Irrigation Control Improvements

This project, started in 2016, was completed in 2017 to help upgrade and improve electrical, and controls for the Fairview Irrigation Pump house Station. Our pump houses are several decades old and finding replacement parts has become more difficult over the years. By installing new controls compatible with our Supervisory Control and Data Acquisition (SCADA) system, it gives us more control of the irrigation system that feeds irrigation water for System #5.

Meet "New" Provincial Groundwater Licensing

The Town used a Consultants services to put together all documentation and licensing to meet new groundwater requirements that is now monitored by the Province.

Gallagher Lake Siphon Damage Repair

The Town is still working on a permanent solution to relocate the canal away from the rock fall area. The Town has continued to do some Engineering and coordination for; design, property acquisitions and archeological assessments. We are also working with Provincial and Federal government to contribute funding to this project.

Fairview Irrigation Pumphouse Revolving Screen Replacement

This project was started in 2017 to replace the ageing and existing revolving screen at our Fairview Irrigation pumphouse. This is a specialty product because it needs to fit properly into an existing position on the canal. This screen helps keep sediment from the canal from going into the pump intake area and distribution lines.

Drought Management Plan

The Town started a plan in 2016 and completed it in 2017 to give the Town staff some guidelines and triggers for water restrictions in times of drought conditions.

Flood Emergency – Canal Irrigation System

The Town had to close the canal irrigation system that affected most irrigation customers due to mud/debris slides that breached Hester and Tinhorn Creeks in May 2017. It took a week of staff and contracted services with several pieces of equipment to clean the system out and get it operational again for irrigation customers.

Station Street Watermain upgrades/services

Design and tendering was completed in 2017. This project will conclude in 2018 and coincides with sewer, storm and road upgrades on Fairview Road and Station Street.

New Roof for Rockcliffe Irrigation Pumphouse

Completed the roof replacement at pumphouse.

6.2 CONTINUING PROJECTS INTO 2018

Head of the Lake Watermain Looping

The Watermain Looping at Head of Lake project was started and will help back up (better serve) the Town's overall domestic water system. The new Buchanan well recently built and working and is not running at full efficiency when helping to supply water back in-Town as a main domestic pump or back up because of water mainline bottleneck's in the system. The Town is looking at looping a new mainline from the north end of Tuc-el-nuit Lake and tying into the existing water system at Lakeside Drive. Part of this project will also bring in a new on-site chlorination generation system installed at the new Buchanan well building.

6A Reservoir Pipe Outfall Improvements

We needed to repair broken pipe that has become separated in a couple of sections that acts as the outfall of the reservoir located in the 6A water system. There was a washout years ago and this pipe was quickly repaired but not to a permanent standard, this will be repaired, and the pipe (HDPE), which is on a steep slope (top to bottom), requires anchoring and installation of a man hole junction that will be screened off so no animals get into the reservoir. This project to finish in early 2018.

Fairview Irrigation Pumphouse Revolving Screen Replacement

This project was started in 2017 to replace the ageing and existing revolving screen at our Fairview Irrigation pumphouse. Completion of all work in early 2018.

Station Street Watermain upgrades/services

Design and tendering was completed in 2017, and all upgrades will start in spring 2018. This coincides with sewer, storm and road upgrades on Fairview Road and Station Street.

6.3 LONG TERM IMPROVEMENT PLANS

The Town has a 5 year budgeted capital plan for known upgrades and new infrastructure and/or projects. These projects include Canal rehabilitation on an annual basis:

Other 2018 projects

- Water Capital Asset Management Plan
- Continue working on Gallagher Lake Siphon re-route
- Canal Rehabilitation Continued
- Gallagher Lake Re-Routing
- Start a Black Sage Domestic VFD Upgrade/Controls
- Flood Restoration on canal property
- Flume 3 Seismic Assessment
- Fairview Irrigation Well – Starter & disconnect
- Apply for a “Flood Preparedness” grant
- Major Irrigation Line Fixes – Rd 2 & Primrose Lane

2019

- Gallagher Lake Re-Routing continuation
- Black Sage Domestic VFD upgrade continuation
- McGowan Mainline and service upgrades

- Canal Rehabilitation Continued
- Risk Assessments & Potential Hazards on Canal
- Town Siphon Load & Stress Assessment
- Flood Preparedness Continuation if funding received
- Sawmill Road Extension & Station St. Upgrade
- Earle Crescent water upgrades

2020

- Canal Rehabilitation Continued
- Various undersized water line upgrades
- 7D Drainage re-route
- Continue Risk Assessments & Potential Hazards on Canal
- Kobau Irrigation Control & Electrical Upgrades
- Kobau irrigation pumphouse control and electrical upgrades

2021

- Canal Rehabilitation Continued
- New control panel for Fairview Irrigation
- Upgrade Check gates on canal
- 7D Drainage full upgrade
- Kootenay Street Water Upgrades

2022

- Canal Rehabilitation Continued
- Modify Turnouts on canal system
- Okanagan St. & School Avenue Water Upgrades

7.0 EMERGENCY RESPONSE PLAN

The Town of Oliver has an Emergency Response Plan pertaining to any natural disaster, and the water system. The Emergency Response Plan identifies a number of potential emergencies that could occur and provides a systematic approach on how the Town will deal with the emergency. The plan was recently updated in 2017.

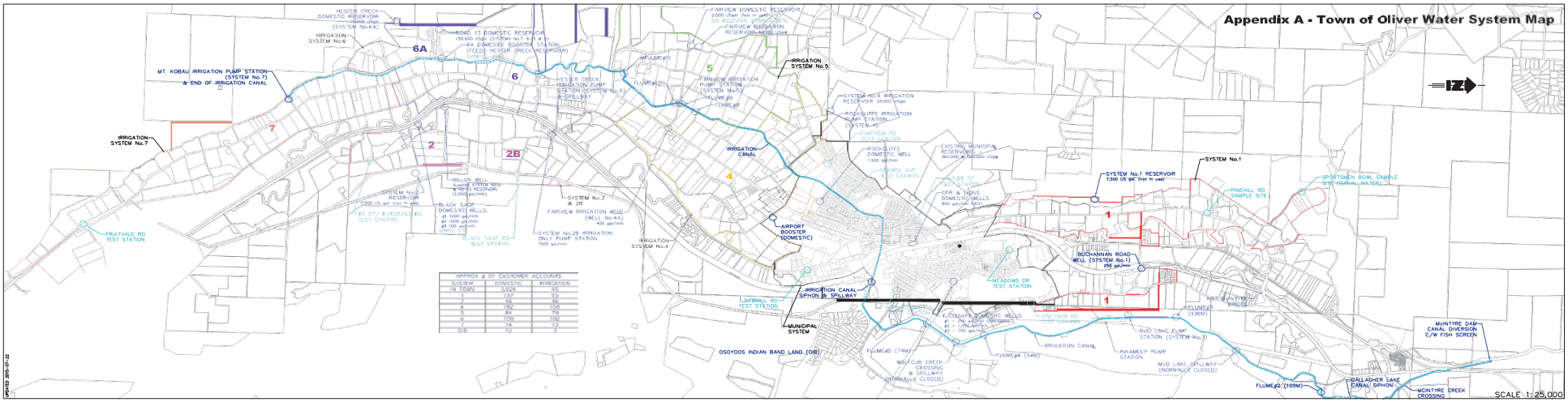
8.0 CROSS CONNECTION CONTROL PROGAM

Cross connection is an actual or potential connection between a potable water supply and a non-potable source, where it is possible for a contaminant to enter the drinking water supply. The Town's Cross Connection Control Program continues to work towards addressing the potential for the water system to be compromised by service connections, which could introduce contaminated water into the domestic water system. The program focuses on premise isolation for commercial and industrial customers. In 2017, there were 255 testable backflow assemblies in service (including agricultural devices) being tracked.

9.0 CONCLUSION

The Town of Oliver works hard to maintain water quality and quantity for their residents as well as numerous customers in Regional District area 'C'. Efforts are made to ensure appropriate water usage and educate the public whenever possible. Without these ongoing efforts, the area would not be the robust agricultural community that it is today. If you have any comments regarding this report or other information that you would like to see included, please email works@oliver.ca or request a customer concern form at the Town Hall.

APPENDIX A: THE TOWN OF OLIVER WATER SYSTEM MAP FOR SAMPLING SITES



APPENDIX B: 2017 FULL SPECTRUM

CERTIFICATE OF ANALYSIS

REPORTED TO	Oliver, Town of 5971 Sawmill Road, PO Box 638 Oliver, BC V0H 1T0	**TEL** **FAX**	(250) 485-6213 (250) 498-2456
ATTENTION	Patti Hannas	**WORK ORDER**	7080730
PO NUMBER	39298	**RECEIVED / TEMP**	2017-08-09 09:00 / 14°C
PROJECT	Full Spectrum Analysis	**REPORTED**	2017-08-16
PROJECT INFO	A.1.	**COC NUMBER**	B44293

General Comments:

CARO Analytical Services employs methods which are conducted according to procedures accepted by appropriate regulatory agencies, and/or are conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts, except where otherwise agreed to by the client.

The results in this report apply to the samples analyzed in accordance with the Chain of Custody or Sample Requisition document. This analytical report must be reproduced in its entirety. CARO is not responsible for any loss or damage resulting directly or indirectly from error or omission in the conduct of testing. Liability is limited to the cost of analysis. Samples will be disposed of 30 days after the test report has been issued unless otherwise agreed to in writing.

Authorized By: **Kristin McKeown**
Account Manager

If you have any questions or concerns, please contact me at kmckeown@caro.ca

Locations:

#110 4011 Viking Way
Richmond, BC V6V 2K9
Tel: 604-279-1499

#102 3677 Highway 97N
Kelowna, BC V1X 5C3
Tel: 250-765-9646

17225 109 Avenue
Edmonton, AB T5S 1H7
Tel: 780-489-9100

www.caro.ca

ANALYSIS INFORMATION

REPORTED TO	Oliver, Town of	**WORK ORDER**	7080730
PROJECT	Full Spectrum Analysis	**REPORTED**	2017-08-16

Analysis Description	Method Reference	Technique	Location
Alkalinity in Water	APHA 2320 B*	Titration with H2SO4	Kelowna
Anions by IC in Water	APHA 4110 B	Ion Chromatography with Chemical Suppression of Eluent Conductivity	Kelowna
Colour, True in Water	APHA 2120 C	Spectrophotometry (456 nm)	Kelowna
Conductivity in Water	APHA 2510 B	Conductivity Meter	Kelowna
Hardness (as CaCO3) in Water	APHA 2340 B*	Calculation: 2.497 [total Ca] + 4.118 [total Mg] (Estimated)	N/A
pH in Water	APHA 4500-H+ B	Electrometry	Kelowna
Solids, Total Dissolved in Water	APHA 2540 C*	Gravimetry (Dried at 103-105C)	Kelowna
Total Metals by ICPMS in Water	APHA 3030 E* / APHA 3125 B	HNO3+HCl Hot Block Digestion / Inductively Coupled Plasma Mass Spectrometry (ICP-MS)	Richmond
Turbidity in Water	APHA 2130 B	Nephelometry	Kelowna

Note: An asterisk in the Method Reference indicates that the CARO method has been modified from the reference method

Method Reference Descriptions:

APHA	Standard Methods for the Examination of Water and Wastewater, 22nd Edition, American Public Health Association/American Water Works Association/Water Environment Federation

Glossary of Terms:

MRL	Method Reporting Limit
<	Less than the Reported Detection Limit (RDL) - the RDL may be higher than the MRL due to various factors such as dilutions, limited sample volume, high moisture, or interferences
AO	Aesthetic objective
MAC	Maximum acceptable concentration (health based)
OG	Operational guideline (treated water)
CU	Colour Units (referenced against a platinum cobalt standard)
mg/L	Milligrams per litre
NTU	Nephelometric Turbidity Units
pH units	pH < 7 = acidic, ph > 7 = basic
µS/cm	Microsiemens per centimetre

Standards / Guidelines Referenced in this Report:

Guidelines for Canadian Drinking Water Quality (Feb 2017)

Website: http://www.hc-sc.gc.ca/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/sum_guide-res_recom-eng.pdf

Note: In some cases, the values displayed on the report represent the lowest guideline and are to be verified by the end user

SAMPLE ANALYTICAL DATA

REPORTED TO Oliver, Town of
PROJECT Full Spectrum Analysis

WORK ORDER 7080730
REPORTED 2017-08-16

Analyte	Result / *Recovery*	Standard / Guideline	MRL / *Limits*	Units	Prepared	Analyzed	Notes
Sample ID: Rockcliffe (7080730-01) [Water] Sampled: 2017-08-08 10:15							F2
Anions							
Chloride	**28.8**	AO ≤ 250	0.10	mg/L	N/A	2017-08-09	
Fluoride	**0.44**	MAC = 1.5	0.10	mg/L	N/A	2017-08-09	
Nitrate (as N)	**4.64**	MAC = 10	0.010	mg/L	N/A	2017-08-09	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	N/A	2017-08-09	
Sulfate	**69.1**	AO ≤ 500	1.0	mg/L	N/A	2017-08-09	
General Parameters							
Alkalinity, Total (as CaCO3)	**262**	N/A	1.0	mg/L	N/A	2017-08-10	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A	1.0	mg/L	N/A	2017-08-10	
Alkalinity, Bicarbonate (as CaCO3)	**262**	N/A	1.0	mg/L	N/A	2017-08-10	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0	mg/L	N/A	2017-08-10	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0	mg/L	N/A	2017-08-10	
Colour, True	< 5.0	AO ≤ 15	5.0	CU	N/A	2017-08-11	
Conductivity (EC)	**724**	N/A	2.0	µS/cm	N/A	2017-08-10	
pH	**8.27**	7.0-10.5	0.10	pH units	N/A	2017-08-10	HT2
Solids, Total Dissolved	**441**	AO ≤ 500	10	mg/L	N/A	2017-08-10	
Turbidity	< 0.10	OG < 0.1	0.10	NTU	N/A	2017-08-09	
Calculated Parameters							
Hardness, Total (as CaCO3)	**337**	N/A	0.500	mg/L	N/A	N/A	
Nitrate+Nitrite (as N)	**4.64**	N/A	0.0200	mg/L	N/A	N/A	
Total Metals							
Aluminum, total	**0.0062**	OG < 0.1	0.0050	mg/L	2017-08-10	2017-08-11	
Antimony, total	< 0.00010	MAC = 0.006	0.00010	mg/L	2017-08-10	2017-08-11	
Arsenic, total	**0.00124**	MAC = 0.01	0.00050	mg/L	2017-08-10	2017-08-11	
Barium, total	**0.0632**	MAC = 1	0.0050	mg/L	2017-08-10	2017-08-11	
Beryllium, total	< 0.00010	N/A	0.00010	mg/L	2017-08-10	2017-08-11	
Bismuth, total	< 0.00010	N/A	0.00010	mg/L	2017-08-10	2017-08-11	
Boron, total	**0.0734**	MAC = 5	0.0050	mg/L	2017-08-10	2017-08-11	
Cadmium, total	< 0.000010	MAC = 0.005	0.000010	mg/L	2017-08-10	2017-08-11	
Calcium, total	**89.0**	N/A	0.20	mg/L	2017-08-10	2017-08-11	
Chromium, total	**0.00069**	MAC = 0.05	0.00050	mg/L	2017-08-10	2017-08-11	
Cobalt, total	< 0.00010	N/A	0.00010	mg/L	2017-08-10	2017-08-11	
Copper, total	**0.00196**	AO ≤ 1	0.00020	mg/L	2017-08-10	2017-08-11	
Iron, total	< 0.010	AO ≤ 0.3	0.010	mg/L	2017-08-10	2017-08-11	
Lead, total	< 0.00010	MAC = 0.01	0.00010	mg/L	2017-08-10	2017-08-11	
Lithium, total	**0.00861**	N/A	0.00010	mg/L	2017-08-10	2017-08-11	
Magnesium, total	**27.7**	N/A	0.010	mg/L	2017-08-10	2017-08-11	
Manganese, total	< 0.00020	AO ≤ 0.05	0.00020	mg/L	2017-08-10	2017-08-11	
Molybdenum, total	**0.00445**	N/A	0.00010	mg/L	2017-08-10	2017-08-11	
Nickel, total	**0.00053**	N/A	0.00020	mg/L	2017-08-10	2017-08-11	
Phosphorus, total	< 0.050	N/A	0.050	mg/L	2017-08-10	2017-08-11	
Potassium, total	**5.96**	N/A	0.10	mg/L	2017-08-10	2017-08-11	
Selenium, total	**0.00267**	MAC = 0.05	0.00050	mg/L	2017-08-10	2017-08-11	
Silicon, total	**9.2**	N/A	1.0	mg/L	2017-08-10	2017-08-11	
Silver, total	< 0.000050	N/A	0.000050	mg/L	2017-08-10	2017-08-11	

REPORTED TO Oliver, Town of
PROJECT Full Spectrum Analysis

WORK ORDER 7080730
REPORTED 2017-08-16

Analyte	Result / *Recovery*	Standard / Guideline	MRL / *Limits*	Units	Prepared	Analyzed	Notes
Sample ID: Rockcliffe (7080730-01) [Water] Sampled: 2017-08-08 10:15, Continued							F2
Total Metals, Continued							
Sodium, total	**22.6**	AO ≤ 200	0.10	mg/L	2017-08-10	2017-08-11	
Strontium, total	**0.946**	N/A	0.0010	mg/L	2017-08-10	2017-08-11	
Sulfur, total	**22.6**	N/A	3.0	mg/L	2017-08-10	2017-08-11	
Tellurium, total	< 0.00020	N/A	0.00020	mg/L	2017-08-10	2017-08-11	
Thallium, total	< 0.000020	N/A	0.000020	mg/L	2017-08-10	2017-08-11	
Thorium, total	< 0.00010	N/A	0.00010	mg/L	2017-08-10	2017-08-11	
Tin, total	< 0.00020	N/A	0.00020	mg/L	2017-08-10	2017-08-11	
Titanium, total	< 0.0050	N/A	0.0050	mg/L	2017-08-10	2017-08-11	
Uranium, total	**0.0132**	MAC = 0.02	0.000020	mg/L	2017-08-10	2017-08-11	
Vanadium, total	**0.0012**	N/A	0.0010	mg/L	2017-08-10	2017-08-11	
Zinc, total	**0.0087**	AO ≤ 5	0.0040	mg/L	2017-08-10	2017-08-11	
Zirconium, total	< 0.00010	N/A	0.00010	mg/L	2017-08-10	2017-08-11	
Sample ID: Black Sage #3 (7080730-02) [Water] Sampled: 2017-08-08 10:40							F2
Anions							
Chloride	**9.63**	AO ≤ 250	0.10	mg/L	N/A	2017-08-09	
Fluoride	**0.41**	MAC = 1.5	0.10	mg/L	N/A	2017-08-09	
Nitrate (as N)	**1.84**	MAC = 10	0.010	mg/L	N/A	2017-08-09	
Nitrite (as N)	< 0.010	MAC = 1	0.010	mg/L	N/A	2017-08-09	
Sulfate	**72.0**	AO ≤ 500	1.0	mg/L	N/A	2017-08-09	
General Parameters							
Alkalinity, Total (as CaCO3)	**228**	N/A	1.0	mg/L	N/A	2017-08-10	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A	1.0	mg/L	N/A	2017-08-10	
Alkalinity, Bicarbonate (as CaCO3)	**228**	N/A	1.0	mg/L	N/A	2017-08-10	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0	mg/L	N/A	2017-08-10	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0	mg/L	N/A	2017-08-10	
Colour, True	< 5.0	AO ≤ 15	5.0	CU	N/A	2017-08-11	
Conductivity (EC)	**588**	N/A	2.0	µS/cm	N/A	2017-08-10	
pH	**8.24**	7.0-10.5	0.10	pH units	N/A	2017-08-10	HT2
Solids, Total Dissolved	**346**	AO ≤ 500	10	mg/L	N/A	2017-08-10	
Turbidity	< 0.10	OG < 0.1	0.10	NTU	N/A	2017-08-09	
Calculated Parameters							
Hardness, Total (as CaCO3)	**277**	N/A	0.500	mg/L	N/A	N/A	
Nitrate+Nitrite (as N)	**1.84**	N/A	0.0200	mg/L	N/A	N/A	
Total Metals							
Aluminum, total	< 0.0050	OG < 0.1	0.0050	mg/L	2017-08-10	2017-08-11	
Antimony, total	< 0.00010	MAC = 0.006	0.00010	mg/L	2017-08-10	2017-08-11	
Arsenic, total	**0.00212**	MAC = 0.01	0.00050	mg/L	2017-08-10	2017-08-11	
Barium, total	**0.0435**	MAC = 1	0.0050	mg/L	2017-08-10	2017-08-11	
Beryllium, total	< 0.00010	N/A	0.00010	mg/L	2017-08-10	2017-08-11	
Bismuth, total	< 0.00010	N/A	0.00010	mg/L	2017-08-10	2017-08-11	
Boron, total	**0.0623**	MAC = 5	0.0050	mg/L	2017-08-10	2017-08-11	
Cadmium, total	**0.000086**	MAC = 0.005	0.000010	mg/L	2017-08-10	2017-08-11	

REPORTED TO Oliver, Town of
PROJECT Full Spectrum Analysis

WORK ORDER 7080730
REPORTED 2017-08-16

Analyte	Result / *Recovery*	Standard / Guideline	MRL / *Limits*	Units	Prepared	Analyzed	Notes
Sample ID: Black Sage #3 (7080730-02) [Water] Sampled: 2017-08-08 10:40, Continued							F2
Total Metals, Continued							
Calcium, total	**65.6**	N/A	0.20	mg/L	2017-08-10	2017-08-11	
Chromium, total	**0.00069**	MAC = 0.05	0.00050	mg/L	2017-08-10	2017-08-11	
Cobalt, total	< 0.00010	N/A	0.00010	mg/L	2017-08-10	2017-08-11	
Copper, total	**0.00960**	AO ≤ 1	0.00020	mg/L	2017-08-10	2017-08-11	
Iron, total	< 0.010	AO ≤ 0.3	0.010	mg/L	2017-08-10	2017-08-11	
Lead, total	**0.00287**	MAC = 0.01	0.00010	mg/L	2017-08-10	2017-08-11	
Lithium, total	**0.00569**	N/A	0.00010	mg/L	2017-08-10	2017-08-11	
Magnesium, total	**27.6**	N/A	0.010	mg/L	2017-08-10	2017-08-11	
Manganese, total	**0.00082**	AO ≤ 0.05	0.00020	mg/L	2017-08-10	2017-08-11	
Molybdenum, total	**0.00658**	N/A	0.00010	mg/L	2017-08-10	2017-08-11	
Nickel, total	**0.00067**	N/A	0.00020	mg/L	2017-08-10	2017-08-11	
Phosphorus, total	< 0.050	N/A	0.050	mg/L	2017-08-10	2017-08-11	
Potassium, total	**5.25**	N/A	0.10	mg/L	2017-08-10	2017-08-11	
Selenium, total	**0.00176**	MAC = 0.05	0.00050	mg/L	2017-08-10	2017-08-11	
Silicon, total	**9.9**	N/A	1.0	mg/L	2017-08-10	2017-08-11	
Silver, total	< 0.000050	N/A	0.000050	mg/L	2017-08-10	2017-08-11	
Sodium, total	**19.6**	AO ≤ 200	0.10	mg/L	2017-08-10	2017-08-11	
Strontium, total	**0.789**	N/A	0.0010	mg/L	2017-08-10	2017-08-11	
Sulfur, total	**22.6**	N/A	3.0	mg/L	2017-08-10	2017-08-11	
Tellurium, total	< 0.00020	N/A	0.00020	mg/L	2017-08-10	2017-08-11	
Thallium, total	< 0.000020	N/A	0.000020	mg/L	2017-08-10	2017-08-11	
Thorium, total	< 0.00010	N/A	0.00010	mg/L	2017-08-10	2017-08-11	
Tin, total	< 0.00020	N/A	0.00020	mg/L	2017-08-10	2017-08-11	
Titanium, total	< 0.0050	N/A	0.0050	mg/L	2017-08-10	2017-08-11	
Uranium, total	**0.00648**	MAC = 0.02	0.000020	mg/L	2017-08-10	2017-08-11	
Vanadium, total	< 0.0010	N/A	0.0010	mg/L	2017-08-10	2017-08-11	
Zinc, total	**0.0517**	AO ≤ 5	0.0040	mg/L	2017-08-10	2017-08-11	
Zirconium, total	< 0.00010	N/A	0.00010	mg/L	2017-08-10	2017-08-11	

Sample / Analysis Qualifiers:

F2 The sample was not field-preserved with HNO3 and was therefore preserved in the laboratory and held for at least 16 hours prior to analysis for total metals.

HT2 The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.

APPENDIX C: 2017 WEEKLY WATER SAMPLING

2017 WEEKLY CHLORINE RESIDUAL & COLIFORM SAMPLING

(Target 0.2 to 1.50 - Chlorine Residual)

	RURAL NORTH				BLACK SAGE				RURAL SOUTH														MUNICIPAL			
	System #1				System #2				System #4				System #5				System #6				System #7							
	Surface Water Source				Groundwater Source				Ground Water Source				Groundwater Source				Groundwater Source				Groundwater Source				Groundwater Source			
	Chlorine	Sample	Coliform		Chlorine	Sample	Coliform		Chlorine	Sample	Coliform		Chlorine	Sample	Coliform		Chlorine	Sample	Coliform		Chlorine	Sample	Coliform		Chlorine	Sample	Coliform	
DATE	Residual	Location	Total	Ecoli	Residual	Location	Total	Ecoli	Residual	Location	Total	Ecoli	Residual	Location	Total	Ecoli	Residual	Location	Total	Ecoli	Residual	Location	Total	Ecoli	Residual	Location	Total	Ecoli
Jan-03	0.16	Mike's Auto	<1	<1									0.15	5A Booster	<1	<1									0.22	Wolfcub Pl	<1	<1
Jan-10	0.10	Pinehill	<1	<1													0.12	6A Booster	<1	<1					0.34	Granby TS	<1	<1
Jan-16	0.11	Mike's Auto	<1	<1					0.17	Snowbrush	<1	<1													0.24	Fairview TS	<1	<1
Jan-23																	Lo Res	6A Booster	<1	<1					0.14	Hillside TS	<1	<1
Jan-30													0.04	5A Booster	<1	<1									0.35	Meadows Dr	<1	<1
Feb-06													0.14	5A Booster	<1	<1									0.47	Vineyard Rd	<1	<1
Feb-14																	0.08	6A Booster	<1	<1					0.37	Wolfcub Pl	<1	<1
Feb-20													0.19	5A Booster	<1	<1									0.14	Sawmill Rd	<1	<1
Feb-27																	0.03	6A Booster	<1	<1					0.28	Granby TS	<1	<1
Mar-06													0.08	5A Booster	<1	<1									0.42	Fairview TS	<1	<1
Mar-13	0.09	Pinehill	<1	<1					0.35	Snowbrush	<1	<1													0.06	Hillside	<1	<1
Mar-20	0.18	Mike's Auto	<1	<1																	0.12	Fruitvale Way	<1	<1	0.29	Meadows Dr	<1	<1
Mar-27	0.22	Pinehill TS	<1	<1									0.06	5A Booster	<1	<1									0.22	Vineyard Rd	<1	<1
Apr-03	0.15	Mike's Auto	<1	<1													0.08	6A Booster	<1	<1					0.27	Wolfcub Pl	<1	<1
Apr-10	0.11	Pinehill Rd							0.15	Snowbrush															0.22	Sawmill Rd		
Apr-18	0.15	Mike's Auto	<1	<1																	0.11	Fruitvale Way	<1	<1	0.24	Fairview Rd		
Apr-24	0.05	Pinehill	<1	<1									0.11	5A Booster	<1	<1									0.12	Hillside TS	<1	<1
May 1	0.15	Pinehill	<1	<1	0.27	Blacksage Rd	<1	<1									0.07	6A Booster	<1	<1					0.19	Meadows Dr	<1	<1
May 8	0.19	Mike's Auto	<1	<1	0.53	Ryegrass	<1	<1	0.09	Snowbrush	<1	<1													0.33	Tucelnuit	<1	<1
																									0.19	Old Reservoir	<1	<1
May 15	0.11	Pinehill	<1	<1	0.27	Blacksage Rd	<1	<1													0.08	Fruitvale Way	<1	<1	0.23	Wolfcub Pl	<1	<1
May 23	0.15	Mike's Auto	<1	<1	0.18	Ryegrass	<1	<1																	0.19	Sawmill Rd	<1	<1
						Miller Road Well	<1	<1																				
						Black Sage Well	<1	<1																				
May 29	0.11	Pinehill	<1	<1	0.23	Blacksage Rd	<1	<1					0.07	5A Booster	<1	<1									0.33	Granby TS	<1	<1
June 12	0.08	Mike's Auto	<1	<1	0.25	Ryegrass	2	<1									0.07	6A Booster	<1	<1					0.24	Fairview	<1	<1
June 19	0.08	Pinehill	<1	<1	0.15	Blacksage Rd	1	<1	Low	Snowbrush	<1	<1													0.16	Hillside	<1	<1
June 20					0.42	Ryegrass	1	<1																				
June 26	0.46	Mike's Auto	<1	<1	0.60	Ryegrass	<1	<1					0.11	5A Booster	<1	<1									0.32	Meadows	<1	<1
					0.26	Blacksage Rd	<1	<1																				
July 4	0.27	Mike's Auto	<1	<1	0.38	Ryegrass Rd	<1	<1													Lo	Fruitvale Way	<1	<1	0.33	Tucelnuit	<1	<1

July 10	0.05	Pinehill	<1	<1	0.25	Blacksage Rd	<1	<1																	0.10	Fairview	<1	<1
																									0.45	Wolfcub	<1	<1
July 17	0.26	Mike's Auto	<1	<1	0.43	Ryegrass	<1	<1									0.10	Hester B.	<1	<1					0.26	Sawmill Rd	<1	<1
						Black Sage #1	<1	<1																				
July 24	0.05	Pinehill	<1	<1	0.28	Blacksage Rd	<1	<1	0.14	Snowbrush	<1	<1													0.37	Granby TS	<1	<1
July 31	0.28	Mike's Auto	<1	<1	0.23	Ryegrass	<1	<1													0.12	Fruitvale Way	<1	<1	0.21	Fairview TS	<1	<1
																									0.11	556 Lakeview	<1	<1
August 8	0.36	Pinehill	<1	<1	0.03	Black Sage	<1	<1									0.11	Hester B.	<1	<1					0.30	Hillside	<1	<1
					0.37	Ryegrass	<1	<1																				
Aug 14	0.17	Mike's	<1	<1	Lo	Ryegrass	<1	<1					0.04	5A Booster	<1	<1									0.43	Meadows	<1	<1
Aug-21	0.22	Pinehill	<1	<1	0.16	Black Sage	<1	<1									0.12	6A Booster	<1	<1					0.14	Tucelnuit	<1	<1
Aug-28	0.15	Mike's			0.28	Ryegrass															0.08	Fruitvale Way			0.18	Wolfcub		
Sep-05	0.32	Pinehill			0.25	Blacksage			0.17	Snowbrush															0.20	Sawmill		
Sep-11	0.15	Pinehill	<1	<1	0.24	Blacksage	<1	<1	0.23	Snowbrush	<1	<1													0.08	Sawmill	1	<1
Sep-14																									0.23	Sawmill		
Sep-18	0.21	Mike's	<1	<1	0.22	Ryegrass	<1	<1													0.07	Fruitvale Way	<1	<1	0.18	Granby	<1	<1
																									0.18	Sawmill	<1	<1
Sep-25	0.15	Pinehill	<1	<1	0.18	Blacksage	<1	<1					Lo	5A Booster	<1	<1									0.33	Fairview	<1	<1
Oct-2	0.25	Mike's	<1	<1	0.22	Ryegrass	<1	<1									0.12	6A Booster	<1	<1					0.05	Hollow	<1	<1
Oct-11	0.40	Pinehill	<1	<1	0.29	Blacksage	<1	<1	0.25	Snowbrush	<1	<1													0.27	Meadows	<1	<1
Oct-16	0.30	Mike's	<1	<1	0.21	Ryegrass	<1	<1													0.10	Fruitvale Way	<1	<1	0.31	Vineyard Rd	<1	<1
Oct-23	0.08	Pinehill	<1	<1	0.34	Blacksage	<1	<1					0.13	5A Booster	<1	<1									0.24	Wolfcub	<1	<1
Oct-30	0.11	Mike's	<1	<1													0.12	6A Booster	<1	<1					0.14	Sawmill	<1	<1
Nov-06	0.11	Mike's	<1	<1													0.18	6A Booster	<1	<1					0.34	Granby	<1	<1
Nov-14	0.15	Pinehill	<1	<1					0.15	Snowbrush	<1	<1													0.25	Fairview	<1	<1
Nov-20	0.52	Mike's	<1	<1																	0.15	Fruitvale Way	<1	<1	0.22	Hillside	<1	<1
Nov-27	0.21	Pinehill	<1	<1																					0.35	Meadows	<1	<1
	0.36	McGowan	<1	<1																								
Dec-04	0.18	Mike's Auto	<1	<1									0.12	5A Booster	<1	<1									-	Tucelnuit	<1	<1
Dec-11	0.41	McGowan	<1	<1													0.01	6A Booster	<1	<1					0.43	Wolfcub	<1	<1
Dec-18	0.30	Pinehill	<1	<1					0.20	Snowbrush	<1	<1													0.29	Sawmill	<1	<1
Dec-27	0.25	Mike's	<1	<1																	low	Fruitvale Way	<1	<1	0.30	Granby	<1	<1
Samples did not make it to the lab in Kelowna in time for testing																												

APPENDIX D: 2017 PUMPING DATA

MONTH	GROUNDWATER SOURCES (US GALLONS)													SURFACE WATER SOURCE (US GALLONS)								TOTAL WATER USED IN 2017
	Scada ROCKCLIFFE DOMESTIC PS Mun used for DOMESTIC	Scada TUCELNUIT PS 2 Mun used for DOMESTIC	Scada TUCELNUIT PS 3 Mun used for DOMESTIC	Scada BUCHANAN DOM WELL Sys 1 used for DOMESTIC	Scada MILLER RD RD 13 4,5,6,7 used for DOMESTIC	TOTAL GROUNDWATER USED FOR DOMESTIC	Scada MILLER RD DOM/IRR PS Sys 2 used for BOTH	Scada BLACK SAGE DOM/IRR PS Sys 2 used for BOTH	TOTAL GROUNDWATER USED FOR Both	Scada FAIRVIEW IRR WELL Sys 5A used for AGRICULTURE	Scada BUCHANAN ROAD PS * Sys 1 used for AGRICULTURE	TOTAL GROUNDWATER USED FOR AGRICULTURE	TOTAL GROUNDWATER USED	Scada MUD LAKE PS Sys 1 used for AGRICULTURE	Scada ROCKCLIFFE IRR PS Sys 4 used for AGRICULTURE	Scada FAIRVIEW IRR PS Sys 5 used for AGRICULTURE	Scada HESTER CREEK PS Sys 6 used for AGRICULTURE	Scada MT KOBAU PS Sys 7 used for AGRICULTURE	Scada BLK SAGE IRR PS Sys 2B used for AGRICULTURE	TOTAL SURFACE WATER USED	TOTAL WATER used for AGRICULTURE	
January	13,709,495	7,269,578	6,544,398	-	4,909	27,528,380	3,005	-	3,005	-	-	-	**27,531,385**	-	-	-	-	-	-	-	-	27,531,385
Febuary	12,420,243	9,185,144	5,190,983	-	-	26,796,369	1,533	137,908	139,442	-	-	-	**26,935,811**	-	-	-	-	-	-	-	-	26,935,811
March	16,212,275	11,608,240	4,559,391	-	-	32,379,905	1,120	837	1,957	-	-	-	**32,381,863**	-	-	-	-	-	-	-	-	32,381,863
April	10,328,436	11,216,930	4,808,719	-	3,559,500	29,913,584	2,404,946	809,387	3,214,333	-	-	-	**33,127,917**	-	8,325,552	-	757,059	16,813,074	10,786	**25,906,471**	25,906,471	59,034,389
May	15,795,658	11,240,806	6,397,779	1,175,089	11,114,200	45,723,532	4,845,321	14,716,660	19,561,981	-	4,407,368	4,407,368	**69,692,881**	28,235,506	70,430,662	-	31,517,030	21,289,198	8,121,603	**159,593,999**	164,001,368	229,286,880
June	29,876,562	10,469,169	7,232,443	7,815,043	10,484,500	65,877,717	4,168,900	31,208,630	35,377,530	-	4,584,497	4,584,497	**105,839,743**	80,333,503	169,102,731	-	88,111,673	83,649,481	19,899,147	**441,096,535**	445,681,031	546,936,278
July	37,807,441	20,275,799	16,840,019	8,014,391	16,957,900	99,895,551	7,567,800	46,785,471	54,353,271	-	2,063,095	2,063,095	**156,311,916**	153,571,207	245,786,693	-	130,989,938	123,865,961	32,928,381	**687,142,179**	689,205,274	843,454,095
August	36,644,289	16,749,744	12,197,423	10,955,004	11,813,900	88,360,360	3,406,969	44,616,618	48,023,587	-	11,063,552	11,063,552	**147,447,499**	121,814,226	233,185,769	-	111,360,267	105,742,015	32,219,854	**604,322,130**	615,385,682	751,769,629
September	21,379,949	19,897,031	5,186,080	7,673,164	7,894,200	62,030,424	1,790,100	24,473,286	26,263,386	-	4,374,118	4,374,118	**92,667,928**	74,026,667	144,658,198	-	63,254,967	61,056,947	22,513,124	**365,509,904**	369,884,022	458,177,832
October	10,615,934	11,274,679	6,503,969	6,780,826	4,705,900	39,881,308	1,998,000	19,060,872	21,058,872	-	3,775,031	3,775,031	**64,715,211**	23,276,509	54,948,066	-	25,518,267	18,939,698	8,073,193	**130,755,733**	134,530,764	195,470,943
Novemeber	7,335,548	10,384,369	4,319,226	3,392,486	2,545	25,434,174	2,969	-	2,969	-	-	-	**25,437,142**	-	-	-	-	-	-	-	-	25,437,142
December	10,572,469	6,728,436	3,075,094	4,516,688	153,455	25,046,142	7,803	-	7,803	-	-	-	**25,053,945**	-	-	-	-	-	-	-	-	25,053,945
TOTALS	**222,698,297**	**146,299,925**	**82,855,523**	**50,322,691**	**66,691,009**	**568,867,445**	**26,198,467**	**181,809,669**	**208,008,136**	**0**	**30,267,661**	**30,267,661**	**807,143,242**	**481,257,617**	**926,437,671**	**0**	**451,509,202**	**431,356,373**	**123,766,089**	**2,414,326,951**	**2,444,594,612**	**3,221,470,193**
WHEN ACTIVE					double-check:	568,867,445					double-check:	420,085,466	807,143,242							double-check:	2,414,326,951	double-check:	3,221,470,193
Max Flow	37,807,441	20,275,799	16,840,019	10,955,004	16,957,900	99,895,551	7,567,800	46,785,471	54,353,271	0	11,063,552	11,063,552	156,311,916	153,571,207	245,786,693	0	130,989,938	123,865,961	32,928,381	687,142,179	689,205,274	**843,454,095**
Min Flow	7,335,548	6,728,436	4,319,226	3,392,486	0	25,046,142	2,969	809,387	3,214,333	0	2,063,095	0	25,053,945	0	8,325,552	0	757,059	16,813,074	10,786	0	25,906,471	**25,053,945**
Avg Year Flow	18,558,191	12,191,660	6,904,627	4,193,558	5,557,584	47,405,620	2,183,206	15,150,806	17,334,011	0	2,522,305	2,522,305	67,261,937	40,104,801	77,203,139	0	37,625,767	35,946,364	10,313,841	201,193,913	203,716,218	**268,455,849**

NOTE Black Sage PS values are recorded as one combined value. These values have been calculated into agriculture as the activation of the pump pertains to the IRR Season.

* Meter only read on a periodic basis

MONTH	GROUNDWATER SOURCES (CUBIC METERS)													SURFACE WATER SOURCE (CUBIC METERS)								TOTAL WATER USED IN 2017
	Scada ROCKCLIFFE DOMESTIC PS Mun used for DOMESTIC	Scada TUCELNUIT PS 2 Mun used for DOMESTIC	Scada TUCELNUIT PS 3 Mun used for DOMESTIC	Scada BUCHANAN DOM WELL Sys 1 used for DOMESTIC	Scada MILLER RD RD 13 4,5,6,7 used for DOMESTIC	TOTAL GROUNDWATER USED FOR DOMESTIC	Scada MILLER RD DOM/IRR PS Sys 2 used for BOTH	Scada BLACK SAGE DOM/IRR PS Sys 2 used for BOTH	TOTAL GROUNDWATER USED FOR Both	Scada FAIRVIEW IRR WELL Sys 5A used for AGRICULTURE	Scada BUCHANAN ROAD PS * Sys 1 used for AGRICULTURE	TOTAL GROUNDWATER USED FOR AGRICULTURE	TOTAL GROUNDWATER USED	Scada MUD LAKE PS Sys 1 used for AGRICULTURE	Scada ROCKCLIFFE IRR PS Sys 4 used for AGRICULTURE	Scada FAIRVIEW IRR PS Sys 5 used for AGRICULTURE	Scada HESTER CREEK PS Sys 6 used for AGRICULTURE	Scada MT KOBAU PS Sys 7 used for AGRICULTURE	Scada BLK SAGE IRR PS Sys 2B used for AGRICULTURE	TOTAL SURFACE WATER USED	TOTAL WATER used for AGRICULTURE	
January	51,896	27,518	24,773	-	19	104,206	11	-	11	-	-	-	**104,218**	-	-	-	-	-	-	-	-	104,218
February	47,016	34,770	19,650	-	-	101,435	6	522	528	-	-	-	**101,963**	-	-	-	-	-	-	-	-	101,963
March	61,370	43,942	17,259	-	-	122,571	4	3	7	-	-	-	**122,579**	-	-	-	-	-	-	-	-	122,579
April	39,097	42,461	18,203	-	13,474	113,235	9,104	3,064	12,168	-	-	-	**125,403**	-	31,516	-	2,866	63,644	41	**98,067**	98,067	223,469
May	59,793	42,551	24,218	4,448	42,072	173,082	18,342	55,709	74,050	-	16,684	16,684	**263,816**	106,883	266,609	-	119,305	80,588	30,744	**604,129**	620,812	867,945
June	113,095	39,630	27,378	29,583	39,688	249,374	15,781	118,137	133,918	-	17,354	17,354	**400,647**	304,095	640,123	-	333,539	316,648	75,326	**1,669,731**	1,687,085	2,070,378
July	143,117	76,752	63,746	30,338	64,193	378,146	28,647	177,102	205,749	-	7,810	7,810	**591,705**	581,330	930,403	-	495,851	468,883	124,647	**2,601,115**	2,608,925	3,192,820
August	138,714	63,405	46,172	41,469	44,720	334,480	12,897	168,892	181,789	-	41,880	41,880	**558,149**	461,117	882,704	-	421,544	400,277	121,965	**2,287,607**	2,329,487	2,845,756
September	80,932	75,318	19,631	29,046	29,883	234,811	6,776	92,641	99,418	-	16,558	16,558	**350,786**	280,221	547,591	-	239,446	231,126	85,221	**1,383,605**	1,400,163	1,734,391
October	40,186	42,679	24,620	25,668	17,814	150,967	7,563	72,153	79,716	-	14,290	14,290	**244,974**	88,111	208,001	-	96,597	71,695	30,560	**494,964**	509,254	739,938
November	27,768	39,309	16,350	12,842	10	96,279	11	-	11	-	-	-	**96,290**	-	-	-	-	-	-	-	-	96,290
December	40,021	25,470	11,640	17,098	581	94,810	30	-	30	-	-	-	**94,839**	-	-	-	-	-	-	-	-	94,839
TOTALS	**843,004**	**553,805**	**313,642**	**190,492**	**252,453**	**2,153,397**	**99,172**	**688,224**	**787,396**	**0**	**114,576**	**114,576**	**3,055,368**	**1,821,757**	**3,506,946**	**0**	**1,709,147**	**1,632,861**	**468,505**	**9,139,217**	**9,253,793**	**12,194,585**
WHEN ACTIVE					double-check:	2,153,397					double-check:	1,590,196	3,055,368							double-check:	9,139,217		
Max Flow	143,117	76,752	63,746	41,469	64,193	378,146	28,647	177,102	205,749	0	41,880	41,880	591,705	581,330	930,403	0	495,851	468,883	124,647	2,601,115	2,608,925	**3,192,820**
Min Flow	27,768	25,470	16,350	12,842	0	94,810	11	3,064	12,168	0	7,810	0	94,839	0	31,516	0	2,866	63,644	41	0	98,067	**94,839**
Avg Year Flow	70,250	46,150	26,137	15,874	21,038	179,450	8,264	57,352	65,616	0	9,548	9,548	254,614	151,813	292,246	0	142,429	136,072	39,042	761,601	771,149	**1,016,215**

APPENDIX E: 2017 GROUNDWATER AND SURFACE WATER CONSUMPTION DATA

Town of Oliver

Groundwater Consumption Data

US GALLONS

YEAR	January	February	March	April	May	June	July	August	September	October	November	December	YTD	Year Average	Average
2017	27,531,385	26,935,811	32,381,863	33,127,917	69,692,881	105,839,743	156,311,916	147,447,499	92,667,928	64,715,211	25,437,142	25,053,945	807,143,242	67,261,937	812,014,598
2016	26,495,703	25,304,817	29,968,727	64,556,558	114,449,576	105,588,928	126,590,568	139,721,723	84,497,704	52,219,628	26,892,706	25,529,293	821,815,931	68,484,661	812,014,598
2015	24,995,670	22,331,907	28,348,130	69,828,360	107,509,652	134,080,260	163,478,571	140,709,274	101,276,667	68,802,269	26,439,576	25,334,906	913,135,245	76,094,604	812,014,598
2014	24,199,544	21,567,526	24,744,328	54,446,855	90,368,412	100,455,656	133,158,307	123,562,365	88,162,857	72,119,009	24,827,571	23,993,338	781,605,767	65,133,814	812,014,598
2013	26,822,480	25,225,568	32,194,465	46,945,213	99,359,703	105,530,172	153,640,351	131,088,478	71,923,869	70,689,721	23,627,363	23,893,335	810,940,720	67,578,393	812,014,598
2012	26,446,789	24,931,551	26,707,218	43,328,887	86,287,310	72,429,739	102,567,255	137,385,689	100,953,172	57,715,080	32,379,972	26,314,026	737,446,685	61,453,890	812,014,598
Average	***26,081,929***	***24,382,863***	***29,057,455***	***52,038,965***	***94,611,256***	***103,987,416***	***139,291,161***	***136,652,505***	***89,913,699***	***64,376,820***	***26,600,722***	***25,019,807***	***812,014,598***		

CUBIC METERS

YEAR	January	February	March	April	May	June	July	August	September	October	November	December	YTD	Year Average	Average
2017	104,218	101,963	122,579	125,403	263,816	400,647	591,705	558,149	350,786	244,974	96,290	94,839	3,055,368	254,614	3,073,808
2016	100,297	95,789	113,444	244,373	433,239	399,697	479,197	528,904	319,858	197,673	101,800	96,639	3,110,910	259,243	3,073,808
2015	94,619	84,535	107,309	264,329	406,968	507,549	618,833	532,642	383,374	260,445	100,085	95,903	3,456,591	288,049	3,073,808
2014	91,605	81,642	93,667	206,104	342,081	380,266	504,059	467,734	333,733	273,000	93,983	90,825	2,958,698	246,558	3,073,808
2013	101,534	95,489	121,869	177,707	376,117	399,475	581,592	496,224	272,261	267,590	89,439	90,446	3,069,743	255,812	3,073,808
2012	100,112	94,376	101,098	164,018	326,633	274,176	388,259	520,061	382,149	218,475	122,571	99,609	2,791,538	232,628	3,073,808
Average	***98,731***	***92,299***	***109,994***	***196,989***	***358,142***	***393,635***	***527,274***	***517,286***	***340,360***	***243,693***	***100,695***	***94,710***	***3,073,808***		

Town of Oliver

Surface Water Consumption Data

US GALLONS

YEAR	January	February	March	April	May	June	July	August	September	October	November	December	YTD	Year Average	Average
2017	0	0	0	25,906,471	159,593,999	441,096,535	687,142,179	604,322,130	365,509,904	130,755,733	0	0	2,414,326,951	201,193,913	2,841,423,648
2016	0	0	0	195,820,565	424,420,450	369,144,236	517,489,259	674,696,799	320,877,783	132,229,659	0	0	2,634,678,752	219,556,563	2,841,423,648
2015	0	0	0	242,341,115	487,581,169	653,959,751	763,431,674	667,904,291	465,978,262	223,374,730	0	0	3,504,570,991	292,047,583	2,841,423,648
2014	0	0	0	9,259,933	450,829,671	532,264,210	770,607,532	655,345,192	415,486,514	139,133,678	0	0	2,972,926,730	247,743,894	2,841,423,648
2013	0	0	0	111,513,914	414,598,794	427,810,480	826,320,197	585,448,024	187,664,000	127,259,405	0	0	2,680,614,814	223,384,568	2,841,423,648
10 Yr Average	**0**	**0**	**0**	**116,968,400**	**387,404,817**	**484,855,042**	**712,998,168**	**637,543,287**	**351,103,293**	**150,550,641**	**0**	**0**	**2,841,423,648**		
Average	***0***	***0***	***0***	***116,968,400***	***387,404,817***	***484,855,042***	***712,998,168***	***637,543,287***	***351,103,293***	***150,550,641***	***0***	***0***	***2,841,423,648***		

CUBIC METERS

YEAR	January	February	March	April	May	June	July	August	September	October	November	December	YTD	Year Average	Average
2017	0	0	0	98,067	604,129	1,669,731	2,601,115	2,287,607	1,383,605	494,964	0	0	9,139,217	761,601	10,755,953
2016	0	0	0	741,261	1,606,605	1,397,362	1,958,909	2,554,004	1,214,654	500,543	0	0	9,973,339	831,112	10,755,953
2015	0	0	0	917,360	1,845,695	2,475,506	2,889,902	2,528,292	1,763,919	845,565	0	0	13,266,238	1,105,520	10,755,953
2014	0	0	0	35,053	1,706,575	2,014,838	2,917,065	2,480,750	1,572,787	526,678	0	0	11,253,747	937,812	10,755,953
2013	0	0	0	422,126	1,569,426	1,619,438	3,127,961	2,216,161	710,385	481,729	0	0	10,147,226	845,602	10,755,953
10 Yr Average	**0**	**0**	**0**	**442,773**	**1,466,486**	**1,835,375**	**2,698,990**	**2,413,363**	**1,329,070**	**569,896**	**0**	**0**	**10,755,953**		
Average	***0***	***0***	***0***	***442,773***	***1,466,486***	***1,835,375***	***2,698,990***	***2,413,363***	***1,329,070***	***569,896***	***0***	***0***	***10,755,953***		