

SUMMARY REPORT 2016

ST. THOMAS WATER DISTRIBUTION SYSTEM

License Number: 057-101

Permit Number: 057-201

Provincial Regulation 170/03
Summary Report

For the Period
January 1, 2016 – December 31, 2016



THE CORPORATION OF THE CITY OF
ST. THOMAS

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1 Summary Report Requirements

1.1 Introduction

The 2016 Summary Report for the St. Thomas Water Distribution System is being submitted to satisfy Schedule 22 of Ontario Regulation 170/03, the requirement to prepare and distribute a summary report of water quality.

As per Ontario Regulation 170/03, the summary report must:

- a. List the requirements of the Act, the regulations, the system's approval, drinking water works permit, municipal drinking water licence, and any orders applicable to the system that were not met at any time during the period covered by the report; and
- b. For each requirement referred to in clause (a) that was not met, specify the duration of the failure and the measures that were taken to correct the failure.

The report must also include the following information for the purpose of enabling the owner of the system to assess the capability of the system to meet existing and planned uses of the system:

- A summary of the quantities and flow rates of the water supplied during the period covered by the report, including monthly average and maximum daily flows.
- A comparison of the summary to the rated capacity and flow rates approved in the system's approval, drinking water works permit or municipal drinking water licence, or if the system is receiving all of its water from another system under an agreement, to the flow rates specified in the written agreement.

The information provided is for the purpose of enabling the owner of the system to assess the capacity of the system. This report covers the reporting period from January 1, 2016 to December 31, 2016.

1.2 System Approval

The City of St. Thomas is supplied water from the Elgin Area Water Treatment Plant on Dexter Line east of Port Stanley Ontario. The distribution system has various approvals from the Ministry of Environment for the infrastructure as it was constructed.

During the reporting period, The St. Thomas Drinking Water System was operated pursuant to the approvals, licences and permits listed below:

The supply of water to the system governed by the following Municipal Drinking Water Licences (MDWL) and Drinking Water Works Permits (DWWP):

- City of St. Thomas Water Distribution System
 - MDWL No. 057-101, issued on July 15 2016
 - DWWP No. 057-201, issued on July 15 2016

- St. Thomas Area Secondary Water Supply System
 - MDWL No. 190-101, issued on June 28 2016
 - DWWP No. 190-101, issued on June 28 2016

The distribution of water within the system is governed by the following three licences and permits:

- Southwold Distribution System
 - MDWL No. 055-101, issued on July 29 2016
 - DWWP No. 055-201, issued on July 29 2016
- Central Elgin Distribution System
 - MDWL No. 046-101, issued on August 26 2014
 - DWWP No. 046-201, issued on August 7 2014

The DWWP and MDWL were issued in accordance with the Safe Drinking Water Act (SDWA), 2002.

The City of St Thomas Environmental Services Department/Operations Division Water Section received the Certificate of Accreditation for full scope –Entire DWQMS May 17, 2013 Certificate # Cert-0064202 for all four systems they operate:

1. The City of St Thomas Water Distribution - File # 1631369,
2. The St Thomas Area Secondary Water Supply System - File # 1631370.
3. The Municipality of Central Elgin Water Distribution System - File # 1631368
4. Township of Southwold Water Distribution System (Lynhurst) - File # 1631371

SAI Global performed an S2 Surveillance Audit November 28 & 29, 2016 for all four systems noted above

The findings were the overall effectiveness of the St Thomas Environmental Services Department/Operations Division Quality Management System was deemed to be effective with 0 non-conformances and 4 Opportunities for Improvement:

- 1) Commitment statement from Mayor or Council
- 2) Consider Reliability and redundancy in risk assessment
- 3) List control measures on hazard analysis spreadsheet
- 4) Identify timelines for Southwold action item

2 Water Quantity Summary

2.1 Overview

The St. Thomas Water Distribution System has three entry points into the network from the St. Thomas Area Secondary Water Supply System, the East Chamber located at the Elgin Middlesex Booster Station (490 South Edgeware Road), the West Chamber located in Water Works Park (2 South Edgeware), and the Wellington Road Chamber (Ford Line and Wellington Road), one entry point into the network from the Elgin Area Primary Water Supply System at the Albert Robert Booster Station (8754 Tyke Road) in the Municipality of Central Elgin and one entry point into the network from the Southwold Water Distribution System on Fingal Line at the municipal boundary.

2.2 Albert Roberts Booster Station – Elgin Area Primary Water Supply System

The Albert Roberts Booster Station (ARBS) receives treated water from the Elgin Area Primary Water Supply System, which pumps water from the water treatment plant located on the shores of Lake Erie to the east of the Town of Port Stanley. Water is pumped from a connection point on the transmission main that connects water treatment plant to the Elgin Middlesex Pump Station and reservoir.

The ARBS is comprised of three high lift pumps that deliver water through a transmission main that services the St. Thomas Distribution System. The station maintains the operating pressure and includes a flow meter, chlorine analyzer, monitoring control, alarm system and instrumentation. Remote monitoring and control of the pumps capabilities are possible through the St. Thomas SCADA system.

Pump No. MV1 is a US Electrical Motors 29.8 kW (40 HP), 575V/3ph/60 HZ rated at 69.4 l/s at 23 m (75 feet) TDH at 1780 rpm. Pumps Nos. MV2 and MV3 are each U.S Electrical Motors 37.3 kW (50 HP), 575V/3ph/60HZ rated at 100.9 l/s at 24.4 m (80 feet) TDH at 1780 rpm. All pumps are equipped with VFDs (variable frequency drives). The facility includes the provisions for future installation of a stand-by generator set as well as a fourth pump.

All pumps use a common header and the firm rated pumping capacity (2 pumps operating) of the ARBS is 170.3 l/s or a total of 14,714 m³/d). There is no additional treatment nor rechlorination of the water supply delivered to the City of St. Thomas Water Distribution System from the ARBS. The booster pumps have an interlock booster pump shutdown and alarm upon receiving a low free chlorine residual signal.

The ARBS instrumentation equipment includes a prominent chlorine analyzer (internal pH compensation) which continuously monitors the free chlorine residual and pH. The flow meter is a Fisher Porter and is owned by Regional Water and calibrated by them on a yearly basis. Flow and free chlorine residuals are monitored through SCADA and transmitted back to the Public Works Service Centre located at 100 Burwell Road, St. Thomas Ontario.

2.3 East, West and Wellington Chambers – St. Thomas Area Secondary Water Supply System

The East, West and Wellington Chamber provide water from the St. Thomas Area Secondary Water Supply System and have volume limits of 54,605 m³/day that was established jointly within the Elgin Middlesex Pumping Station. The Summary Report for the Elgin Middlesex Pumping Station will summarize flows and capacity for the St. Thomas Area Secondary Water Supply System. The chambers contain flow meters, online chlorine analyzers and pressure gauges that are linked and monitored through SCADA and transmitted back to the back to the Public Works Service Centre located at 100 Burwell Road, St. Thomas Ontario.

2.4 Fingal Line Chamber – Southwold Water Distribution System

The Fingal Line Chamber supplies water from the Southwold Water Distribution System to a section of the St. Thomas Water Distribution System along Fingal Line. The water in the Southwold Water Distribution System originates from the St. Thomas Area Secondary Water Supply System. The water is rechlorinated within the Southwold Water Distribution System. The chamber contains a flow meter. The volumes limits entering the St. Thomas Distribution System from the Southwold Water Distribution System are part of the overall volume limit of 54,605 m³/day that was established jointly within the Elgin Middlesex Pumping Station License.

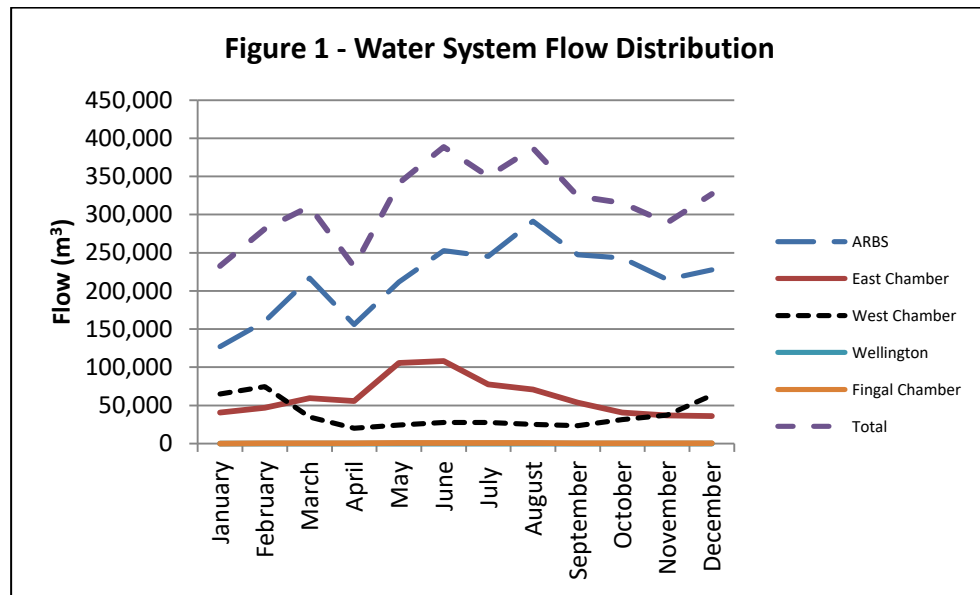
2.5 St. Thomas Water Distribution System – Flow Distribution

An overview summary of the flows entering the St. Thomas Water Distribution System is provided on **Table 1**, (based on monthly bulk meter readings not SCADA).

Table 1 – Annual Water Quantity Summary

Month	Albert Roberts BS (m ³)	East Chamber (m ³)	West Chamber (m ³)	Wellington Road Chamber (m ³)	Fingal Line Chamber (m ³)	Total System Flow (m ³)
January	127,005	40,522	64,932	0	143	232,459
February	160,109	46,721	74,441	0	260	281,271
March	216,600	59,503	34,655	0	539	310,758
April	156,122	55,813	20,014	-10	420	231,949
May	211,645	105,435	24,342	0	597	341,422
June	252,868	108,265	27,675	0	877	388,808
July	245,044	77,607	27,548	0	799	350,199
August	291,277	70,719	24,915	0	648	386,911
September	247,201	53,585	23,259	-130	493	324,045
October	243,117	40,767	31,347	0	500	315,231
November	215,047	36,900	37,344	-45	436	289,291
December	227,586	36,072	63,457	0	563	327,115
2016 Totals	2,593,621	731,909	453,929	-185	6,275	3,779,459

Figure 1 provides a graphical overview of the flows entering the St. Thomas Water Distribution System. Based on the 2016 flow data, the distribution of flows into the distribution system between the water supplied from the Albert Roberts Booster Station versus the St. Thomas Area Secondary Water Supply System (through the East, West and Wellington Chambers) and Fingal Line Chamber is calculated to be 65 percent.

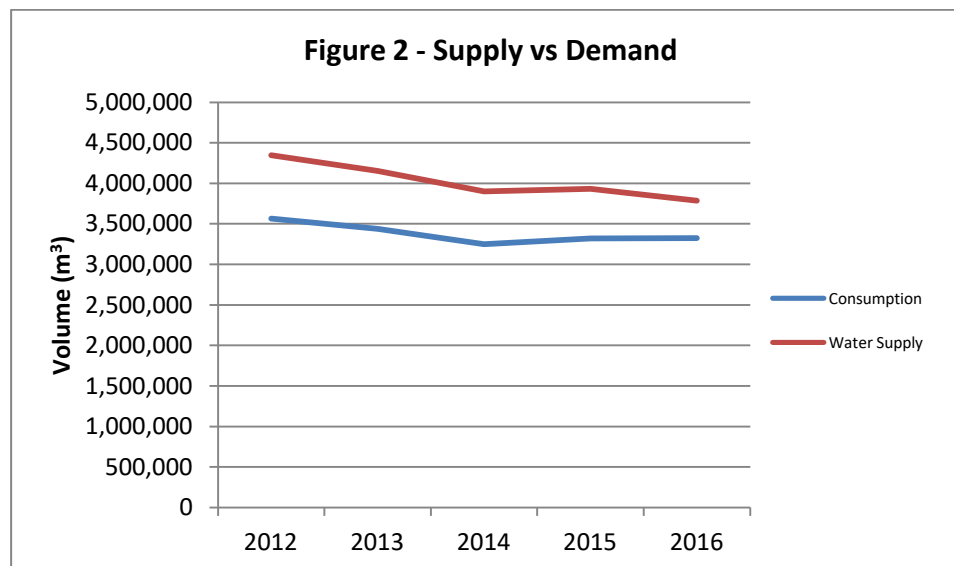


The total flow into the St. Thomas Water Distribution System decreased by 3.7% from 3,931,997 to 3,785,919m³

The total consumption by customers of the St. Thomas Water Distribution System increased slightly by approximately 1 % in 2016 from 3,321,735 to 3,323,393m³

The unaccounted water loss in the St. Thomas Water Distribution System was under 10%. This can be attributed to an aggressive leak detection program, relining of existing water main, capital improvements and monitoring of all water uses from maintenance/capital initiatives.

Figure 2 provides an overview of the supply vs consumption flows in the St. Thomas Water Distribution System over the last number of years.



2.6 Water Quantity Analysis – Albert Roberts Booster Station

The rated pumping capacity (2 pumps operating) of the Albert Roberts Booster Station is 170.3 L/s or a total of 14,714 m³/d.

At no time during the year was the max flow exceeded and there were no unusual operating conditions to note in this report

A summary of the monthly peak flows at the station collected by the SCADA system is provided on **Table 2**.

Table 2 – Albert Roberts Booster Station Water Quantity Summary

Month	Max Daily Instantaneous Peak Flow l/s	Average Daily Total Flow m ³ /day	Maximum Daily Total Flow m ³ /day	Total Monthly Flow m ³ /day
January	129.5	4953.05	5256.00	153544.50
February	125.6	5328.25	11986.00	154519.25
March	202.9	6054.08	6691.00	187676.50
April	300.0 *	6136.15	7101.75	184084.50
May	150.4	6505.50	8188.75	201670.50
June	167.1	8240.33	9598.00	247210.00
July	158.9	8202.76	8931.50	254285.50
August	171.3	8602.74	9730.50	266685.00
September	155.5	8065.25	9025.50	241957.50
October	142.8	7714.27	8362.50	239142.50
November	155.0	7024.93	7477.00	210748.00
December	129.6	6585.31	6948.00	204144.50
2016 Yearly	300.0	6951.05	11986.00	2545668.25

*Flow meter maintenance caused false High value

Appendix A includes a detailed summary of the monthly average and maximum daily flows for the Albert Roberts Booster Station.

2.7 System Interruptions

A listing of system interruptions is noted in the Albert Roberts Booster Station logbook.

2.8 Water Quantity Analysis – East, West, Wellington and Fingal Line Chambers

The Summary Report for the Elgin Middlesex Pumping Station will summarize flows and capacity for the entire St. Thomas Area Secondary Water Supply System.

3 Water Quality Summary

3.1 Albert Roberts Booster Station Samples

Water quality sampling at the Albert Roberts Booster Station is performed in accordance with Ontario Regulation 170/03. Chlorine residual is monitored by an on-line analyzer and is calibrated annually by licensed contractors. A summary of the flows at the station collected by the Scada system is provided on **Table 3**.

Table 3 – Albert Roberts Booster Station Water Quality Summary

Month	Free Chlorine Residual (mg/l)		
	Average	Maximum	Minimum
January	1.02	1.51	0.45
February	1.02	1.28	0.63
March	1.11	1.87	0.00
April	1.02	2.00	0.27
May	1.06	1.87	0.45
June	1.08	1.77	0.21
July	1.11	1.67	0.46
August	1.06	2.00	0.00
September	1.12	1.77	0.32
October	1.18	1.86	0.48
November	1.20	2.00	0.20
December	1.06	1.41	0.29
2016 Yearly	1.09	2.00	0.00

Minimums of 0.00 mg/l Free Chlorine - result from chlorine analyser calibration, maintenance, and alarm testing.

3.2 Water Distribution System Samples

Microbiological testing was done under the Schedule 10, 11 or 12 of Regulation 170/03, during this reporting period. **Table 4** summaries the results of the microbiological testing.

Table 4 – Microbiological Testing Summary

	Number of Samples	Range of E.Coli Or Fecal Results (min #)-(max #)	Range of Total Coliform Results (min #)-(max #)	Number of HPC Samples	Range of HPC Results (min #)-(max #)
Distribution Total	704	(0)-(0)	(0)-(87)	648	(<10)-(<2000)
St. Thomas	626	(0)-(0)	(0)-(87)	570	(<10)-(>2000)
Central Elgin	65	(0)-(0)	(0)-(0)	65	(<10)-(>2000)
Southwold	13	(0)-(0)	(0)-(0)	13	(<10)-(30)

Table 5 summarizes the incidents where a parameter under Regulation 170/03 exceeded the standard prescribed in the Ontario Drinking Water Quality Standards.

Table 5 – Sampling Parameter Results

Incident Date	Parameter	Result	Unit of Measure	Corrective Action	Corrective Action Date
February 23 2016	Total Coliform	87	cfu/100ml	Flush and re-sample	February 26 2016
October 12 2016	Total Coliform and E. Coli	NDOGN	cfu/100ml	Flush and re-sample	October 18 2016
December 29 2016	Total Coliform	1	cfu/100ml	Flush and re-sample	January 05 2017

All samples taken during the most recent testing period for Inorganic (not including Lead) and Organic parameters met the standards of the Safe Drinking Water Act Regulation 170/03.

3.3 Lead Testing Samples

Lead Testing under Regulation 170/03 Section 15.1 was conducted at residential and non residential locations. During 2016, 1 water sample was taken from the watermain distribution system. **Table 6** summaries the lead sampling results.

Table 6 – Lead Sampling Summary

Location Type	Number of Samples	Range of Lead Results (min#) – (max #)	Number of Exceedances
Plumbing			
Distribution	1	.43	0

The City is currently under a lead sampling exemption from the MOE due to the low number of lead services that have been discovered. Although no longer required to sample for lead, the city continues to actively investigate older areas for lead services .

At any locations where the plumbing samples exceeded the standards, the water service to the home was checked and replaced within the City right of way limits by Operations staff if a lead service was found. Home owners were notified of the results and advised to change the lead pipes on the private side of the service if they exist.

Humans are exposed to lead through food, water, and air. Historically, lead in tin cans and paint were major sources of exposure in food and air respectively. The relative importance of water-borne lead sources is increasing as other man-made sources of lead are reduced through changing industrial practices. Ingested lead enters the blood through the stomach; it is then stored in bones and teeth.

4 Summary of Non Compliance Issues

4.1 Ministry of the Environment Drinking Water Inspection

On April 27th 2016, the Ministry of the Environment (MOE) conducted an inspection of the St. Thomas Distribution System. Subsequently, a Drinking Water Inspection Report documenting the results of the inspection was received outlining a description of the drinking water system, capacity assessment, the distribution system, operations manuals, logbooks, contingency/emergency planning, security, consumer relations, certification and training, water quality monitoring, quality water assessment, reporting and corrective actions and other inspection findings.

The Drinking Water Inspection Report found one non-compliance issue which did not meet the regulatory requirement with regards to the recording of disinfection practices in log books. The Distribution was rated as having an inspection risk rating of 7.02% and achieving an overall final inspection rating of 92.98%, indicating that the risk was minimal.

APPENDIX A

St. Thomas Water Distribution System - 2016 Summary Report Albert Robert Booster Station Monthly Data

January 2016

Day of the Month	Discharge Flow	Suction Header Pressure	Discharge Header Pressure	Discharge Free Chlorine Residual	Discharge Volume
	<i>l/s</i>	<i>kPa</i>	<i>kPa</i>	<i>mg/l</i>	<i>m3</i>
1	54.3	115	328	1.09	4685.50
2	55.4	115	328	1.06	4786.50
3	57.8	115	328	1.06	4990.00
4	53.9	116	328	1.12	4657.25
5	52.1	121	328	1.15	4496.25
6	52.2	113	328	1.06	4512.50
7	54.3	112	328	1.07	4688.25
8	54.6	117	329	1.11	4715.25
9	60.4	118	330	1.06	5217.25
10	60.9	118	330	1.03	5256.00
11	58.9	114	330	0.93	5087.25
12	57.9	120	330	0.94	4996.25
13	58.6	122	330	0.97	5061.25
14	57.3	114	330	0.96	4945.50
15	57.3	115	330	0.99	4949.25
16	58.9	114	330	1.02	5084.75
17	60.4	114	330	1.00	5217.25
18	57.9	127	330	0.98	5002.50
19	60.3	115	330	1.00	5185.00
20	57.7	120	330	1.07	4983.50
21	58.6	136	330	1.09	5066.25
22	56.7	120	330	1.07	4897.75
23	58.8	110	330	0.97	5065.50
24	60.3	114	330	1.01	5210.75
25	56.3	116	330	1.00	4743.00
26	56.8	117	330	0.98	4904.25
27	57.2	136	330	1.00	4938.25
28	57.8	116	330	0.98	4988.50
29	56.3	112	330	0.97	4866.25
30	59.4	113	330	1.02	5133.75
31	60.4	112	330	0.96	5213.00
Average	57.4	117	329	1.02	4953.05
Minimum	2.0	82	248	0.45	4496.25
Day of Minimum	31	19	25	19	5
Maximum	129.5	207	371	1.51	5256.00
Day of Maximum	30	27	18	4	10
Monthly Total					153544.50
Events				0	

St. Thomas Water Distribution System - 2016 Summary Report Albert Robert Booster Station Monthly Data

February 2016

Day of the Month	Discharge Flow	Suction Header Pressure	Discharge Header Pressure	Discharge Free Chlorine Residual	Discharge Volume
	<i>l/s</i>	<i>kPa</i>	<i>kPa</i>	<i>mg/l</i>	<i>m3</i>
1	56.3	113	330	0.97	4866.50
2	56.5	115	330	1.00	4882.25
3	56.3	113	330	0.99	4849.50
4	56.7	117	330	0.97	4893.75
5	55.4	120	330	0.98	4787.50
6	59.2	112	330	1.00	5114.25
7	59.0	115	330	1.00	5096.50
8	56.4	121	330	0.98	4872.75
9	56.6	113	330	1.00	4888.00
10	56.7	117	330	0.98	4895.75
11	57.6	116	330	0.99	4974.75
12	56.1	107	330	0.99	4849.75
13	57.3	114	330	0.94	4953.25
14	55.2	120	330	0.96	4767.75
15	57.6	117	330	0.96	4977.75
16	56.3	114	330	0.96	4863.25
17	56.9	120	330	1.08	4914.25
18	58.2	112	330	1.07	5027.50
19	57.2	117	330	1.09	4939.00
20	60.4	113	330	1.08	5203.75
21	59.8	113	330	1.06	5161.25
22	57.6	113	330	1.14	4977.25
23	57.2	114	330	1.10	4936.50
24	61.8	115	330	0.98	5336.00
25	n/a	115	330	1.18	11986.00
26	66.1	113	330	1.06	5707.50
27	69.5	115	330	1.06	5998.25
28	69.7	116	330	1.03	6017.50
29	67.0	114	330	1.02	5781.25
30					
31					
Average	59.0	115	330	1.02	5328.25
Minimum	1.1	75	306	0.63	4767.75
Day of Minimum	19	26	26	27	14
Maximum	125.6	192	362	1.28	11986.00
Day of Maximum	20	5	15	22	25
Monthly Total					154519.25
Events				0	

St. Thomas Water Distribution System - 2016 Summary Report Albert Robert Booster Station Monthly Data

March 2016

Day of the Month	Discharge Flow	Suction Header Pressure	Discharge Header Pressure	Discharge Free Chlorine Residual	Discharge Volume
	<i>l/s</i>	<i>kPa</i>	<i>kPa</i>	<i>mg/l</i>	<i>m3</i>
1	66.2	116	330	1.04	5708.25
2	70.8	114	330	1.04	6103.50
3	67.1	116	330	1.07	5781.50
4	66.1	112	330	1.12	5713.75
5	68.6	113	330	1.11	5924.75
6	69.5	116	330	1.14	5997.25
7	67.1	117	330	1.12	5797.00
8	66.7	111	330	1.07	5760.25
9	67.5	111	330	1.05	5825.75
10	66.3	119	330	1.04	5721.75
11	67.0	112	330	1.07	5789.00
12	69.3	115	330	1.05	5981.00
13	n/a	114	330	1.00	5654.25
14	65.6	113	330	1.04	5671.00
15	65.8	115	330	1.06	5671.50
16	67.1	112	330	1.04	5795.75
17	67.5	113	330	1.01	5830.00
18	67.2	114	330	1.03	5804.50
19	70.7	114	330	1.01	6110.25
20	71.6	113	330	1.03	6185.25
21	69.0	115	330	1.07	5955.50
22	68.7	116	330	1.17	5933.00
23	73.1	118	331	1.27	6316.50
24	74.3	115	332	1.27	6416.75
25	75.9	117	332	1.29	6555.75
26	76.5	113	332	1.31	6606.50
27	77.5	112	332	1.35	6691.00
28	77.3	114	332	1.31	6669.50
29	76.2	113	332	1.29	6582.25
30	76.3	115	332	1.14	6585.00
31	75.7	112	332	0.92	6538.50
Average	70.3	114	331	1.11	6054.08
Minimum	5.9	74	164	0.00	5654.25
Day of Minimum	13	8	2	4	14
Maximum	202.9	198	362	1.87	6691.00
Day of Maximum	2	31	8	4	27
Monthly Total					187676.50
Events				1	

St. Thomas Water Distribution System - 2016 Summary Report Albert Robert Booster Station Monthly Data

April 2016

Day of the Month	Discharge Flow	Suction Header Pressure	Discharge Header Pressure	Discharge Free Chlorine Residual	Discharge Volume
	<i>l/s</i>	<i>kPa</i>	<i>kPa</i>	<i>mg/l</i>	<i>m3</i>
1	75.7	113	332	1.02	6517.00
2	77.2	109	332	1.00	6649.25
3	79.0	114	332	0.96	6818.25
4	77.5	112	332	0.97	6686.50
5	77.5	112	332	1.31	6692.25
6	77.4	114	332	1.21	6683.25
7	75.1	111	332	0.97	6412.00
8	74.7	110	332	0.97	6448.50
9	77.0	115	332	1.10	6652.75
10	77.5	115	332	1.12	6693.50
11	75.1	112	332	1.02	6486.50
12	75.1	115	332	1.05	6485.50
13	76.7	112	332	1.04	6626.50
14	76.8	115	332	1.03	6566.75
15	77.6	113	332	1.01	6703.50
16	80.8	110	332	1.04	6969.00
17	82.3	111	332	1.02	7101.75
18	65.5	115	332	1.05	5654.50
19	62.6	118	332	1.07	5406.75
20	63.6	111	332	1.10	5490.25
21	61.6	112	332	0.99	5325.50
22	61.9	112	332	1.01	5350.00
23	n/a	115	332	0.95	4856.25
24	66.6	117	332	0.96	5711.00
25	65.1	113	332	0.96	5621.00
26	63.1	117	332	1.00	5455.00
27	62.7	115	332	0.99	5389.75
28	62.9	117	332	0.90	5435.50
29	64.0	115	332	0.86	5530.50
30	65.6	116	332	0.93	5665.75
31					
Average	71.7	114	332	1.02	6136.15
Minimum	0.5	59	113	0.27	4856.25
Day of Minimum	14	26	26	12	23
Maximum	300.0	197	373	2.00	7101.75
Day of Maximum	14	12	7	29	17
Monthly Total					184084.50
Events				0	

St. Thomas Water Distribution System - 2016 Summary Report Albert Robert Booster Station Monthly Data

May 2016

Day of the Month	Discharge Flow	Suction Header Pressure	Discharge Header Pressure	Discharge Free Chlorine Residual	Discharge Volume
	<i>l/s</i>	<i>kPa</i>	<i>kPa</i>	<i>mg/l</i>	<i>m3</i>
1	65.8	112	332	0.90	5666.25
2	65.3	114	332	0.85	5643.25
3	66.7	116	332	0.95	5759.50
4	68.2	117	332	1.07	5889.75
5	68.3	114	332	0.98	5877.25
6	70.6	112	332	0.99	6103.00
7	71.1	116	332	1.06	6139.50
8	70.7	110	332	1.00	6080.00
9	73.2	109	332	1.06	6320.50
10	69.8	112	332	1.05	6001.75
11	71.2	112	332	1.05	6148.50
12	72.5	110	332	1.07	6258.25
13	69.5	113	332	1.10	6006.75
14	70.3	116	332	1.03	6070.75
15	71.3	109	331	1.07	5989.50
16	81.9	115	328	1.06	4493.00
17	72.2	115	332	1.12	6239.75
18	74.6	113	332	1.15	6444.50
19	76.1	115	332	1.22	6567.50
20	77.3	112	332	0.99	6676.75
21	76.7	115	332	0.90	6618.25
22	74.2	112	332	0.89	6412.75
23	85.0	113	332	0.89	7341.00
24	80.3	112	332	0.89	6938.00
25	83.9	113	331	0.95	7243.25
26	84.9	115	332	1.22	7326.00
27	89.6	110	332	1.33	7694.50
28	96.2	108	332	1.33	8188.75
29	93.7	118	332	1.25	7805.75
30	92.6	111	332	1.09	7899.00
31	91.7	109	332	1.29	7827.25
Average	76.6	113	332	1.06	6505.50
Minimum	2.3	0	0	0.45	4493.00
Day of Minimum	2	15	15	12	16
Maximum	150.4	208	381	1.87	8188.75
Day of Maximum	30	15	17	31	28
Monthly Total					201670.50
Events				0	

St. Thomas Water Distribution System - 2016 Summary Report Albert Robert Booster Station Monthly Data

June 2016

Day of the Month	Discharge Flow	Suction Header Pressure	Discharge Header Pressure	Discharge Free Chlorine Residual	Discharge Volume
	<i>l/s</i>	<i>kPa</i>	<i>kPa</i>	<i>mg/l</i>	<i>m3</i>
1	92.8	111	332	1.33	7952.75
2	88.1	109	331	1.13	7587.00
3	93.2	110	331	1.17	8050.50
4	90.0	116	332	1.18	7757.50
5	77.5	119	332	1.08	6688.00
6	81.9	113	332	1.06	7073.50
7	78.6	114	332	1.06	6787.50
8	84.7	115	333	1.08	7314.75
9	89.3	111	334	1.06	7715.00
10	93.2	114	334	1.14	8040.25
11	98.5	113	334	1.12	8463.50
12	97.0	114	334	1.13	8278.50
13	95.1	110	334	1.09	8207.50
14	94.9	117	334	1.08	8185.50
15	90.8	112	334	1.03	7832.75
16	86.3	119	334	1.11	7447.50
17	97.8	112	334	1.06	8441.75
18	99.2	112	333	1.05	8489.25
19	95.9	111	331	1.11	8060.50
20	105.5	113	334	1.12	8729.25
21	105.5	114	334	1.03	9085.75
22	105.4	114	334	0.93	9027.00
23	103.7	109	332	0.97	8804.00
24	109.0	110	332	1.06	9238.75
25	112.0	111	333	1.08	9598.00
26	106.2	114	333	1.03	9155.50
27	101.2	115	334	1.01	8714.50
28	98.3	115	334	0.93	8362.00
29	106.9	115	334	1.03	9215.75
30	103.6	115	334	1.01	8906.00
31					
Average	96.1	113	333	1.08	8240.33
Minimum	2.4	72	196	0.21	7073.50
Day of Minimum	29	9	27	7	6
Maximum	167.1	185	363	1.77	9598.00
Day of Maximum	21	27	29	1	25
Monthly Total					247210.00
Events				0	

St. Thomas Water Distribution System - 2016 Summary Report Albert Robert Booster Station Monthly Data

July 2016

Day of the Month	Discharge Flow	Suction Header Pressure	Discharge Header Pressure	Discharge Free Chlorine Residual	Discharge Volume
	<i>l/s</i>	<i>kPa</i>	<i>kPa</i>	<i>mg/l</i>	<i>m3</i>
1	93.2	115	334	0.98	8049.00
2	94.2	113	334	0.93	8119.00
3	101.6	111	334	0.98	8754.00
4	103.4	112	334	1.11	8931.50
5	100.9	113	333	1.15	8706.00
6	100.3	111	334	1.18	8608.50
7	103.1	112	334	1.17	8764.00
8	95.5	118	334	1.15	8231.50
9	85.5	116	334	0.95	7346.50
10	91.3	112	334	0.97	7765.50
11	98.6	110	334	1.11	8428.50
12	98.2	115	334	1.25	8416.00
13	99.3	118	334	1.38	8537.50
14	91.6	111	334	1.22	7896.50
15	97.1	115	334	1.21	8175.00
16	94.4	110	334	1.20	8071.00
17	97.5	113	334	1.25	8368.50
18	100.8	115	334	1.16	8079.50
19	99.4	112	334	1.11	8326.50
20	101.6	118	334	1.16	8734.50
21	100.4	114	334	1.13	8599.50
22	99.9	112	334	1.08	8615.00
23	99.4	113	333	1.14	8580.00
24	99.4	115	334	1.15	8338.00
25	n/a	102	303	1.02	5500.00
26	94.0	111	333	1.07	8094.00
27	98.6	114	334	1.01	8211.50
28	93.5	112	333	1.13	7995.00
29	98.1	113	333	1.02	8290.50
30	94.8	115	333	1.08	7919.00
31	91.3	116	334	1.07	7834.00
Average	97.2	113	333	1.11	8202.76
Minimum	2.2	0	0	0.46	5500.00
Day of Minimum	25	25	25	14	25
Maximum	158.9	190	371	1.67	8931.50
Day of Maximum	4	25	25	13	4
Monthly Total					254285.50
Events				0	

St. Thomas Water Distribution System - 2016 Summary Report Albert Robert Booster Station Monthly Data

August 2016

Day of the Month	Discharge Flow	Suction Header Pressure	Discharge Header Pressure	Discharge Free Chlorine Residual	Discharge Volume
	<i>l/s</i>	<i>kPa</i>	<i>kPa</i>	<i>mg/l</i>	<i>m3</i>
1	92.9	114	333	1.04	7982.00
2	98.2	111	333	1.11	8437.50
3	102.4	111	333	1.06	8839.00
4	105.1	111	334	1.05	9088.00
5	105.3	110	334	0.98	9091.00
6	103.4	115	333	1.12	8928.50
7	101.8	113	333	1.11	8574.00
8	110.7	115	334	1.14	9426.00
9	104.5	107	332	1.06	9016.50
10	112.7	110	334	1.15	9730.50
11	105.4	116	333	1.02	9086.50
12	110.7	112	334	1.03	9558.00
13	99.2	110	333	1.04	8557.00
14	94.1	111	332	1.15	8103.50
15	100.5	109	333	1.02	8679.00
16	97.6	114	334	1.01	8111.00
17	97.3	110	333	0.92	8365.00
18	96.5	115	333	1.04	8176.00
19	99.3	113	333	1.10	8416.50
20	100.1	114	334	0.99	8630.00
21	97.7	114	333	0.99	8435.00
22	101.6	115	334	1.11	8731.00
23	103.8	112	334	1.11	8615.50
24	98.6	112	333	1.22	7996.00
25	92.7	111	332	1.19	7501.50
26	96.1	117	333	1.15	8115.00
27	97.7	114	334	1.06	8319.50
28	96.8	113	333	0.97	8339.00
29	102.9	115	333	1.11	8655.00
30	100.7	112	333	0.88	8676.00
31	100.2	114	334	1.06	8506.00
Average	100.8	112	333	1.06	8602.74
Minimum	34.8	71	293	0.00	7501.50
Day of Minimum	28	11	15	26	25
Maximum	171.3	190	364	2.00	9730.50
Day of Maximum	15	10	10	26	10
Monthly Total					266685.00
Events				3	

St. Thomas Water Distribution System - 2016 Summary Report Albert Robert Booster Station Monthly Data

September 2016

Day of the Month	Discharge Flow	Suction Header Pressure	Discharge Header Pressure	Discharge Free Chlorine Residual	Discharge Volume
	<i>l/s</i>	<i>kPa</i>	<i>kPa</i>	<i>mg/l</i>	<i>m3</i>
1	98.8	111	333	1.06	8497.00
2	103.3	113	334	1.12	8913.50
3	99.5	114	333	1.00	8597.50
4	96.0	111	333	1.02	8292.50
5	99.7	112	332	1.02	8610.50
6	104.6	112	334	1.00	9025.50
7	102.3	108	333	0.93	8827.00
8	101.7	115	334	1.14	8785.50
9	98.8	111	334	1.05	8535.00
10	99.7	112	334	1.07	8603.50
11	96.9	112	333	1.00	7949.50
12	99.0	110	333	0.85	8421.50
13	95.3	112	325	0.91	5207.50
14	100.6	111	327	0.96	6004.50
15	95.3	111	333	1.18	8235.50
16	93.9	110	333	1.32	8041.00
17	93.2	114	333	1.24	8039.50
18	92.1	115	333	1.20	7957.50
19	94.4	115	334	1.20	8130.50
20	91.7	111	333	1.09	7866.00
21	96.2	112	334	1.12	8276.50
22	92.2	110	333	1.15	7943.50
23	95.7	113	334	1.30	8109.50
24	91.6	112	333	1.19	7893.00
25	89.9	112	332	1.20	7760.50
26	93.5	113	334	1.32	8062.50
27	92.0	111	333	1.13	7940.50
28	92.1	112	334	1.25	7952.50
29	89.5	110	333	1.21	7716.00
30	90.0	114	334	1.26	7762.50
31					
Average	96.0	112	333	1.12	8065.25
Minimum	1.3	63	242	0.32	5027.50
Day of Minimum	13	27	12	14	13
Maximum	155.5	191	366	1.77	9025.50
Day of Maximum	10	25	27	16	6
Monthly Total					241957.50
Events				0	

St. Thomas Water Distribution System - 2016 Summary Report Albert Robert Booster Station Monthly Data

October 2016

Day of the Month	Discharge Flow	Suction Header Pressure	Discharge Header Pressure	Discharge Free Chlorine Residual	Discharge Volume
	<i>l/s</i>	<i>kPa</i>	<i>kPa</i>	<i>mg/l</i>	<i>m3</i>
1	90.3	117	334	1.18	7785.00
2	89.3	113	334	1.08	7712.50
3	92.8	115	334	1.13	8017.50
4	96.3	110	334	1.03	8315.50
5	97.1	116	334	1.10	8362.50
6	96.4	117	334	1.06	8326.00
7	92.7	114	334	1.14	8004.50
8	87.7	113	333	1.05	7576.50
9	87.1	114	334	1.10	7519.00
10	86.8	112	333	1.01	7493.50
11	90.3	115	334	1.20	7798.50
12	95.4	116	334	1.19	8231.50
13	95.6	115	334	1.19	8259.50
14	92.6	114	334	1.05	7990.00
15	86.8	113	334	1.14	7494.00
16	85.1	112	334	1.07	7355.00
17	93.3	114	334	1.22	8049.00
18	88.9	113	334	1.17	7640.50
19	89.3	111	334	1.17	7685.00
20	87.5	113	334	1.26	7562.50
21	85.6	110	334	1.09	7388.50
22	85.6	115	334	1.19	7390.00
23	84.6	109	334	1.08	7304.00
24	87.4	113	334	1.20	7544.00
25	88.2	112	333	1.10	7576.00
26	88.8	114	334	1.18	7652.00
27	88.3	112	334	1.31	7608.50
28	86.3	116	334	1.59	7439.50
29	84.6	115	334	1.42	7314.50
30	85.6	112	334	1.42	7392.00
31	85.2	115	334	1.37	7355.50
Average	89.4	114	334	1.18	7714.27
Minimum	16.4	0	0	0.48	7304.00
Day of Minimum	25	25	25	21	23
Maximum	142.8	191	364	1.86	8362.50
Day of Maximum	17	28	2	28	5
Monthly Total					239142.50
Events				0	

St. Thomas Water Distribution System - 2016 Summary Report Albert Robert Booster Station Monthly Data

November 2016

Day of the Month	Discharge Flow	Suction Header Pressure	Discharge Header Pressure	Discharge Free Chlorine Residual	Discharge Volume
	<i>l/s</i>	<i>kPa</i>	<i>kPa</i>	<i>mg/l</i>	<i>m3</i>
1	86.6	115	334	1.26	7477.00
2	85.3	114	334	1.22	7369.00
3	85.3	113	334	1.18	7368.50
4	84.7	114	334	1.26	7311.00
5	84.1	114	334	1.23	7252.00
6	85.0	116	334	1.31	7470.50
7	83.8	115	334	1.32	7227.00
8	80.5	107	310	1.31	6211.50
9	82.2	115	334	1.32	7096.50
10	83.0	115	334	1.24	7162.50
11	81.5	110	334	1.18	7017.50
12	81.6	111	334	1.24	7041.00
13	81.3	113	334	1.24	7013.00
14	81.8	114	334	1.20	7062.50
15	81.0	113	334	1.33	6985.50
16	80.2	115	334	1.17	6928.00
17	80.0	117	334	1.12	6907.50
18	81.1	112	334	1.16	6999.00
19	80.9	112	334	1.20	6973.50
20	81.3	113	334	1.23	7021.50
21	81.1	111	334	1.26	7006.00
22	80.6	111	334	1.20	6934.00
23	79.4	116	334	1.17	6830.00
24	78.5	112	334	1.08	6778.50
25	79.3	111	334	1.05	6839.00
26	81.5	119	334	1.08	7040.50
27	82.3	113	334	1.08	7092.50
28	79.3	116	334	1.14	6851.50
29	77.9	113	334	1.12	6721.50
30	78.4	111	334	1.14	6760.00
31					
Average	81.6	113	333	1.20	7024.93
Minimum	0.5	0	0	0.20	6211.50
Day of Minimum	8	8	8	18	8
Maximum	155.0	206	362	2.00	7477.00
Day of Maximum	10	2	24	18	1
Monthly Total					210748.00
Events				0	

St. Thomas Water Distribution System - 2016 Summary Report Albert Robert Booster Station Monthly Data

December 2016

Day of the Month	Discharge Flow	Suction Header Pressure	Discharge Header Pressure	Discharge Free Chlorine Residual	Discharge Volume
	<i>l/s</i>	<i>kPa</i>	<i>kPa</i>	<i>mg/l</i>	<i>m3</i>
1	79.2	116	334	1.14	6831.00
2	79.4	114	334	1.10	6853.50
3	80.4	114	334	1.20	6948.00
4	79.7	116	334	1.22	6862.00
5	77.9	113	334	0.99	6711.50
6	78.6	116	334	1.02	6790.50
7	79.6	116	334	1.05	6876.50
8	79.3	116	334	1.11	6844.50
9	78.7	112	334	1.13	6798.50
10	79.6	114	334	1.05	6867.00
11	78.8	117	334	1.17	6790.50
12	78.5	108	334	1.06	6763.50
13	75.9	107	334	1.08	6548.50
14	78.3	121	334	1.17	6759.00
15	76.3	109	334	1.12	6594.50
16	76.4	109	334	1.00	6591.50
17	76.4	118	334	0.99	6592.50
18	74.6	112	334	0.99	6435.00
19	74.8	112	334	0.99	6454.00
20	74.3	112	334	0.99	6407.50
21	74.7	118	334	1.10	6436.00
22	74.1	110	334	1.07	6402.50
23	75.1	109	334	1.01	6485.00
24	78.1	115	334	1.04	6745.50
25	69.8	116	334	1.07	6030.50
26	70.9	114	334	1.05	6126.00
27	72.6	113	334	1.00	6265.00
28	73.7	112	334	0.95	6359.50
29	72.3	108	334	1.00	6242.00
30	73.2	106	334	0.93	6316.50
31	74.3	106	334	1.00	6416.50
Average	76.3	113	334	1.06	6585.31
Minimum	7.7	62	309	0.29	6030.50
Day of Minimum	14	9	12	6	25
Maximum	129.6	221	376	1.41	6948.00
Day of Maximum	14	14	25	7	3
Monthly Total					204144.50
Events				0	

2016 Yearly Report - Albert Roberts

Month of the Year	Discharge Flow	Suction Header Pressure	Discharge Header Pressure	Discharge Free Chlorine Residual	Discharge Volume
	<i>l/s</i>	<i>kPa</i>	<i>kPa</i>	<i>mg/l</i>	<i>m3</i>
January	57.4	117	329	1.02	153544.50
February	59.0	115	330	1.02	154519.25
March	70.3	114	331	1.11	187676.50
April	71.7	114	332	1.02	184084.50
May	76.6	113	332	1.06	201670.50
June	96.1	113	333	1.08	247210.00
July	97.2	113	333	1.11	254285.50
August	100.8	112	333	1.06	266685.00
September	96.0	112	333	1.12	241957.50
October	89.4	114	334	1.18	239142.50
November	81.6	113	333	1.20	210748.00
December	76.3	113	334	1.06	204144.50
Average	81.0	114	332	1.09	212139.02
Minimum	0.5	0	0	0.00	153544.50
Day of Minimum	14	8	8	26	
Month of Minimum	Apr	Nov	Nov	Aug	January
Maximum	300.0	221	381	2.00	266685.00
Day of Maximum	14	14	17	29	
Month of Maximum	Apr	Dec	May	Apr	August
Yearly Total					2545668.25

