

**East St. Paul Water System  
2016 Annual Report**



Prepared for:  
RM of East St. Paul  
3021 Bird's Hill Road  
East St. Paul, MB R2E 1A7

Prepared by:  
Stantec Consulting Ltd.  
500-311 Portage Ave.  
Winnipeg, MB R3B 2B9

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## 1.0 WATER SYSTEM

### 1.1 DESCRIPTION OF WATER SYSTEM

The Rural Municipality of East St. Paul (RM) Water System consists of groundwater pumping, UV disinfection, chlorination, treated water storage, distribution pumping and distribution piping. Refer to Figure 1.0 for a process flow diagram of the water system.

#### 1.1.1 Groundwater Source

Groundwater is conveyed to the water treatment plant (WTP) using a series wells. Five (5) production wells are located east of the Floodway off Oasis Road in the RM of Springfield. Four of these production wells (PW1, PW4, PW5 and PW6) withdraw groundwater from a sand and gravel aquifer at a depth of approximately 24 meters below the existing grade and can provide a combined 18 L/s to the WTP. Water Rights License No. 2007-074 authorizes the withdrawal of 358,000 m<sup>3</sup>/yr. at a maximum rate of 11.4 L/s from these four wells.

The fifth production well (PW8) withdraws groundwater from a bedrock carbonate aquifer at a depth of approximately 43 meters below grade and can provide 20 L/s to the WTP. Water Rights License No. 2005-060 authorizes the withdrawal of 195,000 m<sup>3</sup>/yr. at a maximum rate of 20 L/s from this well.

Two meter chambers measure the groundwater withdrawn from each aquifer. There is also a turbidity meter in each meter chamber to monitor the turbidity of the groundwater.

A sixth production well (PW7) is located adjacent the WTP off Wenzel Street in the RM of East St. Paul. PW7 withdraws groundwater from the bedrock aquifer and can provide 19 L/s to the WTP. Water Rights License 2009-030 was issued July 16, 2009 and authorizes the withdrawal of 612,000 m<sup>3</sup>/yr. at a maximum rate of 19 L/s from this well.

#### 1.1.2 UV Disinfection

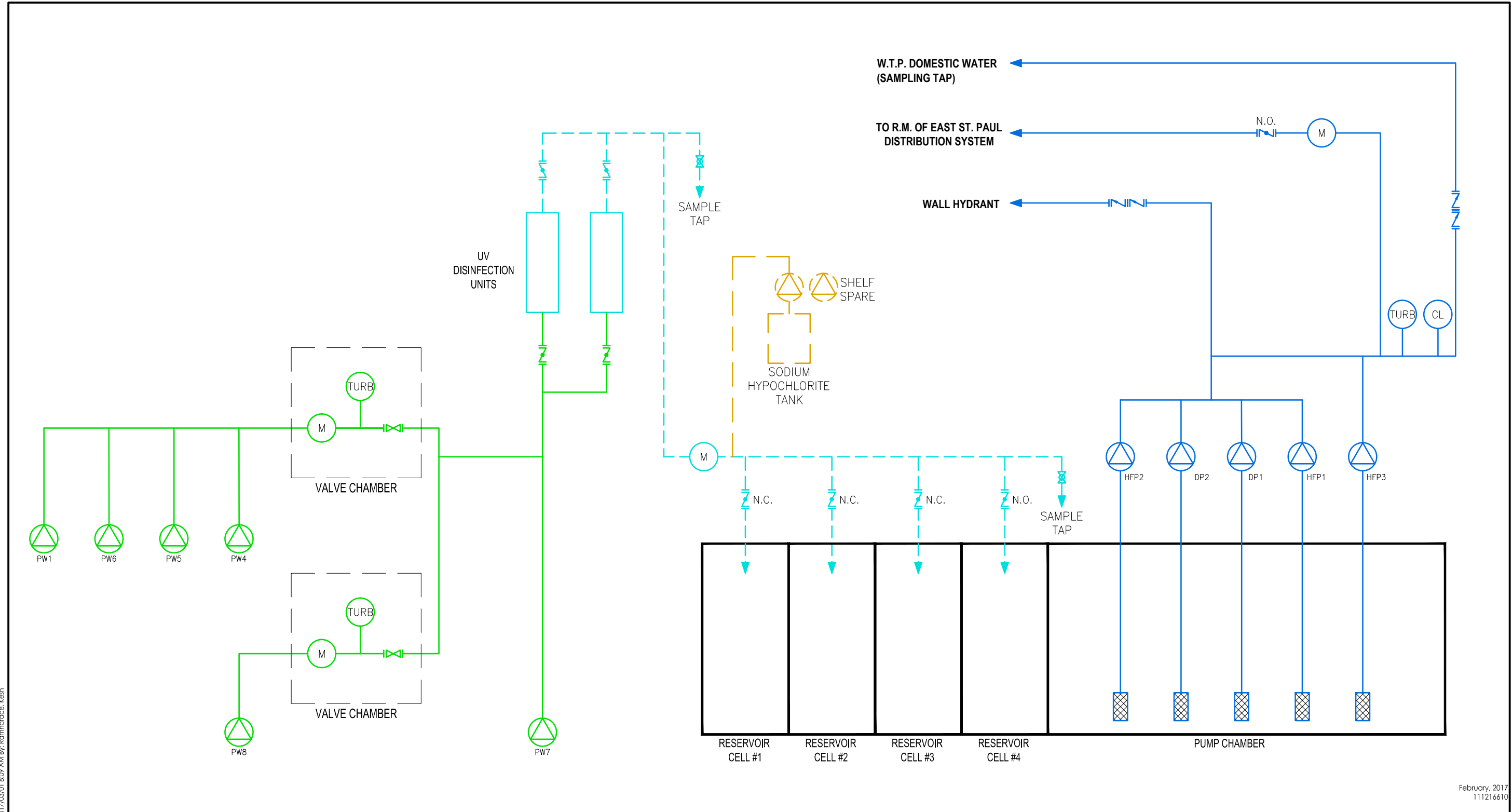
The raw water is disinfected by ultraviolet (UV) light. The intent of the UV disinfection process is to provide three log reduction credits for *Giardia* and *Cryptosporidium*. There are two completely redundant UV disinfection units that operate in duty / standby mode. The UV dose is automatically adjusted based on raw water flow.

#### 1.1.3 Chlorination

The groundwater is chlorinated prior to being discharged to a reservoir for storage. Liquid chlorine (sodium hypochlorite – 12%) is dosed to the groundwater using a chemical feed pump based on flow. The chlorine dose is manually adjusted based on the chlorine residual entering the distribution system.



V:\112\active\111216610\0300\_drawing\0301\_sketches\16610-Fig.1.dwg Fig. 1.0  
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Stantec Consulting Ltd.  
Suite 500, 311 Portage Avenue  
Winnipeg MB Canada R3B 2B9  
Tel. 204.489.5900 Fax. 204.453.9012  
www.stantec.com

Legend

- RAW WATER
- POTABLE WATER
- CHEMICAL FEED
- TREATED WATER

- PUMP
- WELL PUMP
- JOCKEY PUMP
- HIGH FLOW PUMP
- DOMESTIC PUMP

- RELIEF VALVE
- BUTTERFLY VALVE
- GATE VALVE
- NORMALLY CLOSED
- NORMALLY OPEN

- METER
- TURBIDIMETER
- CHLORINE ANALYZER
- BACKFLOW PREVENTER

Client/Project  
R.M. OF EAST ST. PAUL  
WATER SYSTEM

Figure No.

1.0

Title

PROCESS FLOW DIAGRAM

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### 1.1.4 Treated Water Storage

Treated water is stored in a four cell reservoir. The reservoir buffers the peak instantaneous demands in the distribution system and provides storage for fire protection. The total active storage volume is 2,895 m<sup>3</sup>.

### 1.1.5 Distribution Pumping

The distribution pumping system is made up of five (5) vertical turbine pumps. Two (2) domestic pumps (DP1 & DP2) each rated at 27 L/s, one high flow pump (HFP1) rated at 53 L/s and two high flow pump (HFP2 & HFP3) each rated at 65 L/s. The total and firm pumping capacity is 237 L/s and 172 L/s, respectively. All distribution pumps are operated by variable frequency drives that vary to maintain a distribution system pressure of 65 psi in the header in the WTP.

### 1.1.6 Distribution System

The distribution system is comprised of approximately 37,005 meters of PVC and HDPE. There are approximately 986 service connections in the distribution system.

## 1.2 DISINFECTION

The raw water source is deemed surface water under the direct influence (GUDI) of surface water and therefore is required to provide:

- 3 log reduction for *Giardia* and *Cryptosporidium*
- 4 log reduction of viruses
- 20 minutes of chlorine contact time

UV and chlorine are both relied on for disinfection. UV provides 3 log reduction for *Giardia* and *Cryptosporidium*, while chlorine contact time provides 4 log reduction for viruses and satisfies the 20 minute contact time requirement for bacteria.

The effectiveness of the UV system is tracked by monitoring UV intensity and calculating the UV dose based on an operator entered UV transmittance. The daily average, minimum and maximum UV dose is tracked and reported against the required UV dose to provide 3 log reduction of *Giardia* and *Cryptosporidium*. The UV reporting function has been operable since December, 2015.

The Drinking Water Safety Act (DWSA) also requires a minimum free chlorine residual entering the distribution system of 0.5 mg/L and a minimum free chlorine residual of 0.1 mg/L in the distribution system. The RM continuously measures the chlorine level entering the distribution system using an online analyzer. They also manually measure the chlorine level entering the distribution system on a daily basis and the chlorine level at various locations in the distribution

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system on a biweekly basis. There were no occurrences where there was no daily chlorine residual sample taken.

**Table 1.1 – Disinfection Testing Performance**

Description	Requirement	Compliance
Free Chlorine residual entering the distribution system	≥ 0.5 mg/L	100%
Frequency of testing daily at WTP	Daily	100%
Free Chlorine residual in the distribution system	≥ 0.1 mg/L	100%
Frequency of testing in the distribution system	weekly	100%
Report Submission	Monthly	100%
UV dose	≥ 33 mJ/cm <sup>2</sup> (95% / month)	100%

## 1.3 SAMPLING, TESTING AND REPORTING

### 1.3.1 Bacteriological Sampling

While the RM is required to sample the raw water entering the WTP, treated water leaving the WTP and treated water in the distribution system on a biweekly basis, the RM samples weekly in an effort to be proactive. Samples are sent to ALS Laboratory Group for Total Coliform and E. Coli testing.

Total coliform was found in the raw water on 7 of the 52 samples, while E. Coli was never present. The highest concentration of total coliform in one sample was 2 most probable number (MPN) / 100 mL.

Sampling results for the treated water are summarized as follows:

**Table 1.2 – Bacteriological Testing Performance**

Description	Requirement	Compliance
Sampling Frequency	Bi-weekly	100%
Total Coliform	< 1 MPN / 100 mL	100%
E. Coli	< 1 MPN / 100 mL	100%



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## 1.4 CHEMICAL AND RADIOLOGICAL PARAMETERS

The RM is required to sample and test for chemical and radiological parameters once every year. The sampling results for key parameters related to the Guideline for Canadian Drinking Water Quality (GCDWQ) aesthetic objectives (AO) and the DWSA maximum acceptable concentration (MAC) are summarized in Table 1.3.

**Table 1.3 – Raw Water Quality Data Relevant to the DWSA**

Parameter	Raw	Treated	[MAC] / AO (mg/L)
Arsenic (mg/L)	< 0.0002	< 0.0002	[0.01]
Fluoride (mg/L)	0.201	0.185	[1.5]
Lead (mg/L)	0.00042	< 0.00013	[0.01]
Nitrate-N (mg/L)	0.041	0.037	[10]
Uranium (mg/L)	0.0022	0.0018	[0.02]
Iron (mg/L)	0.149	0.013	0.3
Manganese (mg/L)	0.008	0.027	0.5 ^
Hardness (mg/L as CaCO <sub>3</sub> )	290	264	200/500
TDS (mg/L)	290	278	500
Turbidity (NTU)	0.34	0.36	/
UVT (%)	97.1	97.7	/

^New manganese AO of 0.02 mg/L and MAC o 0.1 mg/L under consideration

Starting in 2016, the RM is required to take quarterly samples from the distribution system (February, May, August and November) that are to be analyzed for trihalomethanes (THM) and haloacetic acid (HAA) every second year. Results are summarized in Table 1.4.

**Table 1.4 – Average Disinfection Byproduct Sampling Results (mg/L)**

Parameter	February	May	August	November	Quarterly Average	MAC
Total Trihalomethanes (TTHM)	0.0356	0.0151	0.0146	0.0241	0.0224	0.1
Total Haloacetic Acids (HAA)	< 0.0054	< 0.0054	< 0.0054	0.0073	< 0.0059	0.08



### **1.4.1 Physical Parameters**

There are no physical limits specified in the R.M's operating license, although the new operating license requires the RM to take one sample per day of the raw and analyze it for turbidity. Turbidity is also to be noted in the distribution system at the time of bacteriological sampling.

### **1.4.2 Microbial Parameters**

The RM's operating license requires:

- 3 log reduction for *Giardia* and *Cryptosporidium*
- 4 log reduction of viruses
- 20 minutes of chlorine contact time

UV disinfection satisfies the 3 log reduction requirement for *Giardia* and *Cryptosporidium*, while chlorine contact time in the reservoir satisfies the 20 minute chlorine contact time requirement and the 4 log reduction requirement for viruses.

## **1.5 RECORD KEEPING**

The RM retains all the testing data and stores one copy at the WTP. Copies of the chlorination and UV data are submitted to the ODW on a monthly basis. Bacteriological testing results are also copied to the regional drinking water officer.

The RM received the annual audit from the Office of Drinking Water for 2016 and no compliance issues were noted.

## **1.6 DRINKING WATER SAFETY ORDERS**

There were no drinking water safety orders issued to the RM in 2016.

## **1.7 BOIL WATER ADVISORIES**

There was no boil water advisories issued to the RM in 2016.

## **1.8 MAJOR EXPENSES INCURRED**

The RM completed the following water system related projects in 2016:

WTP Upgrades



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The RM undertook an expansion of the WTP in 2016. The key components of the expansion included:

- Reservoir expanded from 2523 m<sup>3</sup> to 2895 m<sup>3</sup> primarily to accommodate future growth;
- Distribution pumping capacity increased from 57 L/s to 172 L/s to provide an increased level of fire protection along with accommodating future growth;
- Distribution header replaced to accommodate increased distribution pumping capacity;
- Distribution header through the reservoir and pump chamber to the distribution system was replaced with a new stainless steel pipe as it was discovered to be corroded.
- Raw water line passing through the reservoir and pump chamber was replaced and relocated through the dry pit.
- New emergency generator provided to accommodate increased distribution pumping capacity.

The distribution system was also extended by 255 m on Wallace Avenue east of Mowat Road.

### **1.9 UPCOMING EXPENSES**

The RM is required to complete an engineering reassessment of the water system in accordance with the Office of Drinking Water requirements every five years. The RM's next reassessment is due by March 31, 2017.