

# Public Water System Annual Report

**-2019-**

Name of the Public Water System: **G3 Regional Water Co-op**

Name of the Legal Owner: **G3 Regional Water Co-operative Inc.**

Contact Person: **Leanne McKay**

Phone: **(204) 548-2326**

Emergency number: **(204) 647-1148**

Name of Operators: **Mr. Ivan Yakimishen, Mr. Dallas Wilson**

Phone during business hours: **(204) 548-4561**



Date Prepared: March 2020

---

Leanne McKay  
*Secretary Treasurer*  
*G3 Regional Water Co-op Inc.*

# Table of Contents

<b>1. Introduction:</b> .....	<b>3</b>
<b>2. Description of the Water System</b> .....	<b>3</b>
<i>2.1. Water Supply Source</i> .....	<i>3</i>
<i>2.2 Water Treatment Process</i> .....	<i>3</i>
<i>2.3 Classification and Certification</i> .....	<i>4</i>
<b>3. List of Water Quality Standards</b> .....	<b>5</b>
<b>4. Water System Incidents and Corrective Actions</b> .....	<b>5</b>
<b>5. Drinking Water Safety Orders, Warnings, and Charges</b> .....	<b>5</b>
<b>6. Major Expenses Incurred</b> .....	<b>5</b>
<b>7. Future System Expansion</b> .....	<b>5</b>
<i>Appendix A</i> .....	<i>6</i>
<i>Appendix B</i> .....	<i>15</i>



## 1. Introduction:

The 2019 G3 Regional Water Co-op Annual Report summarizes the water utility's ability to provide safe potable water and comply with provincial regulations.

## 2. Description of the Water System

The G3 Water Co-op provides potable drinking water to a population of approximately 2500 residents within the Municipalities of Grandview and Gilbert Plains, as well as supplying water to approximately 485 residents in the RM of Dauphin. No corrective actions or emergency reporting was required. Full sampling results are attached in Appendix A.

The G3 Regional Co-op water system consists of two wells, raw water supply pipeline, water treatment plant (WTP), and a network of distribution pipelines.

### 2.1. *Water Supply Source*

The G3 Regional Water Co-op receives its raw water supply from two 300 mm groundwater wells. The wells are located approximately 1 km north of the WTP on municipal right-of-way west of the NW 26-26-23 W. One well can supply the system, however a fully equipped and redundant back-up well is provided to ensure supply can be maintained at all times.

### 2.2 *Water Treatment Process*

The treatment system is comprised of: two parallel RO membrane filtration skids; manganese greensand bypass filter; and forced air degasification for carbon dioxide (CO<sub>2</sub>) removal to provide pH adjustment. The treatment system ensures that the water meets the *Guidelines for Canadian Drinking Water Quality* and the provincial *Drinking Water Safety Act*.

The water treatment process is designed to reduce iron and manganese concentrations, ammonia reduction, and reduce hardness to an acceptable level. Iron and manganese are metals that cause laundry and plumbing fixture staining problems, and can build up in the distribution pipes and cause reduced flow. Calcium carbonate (CaCO<sub>3</sub>) causes hardness in water which diminishes the ability of the water to react with soap and form lather. Hardness also forms scale deposits in kettles and hot water tanks which can reduce the life expectancy of these appliances. Ammonia creates a high chlorine demand and complicates water disinfection where free chlorine residual must be maintained as the primary disinfectant.

Since membranes are capable of removing most of the hardness ions, a percentage of the raw water bypasses the membrane system and is filtered through a 2.1 m diameter manganese greensand pressure filter. Water passing through the pressure

filter is blended with membrane permeate to produce the desired finished water hardness of approximately 100 mg/L (as CaCO<sub>3</sub>).

The membranes reject approximately 25% concentrate water to Sulfur Spring Creek as permitted by Environment Act Licence No. 2853.

Potassium Permanganate is injected prior to the green sand filter to oxidize iron and manganese. Iron is precipitated and filtered out, while manganese is removed mostly by adsorption within the green sand layer of the pressure filter.

Antiscalent is injected in the membrane raw water supply to minimize RO membrane fouling by sequestering dissolved metals and minerals during the treatment and concentrate phases. Since membranes remove dissolved minerals, water stabilization through pH adjustment is required to produce a non-corrosive treated water supply. Forced air degasification is used to remove dissolved CO<sub>2</sub>, which provides an efficient and economical method to increase pH while minimizing sodium hydroxide chemical usage.

The raw water supply contains ammonia which, unless removed through the treatment system, interferes with chlorine disinfection capability. Ammonia is removed through membrane treatment but not typically through the greensand filter. Chlorine for disinfection is added to maintain an adequate free chlorine residual concentration in the reservoir. Plant operators are required to test the water several times throughout the day at various points within the WTP to ensure break-point chlorination, required for water safety, is being achieved.

Treated water is stored in a 1.2 ML, three-cell reinforced concrete reservoir. The reservoir is equipped with ultrasonic level control and monitored with a SCADA system. The SCADA system also has the capability of monitoring and controlling reservoir levels located in the Grandview and Gilbert Plains, and can monitor flow and pressures at booster stations in Mun. of Gilbert Plains and RM of Dauphin.

Corrosion inhibitor is added to the Municipality of Gilbert Plains line at their request to sequester any remaining metals in a dissolved state to minimize the probability of discoloured water in the distribution system.

A schematic of the water treatment process can be found in Appendix B.

### *2.3 Classification and Certification*

The G3 Water Treatment Plant is a Class 2 Facility and the G-3 Water Distribution System is a Class 1 System. The facility classifications are used to determine certification requirements for the water system operators.

### **3. List of Water Quality Standards**

The Province of Manitoba has adopted a number of water quality standards from the Health Canada *Guidelines for Canadian Drinking Water Quality*. The health-based parameters express the maximum acceptable concentrations for drinking water. Concentration values in excess of the guidelines constitute a health-related issue and require corrective actions.

Complete water chemistry analysis is only required every three years, however, testing was performed in 2018 and health based parameters were within the limits for the G3 Regional Water System (see Appendix A). Public water systems are required to monitor chlorine levels and undertake regular bacterial testing. The G3 system met all requirements for water quality standards and monitoring requirements in 2019, and is fulfilling the requirements of their Operating Licence.

### **4. Water System Incidents and Corrective Actions**

There were no major water system incidents in 2019. There were no corrective actions or emergency reporting required.

### **5. Drinking Water Safety Orders, Warnings, and Charges**

There were no Drinking Water Safety Orders or warnings issued in 2019, nor were any charges laid on the system.

### **6. Major Expenses Incurred**

There were no major expenses for the G3 Regional Water System in 2019.

### **7. Future System Expansion**

The water distribution system will continue expansion into the RM of Dauphin (at their cost for capital expenditures), and is a growing customer of the G-3 Co-op.

The G-3 member municipalities plan to continue expansion of their distribution networks as funding opportunities arise and finances are available.

# Appendix A

## Results of Water Chemistry, Bacterial and Chlorine Residual Analysis



## Chlorine Residual and TC/EC Analyses

Collection Date	Sample Identification	TC	EC	CL2 Free	CL2 Total
2019-01-07	G3 1 - RAW	0	0	na	na
2019-01-07	G3 2 - TREATED	0	0	0.91	1.07
2019-01-07	G3 3 - DISTRIBUTION GILBERT PLAINS	0	0	0.95	1.01
2019-01-21	G3 1 - RAW	0	0	na	na
2019-01-21	G3 2 - TREATED	0	0	0.87	0.96
2019-01-21	G3 3 - DISTRIBUTION GILBERT PLAINS	0	0	0.86	0.94
2019-02-05	G3 1 - RAW	0	0	na	na
2019-02-05	G3 2 - TREATED	0	0	0.85	0.94
2019-02-05	G3 3 - DISTRIBUTION GILBERT PLAINS	0	0	0.86	0.94
2019-02-19	G3 1 - RAW	0	0	na	na
2019-02-19	G3 2 - TREATED	0	0	0.91	1.11
2019-02-19	G3 3 - DISTRIBUTION GILBERT PLAINS	0	0	0.84	0.93
2019-03-04	G3 1 - RAW	0	0	na	na
2019-03-04	G3 2 - TREATED	0	0	0.96	1.10
2019-03-04	G3 3 - DISTRIBUTION GILBERT PLAINS	0	0	0.85	0.93
2019-03-18	G3 1 - RAW	0	0	na	na
2019-03-18	G3 2 - TREATED	0	0	0.95	1.11
2019-03-18	G3 3 - DISTRIBUTION GILBERT PLAINS	0	0	0.88	0.97
2019-04-01	G3 1 - RAW	0	0	na	Na
2019-04-01	G3 2 - TREATED	0	0	0.92	1.06
2019-04-01	G3 3 - DISTRIBUTION GILBERT PLAINS	0	0	0.91	1.04
2019-04-15	G3 1 - RAW	0	0	na	Na
2019-04-15	G3 2 - TREATED	0	0	0.91	1.13
2019-04-15	G3 3 - DISTRIBUTION GILBERT PLAINS	0	0	0.81	0.96
2019-04-19	G3 1 - RAW	0	0	na	Na
2019-04-29	G3 2 - TREATED	0	0	0.96	1.08
2019-04-29	G3 3 - DISTRIBUTION GILBERT PLAINS	0	0	0.83	0.95
2019-05-13	G3 1 - RAW	0	0	na	na
2019-05-13	G3 2 - TREATED	0	0	0.85	1.01
2019-05-13	G3 3 - DISTRIBUTION GILBERT PLAINS	0	0	0.84	0.92
2019-05-27	G3 1 - RAW	0	0	na	na
2019-05-27	G3 2 - TREATED	0	0	0.93	1.07
2019-05-27	G3 3 - DISTRIBUTION GILBERT PLAINS	0	0	0.88	0.97
2019-06-10	G3 1 - RAW	0	0	na	na

**Chlorine Residual and TC/EC Analyses (continued)**

Collection Date	Sample Identification	TC	EC	CL2 Free	CL2 Total
2019-06-10	G3 2 - TREATED	0	0	0.82	0.97
2019-06-10	G3 3 - DISTRIBUTION GILBERT PLAINS	0	0	0.78	0.97
2019-06-24	G3 1 - RAW	0	0	na	na
2019-06-24	G3 2 - TREATED	0	0	0.91	0.99
2019-06-24	G3 3 - DISTRIBUTION GILBERT PLAINS	0	0	0.78	0.84
2019-07-08	G3 1 - RAW	0	0	na	na
2019-07-08	G3 2 - TREATED	0	0	0.91	0.94
2019-07-08	G3 3 - DISTRIBUTION GILBERT PLAINS	0	0	0.83	0.93
2019-07-22	G3 1 - RAW	0	0	na	na
2019-07-22	G3 2 - TREATED	0	0	0.86	1.00
2019-07-22	G3 3 - DISTRIBUTION GILBERT PLAINS	0	0	0.84	0.91
2019-08-06	G3 1 - RAW	0	0	na	na
2019-08-06	G3 2 - TREATED	0	0	0.84	0.99
2019-08-06	G3 3 - DISTRIBUTION GILBERT PLAINS	0	0	0.86	0.94
2019-08-19	G3 1 - RAW	0	0	na	na
2019-08-19	G3 2 - TREATED	0	0	0.86	0.97
2019-08-19	G3 3 - DISTRIBUTION GILBERT PLAINS	0	0	0.78	0.86
2019-09-03	G3 1 - RAW	0	0	na	na
2019-09-03	G3 2 - TREATED	0	0	0.93	1.01
2019-09-03	G3 3 - DISTRIBUTION GILBERT PLAINS	0	0	0.89	0.91
2019-09-16	G3 1 - RAW	0	0	na	na
2019-09-16	G3 2 - TREATED	0	0	0.88	1.00
2019-09-16	G3 3 - DISTRIBUTION GILBERT PLAINS	0	0	0.81	0.88
2019-10-01	G3 1 - RAW	0	0	na	na
2019-10-01	G3 2 - TREATED	0	0	0.84	0.93
2019-10-01	G3 3 - DISTRIBUTION GILBERT PLAINS	0	0	0.86	0.91
2019-10-15	G3 1 - RAW	0	0	na	na
2019-10-15	G3 2 - TREATED	0	0	0.86	1.03
2019-10-15	G3 3 - DISTRIBUTION GILBERT PLAINS	0	0	0.87	0.93
2019-10-21	G3 1 - RAW	0	0	na	na
2019-10-21	G3 2 - TREATED	0	0	0.87	0.99
2019-10-21	G3 3 - DISTRIBUTION GILBERT PLAINS	0	0	0.85	0.90
2019-11-12	G3 1 - RAW	0	0	na	na
2019-11-12	G3 2 - TREATED	0	0	0.88	1.00
2019-11-12	G3 3 - DISTRIBUTION GILBERT PLAINS	0	0	0.78	0.89



### **Chlorine Residual and TC/EC Analyses (continued)**

Collection Date	Sample Identification	TC	EC	CL2 Free	CL2 Total
2019-11-25	G3 1 - RAW	0	0	na	na
2019-11-25	G3 2 - TREATED	0	0	0.89	0.95
2019-11-25	G3 3 - DISTRIBUTION GILBERT PLAINS	0	0	0.81	0.86
2019-12-09	G3 1 - RAW	0	0	na	na
2019-12-09	G3 2 - TREATED	0	0	0.94	1.05
2019-12-09	G3 3 - DISTRIBUTION GILBERT PLAINS	0	0	0.94	1.01
2019-12-23	G3 1 - RAW	0	0	na	na
2019-12-23	G3 2 - TREATED	0	0	0.88	0.97
2019-12-23	G3 3 - DISTRIBUTION GILBERT PLAINS	0	0	0.84	0.94

**Notes:**

CL2: Reported in units of mg/L

TC/EC: Reported in units of MPN/100 mL

## Water Chemistry



Manitoba Water Services Board  
ATTN: IVAN YAKIMISHEN  
BOX 642  
GILBERT PLAINS MB ROL OXO

Date Received: 12-JUN-18  
Report Date: 27-JUN-18 11:50 (MT)  
Version: FINAL

Client Phone: 204-647-1148

## Certificate of Analysis

Lab Work Order #: L2110101  
Project P.O. #: NOT SUBMITTED  
Job Reference: BR215505  
C of C Numbers:  
Legal Site Desc:

## ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2110101-1 G3 - 1 - RAW							
Sampled By: IVAN on 11-JUN-18 @ 11:25							
Matrix: GRAB							
<b>MB Chemistry for PWS</b>							
<b>Alkalinity, Bicarbonate</b>							
Bicarbonate (HCO3)	469		1.2	mg/L		15-JUN-18	
<b>Alkalinity, Carbonate</b>							
Carbonate (CO3)	<0.60		0.60	mg/L		15-JUN-18	
<b>Alkalinity, Hydroxide</b>							
Hydroxide (OH)	<0.34		0.34	mg/L		15-JUN-18	
<b>Alkalinity, Total (as CaCO3)</b>							
Alkalinity, Total (as CaCO3)	385		1.0	mg/L		14-JUN-18	R4083507
<b>Ammonia by colour</b>							
Ammonia, Total (as N)	1.21		0.10	mg/L		13-JUN-18	R4082646
<b>Bromide in Water by IC (Low Level)</b>							
Bromide (Br)	0.036		0.020	mg/L		12-JUN-18	R4082683
<b>Chloride in Water by IC (Low Level)</b>							
Chloride (Cl)	7.02		0.20	mg/L		12-JUN-18	R4082683
<b>Colour, True</b>							
Colour, True	5.8		5.0	CU		12-JUN-18	R4081386
<b>Conductivity</b>							
Conductivity	1030		1.0	umhos/cm		14-JUN-18	R4083507
<b>Dissolved Organic Carbon by Combustion</b>							
Dissolved Organic Carbon	2.49		0.50	mg/L		26-JUN-18	R4098053
<b>Fluoride in Water by IC</b>							
Fluoride (F)	0.221		0.040	mg/L		12-JUN-18	R4082683
<b>Hardness Calculated</b>							
Hardness (as CaCO3)	551	HTC	0.20	mg/L		14-JUN-18	
<b>Langelier Index 4C</b>							
Langelier Index (4 C)	0.78					15-JUN-18	
<b>Langelier Index 60C</b>							
Langelier Index (60 C)	1.5					15-JUN-18	
<b>Nitrate in Water by IC (Low Level)</b>							
Nitrate (as N)	<0.010	DLM	0.010	mg/L		12-JUN-18	R4082683
<b>Nitrite in Water by IC (Low Level)</b>							
Nitrite (as N)	<0.0020	DLM	0.0020	mg/L		12-JUN-18	R4082683
<b>Sulfate in Water by IC</b>							
Sulfate (SO4)	225		0.60	mg/L		14-JUN-18	R4084220
<b>Total Dissolved Solids (TDS)</b>							
Total Dissolved Solids	749		20	mg/L		13-JUN-18	R4083057
<b>Total Metals in Water by CRC ICPMS</b>							
Aluminum (Al)-Total	<0.0030		0.0030	mg/L	13-JUN-18	13-JUN-18	R4082538
Antimony (Sb)-Total	<0.00010		0.00010	mg/L	13-JUN-18	13-JUN-18	R4082538
Arsenic (As)-Total	0.00758		0.00010	mg/L	13-JUN-18	13-JUN-18	R4082538
Barium (Ba)-Total	0.0208		0.00010	mg/L	13-JUN-18	13-JUN-18	R4082538
Beryllium (Be)-Total	<0.00010		0.00010	mg/L	13-JUN-18	13-JUN-18	R4082538
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L	13-JUN-18	13-JUN-18	R4082538
Boron (B)-Total	0.208		0.010	mg/L	13-JUN-18	13-JUN-18	R4082538
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L	13-JUN-18	13-JUN-18	R4082538
Calcium (Ca)-Total	135		0.050	mg/L	13-JUN-18	13-JUN-18	R4082538
Cesium (Cs)-Total	<0.000010		0.000010	mg/L	13-JUN-18	13-JUN-18	R4082538
Chromium (Cr)-Total	<0.00010		0.00010	mg/L	13-JUN-18	13-JUN-18	R4082538
Cobalt (Co)-Total	0.00014		0.00010	mg/L	13-JUN-18	13-JUN-18	R4082538
Copper (Cu)-Total	<0.00050		0.00050	mg/L	13-JUN-18	13-JUN-18	R4082538
Iron (Fe)-Total	3.43		0.010	mg/L	13-JUN-18	13-JUN-18	R4082538
Lead (Pb)-Total	<0.000050		0.000050	mg/L	13-JUN-18	13-JUN-18	R4082538

## ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2110101-1 G3 - 1 - RAW Sampled By: IVAN on 11-JUN-18 @ 11:25 Matrix: GRAB							
<b>Total Metals in Water by CRC ICPMS</b>							
Lithium (Li)-Total	0.0619		0.0010	mg/L	13-JUN-18	13-JUN-18	R4082538
Magnesium (Mg)-Total	52.0		0.0050	mg/L	13-JUN-18	13-JUN-18	R4082538
Manganese (Mn)-Total	0.158		0.00010	mg/L	13-JUN-18	13-JUN-18	R4082538
Molybdenum (Mo)-Total	0.00386		0.000050	mg/L	13-JUN-18	13-JUN-18	R4082538
Nickel (Ni)-Total	<0.00050		0.00050	mg/L	13-JUN-18	13-JUN-18	R4082538
Potassium (K)-Total	7.79		0.050	mg/L	13-JUN-18	13-JUN-18	R4082538
Phosphorus (P)-Total	0.172		0.050	mg/L	13-JUN-18	13-JUN-18	R4082538
Rubidium (Rb)-Total	0.00197		0.00020	mg/L	13-JUN-18	13-JUN-18	R4082538
Selenium (Se)-Total	<0.000050		0.000050	mg/L	13-JUN-18	13-JUN-18	R4082538
Silicon (Si)-Total	13.4		0.10	mg/L	13-JUN-18	13-JUN-18	R4082538
Silver (Ag)-Total	<0.000010		0.000010	mg/L	13-JUN-18	13-JUN-18	R4082538
Sodium (Na)-Total	47.4		0.050	mg/L	13-JUN-18	13-JUN-18	R4082538
Strontium (Sr)-Total	0.587		0.00020	mg/L	13-JUN-18	13-JUN-18	R4082538
Tellurium (Te)-Total	<0.00020		0.00020	mg/L	13-JUN-18	13-JUN-18	R4082538
Thallium (Tl)-Total	<0.000010		0.000010	mg/L	13-JUN-18	13-JUN-18	R4082538
Thorium (Th)-Total	<0.00010		0.00010	mg/L	13-JUN-18	13-JUN-18	R4082538
Tin (Sn)-Total	<0.00010		0.00010	mg/L	13-JUN-18	13-JUN-18	R4082538
Titanium (Ti)-Total	<0.00030		0.00030	mg/L	13-JUN-18	13-JUN-18	R4082538
Tungsten (W)-Total	<0.00010		0.00010	mg/L	13-JUN-18	13-JUN-18	R4082538
Uranium (U)-Total	0.000246		0.000010	mg/L	13-JUN-18	13-JUN-18	R4082538
Vanadium (V)-Total	<0.00050		0.00050	mg/L	13-JUN-18	13-JUN-18	R4082538
Zinc (Zn)-Total	0.0562		0.0030	mg/L	13-JUN-18	13-JUN-18	R4082538
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L	13-JUN-18	13-JUN-18	R4082538
<b>Total Organic Carbon by Combustion</b>							
Total Organic Carbon	2.41		0.50	mg/L		26-JUN-18	R4098050
<b>Turbidity</b>							
Turbidity	31.1		0.10	NTU		12-JUN-18	R4081647
<b>UV Transmittance (Calculated)</b>							
Transmittance, UV (254 nm)	90.6		1.0	%T/cm		12-JUN-18	R4081410
<b>pH</b>							
pH	7.83		0.10	pH units		14-JUN-18	R4083507
<b>Miscellaneous Parameters</b>							
Silica, Reactive (as SiO2)	24.6		1.0	mg/L		13-JUN-18	R4082787
L2110101-2 G3 - 2 - TREATED Sampled By: IVAN on 11-JUN-18 @ 11:55 Matrix: GRAB							
<b>MB Chemistry for PWS</b>							
<b>Alkalinity, Bicarbonate</b>							
Bicarbonate (HCO3)	90.0		1.2	mg/L		15-JUN-18	
<b>Alkalinity, Carbonate</b>							
Carbonate (CO3)	<0.60		0.60	mg/L		15-JUN-18	
<b>Alkalinity, Hydroxide</b>							
Hydroxide (OH)	<0.34		0.34	mg/L		15-JUN-18	
<b>Alkalinity, Total (as CaCO3)</b>							
Alkalinity, Total (as CaCO3)	73.8		1.0	mg/L		14-JUN-18	R4083507
<b>Ammonia by colour</b>							
Ammonia, Total (as N)	<0.010		0.010	mg/L		13-JUN-18	R4082646
<b>Bromide in Water by IC (Low Level)</b>							
Bromide (Br)	<0.010		0.010	mg/L		13-JUN-18	R4083029
<b>Chloride in Water by IC (Low Level)</b>							
Chloride (Cl)	3.63		0.10	mg/L		13-JUN-18	R4083029

\* Refer to Referenced Information for Qualifiers (if any) and Methodology.

## ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2110101-2 G3 - 2 - TREATED							
Sampled By: IVAN on 11-JUN-18 @ 11:55							
Matrix: GRAB							
<b>Colour, True</b>							
Colour, True	<5.0		5.0	CU		12-JUN-18	R4081386
<b>Conductivity</b>							
Conductivity	224		1.0	umhos/cm		14-JUN-18	R4083507
<b>Dissolved Organic Carbon by Combustion</b>							
Dissolved Organic Carbon	<0.50		0.50	mg/L		26-JUN-18	R4098053
<b>Fluoride in Water by IC</b>							
Fluoride (F)	0.034		0.020	mg/L		13-JUN-18	R4083029
<b>Hardness Calculated</b>							
Hardness (as CaCO3)	87.1	HTC	0.20	mg/L		14-JUN-18	
<b>Langelier Index 4C</b>							
Langelier Index (4 C)	-0.43					15-JUN-18	
<b>Langelier Index 60C</b>							
Langelier Index (60 C)	0.34					15-JUN-18	
<b>Nitrate in Water by IC (Low Level)</b>							
Nitrate (as N)	0.0219		0.0050	mg/L		13-JUN-18	R4083029
<b>Nitrite in Water by IC (Low Level)</b>							
Nitrite (as N)	0.0016		0.0010	mg/L		13-JUN-18	R4083029
<b>Sulfate in Water by IC</b>							
Sulfate (SO4)	33.2		0.30	mg/L		13-JUN-18	R4083029
<b>Total Dissolved Solids (TDS)</b>							
Total Dissolved Solids	143		13	mg/L		13-JUN-18	R4083057
<b>Total Metals in Water by CRC ICPMS</b>							
Aluminum (Al)-Total	<0.0030		0.0030	mg/L	13-JUN-18	13-JUN-18	R4082538
Antimony (Sb)-Total	<0.00010		0.00010	mg/L	13-JUN-18	13-JUN-18	R4082538
Arsenic (As)-Total	0.00178		0.00010	mg/L	13-JUN-18	13-JUN-18	R4082538
Barium (Ba)-Total	0.00291		0.00010	mg/L	13-JUN-18	13-JUN-18	R4082538
Beryllium (Be)-Total	<0.00010		0.00010	mg/L	13-JUN-18	13-JUN-18	R4082538
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L	13-JUN-18	13-JUN-18	R4082538
Boron (B)-Total	0.166		0.010	mg/L	13-JUN-18	13-JUN-18	R4082538
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L	13-JUN-18	13-JUN-18	R4082538
Calcium (Ca)-Total	20.7		0.050	mg/L	13-JUN-18	13-JUN-18	R4082538
Cesium (Cs)-Total	<0.000010		0.000010	mg/L	13-JUN-18	13-JUN-18	R4082538
Chromium (Cr)-Total	0.00027		0.00010	mg/L	13-JUN-18	13-JUN-18	R4082538
Cobalt (Co)-Total	<0.00010		0.00010	mg/L	13-JUN-18	13-JUN-18	R4082538
Copper (Cu)-Total	0.00120		0.00050	mg/L	13-JUN-18	13-JUN-18	R4082538
Iron (Fe)-Total	0.064		0.010	mg/L	13-JUN-18	13-JUN-18	R4082538
Lead (Pb)-Total	<0.000050		0.000050	mg/L	13-JUN-18	13-JUN-18	R4082538
Lithium (Li)-Total	0.0122		0.0010	mg/L	13-JUN-18	13-JUN-18	R4082538
Magnesium (Mg)-Total	8.63		0.0050	mg/L	13-JUN-18	13-JUN-18	R4082538
Manganese (Mn)-Total	0.00635		0.00010	mg/L	13-JUN-18	13-JUN-18	R4082538
Molybdenum (Mo)-Total	0.000513		0.000050	mg/L	13-JUN-18	13-JUN-18	R4082538
Nickel (Ni)-Total	0.00051		0.00050	mg/L	13-JUN-18	13-JUN-18	R4082538
Potassium (K)-Total	1.58		0.050	mg/L	13-JUN-18	13-JUN-18	R4082538
Phosphorus (P)-Total	<0.050		0.050	mg/L	13-JUN-18	13-JUN-18	R4082538
Rubidium (Rb)-Total	0.00044		0.00020	mg/L	13-JUN-18	13-JUN-18	R4082538
Selenium (Se)-Total	<0.000050		0.000050	mg/L	13-JUN-18	13-JUN-18	R4082538
Silicon (Si)-Total	2.21		0.10	mg/L	13-JUN-18	13-JUN-18	R4082538
Silver (Ag)-Total	<0.000010		0.000010	mg/L	13-JUN-18	13-JUN-18	R4082538
Sodium (Na)-Total	14.9		0.050	mg/L	13-JUN-18	13-JUN-18	R4082538
Strontium (Sr)-Total	0.0924		0.00020	mg/L	13-JUN-18	13-JUN-18	R4082538
Tellurium (Te)-Total	<0.00020		0.00020	mg/L	13-JUN-18	13-JUN-18	R4082538
Thallium (Tl)-Total	<0.000010		0.000010	mg/L	13-JUN-18	13-JUN-18	R4082538

\* Refer to Referenced Information for Qualifiers (if any) and Methodology.



## ALS ENVIRONMENTAL ANALYTICAL REPORT

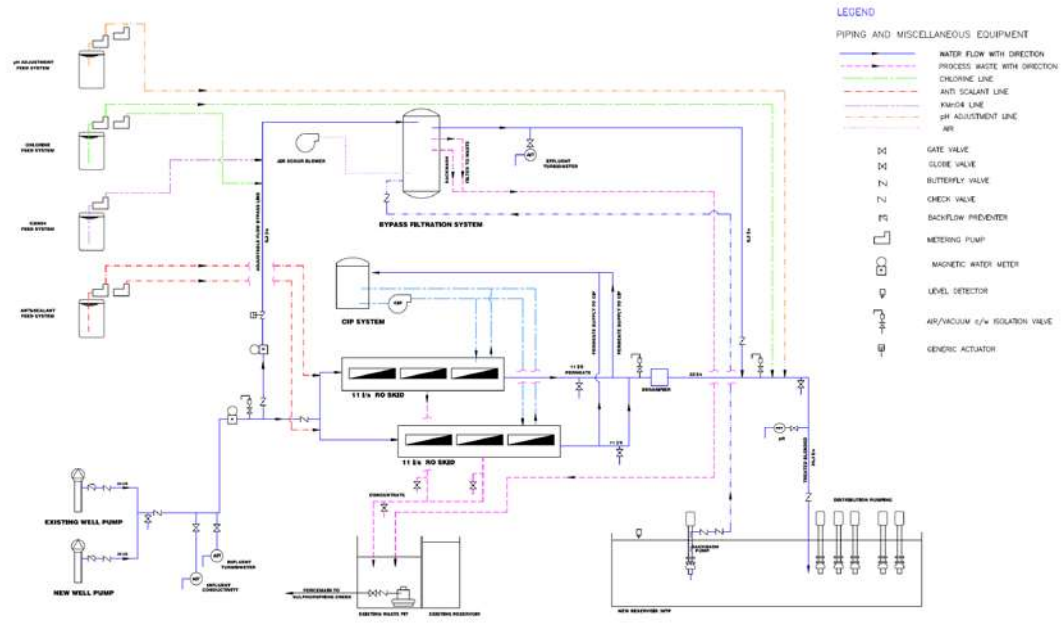
Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2110101-2 G3 - 2 - TREATED							
Sampled By: IVAN on 11-JUN-18 @ 11:55							
Matrix: GRAB							
<b>Total Metals in Water by CRC ICPMS</b>							
Thorium (Th)-Total	<0.00010		0.00010	mg/L	13-JUN-18	13-JUN-18	R4082538
Tin (Sn)-Total	<0.00010		0.00010	mg/L	13-JUN-18	13-JUN-18	R4082538
Titanium (Ti)-Total	<0.00030		0.00030	mg/L	13-JUN-18	13-JUN-18	R4082538
Tungsten (W)-Total	<0.00010		0.00010	mg/L	13-JUN-18	13-JUN-18	R4082538
Uranium (U)-Total	0.000037		0.000010	mg/L	13-JUN-18	13-JUN-18	R4082538
Vanadium (V)-Total	<0.00050		0.00050	mg/L	13-JUN-18	13-JUN-18	R4082538
Zinc (Zn)-Total	<0.0030		0.0030	mg/L	13-JUN-18	13-JUN-18	R4082538
Zirconium (Zr)-Total	<0.000060		0.000060	mg/L	13-JUN-18	13-JUN-18	R4082538
<b>Total Organic Carbon by Combustion</b>							
Total Organic Carbon	<0.50		0.50	mg/L		26-JUN-18	R4098050
<b>Turbidity</b>							
Turbidity	<0.10		0.10	NTU		12-JUN-18	R4081647
<b>UV Transmittance (Calculated)</b>							
Transmittance, UV (254 nm)	98.9		1.0	%T/cm		12-JUN-18	R4081410
<b>pH</b>							
pH	8.00		0.10	pH units		14-JUN-18	R4083507
<b>Miscellaneous Parameters</b>							
Silica, Reactive (as SiO2)	4.5		1.0	mg/L		13-JUN-18	R4082787

\* Refer to Referenced Information for Qualifiers (if any) and Methodology.

# **Appendix B**

## **Water Treatment Plant Process Diagram**

### **Pipeline Schematic**



PROVINCE OF MANITOBA <b>THE MANITOBA WATER SERVICES BOARD</b> MANITOBA INFRASTRUCTURE & TRANSPORTATION			G3 WATER TREATMENT PLANT <b>WTP SCHEMATIC</b>		
DRAWN: R. NASON	CHECKED: T. PARSONS	DATE: 10-12-12	SCALE: NTS	DRAWING NO. 1 of 1	FILE NO.