



The Complete Circle

Presented by On behalf of The City of Merritt:

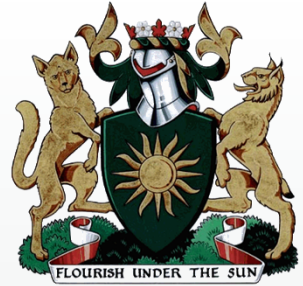
Shawn Boven, Manager of Public Works
Darrell Finnigan, Superintendent of Public Works
Kevin Vilac, Chief Operator





How water gets to your house, how much we use, how it leaves your house and where does it all end up?

- Why water conservation is important
 - Why what you flush is important
- Why how we handle the end products is important



A little about us...

Shawn Boven, AScT, Manager of Public Works

- **25** Years Local Government experience
 - City of Terrace – **3** years
 - City of Castlegar – **9** years
 - City of Penticton – **3** years
 - City of Merritt – **10** years
- **11** Years Engineering Consulting experience on private developments
- Council Appointed Approving Officer (for subdivisions) for the City of Merritt
- Community Representative for ASTTBC (Applied Science Technologists & Technicians of BC)
- Top in Technology Award - 2012
- Executive Board Member BC Public Works Association 2008-2012
- UBCM Green Communities Committee Member
- Presentations and Papers include:
 - BCWWA conference (2006) - STP Upgrade
 - UBCM conference (2008) - Merritt's Carbon Neutral Initiatives
 - GFOA conference (2010) – Communicating With Finance
 - PWABC conference (2010) – Communicating With Finance
 - BCWWA conference (2011) – Co-presented with Brian Bedford MCSCD – Successful Grant Applications
 - BCWWA conference (2013) - Financial Planning for a Sustainable Water Supply System
 - BCWWA Conference (2013) – Sanitary Sewer System Master Planning

A little about us...

Darrell Finnigan, Superintendent of Public Works

3 years in mechanical service, private sector

8 years in the private sector (building & construction)

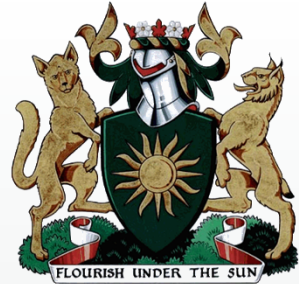
15 years City of Merritt Public Works

- 5 years Superintendent
- 4 years Chief Operator of the Water & Wastewater
- 3 years as operator
- 3 years in solid waste and all other Public Works operations

22 years with Merritt Fire/Rescue Department - Batt. Chief

Certifications

- Level 3 Wastewater Treatment Plant Operator
- Level 1 Water Distribution,
- Level 1 Wastewater collection
- Chlorine Handler



Kevin Vilac, Chief Water/Wastewater Operator

Coquitlam

- 10 years in the Solid Waste and Recycling Industry

9 years City of Merritt Public Works

- 2 seasons as Seasonal Labourer
- 2 years Equipment Operator for Utilities and Roads
- 3 years Acting Chief Operator
- 2 years Chief Operator

Certifications:

- Level 1 Multi Utility Wastewater Collection Operator
- Level 2 Multi Utility Water Distribution System Operator
- Level 2 Multi Utility Wastewater Treatment Plant Operator
- Chlorine Handling

Where do we get our water from?

*City of Merritt's potable water source is 100% groundwater.

*City of Merritt operates under a permit issued by Interior Health. Everything the City does in regards to our water system is regulated by Interior Health.

The City has 5 wells;

- Voght Park VFD – 1980 gal/min (125 l/sec)
- Voght Park GE – 1743 gal/min (110 l/sec)
- Fairley Park – 951 gal/min (60 l/sec)
- Collettville – 951 gal/min (60 l/sec)
- Kengard – 792 gal/min (50 l/sec)
- **Total = 6417 gal/min (405 l/sec)**

Water Storage (Reservoirs)

- Grimmett – 1,000,000 gallons (3,785,000 litres)
- Balancing – 500,000 gallons (1,892,700 litres)
- Grandview – 250,000 gallons (1,135,600 litres)
- Nicola – 128,000 gallons (529,900 litres)

Approx. 70 km in distribution piping accounting for another 1.5 million litres in storage.

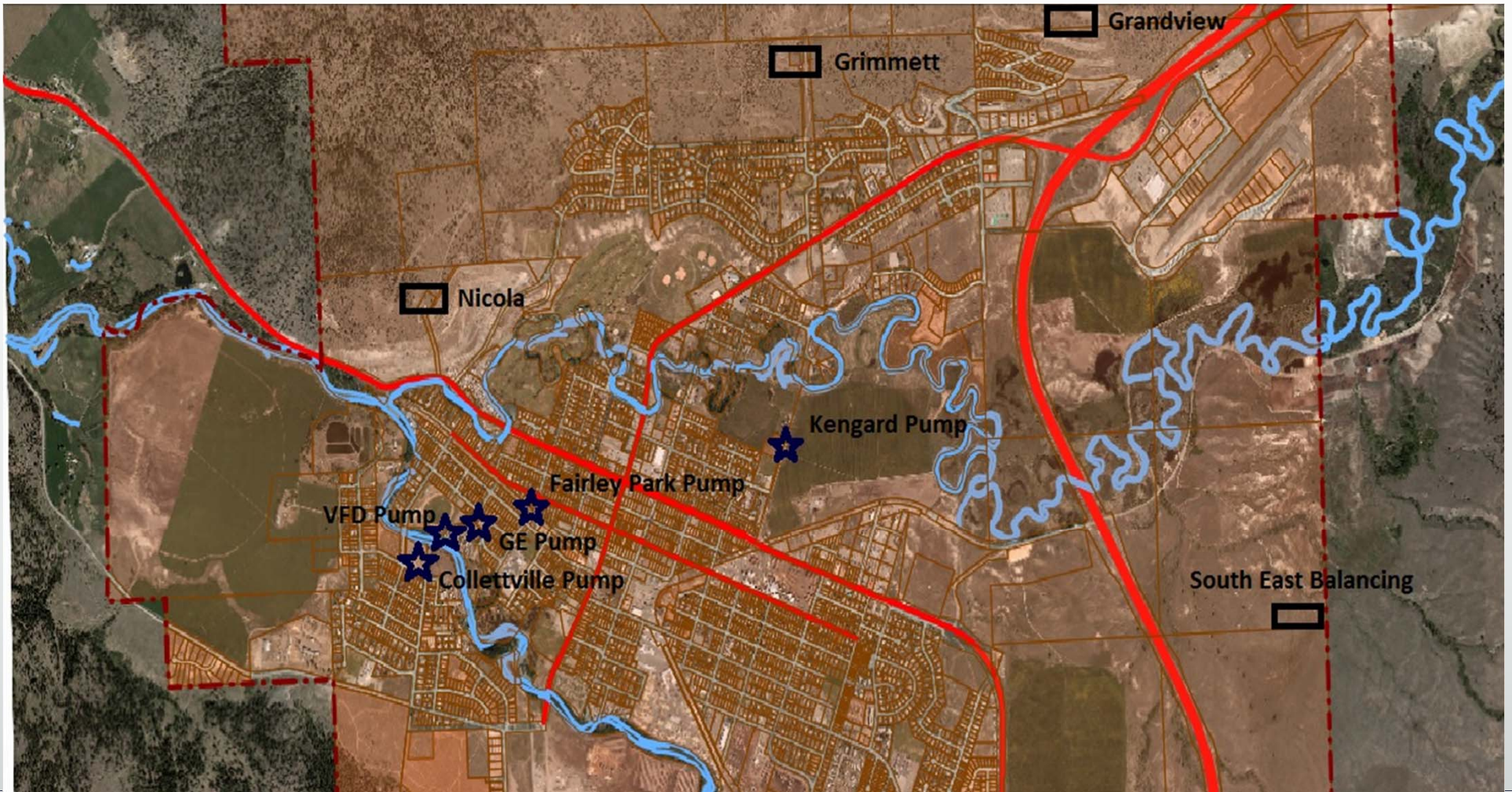


Map of city underground services

*The water pumps directly into the city distribution system. Once the systems demand is met the water is stored in the reservoirs.



Water Pump & Reservoir Locations



What is added to our water?

*As a condition of our permit issued by Interior Health Chlorine (CL₂) is the only substance added to our water system.

- Chlorine is a highly efficient disinfectant, and is added to public water supplies to kill disease-causing pathogens, such as bacteria, viruses, and protozoans, that commonly grow in water supply reservoirs, on the walls of water mains and in storage tanks.
- Chlorine residual is analyzed at 3 points on our system 24/7 and at the far ends of the distribution system each week.
- The minimum chlorine residual in our system is 0.2 mg/l with an average of 0.6 mg/l. Interior Health recommends .6mg/l on average. (Swimming pools average 1 mg/l to 3 mg/l)
- There is an operator working 7 days a week and on call 24/7 365.



South East Balancing Reservoir



Testing our water



ANALYSIS INFORMATION

REPORTED TO PROJECT Merritt, City of Comprehensive
WORK ORDER REPORTED 5011296 Feb-04-15

Analysis Description	Method Reference	Technique	Location
Alkalinity (Total)	APHA 2320 B	Titration with H2SO4 to pH 4.5	Kelowna
Anions in Water by IC	APHA 4110 B	Ion Chromatography with Chemical Suppression of Eluent Conductivity	Kelowna
Colour, True	APHA 2120 C	Spectrophotometry (456 nm)	Kelowna
Conductivity in Water	APHA 2510 B	Conductivity Meter	Kelowna
Cyanide, Total in Liquids	APHA 4500-CN- C / APHA 4500-CN- E	Distillation / Colorimetry	Kelowna
E. coli (CCA)	APHA 9222	Membrane Filtration / Chromocult Agar	Kelowna
Hardness (as CaCO3)	APHA 2340 B	Calculation	N/A
Mercury, total by CVAAS	EPA 245.7	BrCl2 Oxidation / Cold Vapor Atomic Fluorescence Spectrometry (CVAAS)	Richmond
pH in Water	APHA 4500-H+ B	Electrometry	Kelowna
Solids, Total Dissolved	APHA 1030 E	Calculation	N/A
Total Coliforms (CCA)	APHA 9222	Membrane Filtration / Chromocult Agar	Kelowna
Total Recoverable Metals	APHA 3030E / APHA 3125 B	HNO3+HCl Hot Block Digestion / Inductively Coupled Plasma Mass Spectrometry (ICP-MS)	Richmond
Transmissivity at 254 nm	APHA 5010 B	Ultraviolet Absorption	Kelowna
Trihalomethanes	EPA 803GB-021A / APHA 6200 B	Purge&Trap or Headspace / Purge and Trap Capillary Column GC-MSD	Richmond
Turbidity	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
EPA United States Environmental Protection Agency Test Methods

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)
% T	Percent Transmittance
CFU/100 mL	Colony Forming Units per 100 millilitres
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 (Oct 2014)

Website: http://www.ho-sc.gc.ca/ehw-sent/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

CARO Analytical Services
Rev 2015-01-02

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SAMPLE ANALYTICAL DATA

REPORTED TO PROJECT Merritt, City of Comprehensive
WORK ORDER REPORTED 5011296 Feb-04-15

Analyte	Result / Recovery	Standard / Guideline	MRL / Units	Prepared	Analyzed	Notes
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Sample ID: WT# 11D2A Fairley Pump (5011296-01) [Water] Sampled: Jan-27-15 09:57

Anions						
Chloride	61.3	AO ≤ 250	0.10 mg/L	N/A	Jan-28-15	
Fluoride	< 0.10	MAC = 1.5	0.10 mg/L	N/A	Jan-28-15	
Nitrate as N	1.32	N/A	0.010 mg/L	N/A	Jan-28-15	
Nitrite as N	< 0.010	N/A	0.010 mg/L	N/A	Jan-28-15	
Sulfate	37.4	AO ≤ 500	1.0 mg/L	N/A	Jan-28-15	

General Parameters						
Alkalinity, Total as CaCO3	155	N/A	1 mg/L	N/A	Jan-28-15	
Colour, True	< 5	AO ≤ 15	5 CU	N/A	Jan-28-15	
Conductivity (EC)	578	N/A	2 µS/cm	N/A	Jan-28-15	
Cyanide, Total	< 0.010	MAC = 0.2	0.010 mg/L	Jan-28-15	Jan-28-15	
pH	7.60	6.5-8.5	0.01 pH units	N/A	Jan-28-15	HT2
Turbidity	< 0.1	OG < 0.1	0.1 NTU	N/A	Jan-28-15	
UV Transmittance @ 254nm	97.4	N/A	0.1 % T	N/A	Jan-27-15	

Calculated Parameters						
Hardness, Total (Total as CaCO3)	243	N/A	5.0 mg/L	N/A	N/A	
Solids, Total Dissolved	307	AO ≤ 500	2.0 mg/L	N/A	N/A	

Total Recoverable Metals						
Aluminum, total	< 0.05	OG < 0.1	0.05 mg/L	Feb-02-15	Feb-02-15	
Antimony, total	< 0.001	MAC = 0.005	0.001 mg/L	Feb-02-15	Feb-02-15	
Arsenic, total	< 0.005	MAC = 0.01	0.005 mg/L	Feb-02-15	Feb-02-15	
Barium, total	9.12	MAC = 1	0.05 mg/L	Feb-02-15	Feb-02-15	
Beryllium, total	< 0.001	N/A	0.001 mg/L	Feb-02-15	Feb-02-15	
Boron, total	< 0.04	MAC = 5	0.04 mg/L	Feb-02-15	Feb-02-15	
Cadmium, total	< 0.0001	MAC = 0.005	0.0001 mg/L	Feb-02-15	Feb-02-15	
Calcium, total	67.1	N/A	2.0 mg/L	Feb-02-15	Feb-02-15	
Chromium, total	< 0.005	MAC = 0.05	0.005 mg/L	Feb-02-15	Feb-02-15	
Cobalt, total	< 0.0005	N/A	0.0005 mg/L	Feb-02-15	Feb-02-15	
Copper, total	< 0.002	AO ≤ 1	0.002 mg/L	Feb-02-15	Feb-02-15	
Iron, total	< 0.10	AO ≤ 0.3	0.10 mg/L	Feb-02-15	Feb-02-15	
Lead, total	< 0.001	MAC = 0.01	0.001 mg/L	Feb-02-15	Feb-02-15	
Magnesium, total	18.2	N/A	0.1 mg/L	Feb-02-15	Feb-02-15	
Manganese, total	< 0.002	AO ≤ 0.05	0.002 mg/L	Feb-02-15	Feb-02-15	
Mercury, total	< 0.00002	MAC = 0.001	0.00002 mg/L	Feb-02-15	Feb-03-15	
Molybdenum, total	< 0.001	N/A	0.001 mg/L	Feb-02-15	Feb-02-15	
Nickel, total	< 0.002	N/A	0.002 mg/L	Feb-02-15	Feb-02-15	
Phosphorus, total	< 0.2	N/A	0.2 mg/L	Feb-02-15	Feb-02-15	
Potassium, total	1.8	N/A	0.2 mg/L	Feb-02-15	Feb-02-15	
Selenium, total	< 0.005	MAC = 0.05	0.005 mg/L	Feb-02-15	Feb-02-15	
Silicon, total	6	N/A	5 mg/L	Feb-02-15	Feb-02-15	
Silver, total	< 0.0005	N/A	0.0005 mg/L	Feb-02-15	Feb-02-15	
Sodium, total	26.6	AO ≤ 200	0.2 mg/L	Feb-02-15	Feb-02-15	
Uranium, total	0.0008	MAC = 0.02	0.0002 mg/L	Feb-02-15	Feb-02-15	
Vanadium, total	< 0.01	N/A	0.01 mg/L	Feb-02-15	Feb-02-15	
Zinc, total	< 0.04	AO ≤ 5	0.04 mg/L	Feb-02-15	Feb-02-15	

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SAMPLE ANALYTICAL DATA

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Analyte	Result / Recovery	Standard / Guideline	MRL / Units	Prepared	Analyzed	Notes
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Sample ID: WT# 1E18B City Hall (5011296-05) [Water] Sampled: Jan-27-15 09:31, Continued

General Parameters, Continued						
pH	7.55	6.5-8.5	0.01 pH units	N/A	Jan-28-15	HT2
Turbidity	< 0.1	OG < 0.1	0.1 NTU	N/A	Jan-28-15	
UV Transmittance @ 254nm	97.4	N/A	0.1 % T	N/A	Jan-27-15	

Calculated Parameters						
Total Trihalomethanes	< 0.004	MAC = 0.1	0.004 mg/L	N/A	N/A	
Hardness, Total (Total as CaCO3)	239	N/A	5.0 mg/L	N/A	N/A	
Solids, Total Dissolved	300	AO ≤ 500	2.0 mg/L	N/A	N/A	

Total Recoverable Metals						
Aluminum, total	< 0.05	OG < 0.1	0.05 mg/L	Feb-02-15	Feb-02-15	
Antimony, total	< 0.001	MAC = 0.005	0.001 mg/L	Feb-02-15	Feb-02-15	
Arsenic, total	< 0.005	MAC = 0.01	0.005 mg/L	Feb-02-15	Feb-02-15	
Barium, total	0.12	MAC = 1	0.05 mg/L	Feb-02-15	Feb-02-15	
Beryllium, total	< 0.001	N/A	0.001 mg/L	Feb-02-15	Feb-02-15	
Boron, total	< 0.04	MAC = 5	0.04 mg/L	Feb-02-15	Feb-02-15	
Cadmium, total	< 0.0001	MAC = 0.005	0.0001 mg/L	Feb-02-15	Feb-02-15	
Calcium, total	66.5	N/A	2.0 mg/L	Feb-02-15	Feb-02-15	
Chromium, total	< 0.005	MAC = 0.05	0.005 mg/L	Feb-02-15	Feb-02-15	
Cobalt, total	< 0.0005	N/A	0.0005 mg/L	Feb-02-15	Feb-02-15	
Copper, total	0.006	AO ≤ 1	0.002 mg/L	Feb-02-15	Feb-02-15	
Iron, total	< 0.10	AO ≤ 0.3	0.10 mg/L	Feb-02-15	Feb-02-15	
Lead, total	< 0.001	MAC = 0.01	0.001 mg/L	Feb-02-15	Feb-02-15	
Magnesium, total	17.7	N/A	0.1 mg/L	Feb-02-15	Feb-02-15	
Manganese, total	< 0.002	AO ≤ 0.05	0.002 mg/L	Feb-02-15	Feb-02-15	
Mercury, total	< 0.00002	MAC = 0.001	0.00002 mg/L	Feb-02-15	Feb-03-15	
Molybdenum, total	< 0.001	N/A	0.001 mg/L	Feb-02-15	Feb-02-15	
Nickel, total	< 0.002	N/A	0.002 mg/L	Feb-02-15	Feb-02-15	
Phosphorus, total	< 0.2	N/A	0.2 mg/L	Feb-02-15	Feb-02-15	
Potassium, total	1.7	N/A	0.2 mg/L	Feb-02-15	Feb-02-15	
Selenium, total	< 0.005	MAC = 0.05	0.005 mg/L	Feb-02-15	Feb-02-15	
Silicon, total	6	N/A	5 mg/L	Feb-02-15	Feb-02-15	
Silver, total	< 0.0005	N/A	0.0005 mg/L	Feb-02-15	Feb-02-15	
Sodium, total	19.9	AO ≤ 200	0.2 mg/L	Feb-02-15	Feb-02-15	
Uranium, total	0.0008	MAC = 0.02	0.0002 mg/L	Feb-02-15	Feb-02-15	
Vanadium, total	< 0.01	N/A	0.01 mg/L	Feb-02-15	Feb-02-15	
Zinc, total	< 0.04	AO ≤ 5	0.04 mg/L	Feb-02-15	Feb-02-15	

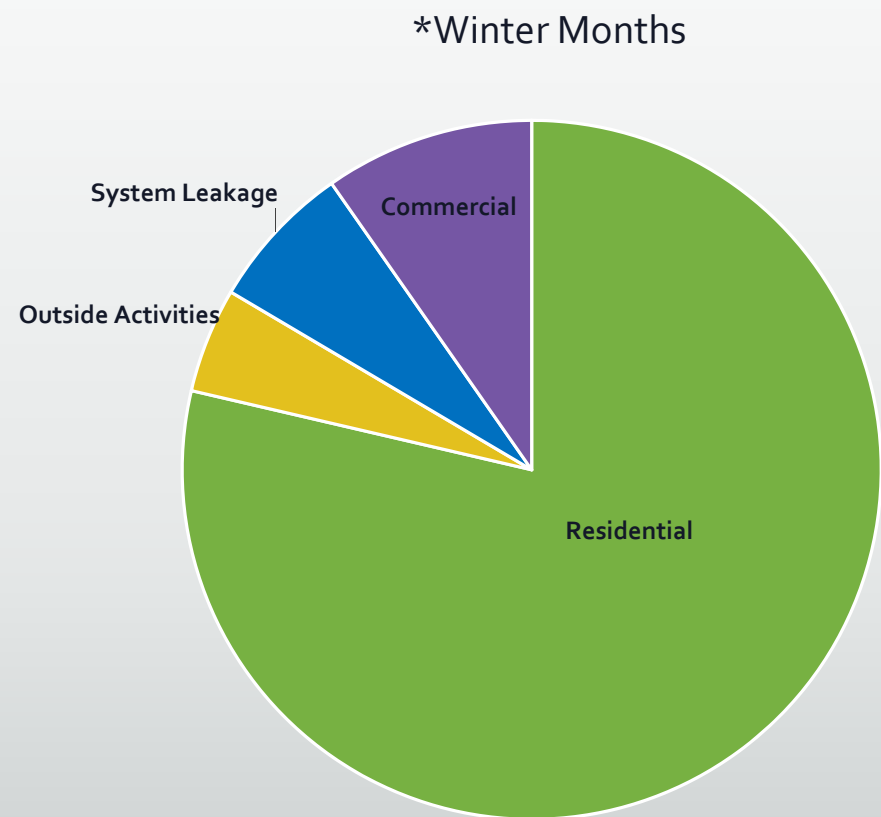
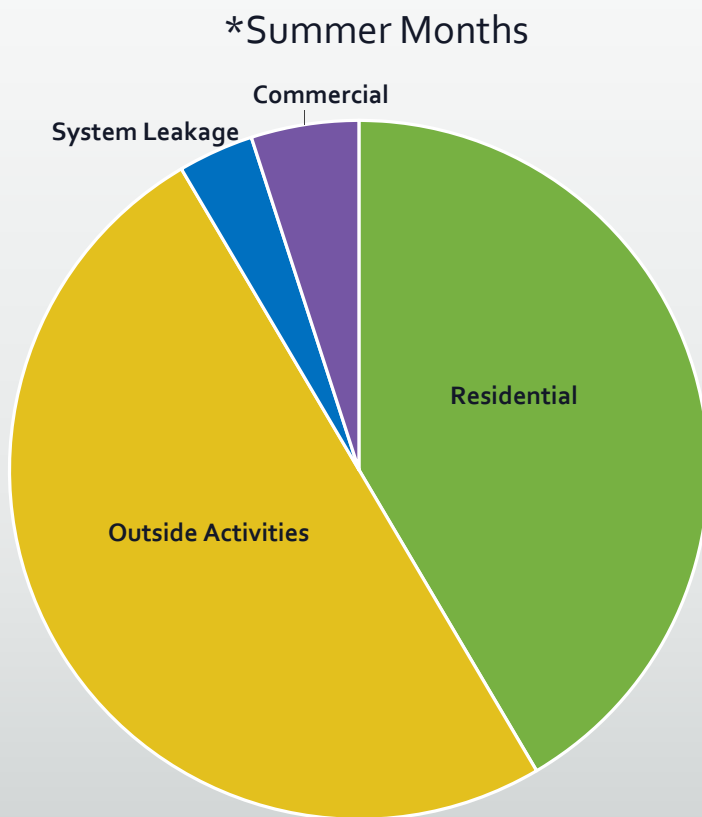
Microbiological Parameters						
Coliforms, Total	< 1	MAC = None Detected	1 CFU/100 mL	Jan-28-15	Jan-29-15	

E. coli	< 1	MAC = None Detected	1 CFU/100 mL	Jan-28-15	Jan-29-15	
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Volatile Organic Compounds (VOC)						
Bromodichloromethane	< 0.001	N/A	0.001 mg/L	N/A	Jan-31-15	
Bromofrom	0.001	N/A	0.001 mg/L	N/A	Jan-31-15	
Chlorofrom	< 0.001	N/A	0.001 mg/L	N/A	Jan-31-15	

Where does the water go?

- * Winter average water usage 1,500,000 gal/day (5,678,000 l/day)
- * Summer average water usage 2,767,000 gal/day (10,474,000 l/day)
- * 84% increase in water usage from winter to summer



Water usage stats

* Water statistics are very weather dependant and will vary with cool or wet weather.

City of Merritt Total Water Usage

	Gallons	Cubic Meters
2004	714,154,000	3,246,155
2005	707,307,000	3,215,032
2006	755,938,000	3,436,082
2007	782,482,000	3,556,736
2008	655,503,000	2,979,559
2009	676,659,000	3,075,723
2010	643,718,000	2,925,991
2011	647,147,000	2,941,577
2012	582,806,000	2,649,118
2013	594,852,000	2,703,873
2014	608,876,000	2,767,618



Surrounding Communities Potable Water

- *About 80% of BC communities use surface water as their primary source of potable water.
- *In comparison Kamloops uses about 1.2 mg/l of chlorine to have a residual of 0.2 mg/l at the far ends of their system.



**The South Thompson River directly supplies approximately 12 communities with potable drinking water that is treated with chlorine.*

**The South Thompson River is also the used by each of these communities for discharge of their wastewater effluent.*

** Okanagan Lake supplies Kelowna with their potable water source and also discharges their effluent into Okanagan lake.*



This is why Certified Operators are important!

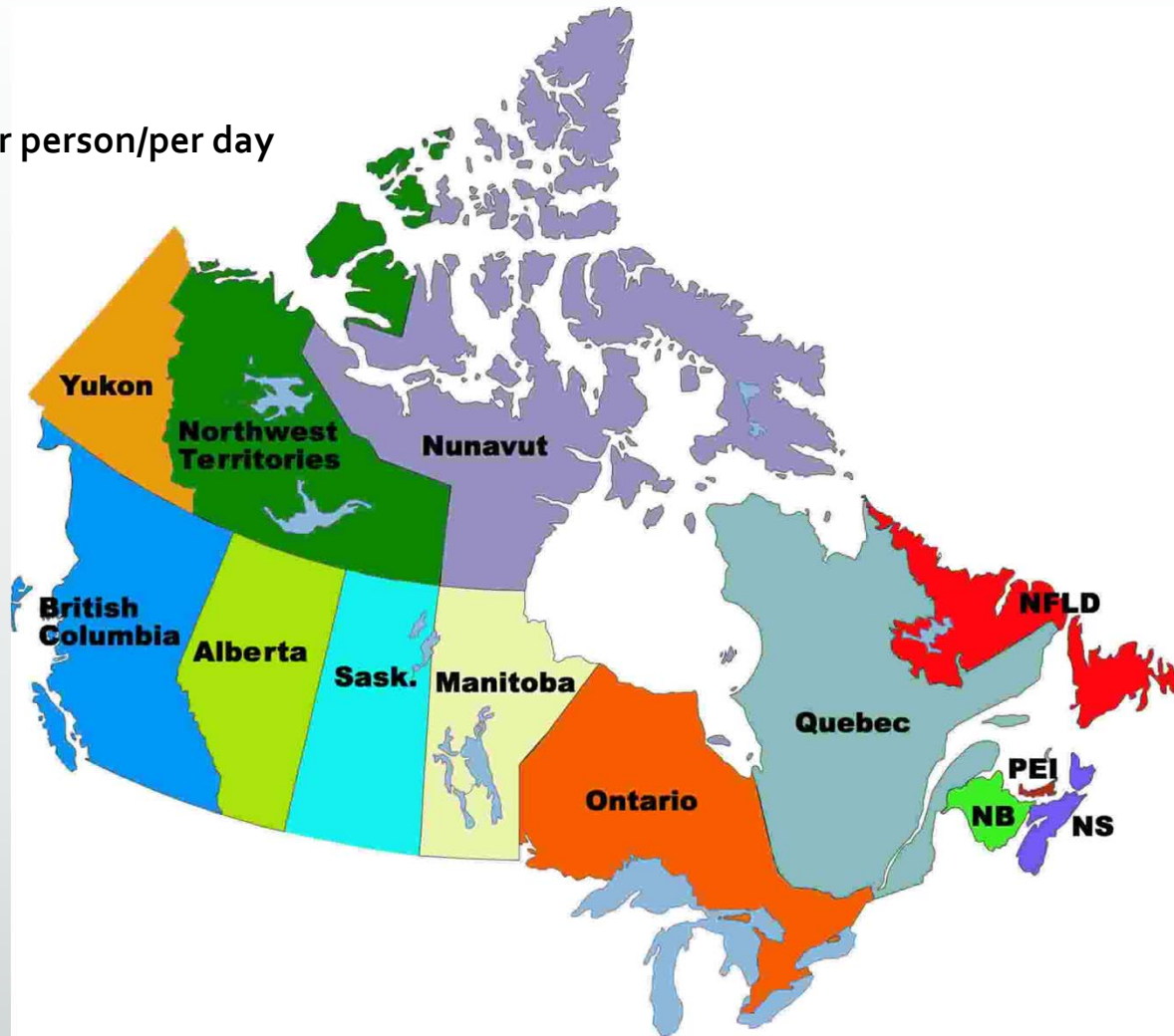
Water usage stats

2012 Canadian water usage statistics in gallons per person/per day

- Newfoundland & Labrador – **212 (802 liters)**
- P.E.I. - **133 (503)**
- Nova Scotia – **135 (511)**
- New Brunswick – **216 (817)**
- Quebec – **186 (704)**
- Ontario – **108 (408)**
- Manitoba – **93 (352)**
- Saskatchewan – **136 (514)**
- Alberta - **104 (393)**
- British Columbia – **160 (605)**
- Territories – **158 – (598)**

National Average – 149 (564)

Merritt – 238 – (900) (2014)



What is the City of Merritt doing about water conservation?



- Watering restrictions
- Fines for non compliant watering
- 98% of all commercial buildings have water meters and are read and invoiced for usage
- All new residential buildings have water meters (as of 2000, not read or invoiced for usage)
- Leak detection program
- Capital programs for old water & sewer main replacements
- Public Works is recycling and conserving water when possible
some examples are:
 - Sidewalk cleaning is done in conjunction with our bi-annual dead-end flushing program
 - Street sweeper uses hydrants to fill throughout the city to help flush the system
 - Parks has implemented a computer operated weather controlled sprinkler system



Wastewater

The City of Merritt maintains;

- Wastewater collection system (approx. 68km of collection piping)
- 2 - syphons
- 3 - lift stations (Nicola, Collettville, Treatment plant)
- 1 - Wastewater treatment plant
- 5 - Rapid infiltration basins and one main distribution pond.



Collettville Sewer Lift Station



Wastewater Treatment Plant

- * All wastewater flows to 1298 Coldwater Ave where it is treated in the City of Merritt's Wastewater Treatment Plant.
- * Wastewater the City's plant receives is normal for a typical municipality. There are no heavy metal or organic contributors.

The City of Merritt operates an Activated Sludge Plant;

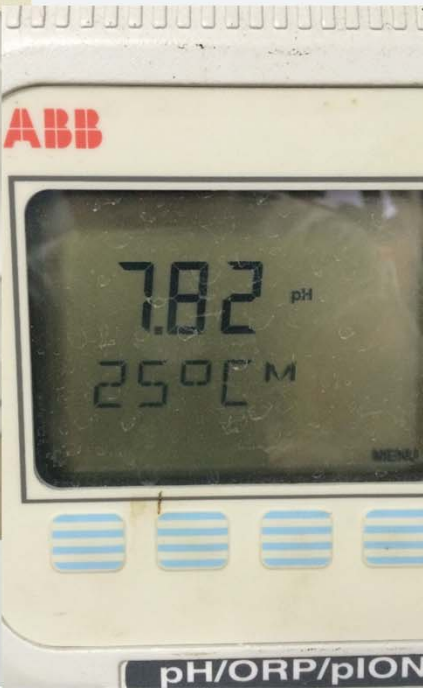
1. Removes inorganic contaminants
2. Removes sand and grit
3. Natural "bugs" are used to breakdown and clean wastewater
4. Organics are separated from the cleaned wastewater
5. Effluent (cleaned wastewater) is sent to Collettville to the City's rapid infiltration basins which is settled into the ground naturally
6. Organics are sent through a press that presses the remaining water out
7. The bio solids (pressed organics) are delivered to the Good Earth Company for compost



Wastewater

*Wastewater Treatment Plant Stats

- Treats 3146 m³/day (831,085 gals) of wastewater per day
- Treats 22,022 m³/week (5,817,596 gals) of wastewater per week
- Treats 1,148,290 m³/year (303,346,126 gals) of wastewater per year



What not to flush?

DO NOT FLUSH LIST:



Cigarettes

Condoms

Cotton Swabs



Diapers

Medication

Needles



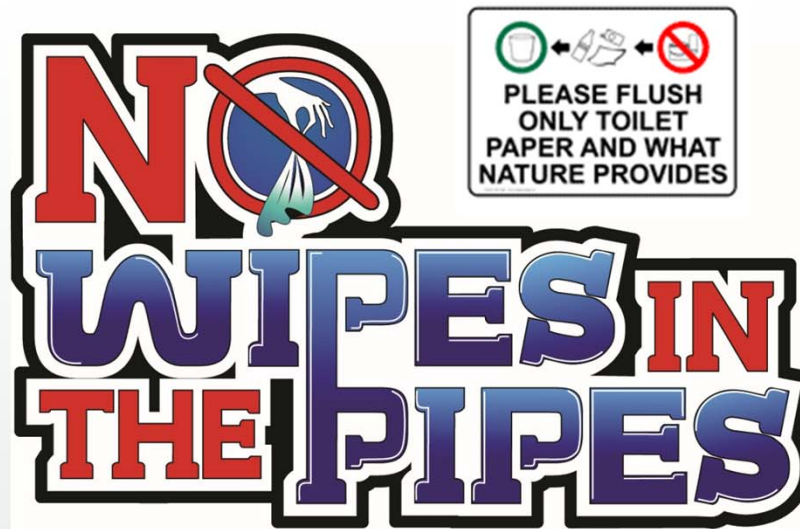
Paper Towels

Tampons

Wipes

Help us keep your drains and the environment clean

TheRentables.com



Only toilet paper down the toilet



GREASE IS YOUR DRAIN'S WORST ENEMY!



Do you know
what should go
down the drain?

Preliminary Treatment



Sand & Grit Removal

*Contaminate removal



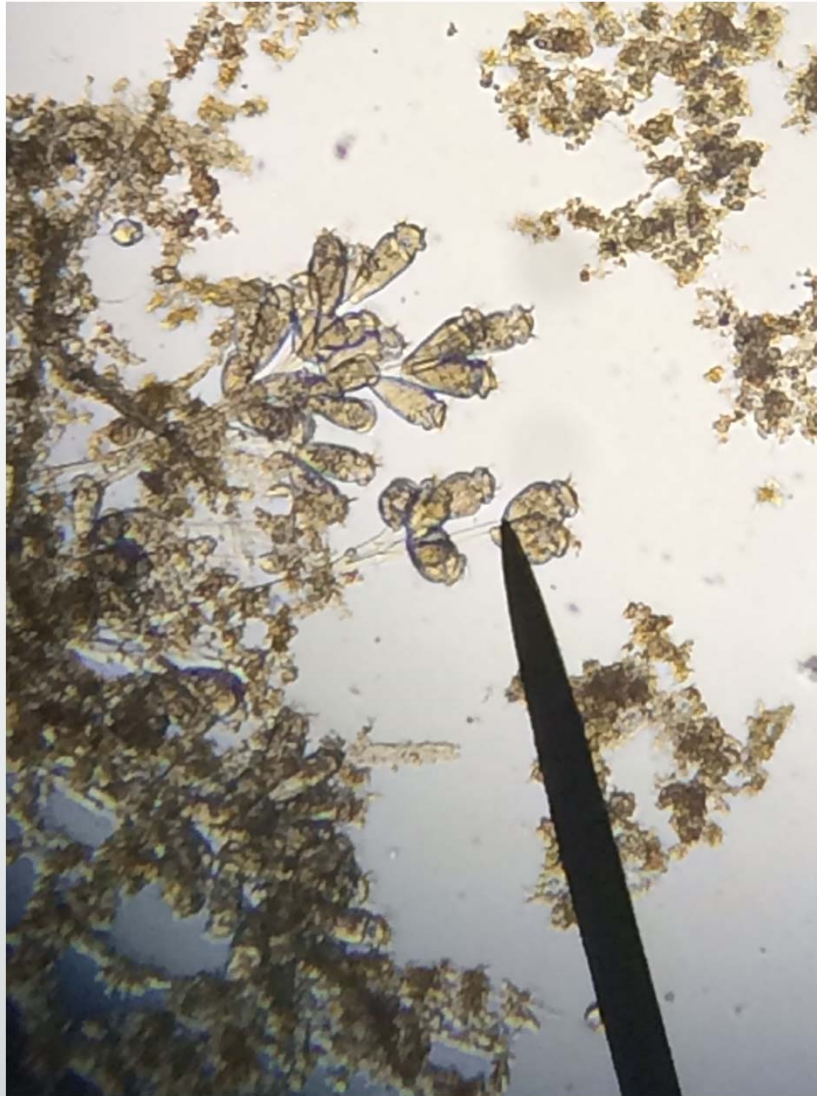
Wastewater

"Bugs"

"The **ciliates** are a group of **protozoans** characterized by the presence of hair-like organelles called **cilia**"

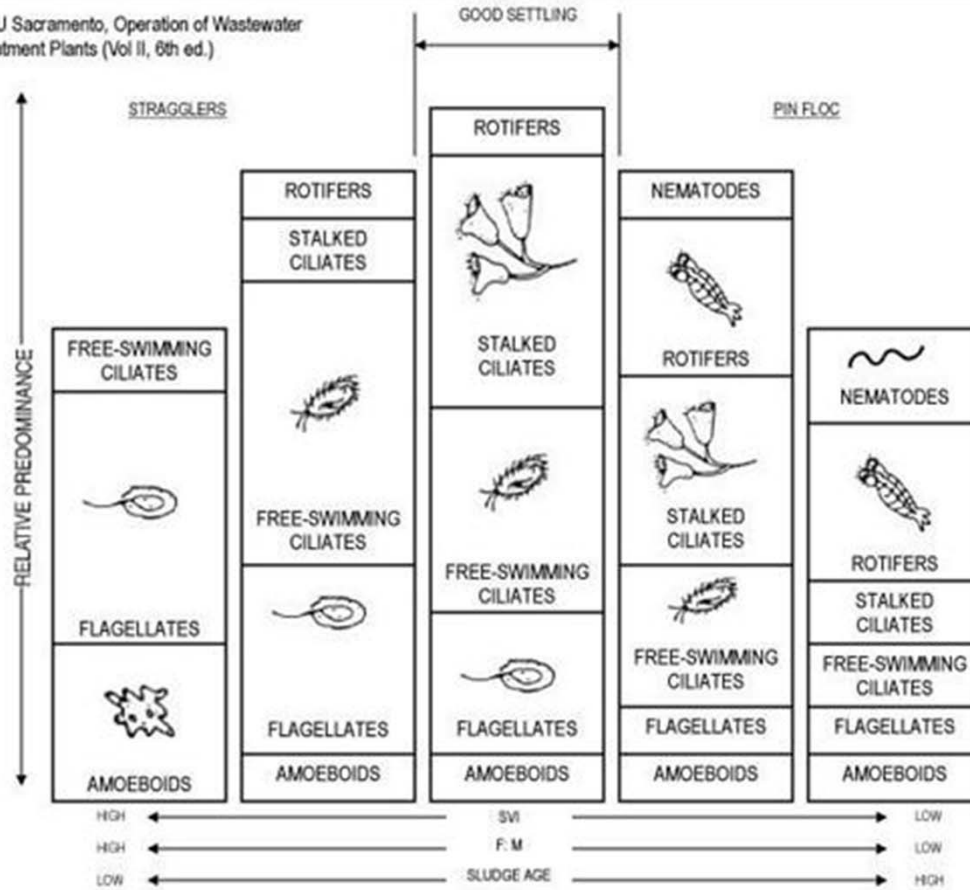
"**Protozoa** are a diverse group of mostly motile unicellular eukaryotic organisms"

"A **eukaryote** is any organism whose cells contain a nucleus and other organelles enclosed within membranes"



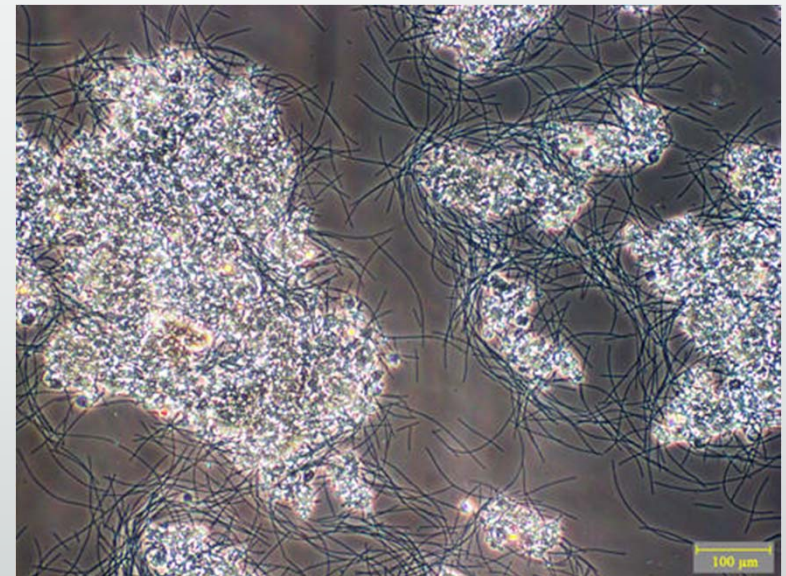
"Good Bugs"

Courtesy of CSU Sacramento, Operation of Wastewater Treatment Plants (Vol II, 6th ed.)



"Bad Bugs"

Filamentous





Wastewater

*Separating organics from effluent

The Wastewater Treatment Plant uses clarifiers that allow the solids to separate from the effluent.

99.4% of all solids are removed from the effluent before it is discharged into the Rapid infiltration basins.



Wastewater

Effluent and Rapid Infiltration Basins

The rapid infiltration basins receive approximately 1,148,290 m³ (303,346,126 gals) per year.

The City of Merritt is one of the only Municipalities that does not discharge effluent directly into receiving water.

The City does have a permit to discharge into receiving waters (Coldwater River) in an emergency event. The City has not discharged into the Coldwater River since 1993.

Quarterly groundwater samples are taken each year to ensure the surrounding ground is not being compromised.



Bio-Solids Press

*The solids are separated by a polymer, this natural substance helps separate solids from liquids so it can be pressed into a cake like material for composting.

*Wastewater treatment plant produces on average **1758** cubic meters of bio solids per year and **214.7** dry metric tonnes.



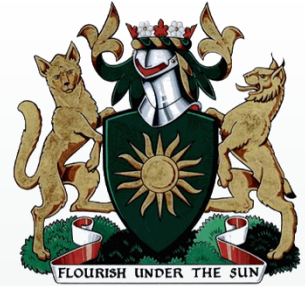
Composting

All of Merritt's bio-solids are delivered to the Good Earth Site.

Good Earth compost is a nutrient-rich, organic soil enhancement made from composting a mixture of wood chips, manures and bio-solids. It is safe, environmentally-friendly, and effective for lawns, flower beds and pots, vegetable gardens, shrubs and orchards. Our compost is tested by an independent lab and exceeds the standards set by the Organic Matter Recycling Regulations and The Ministry of Environment.

Good Earth web site
www.goodearthcompany.ca





Thank you!

Questions?