East St. Paul Water System
2017 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^3/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^3/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Two meter chambers measure the groundwater withdrawn from each aquifer.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.

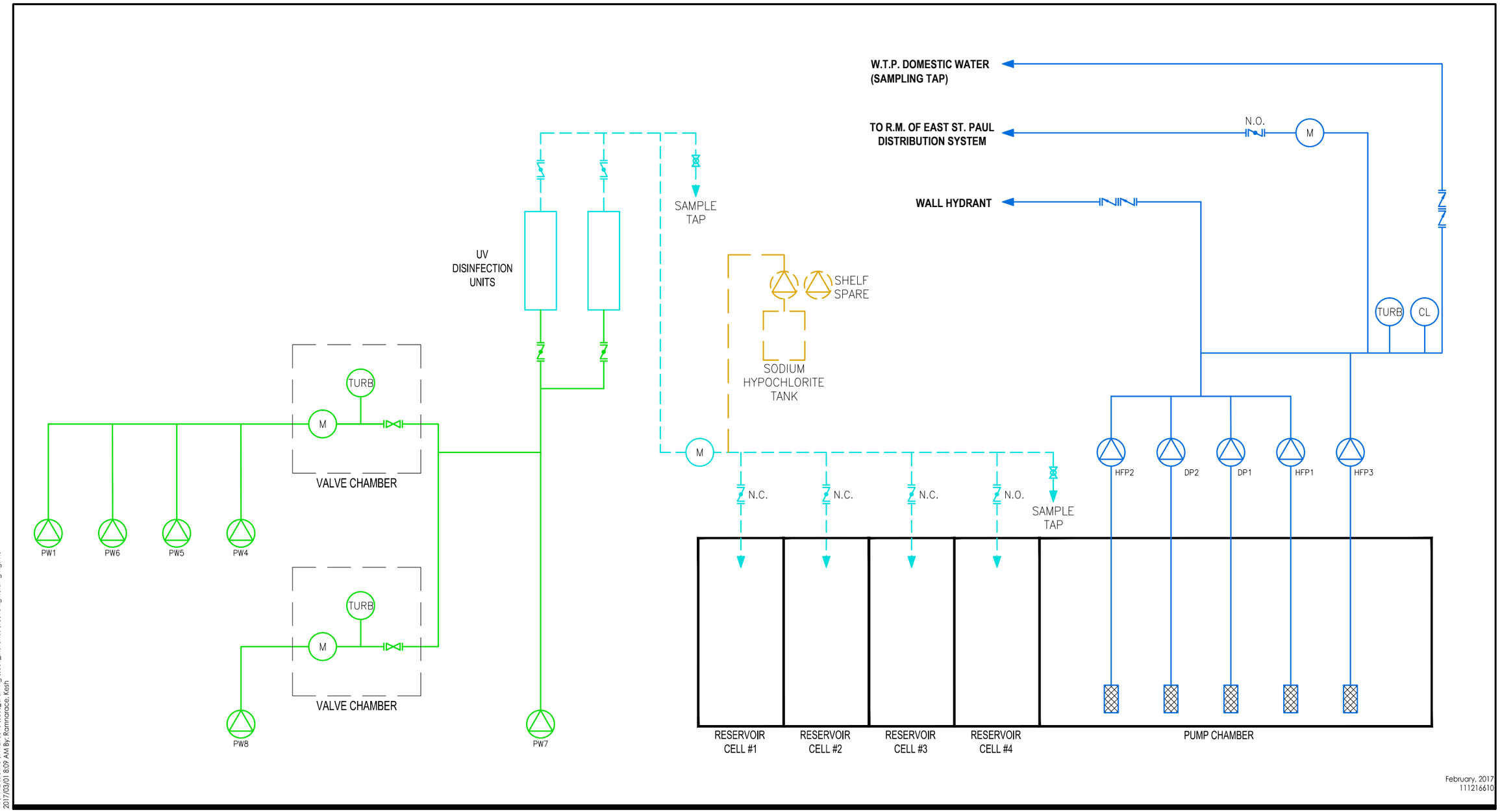
A sixth production well (PW7) is located adjacent the WTP off Wenzel Street in the RM of East St. Paul. PW7 withdraws groundwater from the bedrock aquifer and can provide 19 L/s to the WTP. Water Rights License 2009-030 was issued July 16, 2009 and authorizes the withdrawal of 612,000 m^3/yr. at a maximum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



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Stantec
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	PUMP	R	RELIEF VALVE	M	METER
POTABLE WATER	PW	WELL PUMP		BUTTERFLY VALVE	TURB	TURBIDIMETER
CHEMICAL FEED	JP	JOCKEY PUMP		GATE VALVE	CL	CHLORINE ANALYZER
TREATED WATER	HFP	HIGH FLOW PUMP	N.C.	NORMALLY CLOSED		BACKFLOW PREVENTER
	DP	DOMESTIC PUMP	N.O.	NORMALLY OPEN		

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

Figure No.
1.0

Title
PROCESS FLOW DIAGRAM

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^3.

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 contract time provides 4 log reduction for viruses and satisfies the 20 minute contact time requirement for bacteria.

The operating license requires a minimum UV dose of 33 mJ/cm^2 for 95% of the readings in one month to provide 3 log reduction for *Giardia* and *Cryptosporidium*. 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 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 and reports the reading every 5 minutes. The RM also manually measures the chlorine level entering the distribution system on a daily basis and the chlorine level at various locations in the distribution system on a biweekly basis.

The compliance with respect to monitoring the UV dose and chlorine residual is summarized in Table 1.1.

Table 1.1 – Disinfection Testing Performance

Description	Requirement	Compliance
Free Chlorine residual entering the distribution system based on manual daily sample	≥ 0.5 mg/L	100%
Free chlorine residual entering the distribution system based on 5 minute sample results	≥ 0.5 mg/L	99.96% [A]
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^2 (95% / month)	100%

[A] Occasions where the distribution system chlorine analyzer reported lower than 0.5 mg/L were a result of sensor cleaning or power outages.

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 in 1 of the 52 samples, while E. Coli was never present. The concentration of total coliform was 1 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%

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 2017 are not completed and the results below reflect the 2016 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 and Treated Water Quality Data Relevant to the DWSA

Parameter	Raw	Treated	[MAC] / AO
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	0.05 [A]
Hardness (mg/L as $CaCO_{3)}$	290	264	200/500
TDS (mg/L)	290	278	500
Turbidity (NTU)	0.34	0.36	1
UVT (%)	97.1	97.7	/

[A] New manganese AO of 0.02 mg/L and MAC of 0.1 mg/L under consideration

Since 2016 the RM has been 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 for 2016 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 Halocetic 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 water and analyze it for turbidity. Turbidity is also to be noted in the distribution system at the time of bacteriological sampling. The RM was 100% compliant with the requirement for daily raw water turbidity sampling. The reported daily turbidity reading was below the aesthetic objective of 1 NTU in all samples.

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 Office of Drinking Water did not complete an audit of the water system in 2017. The last audit was completed in 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 2017.

1.7 BOIL WATER ADVISORIES

There was no boil water advisories issued to the RM in 2017.

1.8 MAJOR EXPENSES INCURRED

The RM completed the following water system related projects in 2017:

WTP Upgrades

The RM completed the WTP upgrade project that was started in 2016. The project included:

- Reservoir expanded from 2523 m^3 to 2895 m^3 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 the original line 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.

Water System Assessment

The RM completed an engineering reassessment of the water system in accordance with the Office of Drinking Water requirements. An engineering reassessment is required every 5 years.

1.9 UPCOMING EXPENSES

No capital water system projects anticipated for 2018.