
# 2019 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 six 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 all have water meters to record consumption. 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.

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# 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 (Interior Health Authority) 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 that 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 6.5$m^3$ 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 & 2B – Black Sage Area – Black Sage and Miller Road 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 Road 13 Pumphouses

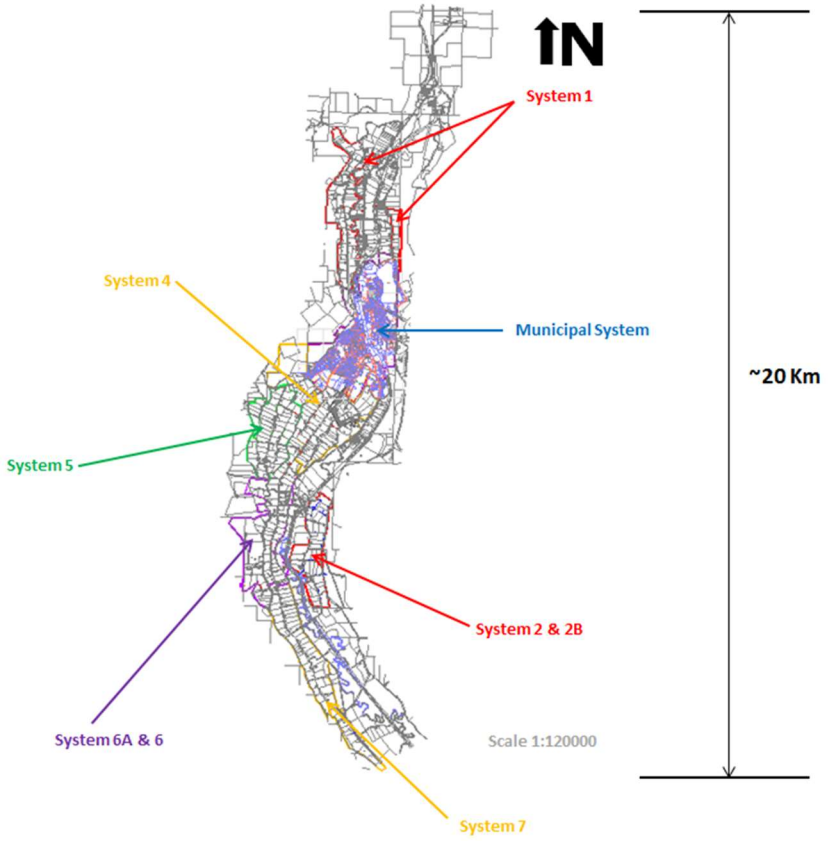



Figure 1: Town of Oliver's 7 Water System Overview

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 consists 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 (1360$m^3$) reservoir and a newer (constructed in 2010) 500,000 US GAL (2470$m^3$) reservoir. The other two reservoirs still in use are located in System 6 & 6A; Road 13 reservoir at 150,000 US gallons (568$m^3$) and Hester Creek reservoir at 15,000 US gallons (57$m^3$).

### 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 to System 1 and domestic ground water to System 1 and into Municipal System 3. Buchanan pump station has one domestic ground water pump with 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 domestic 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 with 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 thru 7, via 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 total 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 utilizes 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 (6A), while the Airport Booster has the option to alternate between the Municipal System and 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; T&A Rockworks carried out rock scaling. A pipe repair was then completed from within the pipe, during which time a 1.2m (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 has been sufficient for 2016, 2017, 2018 and 2019 so far, it may not be adequate during warmer, drier seasons in the future and hinders the Town from incorporating new customers.

The 2019 irrigation season started on April 15th and ended on October 8th. Crews began filling the canal and turning on spray fillers April 8th. The canal diversion was shut down on October 29th. All Town irrigation systems were shut down and winterized by the end of October.

The Town is still working on re-routing this portion of the canal (damaged siphon) with the help of provincial funding and borrowing. In late 2019, Town Council decided to carry forward with this project and should see finalized drawings, tendering and project construction start in the latter half of 2020. There are hopes that this project will be fully complete by early 2022.

Heavier creek flows on many creeks the last few years (2017 & 2018) on the west side of the valley had staff continuing to monitor; Hester, Tinhorn, Reid & Park Rill Creeks as the heavier flow can have an affect on our irrigation system, similar to the 2017 debris run-off into the canal. As in the last two years, staff spent extra time monitoring, working with contractors and periodically removing extra material in creeks or keeping culverts clear that could potentially damage the Town's irrigation infrastructure.

### 2.2.1 SYSTEM 1 IRRIGATION

System 1 utilizes two pump stations for its irrigation supply, 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 pressure irrigated, excluding 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 (94$m^3$) 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. Fairview Irrigation supplies pressurized irrigation to approximately 467 acres. Another Fairview Irrigation well in System 5, which used to be part of the domestic water system, was changed over to supply 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 (189$m^3$) 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

In the past the Town of Oliver 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 now 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 from various sampling sites throughout the domestic system for bacteriological testing for Total Coliforms, and E-Coli Bacteria. In conjunction with these 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, 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 water results are then compared to the *GCDWQ* to ensure compliance.

- *(Please See Appendix A: The Town of Oliver Water System Map for Sampling Sites)*
- *(Please See Appendix B: 2019 Full Spectrum Results and GCDWQ)*
- *(Please See Appendix C: 2019 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 result 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 resampling of water where contamination was located. Resampling occurs immediately for lab testing and in-house 'presence/absence' samples are also taken to identify coliforms.

# 4.0 WATER CONSUMPTION

## 4.1 TOTAL CONSUMPTION

The water works system 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 3,363,182,152 US GAL of water in 2019. That is 12,731,029,350 liters (L) of water or 12,731,029 $m^3$ of water.

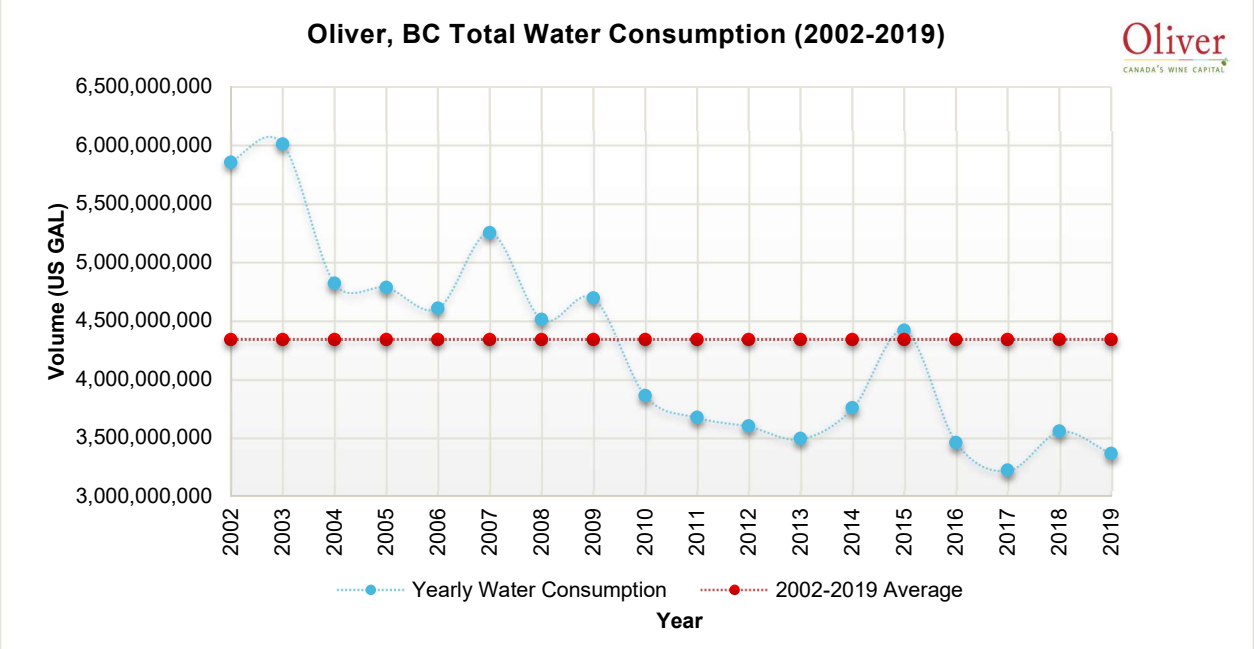



Figure 2: Total Water Consumption 6 Year Trend

As shown in *Figure 2,* Oliver consumed 5.37% more water than the previous year (2018). The seventeen-year average is 4,180,482,102 US GAL. In 2018, Oliver consumed 19.55% less than the seventeen-year average. Water demand is influenced by population and irrigation usage, population has been slightly increasing each year in Oliver and surrounding area. The 2016 Census reported Oliver's population as 4,928, however, the Town of Oliver's water system extends beyond its borders making it difficult to define how many people it actually serves; it is estimated to be over 6,000 people.

Irrigation technology has seen improvements over the years for ground crops, orchards and vineyards; this has 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 on the change in water demand; this includes the final twinning stages of the water system in 2014. The other major contributing factor for irrigating is weather and precipitation. In 2015, The South Okanagan was declared, by the government of BC, a drought level 4. In 2016, the South Okanagan did not reach a drought level 4, 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, above normal snowpack and late winter/early spring precipitation caused unsuspected flooding throughout the region. In 2018, the Okanagan was in a valley wide emergency state due to flooding again. 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 season to be a wet one, and the large amount of precipitation influenced the irrigation demand. Oliver's maximum residential domestic water demand was on June 17, 2019. *See Figure 3.* Oliver had a maximum daily water demand peak at 27,355.67m³, while minimum daily demand occurred on March 08, 2019 at 2,244.99 m³.

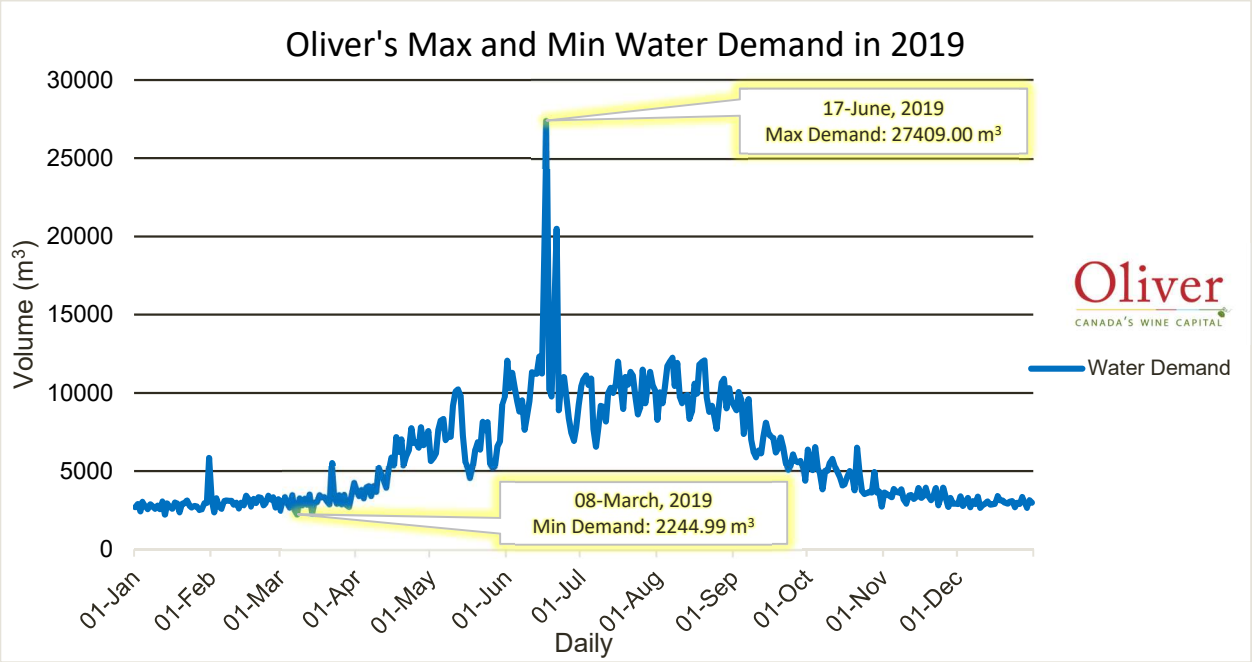



Figure 3: Oliver's 2019 Max and Min Domestic Water Demand

## 4.2 BREAKDOWN OF CONSUMPTION

The Town of Oliver consumed 780,718,943 US GAL (2,856,304m³, 2,866,304,030L) of groundwater in 2019. This amount is 23.06% of the total consumption. The remaining 76.94% is surface water, which is primarily used for irrigation, having a total consumption of 2,582,463,209 US GAL (9,646,789m³, 9,775,686,663L). *See Table 1 below for the breakdown of percentages*.

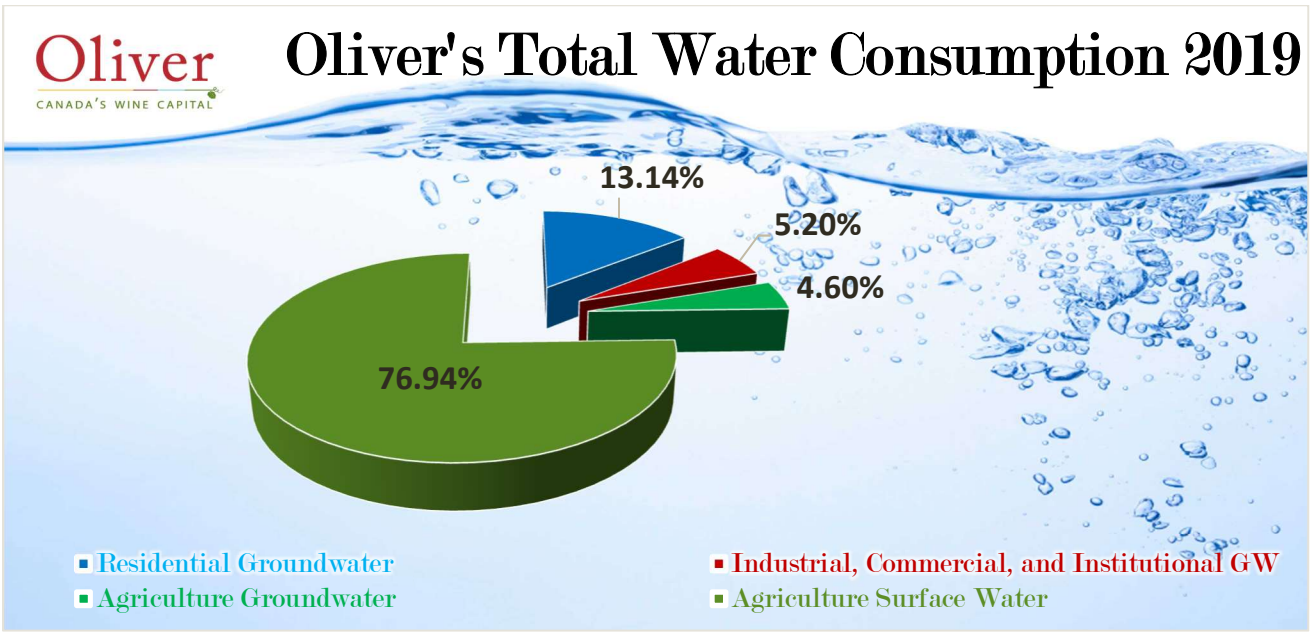



Figure 4: Oliver's Total Water Consumption 2019

| WURC CALCULATIONS | US GAL | CUBIC METERS | PERCENTAGE |
|---|---|---|---|
| TOTAL GW USED | 780718942.98 | 2955341.29 | 23.06% |
| TOTAL SW USED | 2605598584.08 | 9863258.94 | 76.94% |
| TOTAL RES GW | 444878232.88 | 1684046.51 | 13.14% |
| TOTAL RES SW | 0.00 | 0.00 | 0.00% |
| TOTAL ICI GW | 176013275.70 | 666282.41 | 5.20% |
| TOTAL ICI SW | 0.00 | 0.00 | 0.00% |
| TOTAL AG GW | 155786840.18 | 589717.06 | 4.60% |
| TOTAL AG SW | 2605598584.08 | 9863258.94 | 76.94% |
| TOTAL WATER | 3386317527.06 | 12818600.23 | 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 domestic system used approximately 881L of water per person per day in 2019, which is 552L above the Canadian average. *See Figure 5.*

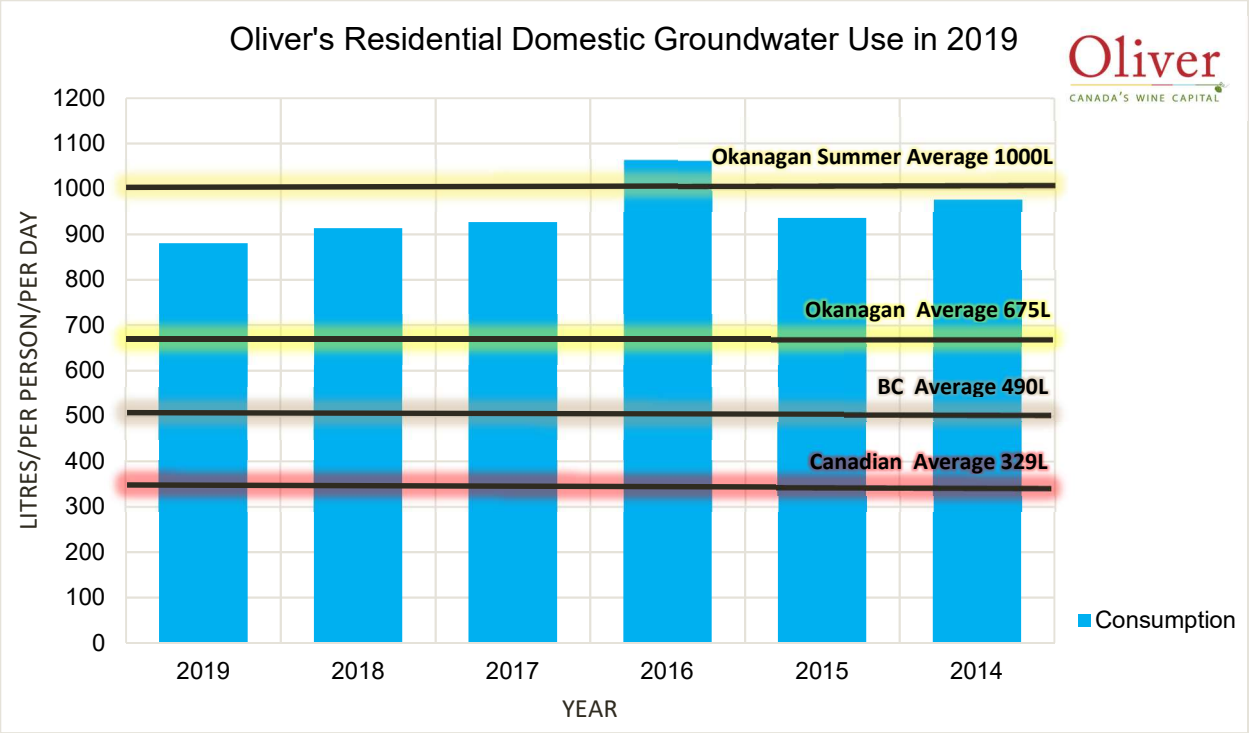



Figure 5: Oliver (2014-2019) vs OBWB Estimated Averages (1996-2006)

During the summer months the average consumption rate exceeds the Okanagan summer average of 1,000L (1m³) with Oliver using 1219L 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 401L 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 - 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, you will get your answer in liters per person per day. Once you have your results, you can compare your usage 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. $Convert\ x(m^3)\ to\ (liters\ (l)) = x(m^3) \times 1000 = x(l)$

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

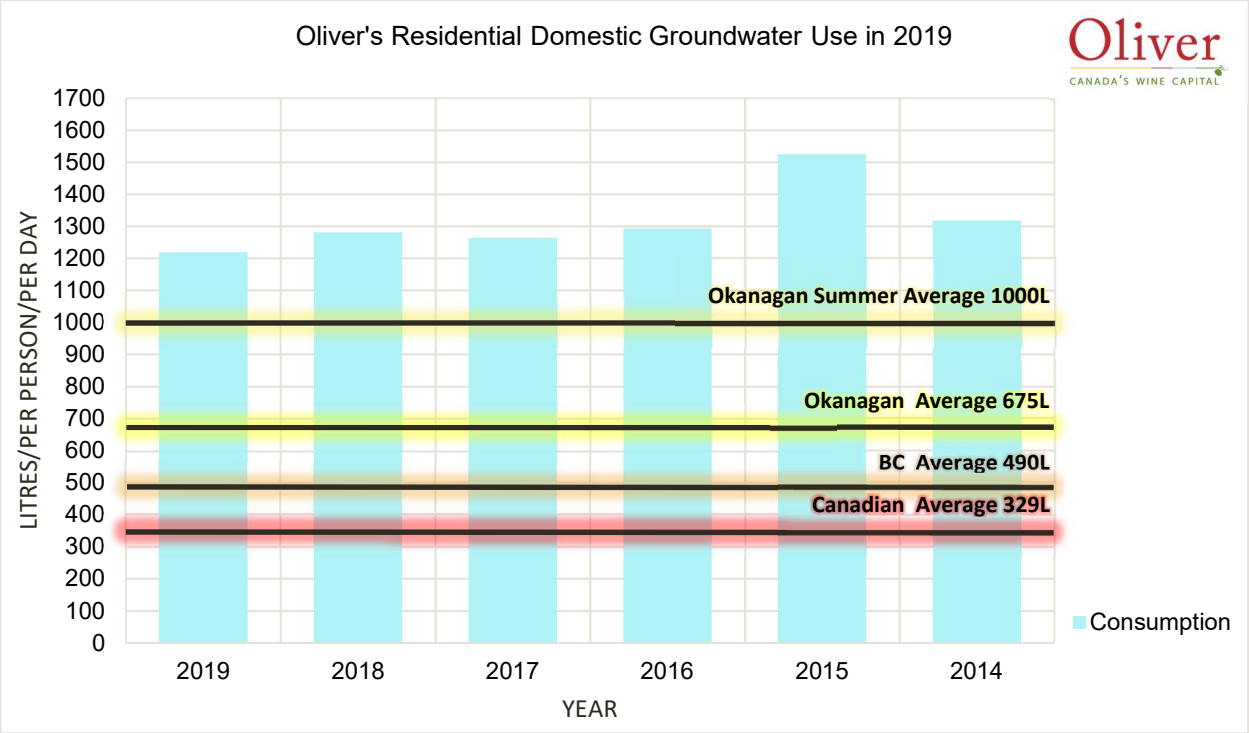



Figure 6: Oliver's (April-October 2014-2019) average vs OBWB Estimated Averages (1996-2006)

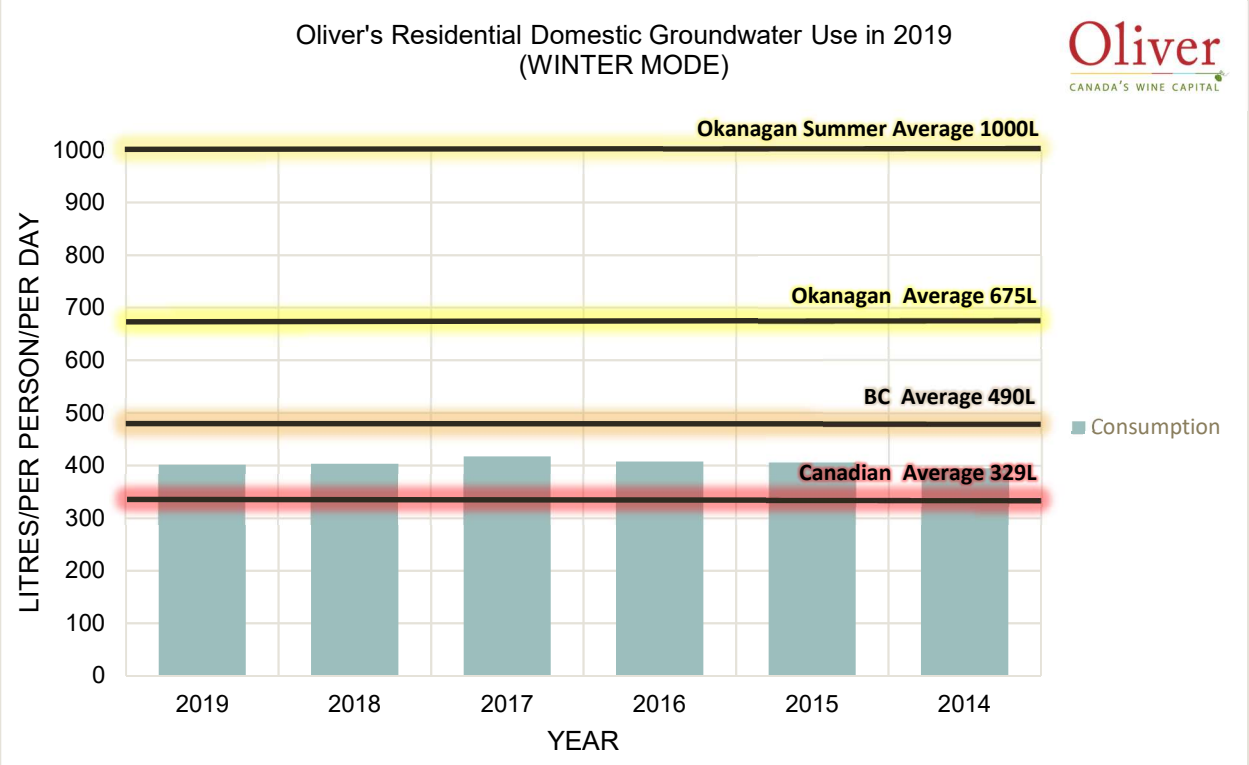



Figure 7: Oliver's (November - March 2014-2019) average vs OBWB Estimate Averages (1996-2006)

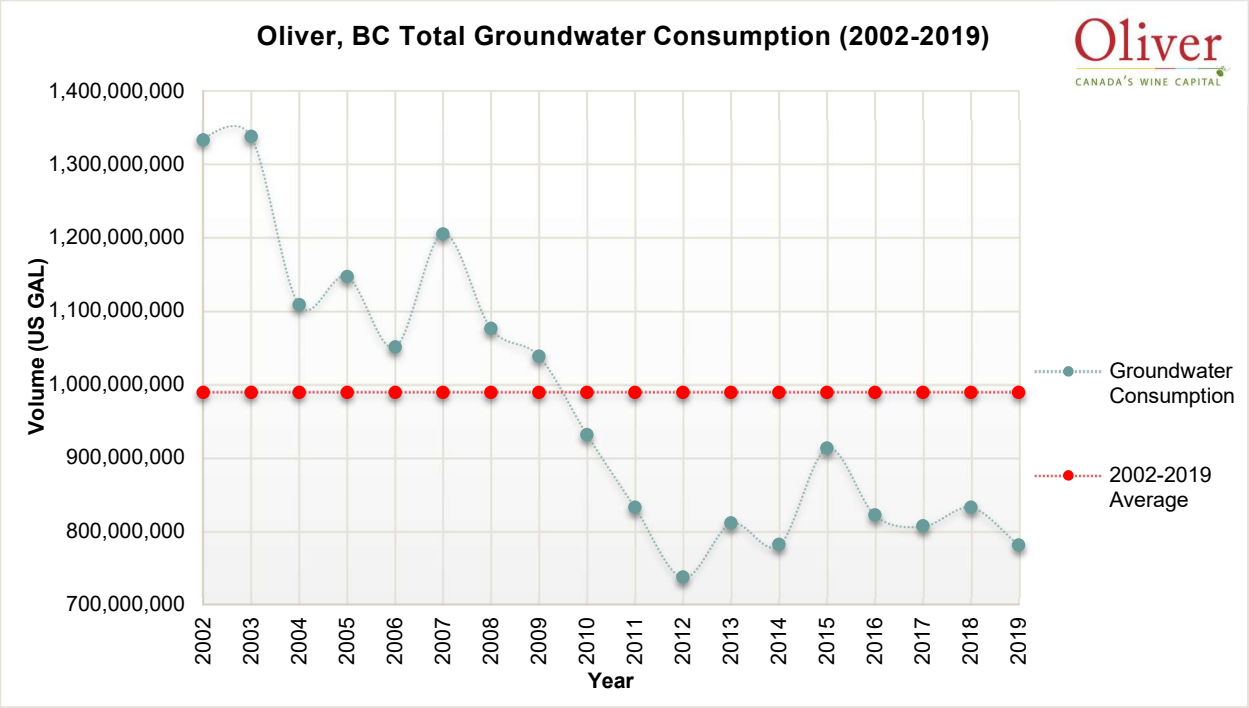



Figure 8: Oliver's Total Groundwater Consumption Trend (2002-2019)

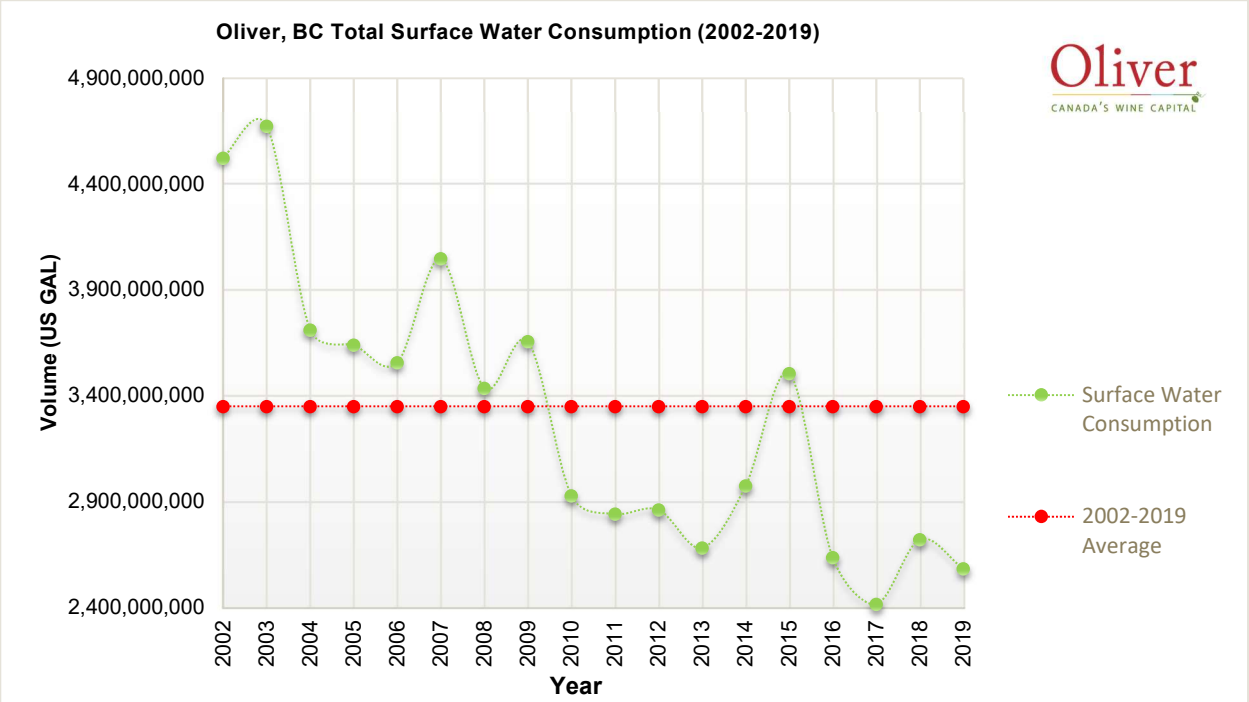



Figure 9: Oliver's Total Surface Water Consumption Trend (2002-2019)

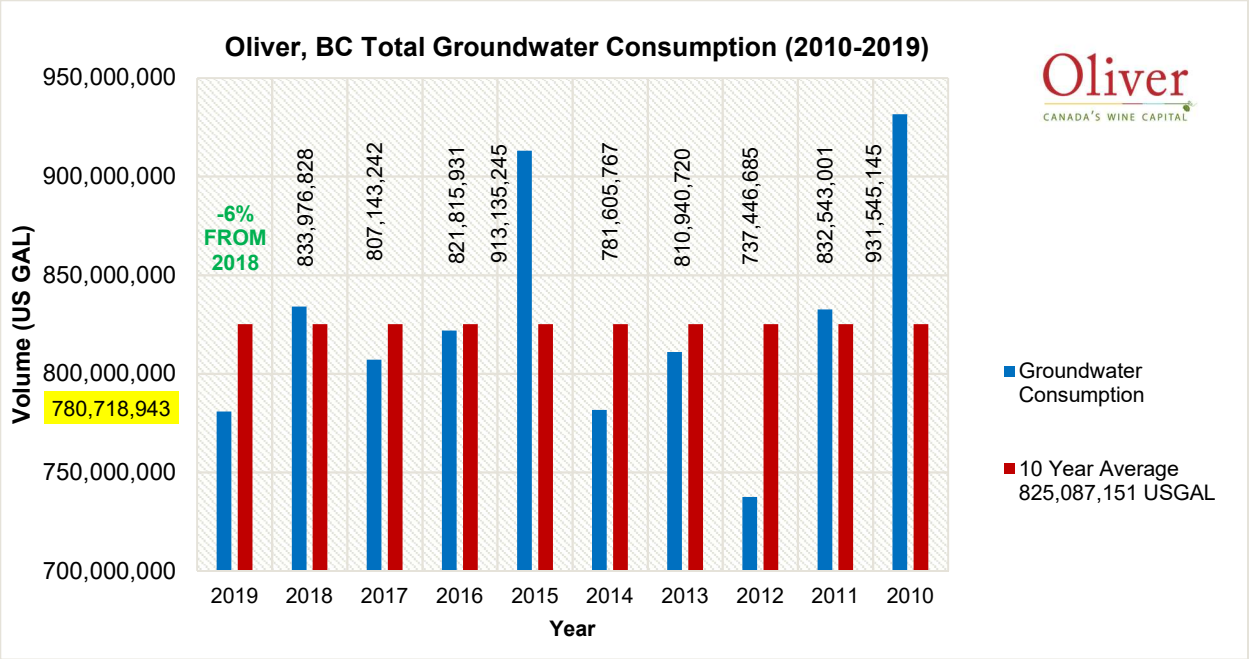



Figure 10: Oliver's Groundwater Consumption (2010-2019)

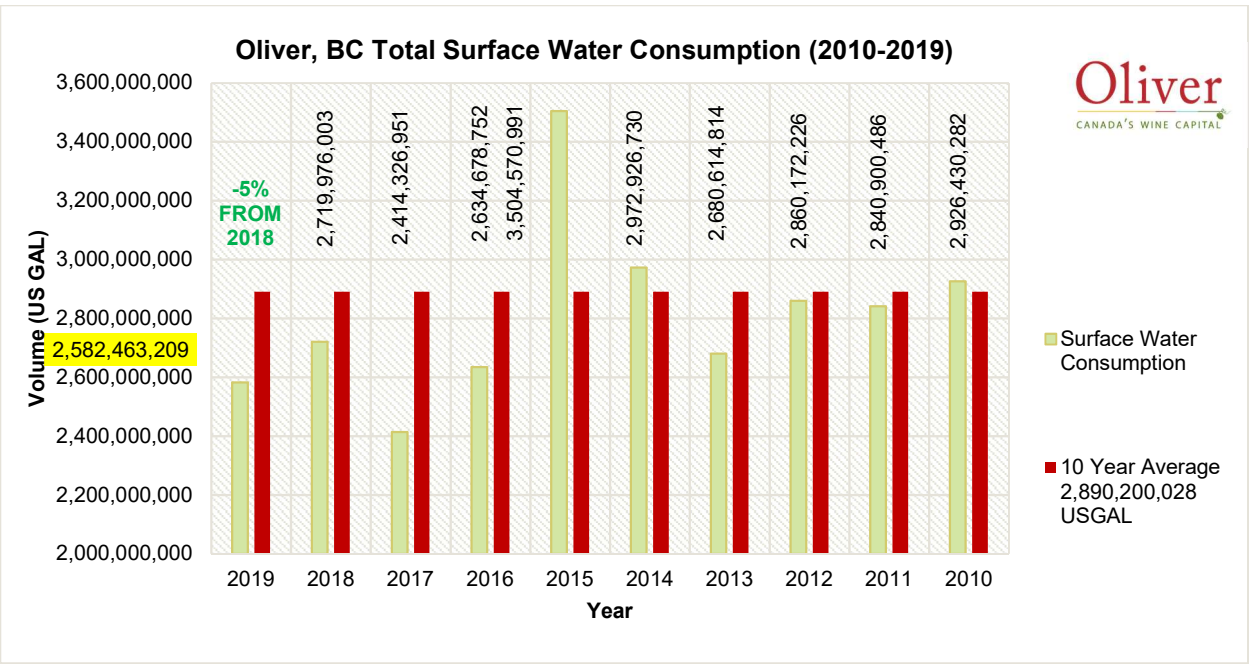



Figure 11: Oliver's Surface Water Consumption (2010-2019)

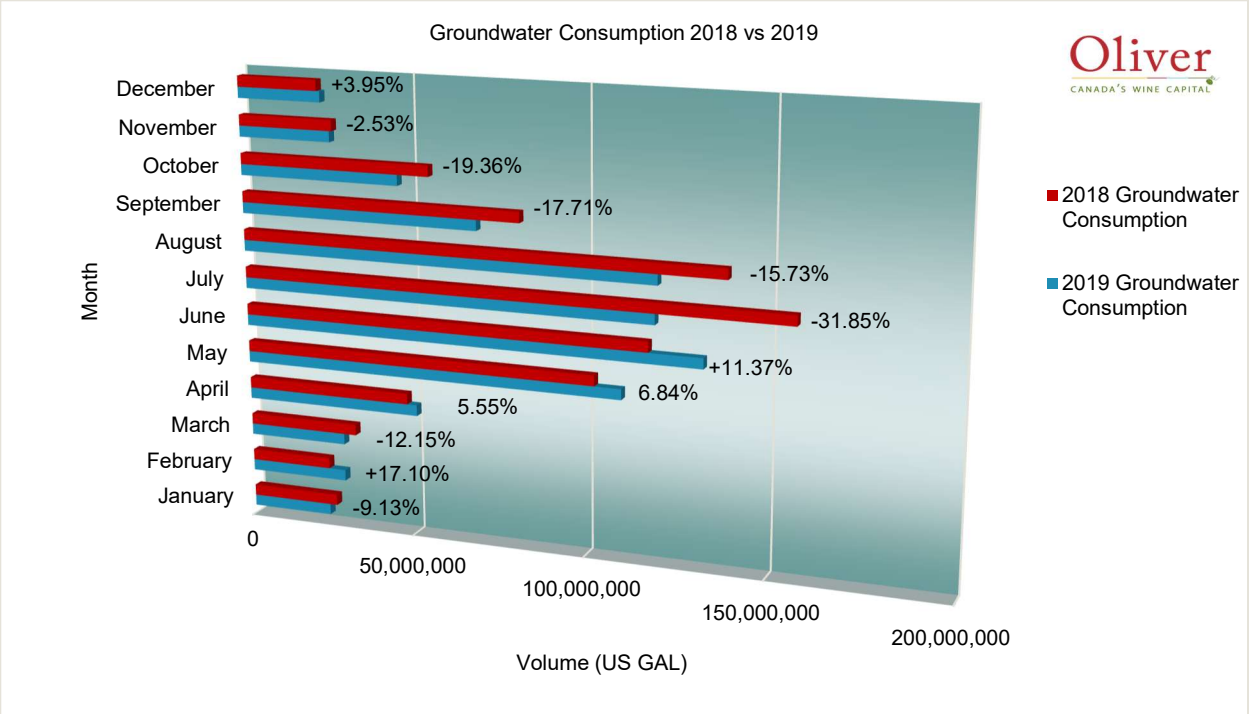



Figure 12: Groundwater Demand Percentages in 2019 Compared to the Previous Year 2018

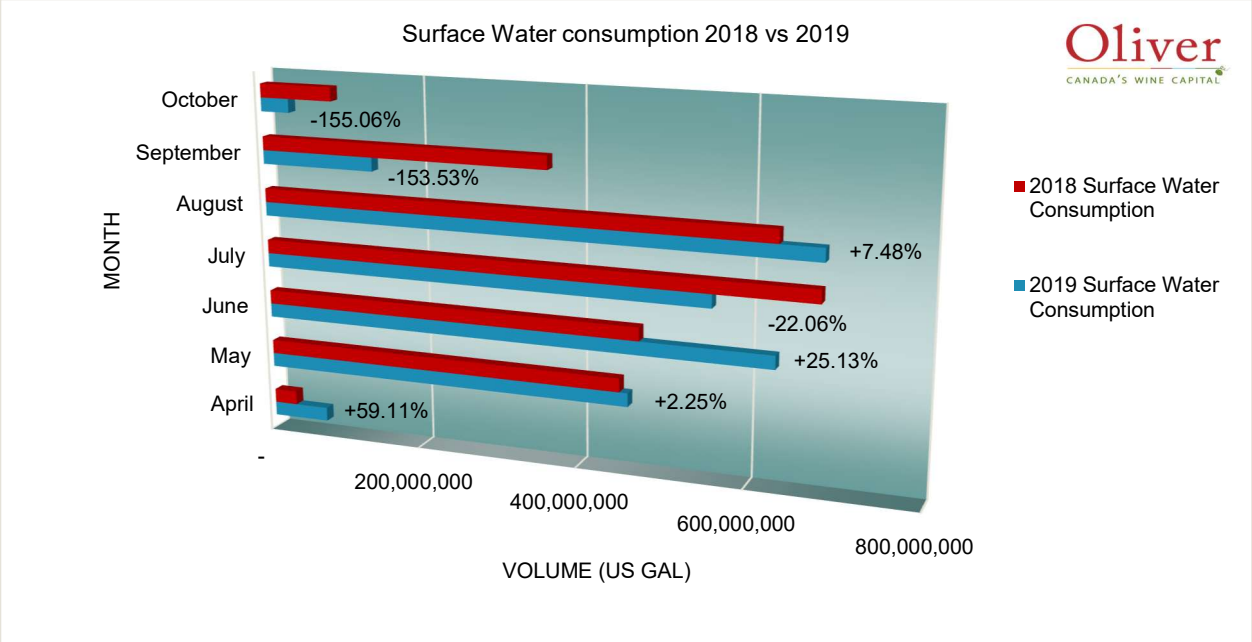



Figure 13: Surface Water Demand Percentages in 2019 Compared to the Previous Year 2018

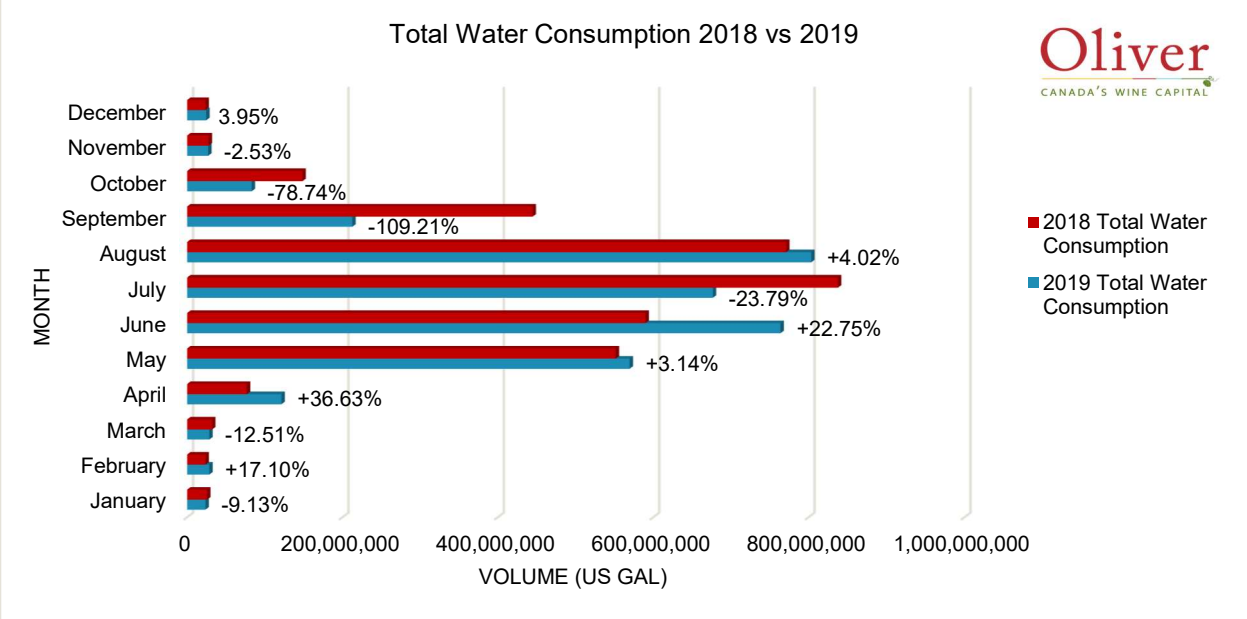



Figure 14: Total Water Demand Percentages in 2019 Compared to the Previous Year 2018

- *(Please See Appendix D: 2019 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 2019 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 classified as Class III. In 2019 Oliver's operations has four certified Water Distribution Operators on staff; two Level I, two Level II, and one Level III.

The Town of Oliver is also classified as a Level I Water Treatment facility (at multiple locations). We currently have three Operators with Level I and two working on receiving their Level I.

All Operators are required to keep up with their education and to maintain 2.4 certified education units (CEU's) every two years, 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 2019

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 or started in 2019:

***Head of the Lake Watermain Looping***

- The Watermain Looping at Head of Lake project was completed in early 2019 and will help back up (better serve) the Town's overall domestic water system. The new Buchanan well recently built and working 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 bottlenecks in the system. The majority of the work was completed in 2018, which consisted of looping a new mainline domestic pipe from the north end of Tuc-el-nuit Lake and tying into the existing water system at Lakeside Drive. Part of this project has also brought in a new on-site chlorination generation system installed at the new Buchanan well building for domestic water treatment.

***Gallagher Siphon Repair & Re-route***

- Town staff and Engineering Consultants have been working on a variety of tasks in order to get this project started in 2020. Environmental & archeological assessments started, land acquisitions and a variety of designs put forward to decide on the best financial/operable design to re-route the current canal system to avoid the rock bluffs. It was approved by Council in late 2019 to go with a 'Low Head Siphon' system, which incorporates a smaller siphon size due to a new lift station building being constructed to help lift and force water from the canal into the siphon. This was chosen to be the best fiscally responsible option which still keeps day-to-day operations at a reasonable level.

***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. 2018 was a similar year but no breach or shut downs were caused by heaving

debris flows because Town Staff and contractors had a better plan of staying on top this inconvenience for the months of March, April and May. Over 200+ dump truck loads were removed from Tinhorn and Hester Creeks areas to resolve any issues in 2018. The Town restored all areas affected in 2019.

***Water Capital Asset Management Plan***

- The Town had staff and Consultants come up with plans for future Capital projects while also updating our existing infrastructure inventory.

***Canal Rehabilitation Continued***

- Town staff worked with contractors to overlay 241m of existing canal floor and walls south of the canal flume 3 location. This project was completed in late March 2019.

***Earle Crescent Services Upgrades***

- This project was mainly a road upgrade project but also involved upgrading all necessary water services to property lines. Completed in fall of 2019.

***McGowan Mainline & Services Upgrades***

- This project upgraded some older valves, water mainline pipe and older water service pipe to properties located on McGowan Road. There was also an additional fire hydrant put in on Crest-a-way Road. Completed in fall of 2019.

***Black Sage Dom. VFD (100HP) & Elect. Upgrades***

- The Town started a project to install a variable frequency drive (VFD) for a 100hp pump motor and electrical upgrades in the pump house in late 2018 and completed in early 2019. The Town would see some power savings, operational flexibility and a reasonable payback over time.

***Old Town Reservoir***

- Town staff inspected this older 360,000-gallon reservoir in previous years. In 2019, the reservoir was drained, cleaned and small broken concrete areas parged within the structure.

***Kobau PH Irrigation Controls & Electrical Improvements***

- The Town started this project after the shutdown of the irrigation system in late 2019. There were some electrical concerns in the building, which required improvements

relating to safety and aging infrastructure. This pump station will be updated to a 600V station; will also receive new soft starts for pump startups, instrumentation for the 'Supervisory Control and Data Acquisition (SCADA) system at this site, and wiring & equipment upgrades in the pump house.

## 6.2 CONTINUING PROJECTS INTO 2020

***CRP - Risk Assessments & Potential Hazards***

- Allnorth's recent canal assessment recommended that the Town undertake a project to look at potential risks on the canal system where the public and properties could be affected in various areas including animal encroachment. We will also do a structural assessment of McIntyre Creek crossing; this will also include extra signage and fencing, with funding carried over to the 2020 budget for completion.

***CRP - Town Siphon Load & Stress Assessment***

- Allnorth recommended that the Town undertake an assessment of the Town Siphon because of the depth of pipe and lack of cover. (CRP – Canal Rehabilitation Project) This assessment would primarily be vehicle loads that could affect or compromise the pipe. This is a carryover project.

## 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 projects for 2020

- Outfall Culvert Repair (Road 11)
- Canal Rehabilitation (300m) by Vineyard Road
- Drain Pipe Replacement from Reservoir (small section)
- Flume 3 Structural Improvements
- Water Meter Replacements
- Booster Station (6A) Upgrades
- Miller Road PH Pump Replacement

2021

- Gallagher Siphon Repair & Re-route Continued
- Canal Lining Rehabilitation Continued

- Water Meter Replacements Continued
- Station Street Water Mainline Upgrade
- Booster Station (6A) Upgrades Continued
- Kootenay Street Water Upgrades
- New control panel and improvements for Fairview Irrigation PH
- Sawmill Road Rehabilitation Water Upgrades

2022

- Gallagher Siphon Repair & Re-route Continued
- Water Meter Replacements Continued
- NW Sector Water Installation
- CRP: Upgrade Check Gates on canal
- Canal Rehabilitation Continued
- CRP: Upgrade Check Gates
- Okanagan Street Rehabilitation – Water Upgrades
- School Avenue Rehabilitation – Water Upgrades
- W1: Okanagan River Xing at Sawmill Road

2023

- Water Meter Replacements Continued
- Modify Turnouts on Canal System
- Okanagan Street & School Avenue Water Upgrades
- Canal Rehabilitation Continued
- CRP: Spillway Structure Upgrade on Canal
- Sawmill Road Extension Water Upgrades
- W2: Park Drive Looping

2024

- Water Meter Replacements Continued
- Canal Rehabilitation Continued
- CRP: Modify Turnouts on Canal
- W3: Main Street North Looping
- W4: Tuc-el-nuit PH Back-up Power

## 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 respond to the emergency.

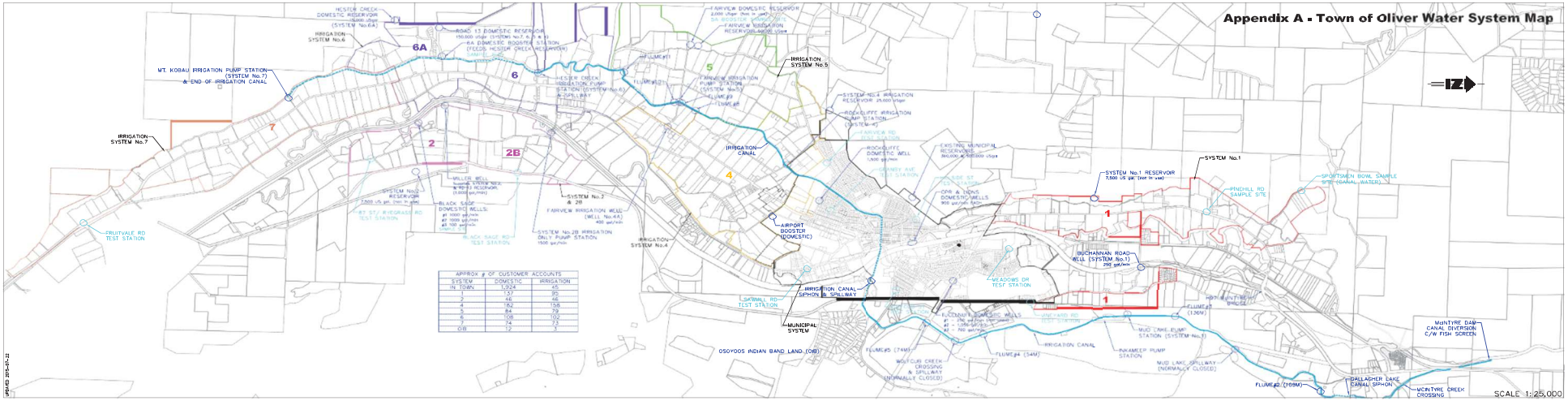
## 8.0 CROSS CONNECTION CONTROL PROGAM

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, which is monitored through Backflow Solutions Inc. (BSI Online) and Town staff, focuses on premise isolation for commercial and industrial customers. In 2019, there were 286 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 the Regional District of Okanagan Similkameen Area 'C'. Efforts are made to ensure appropriate water usage and to 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: 2019 FULL SPECTRUM

# CERTIFICATE OF ANALYSIS

| | | | |
|---|---|---|---|
| **REPORTED TO** | Oliver, Town of<br>5971 Sawmill Road, PO Box 638<br>Oliver, BC V0H 1T0 | | |
| **ATTENTION** | Patti Hannas | **WORK ORDER** | 9081885 |
| **PO NUMBER** | 42981 | **RECEIVED / TEMP** | 2019-08-20 09:40 / 8°C |
| **PROJECT** | Full Spectrum Analysis | **REPORTED** | 2019-08-27 16:15 |
| **PROJECT INFO** | A.1. | **COC NUMBER** | B78588 |

**Introduction:**

CARO Analytical Services is a testing laboratory full of smart, engaged scientists driven to make the world a safer and healthier place. Through our clients' projects we become an essential element for a better world. We employ methods conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts. CARO is accredited by the Canadian Association for Laboratories Accreditation (CALA) to ISO 17025:2005 for specific tests listed in the scope of accreditation approved by CALA.

*Big Picture Sidekicks*

You know that the sample you collected after snowshoeing to site, digging 5 meters, and racing to get it on a plane so you can submit it to the lab for time sensitive results needed to make important and expensive decisions (whew) is VERY important. We know that too.

*We've Got Chemistry*

It's simple. We figure the more you enjoy working with our fun and engaged team members; the more likely you are to give us continued opportunities to support you.

*Ahead of the Curve*

Through research, regulation knowledge, and instrumentation, we are your analytical centre for the technical knowledge you need, BEFORE you need it, so you can stay up to date and in the know.

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

**Authorized By:**

Alana Crump
Junior Account Manager

CARO ANALYTICAL SERVICES

# TEST RESULTS

| | | | |
|---|---|---|---|
| **REPORTED TO** | Oliver, Town of | **WORK ORDER** | 9081885 |
| **PROJECT** | Full Spectrum Analysis | **REPORTED** | 2019-08-27 16:15 |

| Analyte | Result | Guideline | RL | Units | Analyzed | Qualifier |
|---|---|---|---|---|---|---|
| **Miller Rd (9081885-01) \| Matrix: Water \| Sampled: 2019-08-19 11:40** | | | | | | |
| ***Anions*** | | | | | | |
| Chloride | **11.9** | AO ≤ 250 | 0.10 | mg/L | 2019-08-22 | |
| Fluoride | **0.26** | MAC = 1.5 | 0.10 | mg/L | 2019-08-22 | |
| Nitrate (as N) | **3.00** | MAC = 10 | 0.010 | mg/L | 2019-08-22 | |
| Nitrite (as N) | < 0.010 | MAC = 1 | 0.010 | mg/L | 2019-08-22 | |
| Sulfate | **73.8** | AO ≤ 500 | 1.0 | mg/L | 2019-08-22 | |
| ***Calculated Parameters*** | | | | | | |
| Hardness, Total (as CaCO3) | **340** | None Required | 0.500 | mg/L | N/A | |
| Nitrate+Nitrite (as N) | **3.00** | N/A | 0.0200 | mg/L | N/A | |
| ***General Parameters*** | | | | | | |
| Alkalinity, Total (as CaCO3) | **294** | N/A | 1.0 | mg/L | 2019-08-22 | |
| Alkalinity, Phenolphthalein (as CaCO3) | < 1.0 | N/A | 1.0 | mg/L | 2019-08-22 | |
| Alkalinity, Bicarbonate (as CaCO3) | **294** | N/A | 1.0 | mg/L | 2019-08-22 | |
| Alkalinity, Carbonate (as CaCO3) | < 1.0 | N/A | 1.0 | mg/L | 2019-08-22 | |
| Alkalinity, Hydroxide (as CaCO3) | < 1.0 | N/A | 1.0 | mg/L | 2019-08-22 | |
| Colour, True | < 5.0 | AO ≤ 15 | 5.0 | CU | 2019-08-22 | |
| Conductivity (EC) | **699** | N/A | 2.0 | µS/cm | 2019-08-22 | |
| pH | **8.00** | 7.0-10.5 | 0.10 | pH units | 2019-08-22 | HT2 |
| Solids, Total Dissolved | **446** | AO ≤ 500 | 15 | mg/L | 2019-08-26 | |
| Turbidity | **0.12** | OG < 1 | 0.10 | NTU | 2019-08-21 | |
| ***Total Metals*** | | | | | | |
| Aluminum, total | < 0.0050 | OG < 0.1 | 0.0050 | mg/L | 2019-08-26 | |
| Antimony, total | **0.00022** | MAC = 0.006 | 0.00020 | mg/L | 2019-08-26 | |
| Arsenic, total | **0.00256** | MAC = 0.01 | 0.00050 | mg/L | 2019-08-26 | |
| Barium, total | **0.0961** | MAC = 1 | 0.0050 | mg/L | 2019-08-26 | |
| Beryllium, total | < 0.00010 | N/A | 0.00010 | mg/L | 2019-08-26 | |
| Bismuth, total | < 0.00010 | N/A | 0.00010 | mg/L | 2019-08-26 | |
| Boron, total | **0.0591** | MAC = 5 | 0.0050 | mg/L | 2019-08-26 | |
| Cadmium, total | **0.000021** | MAC = 0.005 | 0.000010 | mg/L | 2019-08-26 | |
| Calcium, total | **79.1** | None Required | 0.20 | mg/L | 2019-08-26 | |
| Chromium, total | < 0.00050 | MAC = 0.05 | 0.00050 | mg/L | 2019-08-26 | |
| Cobalt, total | < 0.00010 | N/A | 0.00010 | mg/L | 2019-08-26 | |
| Copper, total | **0.00837** | MAC = 2 | 0.00040 | mg/L | 2019-08-26 | |
| Iron, total | < 0.010 | AO ≤ 0.3 | 0.010 | mg/L | 2019-08-26 | |
| Lead, total | **0.00023** | MAC = 0.005 | 0.00020 | mg/L | 2019-08-26 | |
| Lithium, total | **0.00797** | N/A | 0.00010 | mg/L | 2019-08-26 | |
| Magnesium, total | **34.5** | None Required | 0.010 | mg/L | 2019-08-26 | |
| Manganese, total | **0.114** | MAC = 0.12 | 0.00020 | mg/L | 2019-08-26 | |
| Molybdenum, total | **0.00418** | N/A | 0.00010 | mg/L | 2019-08-26 | |
| Nickel, total | **0.00186** | N/A | 0.00040 | mg/L | 2019-08-26 | |
| Phosphorus, total | < 0.050 | N/A | 0.050 | mg/L | 2019-08-26 | |

CARO ANALYTICAL SERVICES

# TEST RESULTS

| | | | |
|---|---|---|---|
| **REPORTED TO** | Oliver, Town of | **WORK ORDER** | 9081885 |
| **PROJECT** | Full Spectrum Analysis | **REPORTED** | 2019-08-27 16:15 |

| Analyte | Result | Guideline | RL | Units | Analyzed | Qualifier |
|---|---|---|---|---|---|---|
| **Miller Rd (9081885-01) \| Matrix: Water \| Sampled: 2019-08-19 11:40, Continued** | | | | | | |
| ***Total Metals, Continued*** | | | | | | |
| Potassium, total | **5.80** | N/A | 0.10 | mg/L | 2019-08-26 | |
| Selenium, total | **0.00916** | MAC = 0.05 | 0.00050 | mg/L | 2019-08-26 | |
| Silicon, total | **10.8** | N/A | 1.0 | mg/L | 2019-08-26 | |
| Silver, total | < 0.000050 | None Required | 0.000050 | mg/L | 2019-08-26 | |
| Sodium, total | **17.9** | AO ≤ 200 | 0.10 | mg/L | 2019-08-26 | |
| Strontium, total | **1.03** | 7 | 0.0010 | mg/L | 2019-08-26 | |
| Sulfur, total | **27.2** | N/A | 3.0 | mg/L | 2019-08-26 | |
| Tellurium, total | < 0.00050 | N/A | 0.00050 | mg/L | 2019-08-26 | |
| Thallium, total | < 0.000020 | N/A | 0.000020 | mg/L | 2019-08-26 | |
| Thorium, total | < 0.00010 | N/A | 0.00010 | mg/L | 2019-08-26 | |
| Tin, total | **0.00064** | N/A | 0.00020 | mg/L | 2019-08-26 | |
| Titanium, total | < 0.0050 | N/A | 0.0050 | mg/L | 2019-08-26 | |
| Tungsten, total | < 0.0010 | N/A | 0.0010 | mg/L | 2019-08-26 | |
| Uranium, total | **0.00981** | MAC = 0.02 | 0.000020 | mg/L | 2019-08-26 | |
| Vanadium, total | **0.0018** | N/A | 0.0010 | mg/L | 2019-08-26 | |
| Zinc, total | **0.0090** | AO ≤ 5 | 0.0040 | mg/L | 2019-08-26 | |
| Zirconium, total | < 0.00010 | N/A | 0.00010 | mg/L | 2019-08-26 | |
| **Rockcliffe (9081885-02) \| Matrix: Water \| Sampled: 2019-08-19 11:35** | | | | | | |
| ***Anions*** | | | | | | |
| Chloride | **29.4** | AO ≤ 250 | 0.10 | mg/L | 2019-08-22 | |
| Fluoride | **0.33** | MAC = 1.5 | 0.10 | mg/L | 2019-08-22 | |
| Nitrate (as N) | **4.41** | MAC = 10 | 0.010 | mg/L | 2019-08-22 | |
| Nitrite (as N) | < 0.010 | MAC = 1 | 0.010 | mg/L | 2019-08-22 | |
| Sulfate | **61.8** | AO ≤ 500 | 1.0 | mg/L | 2019-08-22 | |
| ***Calculated Parameters*** | | | | | | |
| Hardness, Total (as CaCO3) | **330** | None Required | 0.500 | mg/L | N/A | |
| Nitrate+Nitrite (as N) | **4.41** | N/A | 0.0200 | mg/L | N/A | |
| ***General Parameters*** | | | | | | |
| Alkalinity, Total (as CaCO3) | **275** | N/A | 1.0 | mg/L | 2019-08-22 | |
| Alkalinity, Phenolphthalein (as CaCO3) | < 1.0 | N/A | 1.0 | mg/L | 2019-08-22 | |
| Alkalinity, Bicarbonate (as CaCO3) | **275** | N/A | 1.0 | mg/L | 2019-08-22 | |
| Alkalinity, Carbonate (as CaCO3) | < 1.0 | N/A | 1.0 | mg/L | 2019-08-22 | |
| Alkalinity, Hydroxide (as CaCO3) | < 1.0 | N/A | 1.0 | mg/L | 2019-08-22 | |
| Colour, True | < 5.0 | AO ≤ 15 | 5.0 | CU | 2019-08-22 | |
| Conductivity (EC) | **722** | N/A | 2.0 | µS/cm | 2019-08-22 | |
| pH | **8.05** | 7.0-10.5 | 0.10 | pH units | 2019-08-22 | HT2 |
| Solids, Total Dissolved | **449** | AO ≤ 500 | 15 | mg/L | 2019-08-26 | |
| Turbidity | < 0.10 | OG < 1 | 0.10 | NTU | 2019-08-21 | |

CARO ANALYTICAL SERVICES

# TEST RESULTS

| | | | |
|---|---|---|---|
| **REPORTED TO** | Oliver, Town of | **WORK ORDER** | 9081885 |
| **PROJECT** | Full Spectrum Analysis | **REPORTED** | 2019-08-27 16:15 |

| Analyte | Result | Guideline | RL | Units | Analyzed | Qualifier |
|---|---|---|---|---|---|---|
| **Rockcliffe (9081885-02) \| Matrix: Water \| Sampled: 2019-08-19 11:35, Continued** | | | | | | |
| ***Total Metals*** | | | | | | |
| Aluminum, total | < 0.0050 | OG < 0.1 | 0.0050 | mg/L | 2019-08-26 | |
| Antimony, total | < 0.00020 | MAC = 0.006 | 0.00020 | mg/L | 2019-08-26 | |
| Arsenic, total | **0.00136** | MAC = 0.01 | 0.00050 | mg/L | 2019-08-26 | |
| Barium, total | **0.0671** | MAC = 1 | 0.0050 | mg/L | 2019-08-26 | |
| Beryllium, total | < 0.00010 | N/A | 0.00010 | mg/L | 2019-08-26 | |
| Bismuth, total | < 0.00010 | N/A | 0.00010 | mg/L | 2019-08-26 | |
| Boron, total | **0.0625** | MAC = 5 | 0.0050 | mg/L | 2019-08-26 | |
| Cadmium, total | < 0.000010 | MAC = 0.005 | 0.000010 | mg/L | 2019-08-26 | |
| Calcium, total | **88.9** | None Required | 0.20 | mg/L | 2019-08-26 | |
| Chromium, total | **0.00081** | MAC = 0.05 | 0.00050 | mg/L | 2019-08-26 | |
| Cobalt, total | < 0.00010 | N/A | 0.00010 | mg/L | 2019-08-26 | |
| Copper, total | **0.00182** | MAC = 2 | 0.00040 | mg/L | 2019-08-26 | |
| Iron, total | < 0.010 | AO ≤ 0.3 | 0.010 | mg/L | 2019-08-26 | |
| Lead, total | < 0.00020 | MAC = 0.005 | 0.00020 | mg/L | 2019-08-26 | |
| Lithium, total | **0.00992** | N/A | 0.00010 | mg/L | 2019-08-26 | |
| Magnesium, total | **26.1** | None Required | 0.010 | mg/L | 2019-08-26 | |
| Manganese, total | < 0.00020 | MAC = 0.12 | 0.00020 | mg/L | 2019-08-26 | |
| Molybdenum, total | **0.00479** | N/A | 0.00010 | mg/L | 2019-08-26 | |
| Nickel, total | **0.00091** | N/A | 0.00040 | mg/L | 2019-08-26 | |
| Phosphorus, total | < 0.050 | N/A | 0.050 | mg/L | 2019-08-26 | |
| Potassium, total | **5.61** | N/A | 0.10 | mg/L | 2019-08-26 | |
| Selenium, total | **0.00204** | MAC = 0.05 | 0.00050 | mg/L | 2019-08-26 | |
| Silicon, total | **10.0** | N/A | 1.0 | mg/L | 2019-08-26 | |
| Silver, total | < 0.000050 | None Required | 0.000050 | mg/L | 2019-08-26 | |
| Sodium, total | **21.2** | AO ≤ 200 | 0.10 | mg/L | 2019-08-26 | |
| Strontium, total | **0.992** | 7 | 0.0010 | mg/L | 2019-08-26 | |
| Sulfur, total | **21.7** | N/A | 3.0 | mg/L | 2019-08-26 | |
| Tellurium, total | < 0.00050 | N/A | 0.00050 | mg/L | 2019-08-26 | |
| Thallium, total | < 0.000020 | N/A | 0.000020 | mg/L | 2019-08-26 | |
| Thorium, total | < 0.00010 | N/A | 0.00010 | mg/L | 2019-08-26 | |
| Tin, total | < 0.00020 | N/A | 0.00020 | mg/L | 2019-08-26 | |
| Titanium, total | < 0.0050 | N/A | 0.0050 | mg/L | 2019-08-26 | |
| Tungsten, total | < 0.0010 | N/A | 0.0010 | mg/L | 2019-08-26 | |
| Uranium, total | **0.0119** | MAC = 0.02 | 0.000020 | mg/L | 2019-08-26 | |
| Vanadium, total | **0.0016** | N/A | 0.0010 | mg/L | 2019-08-26 | |
| Zinc, total | < 0.0040 | AO ≤ 5 | 0.0040 | mg/L | 2019-08-26 | |
| Zirconium, total | < 0.00010 | N/A | 0.00010 | mg/L | 2019-08-26 | |

**Sample Qualifiers:**

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

# APPENDIX 1: SUPPORTING INFORMATION

| | | | |
|---|---|---|---|
| **REPORTED TO** | Oliver, Town of | **WORK ORDER** | 9081885 |
| **PROJECT** | Full Spectrum Analysis | **REPORTED** | 2019-08-27 16:15 |

| Analysis Description | Method Ref. | Technique | Location |
|---|---|---|---|
| Alkalinity in Water | SM 2320 B* (2017) | Titration with H2SO4 | Kelowna |
| Anions in Water | SM 4110 B (2017) | Ion Chromatography | Kelowna |
| Colour, True in Water | SM 2120 C (2017) | Spectrophotometry (456 nm) | Kelowna |
| Conductivity in Water | SM 2510 B (2017) | Conductivity Meter | Kelowna |
| Hardness in Water | SM 2340 B* (2017) | Calculation: 2.497 [total Ca] + 4.118 [total Mg] (Est) | N/A |
| pH in Water | SM 4500-H+ B (2017) | Electrometry | Kelowna |
| Solids, Total Dissolved in Water | SM 2540 C* (2017) | Gravimetry (Dried at 103-105C) | Kelowna |
| Total Metals in Water | EPA 200.2* / EPA 6020B | HNO3+HCl Hot Block Digestion / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS) | Richmond |
| Turbidity in Water | SM 2130 B (2017) | Nephelometry | Kelowna |

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

**Glossary of Terms:**

| | |
|---|---|
| RL | Reporting Limit (default) |
| < | Less than the specified Reporting Limit (RL) - the actual RL may be higher than the default RL due to various factors |
| AO | Aesthetic Objective |
| CU | Colour Units (referenced against a platinum cobalt standard) |
| MAC | Maximum Acceptable Concentration (health based) |
| mg/L | Milligrams per litre |
| NTU | Nephelometric Turbidity Units |
| OG | Operational Guideline (treated water) |
| pH units | pH < 7 = acidic, ph > 7 = basic |
| µS/cm | Microsiemens per centimetre |
| EPA | United States Environmental Protection Agency Test Methods |
| SM | Standard Methods for the Examination of Water and Wastewater, American Public Health Association |

**Guidelines Referenced in this Report:**

Guidelines for Canadian Drinking Water Quality (Health Canada, Feb 2017)

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

**General Comments:**

The results in this report apply to the samples analyzed in accordance with the Chain of Custody 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. The quality control (QC) data is available upon request

Results in **Bold** indicate values that are above CARO's method reporting limits. Any results that are above regulatory limits are highlighted **red**. Please note that results will only be highlighted red if the regulatory limits are included on the CARO report. Any Bold and/or highlighted results do not take into account method uncertainty. If you would like method uncertainty or regulatory limits to be included on your report, please contact your Account Manager:acrump@caro.ca

# APPENDIX C: 2019 WEEKLY WATER SAMPLING

# 2019 WEEKLY CHLORINE RESIDUAL & COLIFORMS 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 2 | 0.17 | Mike's | <1 | <1 | | | | | 0.15 | Snowbrush | <1 | <1 | | | | | | | | | | | | | 0.54 | Tucelnuit | <1 | <1 |
| Jan 7 | 0.30 | McGowan | <1 | <1 | | | | | | | | | | | | | | | | | 0.12 | Fruitvale | <1 | <1 | 0.15 | Wolfcub | <1 | <1 |
| Jan 14 | 0.23 | Pinehill | <1 | <1 | | | | | | | | | 0.17 | 5A Booster | <1 | <1 | | | | | | | | | 0.37 | Sawmill | <1 | <1 |
| Jan 21 | 0.38 | Mike's | <1 | <1 | | | | | | | | | | | | | 0.18 | 6A Booster | <1 | <1 | | | | | 0.36 | Granby | <1 | <1 |
| Jan 28 | 0.18 | McGowan | <1 | <1 | | | | | 0.32 | Snowbrush | <1 | <1 | | | | | | | | | | | | | 0.38 | Fairview | <1 | <1 |
| Feb 4 | 0.24 | Pinehill | <1 | <1 | | | | | | | | | | | | | | | | | 0.24 | Fruitvale | <1 | <1 | 0.22 | Meadows | <1 | <1 |
| Feb 11 | 0.20 | Mike's | <1 | <1 | | | | | | | | | 0.20 | 5A Booster | <1 | <1 | | | | | | | | | 0.23 | Tucelnuit | <1 | <1 |
| Feb 19 | 0.13 | McGowan | <1 | <1 | | | | | | | | | | | | | 0.11 | 6A Booster | <1 | <1 | | | | | 0.36 | Vineyard | <1 | <1 |
| Feb 25 | 0.26 | Mike's | <1 | <1 | | | | | | | | | 0.11 | 5A Booster | <1 | <1 | | | | | | | | | 0.15 | Sawmill | <1 | <1 |
| Mar 4 | 0.16 | Pinehill | <1 | <1 | | | | | 0.13 | Snowbrush | <1 | <1 | | | | | | | | | | | | | 0.20 | Granby | <1 | <1 |
| Mar 11 | 0.11 | McGowans | <1 | <1 | | | | | | | | | | | | | 0.09 | 6A Booster | <1 | <1 | | | | | 0.29 | Fairview | <1 | <1 |
| Mar 18 | 0.16 | Mike's | <1 | <1 | | | | | | | | | 0.09 | 5A Booster | <1 | <1 | | | | | | | | | 0.17 | Hillside | 1 | <1 |
| Mar 25 | 0.28 | Mike's | <1 | <1 | | | | | 0.17 | Snowbrush | <1 | <1 | | | | | | | | | | | | | 0.17 | Hillside | <1 | <1 |
| | | | | | | | | | | | | | | | | | | | | | | | | | 0.27 | Meadows | <1 | <1 |
| April 1 | 0.13 | Pinehill | <1 | <1 | | | | | | | | | | | | | | | | | 0.11 | Fruitvale | <1 | <1 | 0.31 | Vineyard | <1 | <1 |
| April 1 | 0.13 | Pinehill | | | | | | | | | | | | | | | | | | | 0.11 | Fruitvale | | | 0.31 | Vineyard | | |
| April 8 | 0.26 | McGowans | <1 | <1 | | | | | | | | | | | | | 0.12 | 6A Booster | <1 | <1 | | | | | 0.28 | Wolfcub | <1 | <1 |
| April 15 | 0.33 | Mike's | <1 | <1 | | | | | | | | | 0.05 | 5A Booster | <1 | <1 | | | | | | | | | 0.26 | Sawmill | <1 | <1 |
| April 23 | 0.14 | Pinehill | <1 | <1 | | | | | 0.22 | Snowbrush | <1 | <1 | | | | | | | | | | | | | 0.36 | Skagit | <1 | <1 |
| April 29 | 0.16 | McGowans | <1 | <1 | 0.45 | Blacksage | <1 | <1 | | | | | | | | | | | | | 0.09 | Fruitvale | <1 | <1 | 0.27 | Fairview | <1 | <1 |
| May 6 | 0.22 | Mikes | <1 | <1 | 0.20 | Ryegrass | <1 | <1 | | | | | | | | | 0.10 | 6A Booster | <1 | <1 | | | | | 0.10 | Hillside | <1 | <1 |
| May 13 | 0.18 | Mikes | <1 | <1 | 0.21 | Blacksage | <1 | <1 | | | | | 0.12 | 5A Booster | <1 | <1 | | | | | | | | | 0.13 | Meadows | <1 | <1 |
| May 21 | 0.16 | Pinehill | <1 | <1 | 0.30 | Ryegrass | <1 | <1 | 0.18 | Snowbrush | <1 | <1 | | | | | | | | | | | | | 0.15 | Tucelnuit | <1 | <1 |
| May 27 | 0.24 | Mikes | <1 | <1 | 0.40 | Blacksage | <1 | <1 | | | | | | | | | | | | | 0.16 | Fruitvale | <1 | <1 | 0.17 | Wolfcub | <1 | <1 |
| June 3 | 0.11 | Pinehill | <1 | <1 | 0.24 | Ryegrass | <1 | <1 | | | | | | | | | 0.13 | 6A Booster | <1 | <1 | | | | | 0.20 | Sawmill | <1 | <1 |
| June 10 | 0.18 | McGowan | <1 | <1 | 0.21 | Blacksage | <1 | <1 | | | | | 0.22 | 5A Booster | <1 | <1 | | | | | | | | | 0.20 | Granby | <1 | <1 |
| June 17 | 0.19 | Mikes | <1 | <1 | 0.28 | Ryegrass | <1 | <1 | 0.16 | Snowbrush | <1 | <1 | | | | | | | | | | | | | 0.19 | Fairview | <1 | <1 |
| June 24 | 0.17 | Pinehill | <1 | <1 | 0.19 | Blacksage | <1 | <1 | | | | | | | | | | | | | 0.13 | Fruitvale | <1 | <1 | 0.19 | Hillside | <1 | <1 |
| July 2 | 0.17 | McGowan | <1 | <1 | 0.25 | Ryegrass | <1 | <1 | | | | | | | | | 0.14 | 6A Booster | <1 | <1 | | | | | 0.16 | Meadows | <1 | <1 |
| July 8 | 0.16 | Mikes | <1 | <1 | 0.21 | Blacksage | <1 | <1 | | | | | 0.17 | 5A Booster | <1 | <1 | | | | | | | | | 0.11 | Vineyard | <1 | <1 |
| July 15 | 0.11 | Pinehill | <1 | <1 | 0.19 | Ryegrass | <1 | <1 | 0.15 | Snowbrush | <1 | <1 | | | | | | | | | | | | | 0.21 | Wolfcub | <1 | <1 |
| July 22 | 0.19 | McGowan | <1 | <1 | 0.18 | Blacksage | <1 | <1 | | | | | | | | | | | | | 0.12 | Fruitvale | <1 | <1 | 0.16 | Sawmill | <1 | <1 |
| July 29 | 0.17 | Mikes | <1 | <1 | 0.22 | Ryegrass | <1 | <1 | | | | | | | | | 0.09 | 6A Booster | <1 | <1 | | | | | 0.25 | Granby | <1 | <1 |
| Aug 6 | 0.14 | Pinehill | <1 | <1 | 0.17 | Blacksage | <1 | <1 | 0.21 | Snowbrush | <1 | <1 | | | | | | | | | | | | | 0.17 | Fairview | <1 | <1 |
| Aug 12 | 0.25 | McGowan | <1 | <1 | 0.36 | Ryegrass | <1 | <1 | | | | | | | | | | | | | 0.14 | Fruitvale | <1 | <1 | 0.15 | Hillside | <1 | <1 |
| Aug 19 | 0.10 | Mikes | <1 | <1 | 0.17 | Blacksage | <1 | <1 | | | | | 0.08 | 5A Booster | <1 | <1 | | | | | | | | | 0.16 | Meadows | <1 | <1 |
| Aug 26 | 0.11 | Pinehill | <1 | <1 | 0.24 | Ryegrass | <1 | <1 | 0.20 | Snowbrush | <1 | <1 | | | | | | | | | | | | | 0.15 | Vineyard | <1 | <1 |
| Sept 3 | 0.14 | McGowan | <1 | <1 | 0.43 | Blacksage | <1 | <1 | | | | | | | | | | | | | 0.09 | Fruitvale | <1 | <1 | 0.38 | Wolfcub | <1 | <1 |
| Sept 9 | 0.11 | Mikes | <1 | <1 | 0.22 | Ryegrass | <1 | <1 | | | | | | | | | 0.10 | 6A Booster | <1 | <1 | | | | | 0.11 | Sawmill | <1 | <1 |
| Sept 16 | 0.08 | McGowan | <1 | <1 | 0.11 | Blacksage | <1 | <1 | 0.15 | Snowbrush | <1 | <1 | | | | | | | | | | | | | 0.29 | Granby | <1 | <1 |
| Sept 23 | 0.18 | Mikes | <1 | <1 | 0.23 | Ryegrass | <1 | <1 | | | | | | | | | | | | | 0.10 | Fruitvale | <1 | <1 | 0.31 | Fairview | <1 | <1 |
| Sept 30 | 0.13 | Pinehill | <1 | <1 | 0.16 | Blacksage | <1 | <1 | | | | | | | | | 0.09 | 6A Booster | <1 | <1 | | | | | 0.25 | Hillside | <1 | <1 |
| Oct 7 | 0.05 | McGowan | <1 | <1 | 0.19 | Ryegrass | <1 | <1 | | | | | 0.13 | 5A Booster | <1 | <1 | | | | | | | | | 0.31 | Meadows | <1 | <1 |
| Oct 15 | 0.18 | Mikes | <1 | <1 | 0.09 | Ryegrass | <1 | <1 | 0.22 | Snowbrush | <1 | <1 | | | | | | | | | | | | | 0.20 | Vineyard | <1 | <1 |
| Oct 21 | 0.03 | Pinehill | <1 | <1 | 0.09 | Ryegrass | <1 | <1 | | | | | | | | | | | | | 0.02 | Fruitvale | <1 | <1 | 0.06 | Wolfcub | <1 | <1 |
| Oct 28 | 0.12 | McGowan | <1 | <1 | | | | | | | | | | | | | 0.09 | 6A Booster | <1 | <1 | | | | | 0.13 | Sawmill | <1 | <1 |
| Nov 4 | 0.18 | Mikes | | | | | | | | | | | 0.08 | 5A Booster | | | | | | | | | | | 0.27 | Granby | | |
| Nov 4 | 0.18 | Mikes | <1 | <1 | | | | | | | | | 0.08 | 5A Booster | <1 | <1 | | | | | | | | | 0.27 | Granby | <1 | <1 |
| Nov 12 | 0.06 | Pinehill | <1 | <1 | | | | | 0.15 | Snowbrush | <1 | <1 | | | | | | | | | | | | | 0.52 | Fairview | <1 | <1 |
| Nov 18 | 0.11 | McGowan | <1 | <1 | | | | | | | | | | | | | | | | | 0.07 | Fruitvale | <1 | <1 | 0.26 | Hillside | <1 | <1 |
| Nov 25 | 0.09 | Mikes | <1 | <1 | | | | | | | | | | | | | 0.14 | 6A Booster | <1 | <1 | | | | | 0.21 | Meadows | <1 | <1 |
| Dec 2 | 0.05 | McGowan | <1 | <1 | | | | | 0.10 | Snowbrush | <1 | <1 | | | | | | | | | | | | | 0.24 | Vineyard | <1 | <1 |
| Dec 9 | 0.11 | Pinehill | <1 | <1 | | | | | | | | | 0.09 | 5A Booster | <1 | <1 | | | | | | | | | 0.10 | Wolfcub | <1 | <1 |
| Dec 16 | 0.14 | Mikes | <1 | <1 | | | | | | | | | | | | | | | | | 0.09 | Fruitvale | <1 | <1 | 0.06 | Sawmill | <1 | <1 |
| Dec 23* | 0.07 | Pinehill | negative | negative | | | | | | | | | | | | | 0.09 | 6A Booster | negative | negative | | | | | 0.19 | Granby | negative | negative |
| Dec 30* | 0.20 | McGowan | negative | negative | | | | | | | | | 0.11 | 5A Booster | negative | negative | | | | | | | | | 0.21 | Fairview | negative | negative |

*Presence / Absence tests done in-house

Samples around the Christmas Holiday, were missed because lab was closed

# APPENDIX D: 2019 PUMPING DATA

## 2019 MONTHLY TOTALS

**TOWN OF OLIVER - PUMPING STATIONS**
**WATER CONSUMPTION DATA**

*US GALLONS*

| DAY | GROUNDWATER SOURCES (US GALLONS) | | | | | | | | | | | | | SURFACE WATER SOURCE (US GALLONS) | | | | | | | TOTAL WATER USED |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 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 | Scada 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 | |
| January | 7,539,650 | 6,411,730 | 7,203,536 | 1,255,858 | 1,018,117 | 23,428,891 | 114,375 | 0 | 114,375 | 0 | 0 | 0 | 23,543,266 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 23,543,266 |
| Feburary | 7,987,414 | 5,348,444 | 6,850,369 | 1,070,478 | 1,134,941 | 22,391,646 | 70,150 | 6,099,447 | 6,169,597 | 0 | 0 | 0 | 28,561,243 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 28,561,243 |
| March | 6,972,478 | 9,261,784 | 7,006,418 | 9,566 | 2,581,750 | 25,831,996 | 314,563 | 2,434,608 | 2,749,171 | 0 | 0 | 0 | 28,581,167 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 28,581,167 |
| April | 16,521,843 | 5,004,990 | 6,686,710 | 4,719,191 | 7,059,928 | 39,992,663 | 902,474 | 6,933,624 | 7,836,098 | 0 | 3,091,806 | 3,091,806 | 50,920,567 | 8,086,597 | 26,235,134 | 11,139,000 | 15,306,591 | 9,461,872 | 194,850 | 70,424,043 | 121,344,610 |
| May | 22,735,181 | 14,640,775 | 12,309,410 | 10,740,378 | 7,700,523 | 68,126,268 | 913,600 | 31,938,115 | 32,851,716 | 0 | 9,001,309 | 9,001,309 | 109,979,293 | 44,416,202 | 147,288,175 | 103,573,000 | 77,549,712 | 70,298,526 | 16,527,072 | 459,652,686 | 569,631,979 |
| June | 37,347,940 | 16,983,825 | 7,656,192 | 11,149,206 | 8,739,533 | 81,876,698 | 593,182 | 43,056,045 | 43,649,227 | 0 | 6,906,877 | 6,906,877 | 132,432,802 | 72,114,607 | 216,390,600 | 91,088,000 | 110,039,631 | 102,172,632 | 39,607,318 | 631,412,787 | 763,845,589 |
| July | 20,013,785 | 24,210,977 | 3,681,926 | 14,784,738 | 8,430,200 | 71,121,626 | 1,064,618 | 36,309,446 | 37,374,064 | 0 | 10,634,229 | 10,634,229 | 119,129,918 | 63,026,670 | 185,342,484 | 85,949,000 | 104,985,300 | 82,261,251 | 36,162,012 | 557,726,718 | 676,856,636 |
| August | 25,123,301 | 17,354,960 | 4,450,461 | 19,016,024 | 6,411,900 | 72,356,647 | 663,810 | 36,687,146 | 37,350,955 | 0 | 10,152,783 | 10,152,783 | 119,860,386 | 84,485,849 | 249,187,992 | 90,919,000 | 102,479,173 | 120,702,507 | 35,876,012 | 683,650,533 | 803,510,918 |
| September | 22,176,081 | 6,430,788 | 9,099,845 | 5,342,972 | 7,056,000 | 50,105,686 | 1,386,408 | 13,242,457 | 14,628,865 | 0 | 4,634,185 | 4,634,185 | 69,368,736 | 13,729,481 | 53,200,948 | 28,911,000 | 21,636,809 | 15,776,415 | 9,985,918 | 143,240,571 | 212,609,307 |
| October | 8,710,887 | 9,095,666 | 3,195,571 | 7,731,753 | 6,663,500 | 35,397,377 | 1,946,585 | 6,599,705 | 8,546,290 | 1,147,000 | 1,639,915 | 2,786,915 | 46,730,582 | 3,046,883 | 23,896,079 | 6,698,000 | 2,714,352 | 557 | 0 | 36,355,871 | 83,086,454 |
| November | 10,775,366 | 2,909,196 | 5,344,220 | 2,962,694 | 5,040,930 | 27,032,406 | 3,287 | 0 | 3,287 | 0 | 0 | 0 | 27,035,693 | 3,947,129 | 13,592,172 | 0 | 0 | 5,596,075 | 0 | 23,135,376 | 50,171,068 |
| December | 9,146,565 | 0 | 6,301,521 | 6,950,413 | 2,176,791 | 24,575,289 | 0 | 0 | 0 | 0 | 0 | 0 | 24,575,289 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 24,575,289 |
| TOTALS | 195,050,491 | 117,653,137 | 79,786,180 | 85,733,272 | 64,014,113 | 542,237,193 | 7,973,052 | 183,300,593 | 191,273,646 | 1,147,000 | 46,061,104 | 47,208,104 | 780,718,943 | 292,853,417 | 915,133,584 | 418,277,000 | 434,711,568 | 406,269,833 | 138,353,182 | 2,605,598,584 | 3,386,317,527 |
| WHEN ACTIVE | | | | | double-check: | 542,237,193 | | | | | | double-check: | 47,208,104 | 780,718,943 | | | | | | double-check: | 2,605,598,584 | 3,386,317,527 |
| YTD Max Flow | 5,624,902 | 2,174,214 | 1,305,365 | 895,644 | 842,100 | 7,226,606 | 242,600 | 3,882,730 | 4,002,130 | 406,000 | 740,964 | 740,964 | 11,242,824 | 12,176,690 | 31,475,674 | 28,125,000 | 11,933,352 | 17,370,308 | 3,862,506 | 70,986,708 | 75,649,497 |
| YTD Min Flow | 0 | 0 | 0 | 0 | 0 | 579,053 | 0 | 0 | 0 | 0 | 0 | 0 | 586,495 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 586,495 |
| Avg Year Flow | 534,385 | 322,337 | 218,592 | 234,886 | 175,381 | 1,485,581 | 21,844 | 547,166 | 524,037 | 5,286 | 126,195 | 129,337 | 2,138,956 | 802,338 | 2,507,215 | 1,226,619 | 1,190,991 | 1,113,068 | 379,050 | 7,138,626 | 9,277,582 |

## 2019 MONTHLY TOTALS

**TOWN OF OLIVER - PUMPING STATIONS**
**WATER CONSUMPTION DATA**

*CUBIC METERS*

| DAY | GROUNDWATER SOURCES (CUBIC METERS) | | | | | | | | | | | | | SURFACE WATER SOURCE (CUBIC METERS) | | | | | | | TOTAL WATER USED |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 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 | Scada 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 | |
| January | 28,541 | 24,271 | 27,268 | 4,754 | 3,854 | 88,688 | 433 | 0 | 433 | 0 | 0 | 0 | 89,121 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 89,121 |
| February | 30,236 | 20,246 | 25,931 | 4,052 | 4,296 | 84,762 | 266 | 23,089 | 23,354 | 0 | 0 | 0 | 108,116 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 108,116 |
| March | 26,394 | 35,060 | 26,522 | 36 | 9,773 | 97,785 | 1,191 | 9,216 | 10,407 | 0 | 0 | 0 | 108,191 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 108,191 |
| April | 62,542 | 18,946 | 25,312 | 17,864 | 26,725 | 151,389 | 3,416 | 26,247 | 29,663 | 0 | 11,704 | 11,704 | 192,755 | 30,611 | 99,311 | 42,166 | 57,942 | 35,817 | 738 | 266,584 | 459,339 |
| May | 86,062 | 55,421 | 46,596 | 89 | 212 | 188,380 | 3,458 | 120,899 | 124,357 | 0 | 34,074 | 34,074 | 346,811 | 168,134 | 557,546 | 392,066 | 293,557 | 266,109 | 62,562 | 1,739,974 | 2,086,785 |
| June | 141,377 | 64,291 | 28,982 | 42,204 | 33,083 | 309,937 | 2,245 | 162,985 | 165,230 | 0 | 26,145 | 26,145 | 501,312 | 272,983 | 819,127 | 344,805 | 416,545 | 386,765 | 149,930 | 2,390,156 | 2,891,469 |
| July | 75,693 | 80,979 | 12,020 | 53,320 | 29,818 | 251,830 | 3,995 | 129,233 | 133,229 | 0 | 36,365 | 36,365 | 421,423 | 224,218 | 652,087 | 317,335 | 371,674 | 289,867 | 127,150 | 1,982,331 | 2,403,754 |
| August | 95,102 | 65,696 | 16,847 | 71,983 | 24,272 | 273,900 | 2,513 | 138,876 | 141,389 | 0 | 38,432 | 38,432 | 453,721 | 319,814 | 943,279 | 344,166 | 387,926 | 456,908 | 135,805 | 2,587,898 | 3,041,618 |
| September | 83,946 | 24,343 | 34,447 | 20,225 | 26,710 | 189,671 | 5,248 | 50,128 | 55,376 | 0 | 17,542 | 17,542 | 262,589 | 51,972 | 201,387 | 109,440 | 81,904 | 59,720 | 37,801 | 542,224 | 804,813 |
| October | 32,974 | 34,431 | 12,097 | 29,268 | 25,224 | 133,994 | 7,369 | 24,983 | 32,351 | 4,342 | 6,208 | 10,550 | 176,894 | 11,534 | 90,456 | 25,355 | 10,275 | 2 | 0 | 137,622 | 314,516 |
| November | 40,789 | 11,012 | 20,230 | 11,215 | 19,082 | 102,329 | 12 | 0 | 12 | 0 | 0 | 0 | 102,341 | 14,942 | 51,452 | 0 | 0 | 21,183 | 0 | 87,577 | 189,918 |
| December | 34,623 | 0 | 23,854 | 26,310 | 8,240 | 93,028 | 0 | 0 | 0 | 0 | 0 | 0 | 93,028 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 93,028 |
| TOTALS | 738,278 | 434,696 | 300,106 | 281,322 | 211,288 | 1,965,690 | 30,146 | 685,655 | 715,802 | 4,342 | 170,470 | 174,812 | 2,856,304 | 1,094,206 | 3,414,646 | 1,575,332 | 1,619,823 | 1,516,372 | 513,985 | 9,734,366 | 12,590,669 |
| WHEN ACTIVE | | | | | | | | | | | | | | | | | | | | | |
| YTD Max Flow | 21,293 | 8,230 | 4,941 | 3,390 | 3,188 | 27,356 | 918 | 14,698 | 15,150 | 1,537 | 2,805 | 2,805 | 42,559 | 46,094 | 119,148 | 106,465 | 45,173 | 65,754 | 14,621 | 268,714 | 286,364 |
| YTD Min Flow | 0 | 0 | 0 | 0 | 0 | 2,192 | 0 | 0 | 0 | 0 | 0 | 0 | 2,220 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2,220 |
| Avg Year Flow | 57,263 | 32,200 | 23,700 | 22,444 | 16,220 | 147,671 | 2,233 | 50,789 | 53,022 | 322 | 12,627 | 12,056 | 209,092 | 81,052 | 252,937 | 116,691 | 119,987 | 112,324 | 38,073 | 671,336 | 880,428 |

# APPENDIX E: 2019 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 | 10 YR Average | Average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2019 | 23,543,266 | 28,561,243 | 28,581,167 | 50,920,567 | 109,979,293 | 132,432,802 | 119,129,918 | 119,860,386 | 69,368,736 | 46,730,582 | 27,035,693 | 24,575,289 | 780,718,943 | 824,942,255 | 989,196,929 |
| 2018 | 25,695,138 | 23,685,611 | 30,700,077 | 48,096,882 | 102,453,177 | 117,372,052 | 157,067,454 | 138,706,689 | 81,652,713 | 55,774,737 | 27,718,659 | 23,604,690 | 832,527,876 | 824,942,255 | 989,196,929 |
| 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 | 824,942,255 | 989,196,929 |
| 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 | 824,942,255 | 989,196,929 |
| 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 | 824,942,255 | 989,196,929 |
| 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 | 824,942,255 | 989,196,929 |
| ***10 Yr Average*** | **27,104,742** | **25,643,983** | **31,255,721** | **51,401,145** | **92,757,574** | **110,294,348** | **143,145,061** | **139,636,460** | **88,608,229** | **62,314,723** | **27,284,359** | **25,495,910** | **824,942,255** | | |
| ***Average*** | ***30,925,990*** | ***29,325,783*** | ***34,773,659*** | ***64,897,381*** | ***111,509,211*** | ***131,839,495*** | ***176,434,520*** | ***167,120,429*** | ***109,138,044*** | ***72,164,549*** | ***31,959,643*** | ***29,108,227*** | ***989,196,929*** | | |

**CUBIC METERS**

| YEAR | January | February | March | April | May | June | July | August | September | October | November | December | YTD | 10 YR Average | Average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2019 | 89,121 | 108,116 | 108,191 | 192,755 | 416,317 | 501,312 | 450,956 | 453,721 | 262,589 | 176,894 | 102,341 | 93,028 | 2,955,341 | 3,122,745 | 3,744,516 |
| 2018 | 97,267 | 89,660 | 116,212 | 182,066 | 387,827 | 444,301 | 594,565 | 525,062 | 309,089 | 211,130 | 104,926 | 89,353 | 3,151,459 | 3,122,745 | 3,744,516 |
| 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 | 3,122,745 | 3,744,516 |
| 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 | 3,122,745 | 3,744,516 |
| 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 | 3,122,745 | 3,744,516 |
| ***10 Yr Average*** | **102,603** | **97,073** | **118,316** | **194,574** | **351,125** | **417,509** | **541,863** | **528,581** | **335,418** | **235,887** | **103,282** | **96,512** | **3,122,745** | | |
| ***Average*** | ***117,068*** | ***111,010*** | ***131,633*** | ***245,663*** | ***422,108*** | ***499,067*** | ***667,877*** | ***632,619*** | ***413,132*** | ***273,172*** | ***120,980*** | ***110,187*** | ***3,744,516*** | | |

## Town of Oliver

## Surface Water Consumption Data

### US GALLONS

| YEAR | January | February | March | April | May | June | July | August | September | October | November | December | YTD | 10 YR Average | Average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2019 | 0 | 0 | 0 | 70,424,043 | 459,652,686 | 631,412,787 | 557,726,718 | 683,650,533 | 143,240,571 | 36,355,871 | 23,135,376 | 0 | 2,605,598,584 | 2,892,303,244 | 0 |
| 2018 | 0 | 0 | 0 | 28,796,595 | 449,315,489 | 472,710,593 | 680,783,618 | 632,482,659 | 363,156,943 | 92,730,107 | 0 | 0 | 2,719,976,003 | 2,892,303,244 | 0 |
| 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 | 2,892,303,244 | 0 |
| 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 | 2,892,303,244 | 0 |
| 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 | 2,892,303,244 | 0 |
| 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 | 2,892,303,244 | 3,350,412,072 |
| ***10 Yr Average*** | **0** | **0** | **0** | **102,067,607** | **397,830,272** | **495,954,369** | **693,513,659** | **688,492,156** | **370,517,654** | **141,824,312** | **2,103,216** | **0** | **2,892,303,244** | | |
| ***Average*** | ***0*** | ***0*** | ***0*** | ***138,413,165*** | ***460,970,888*** | ***553,412,637*** | ***803,833,744*** | ***774,875,884*** | ***470,633,922*** | ***147,054,180*** | ***1,217,651*** | ***0*** | ***3,350,412,072*** | | |

### CUBIC METERS

| YEAR | January | February | March | April | May | June | July | August | September | October | November | December | YTD | 10 YR Average | Average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2019 | 0 | 0 | 0 | 266,584 | 1,739,974 | 2,390,156 | 2,111,224 | 2,587,898 | 542,224 | 137,622 | 87,577 | 0 | 9,863,259 | 10,659,789 | 12,682,683 |
| 2018 | 0 | 0 | 0 | 109,007 | 1,700,843 | 1,789,403 | 2,577,045 | 2,394,206 | 1,374,698 | 351,021 | 0 | 0 | 10,296,224 | 10,659,789 | 12,682,683 |
| 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 | 10,659,789 | 12,682,683 |
| 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 | 10,659,789 | 12,682,683 |
| 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 | 10,659,789 | 12,682,683 |
| 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 | 10,659,789 | 12,682,683 |
| ***10 Yr Average*** | **0** | **0** | **0** | **364,851** | **1,465,502** | **1,775,576** | **2,583,527** | **2,586,965** | **1,360,108** | **514,503** | **8,758** | **0** | **10,659,789** | | |
| ***Average*** | ***0*** | ***0*** | ***0*** | ***523,951*** | ***1,744,964*** | ***2,094,894*** | ***3,042,840*** | ***2,933,223*** | ***1,781,542*** | ***556,660*** | ***0*** | ***0*** | ***12,682,683*** | | |