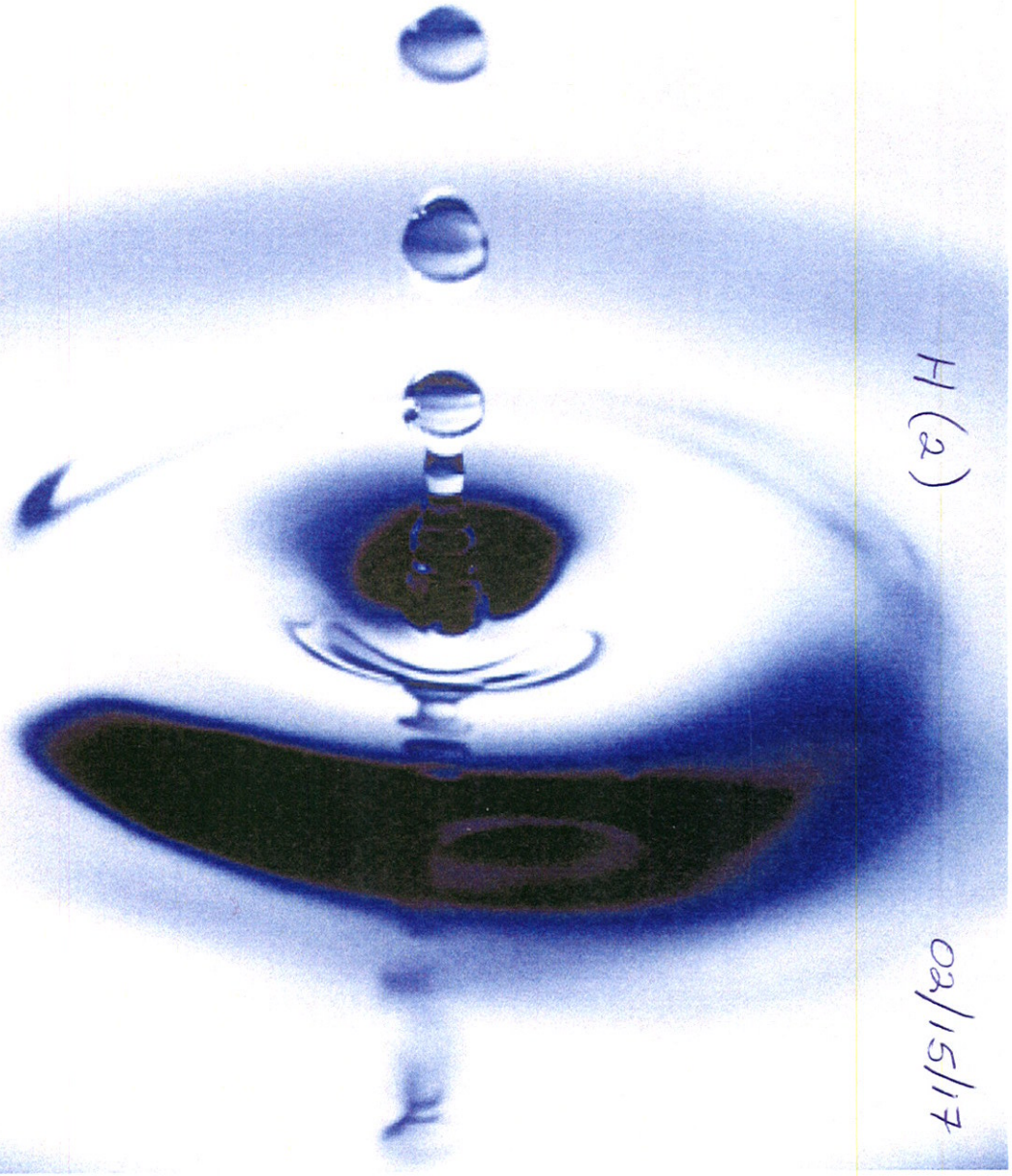
JOHNSON

PUC SERVICES

DESBARATS
DRINKING WATER SYSTEM
WATERWORKS # 210001870

ANNUAL & SUMMARY
REPORTS 2016



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Introduction

This Annual and Summary Report has been prepared in accordance with both Schedule 22 and section 11 of Ontario Regulation 170/03. In this manner, the requirements by regulation for each report have been consolidated into a single document. This Report is intended to brief the ownership and consumers of the Desbarats Drinking Water System on the system's performance over the past calendar year January 1 to December 31, 2016.

This report encompasses all elements as required by O. Reg. 170/03. Each section explains what is required for the category Small Municipal Residential DWS (as it pertains to the Desbarats DWS) and how limits were met or if shortfalls were revealed. The last section contains a list of tables and definition of terms identified in this report.

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System Description

The Desbarats water treatment plant is rated as a Class 2 Water Treatment subsystem, and for the purposes of O. Reg. 170/03 it is categorized as a Small Municipal Residential system.

The treatment plant includes two (2) low lift centrifugal pumps, each pump rated at 4.24 L/s that deliver surface water from Lake Huron.
The treatment system includes an Ecodyne Monoplant complete with mechanical flocculation, sedimentation and dual media filtration compartments. The filter portion of the package plant involves a dual media of sand and anthracite and provides for filtering to waste after backwashing. Waste from the clarifier is drained at timed intervals to backwash settling tanks from which supernatant travels by gravity to a diffuser in Lake Huron, located downstream from the intake site.

Post chlorination using sodium hypochlorite is injected after filtration before the clearwell to achieve primary and secondary chlorination. There are three (3) cells to the clearwell (reservoir) with a total storage capacity of 142 cubic meters. There is standby power for continued pumping capacity and plant operations. The system also involves six (6) pre-charged pressure tanks for distribution pressure control.

There are approximately 276 residents using the system with 110 service connections (93 private residences) and a secondary school with a population of about 600 students. Water is provided to the distribution system through a submarine transmission main.

Chemicals

Chemicals utilized at the Desbarats Treatment plant during 2016 include:

- Sodium Hypochlorite for primary and secondary disinfection
- Aluminum Sulphate for coagulation
- Polymer (Magnafloc LT20) as a coagulant aid
- Soda Ash for pH and alkalinity adjustment

2016 Expenditures

During the year of 2016, expenses were incurred to maintain treatment and distribution functions:

- 2 main breaks and repairs in distribution.
- Electrical conduit replacement due to deterioration.
- PLC and SCADA upgrade.

2016 Drinking Water System Changes

- Form 1 – Record of Watermains Authorized as a Future Alteration
  - **n/a**
- Form 2 – Record of Minor Modification or Replacements
  - **2016-04-14 MOE Form 2 - PLC Replacement**
- Form 3 – Record of addition, modification or replacement of equipment discharging a contaminant of concern to the atmosphere
  - **n/a**

Water Quality

Microbiological Sampling and Testing

Sampling is conducted weekly for the DWS at the frequencies and locations identified by Schedule 11 of O. Reg 170/03 for Small Municipal Residential Systems.

Table 1: Microbiological sampling requirements

Location	Sample Analysis	# samples	Frequency
Raw	EC / TC	1 sample	monthly
Treated	N/A	-	-
Distribution	EC / TC/ HPC-25%	1 sample	bi-weekly

Desbarats' raw samples are collected from a sample tap from the raw water header. Treated samples are collected from a sample tap from the treated discharge header prior to distribution. Distribution samples are rotated weekly at the following locations representing areas throughout the hamlet: Township Office, Baptist Church, Arena, and Central Algoma Secondary School. Other locations may be sampled as required.

Table 1a: Microbiological Sample Results

Type	# samples	EC (range)	TC (range)	# samples	HPC (range)
Raw	12	0 - 4	1 - 1200	-	-
Treated	-	-	-	-	-
Distribution	65	0	0	56	0 - 271

Distribution samples are collected more frequent (weekly) than required by regulation.

Operational Checks and Testing

Operational testing is completed as per Schedules 6 & 7 of O. Reg. 170/03 for Small Municipal Residential Systems. These checks and testing are completed on site at the water treatment facility by licensed operators. Continuous monitoring analyzers (collecting 5 minute readings) are utilized for measurement of filter turbidity and chlorine residuals.

Table 2: Monthly Filter Turbidity Results

Month	Avg turbidity (NTU)	Range (NTU)	Monthly Filter Efficiency
January	0.08	0.04 - 1.00	99.53
February	0.07	0.04 - 0.26	100
March	0.07	0.04 - 0.81	99.98
April	0.06	0.04 - 0.15	100
May	0.04	0.03 - 0.14	100
June	0.04	0.03 - 0.17	100
July	0.04	0.03 - 0.17	100
August	0.04	0.03 - 0.32	99.94
September	0.04	0.03 - 0.05	100
October	0.04	0.03 - 0.08	100
November	0.04	0.03 - 0.19	100
December	0.06	0.03 - 0.26	100

Filter Efficiency is monitored by tracking the turbidity readings above and below 0.30 NTU during filter run time. ***Desbarats maintained filter compliance each month above 95%***, the required limit for dual media filtration to achieve necessary filtration credits for primary disinfection.

Table 3: Chlorine Residuals

Month	Average Chlorine Residual (mg/L)	Chlorine Residual Range (mg/L)
January	1.43	0.89 - 1.82
February	1.42	0.87 - 2.10
March	1.43	0.77 - 1.84
April	1.50	1.07 - 1.74
May	1.39	1.09 - 1.80
June	1.46	1.25 - 1.78
July	1.43	1.03 - 2.51
August	1.45	1.13 - 2.47
September	1.41	1.06 - 1.59
October	1.42	1.18 - 1.60
November	1.46	0.89 - 1.90
December	1.41	1.02 - 2.00

Chlorine residuals are continuously monitored and data is recorded on 5 minute intervals.

Chemical Sampling and Testing

Schedule 13 of O.Reg 170/03 outlines chemical sampling regiments for Small Municipal Residential systems. Schedules 23 (inorganics) and 24 (organics) are collected every 60 months as well as sodium and fluoride. This system requires quarterly sampling for Nitrites/Nitrates and THM's. Schedule 15.1 outlines the requirements for semi-annual lead testing (2 periods per year). Desbarats' lead sampling follows the reduced sampling requirements every third year.

Table 4: Schedule 23 - Inorganics

Parameter	Sample Date	Result (µg/L)	Units	ODWS
Antimony	9-Jan-13	<0.6	µg/L	6
Arsenic	9-Jan-13	<1.0	µg/L	25
Barium	9-Jan-13	<10.0	µg/L	1000
Boron	9-Jan-13	<50.0	µg/L	5000
Cadmium	9-Jan-13	<0.1	µg/L	5
Chromium	9-Jan-13	<1.0	µg/L	50
Fluoride	9-Jan-13	<0.03	mg/L	1.5
Mercury	9-Jan-13	<0.1	µg/L	1
Selenium	9-Jan-13	<1.0	µg/L	10
Sodium	9-Jan-13	4.47	mg/L	20
Uranium	9-Jan-13	<2.0	µg/L	20

All results for inorganic parameters are within the maximum acceptable concentrations (MAC) of the Ontario Drinking Water Quality Standards as defined in O.Reg 169/03. No result is above the half MAC.

Table 5: Nitrite/ Nitrate Results

Date	ODWS	12-Jan-16	12-Apr-16	12-Jul-16	11-Oct-16
Unit	mg/L	mg/L	mg/L	mg/L	mg/L
Nitrite	1.0	<0.010	<0.010	<0.010	<0.010
Nitrate	10	0.315	0.319	0.268	0.236

All quarterly results for Nitrites and Nitrates are well below ODWS.

Table 6: Schedule 24 – Organics

Parameter	Date	Result	Unit	ODWS
Alachlor	9-Jan-13	<0.1	µg/L	5
Aldicarb	9-Jan-13	<1.0	µg/L	9
Aldrin + Dieldrin	9-Jan-13	<0.04	µg/L	0.7
Atrazine + N-dealkylated metobolites	9-Jan-13	<0.2	µg/L	5
Azinphos-methyl	9-Jan-13	<0.1	µg/L	20
Bendiocarb	9-Jan-13	<0.2	µg/L	40
Benzene	9-Jan-13	<0.5	µg/L	5
Benzo(a)pyrene	9-Jan-13	<0.01	µg/L	0.01
Bromoxynil	9-Jan-13	<0.2	µg/L	5
Carbaryl	9-Jan-13	<0.2	µg/L	90
Carbofuran	9-Jan-13	<0.2	µg/L	90
Carbon Tetrachloride	9-Jan-13	<0.5	µg/L	5
Chlordane (Total)	9-Jan-13	<0.3	µg/L	7
Chlorpyrifos	9-Jan-13	<0.1	µg/L	90
Cyanazine	9-Jan-13	<0.1	µg/L	10
Diazinon	9-Jan-13	<0.1	µg/L	20
Dicamba	9-Jan-13	<0.2	µg/L	120
1,2-Dichlorobenzene	9-Jan-13	<0.5	µg/L	200
1,4-Dichlorobenzene	9-Jan-13	<0.5	µg/L	5
Dichlorodiphenyltrichloroethane (DDT) + metabolites	9-Jan-13	<0.4	µg/L	30
1,2-Dichloroethane	9-Jan-13	<0.5	µg/L	5
1,1-Dichloroethylene (vinylidene chloride)	9-Jan-13	<0.5	µg/L	14
Dichloromethane	9-Jan-13	<0.5	µg/L	50
2-4 Dichlorophenol	9-Jan-13	<0.3	µg/L	900
2,4-Dichlorophenoxy acetic acid	9-Jan-13	<0.2	µg/L	100
Diclofop-methyl	9-Jan-13	<0.2	µg/L	9
Dimethoate	9-Jan-13	<0.1	µg/L	20
Dinoseb	9-Jan-13	<0.2	µg/L	10

Parameter	Date	Result	Unit	ODWS
Diquat	9-Jan-13	<1.0	µg/L	70
Diuron	9-Jan-13	<1.0	µg/L	150
Glyphosate	9-Jan-13	<5.0	µg/L	280
Heptachlor + Heptachlor Epoxide	9-Jan-13	<0.2	µg/L	3
Lindane (Total)	9-Jan-13	<0.1	µg/L	4
Malathion	9-Jan-13	<0.1	µg/L	190
Methoxychlor	9-Jan-13	<0.1	µg/L	900
Metolachlor	9-Jan-13	<0.1	µg/L	50
Metribuzin	9-Jan-13	<0.1	µg/L	80
Monochlorobenzene	9-Jan-13	<0.5	µg/L	80
Paraquat	9-Jan-13	<1.0	µg/L	10
Parathion	9-Jan-13	<0.1	µg/L	50
Pentachlorophenol	9-Jan-13	<0.5	µg/L	60
Phorate	9-Jan-13	<0.1	µg/L	2
Picloram	9-Jan-13	<0.2	µg/L	190
Polychlorinated Byphenols (PCB)	9-Jan-13	<0.035	µg/L	3
Prometryne	9-Jan-13	<0.1	µg/L	1
Simazine	9-Jan-13	<1.0	µg/L	10
THM (RAA)	2016	10.1	µg/L	100
Temephos	9-Jan-13	<0.1	µg/L	280
Terbufos	9-Jan-13	<0.2	µg/L	1
Tetrachloroethylene	9-Jan-13	<0.5	µg/L	30
2,3,4,6-Tetrachlorophenol	9-Jan-13	<0.5	µg/L	100
Triallate	9-Jan-13	<0.1	µg/L	230
Trichloroethylene	9-Jan-13	<0.5	µg/L	5
2,4,6-Trichlorophenol	9-Jan-13	<0.5	µg/L	5
2,4,5-Trichlorophenoxy acetic acid	9-Jan-13	<0.2	µg/L	280
Trifluralin	9-Jan-13	<0.1	µg/L	45
Vinyl Chloride	9-Jan-13	<0.5	µg/L	2

All results for the required organic sampling of schedule 24 are below the MAC.

Lead Sampling: The maximum acceptable concentration for lead in drinking water is 10 ug/L. This applies to water at the point of consumption since lead is only present as a result of corrosion of lead solder, lead containing brass fittings or lead pipes which are found close to or in domestic plumbing and the service connection to buildings.

Table 7: Community Lead Sampling Results

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

Lead samples are collected during the two prescribed periods each year (Dec 15 – Mar15 and June 15- Oct 15).

Sample results revealed zero exceedances during year 2016.

Table 8: TSS – C of A requirement for plant process waste water

Month	Result Value	Unit
January	9.0	mg/L
February	8.0	mg/L
March	17.0	mg/L
April	30.5	mg/L
May	9.0	mg/L
June	21.0	mg/L
July	13.0	mg/L
August	31.0	mg/L
September	2.0	mg/L
October	11.0	mg/L
November	10.0	mg/L
December	3.0	mg/L

The 2016 annual average suspended solids is 18.6 mg/L for plant service water (backwash water, instrumentation flows) released back to the environment, ***and is under the C of A limit of 25 mg/L.***

Compliance

Adverse Water Quality Incidents

During 2016, the Desbarats DWS reported three incidents of adverse water quality.

Table 9: Adverse Water Quality Incidents

Date	Incident Reported
06-Jan-16	Loss of Distribution pressure for main repair
28-Jan-16	High filter turbidity due to poor dosage rates of coagulant for low lift pump losing prime.
26-Jul-16	Loss of Distribution pressure for main repair

Two of the AWQI incidents that occurred in 2016 were the result of loss of distribution pressure due to repairs of main breaks in the system. After repairs were completed and the water supply restored, the hamlet was placed on a DWA until system flushing and microbiological sampling completed, obtaining results non-detect. The filter turbidity AWQI was due to a loss of prime on the raw water pump, causing high chemical dosage within the reactor. The reactor was drained and re-filled to correct proper dosage and the filters were backwashed.

Annual Drinking Water System Inspection

The annual DWS inspection took place on Dec 7, 2016 by MOECC Drinking Water inspector Stephanie Robbins. Zero non-conformances and zero recommendations and best practice were identified. ***The DWS received a final inspection rating of 100%***

Flows

The Permit to Take Water authorizes the municipality to draw water from Lake Huron at a rate not to exceed 547.2 m^3/d.

The maximum daily volume taken was 247 m^3, 45.1% of the permit limit.

Municipal Drinking Water Licence: 275-201 specifies a maximum intake capacity of 366 m^3/d.

The max flow rate reported was 197 m^3, 53.8% of the rated capacity.

The Desbarats WTP treated and distributed a total of 32,226 m^3 during the year of 2016. The average day treated flow demand was 88m^3/d, and maximum day flow was 197 m^3 on July 26, 2016 (during the occurrence of a main break).

Chart 1: Five year Flow Comparison

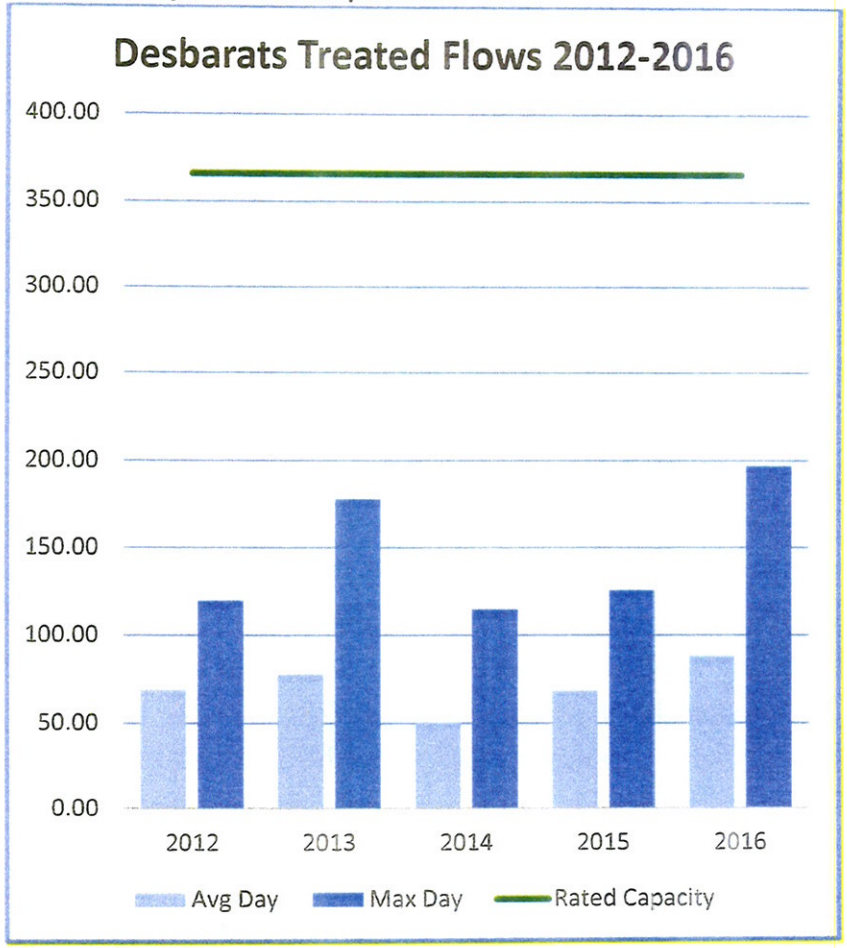
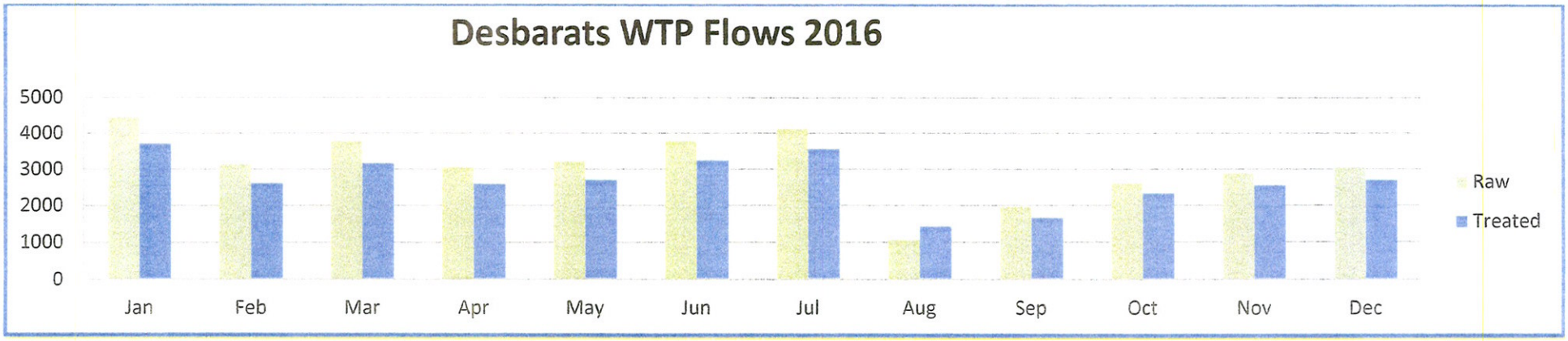


Table 10: Raw and Treated water Flows 2016

2016	Raw Water Flows					Treated Water Flows			
Month	Raw Water (m^3)	Minimum Day (m^3/d)	Maximum Day (m^3/d)	Average Day (m^3/d)	% Max. Flow Day of PTTW	Treated Water (m^3)	Minimum Day (m^3/d)	Maximum Day (m^3/d)	Average Day (m^3/d)
January	4,472	99	203	144	37.1	3,708	91	166	120
February	3,173	90	126	109	23.0	2,614	77	105	90
March	3,806	88	162	123	29.6	3,167	71	140	102
April	3,077	74	135	103	24.7	2,593	61	113	86
May	3,243	76	139	105	25.4	2,704	70	113	87
June	3,800	87	184	127	33.6	3,244	77	163	108
July	4,144	48	247	134	45.1	3,555	35	197	115
August	1,076	42	95	55	17.4	1,418	33	60	46
September	1,970	45	88	66	16.1	1,651	38	77	55
October	2,633	51	118	85	21.6	2,331	44	103	75
November	2,904	64	132	97	24.1	2,547	67	99	85
December	3,073	70	135	99	24.7	2,694	65	122	87

Chart 2: Desbarats WTP Flows 2016



Report Endorsement

Report Availability

Section 11 of O. Reg. 170/03 defines that this Annual Report must be given, without charge, to every person who requests a copy. Effective steps must also be taken to advise users of water from the system that copies of the report are available, without charge, and of how a copy may be obtained. This Annual Report shall be made available for inspection by the public on the Town Office.

Township of Johnson
1 Johnson Drive
Desbarats, ON
P0R 1E0

In accordance with Schedule 22 of O. Reg. 170/03, this Annual Report must be given to the members of the municipal council. Section 19 (Standard of care, municipal drinking-water system) of Ontario's Safe Drinking Water Act also places certain responsibilities upon those municipal officials who oversee an accredited operating authority or exercise decision-making authority over a system

Report Endorsement

This Summary report for The Desbarats Drinking Water System has been prepared in accordance to Schedule 22 of O. Reg 170/03, for the period of January 1st to December 31st 2016. The report has been reviewed and accepted by the Township of Johnson council.

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Date

Tables, Definition of Terms

Appendix A: List of Tables/ Charts

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Appendix B: Definition of Terms

Acronym	Definition
AWQI	Adverse water quality incident
BWA	Boil Water Advisory
DM	Dual Media
DWS	Drinking water system
EC	E. Coli
GUDI	Groundwater under direct influence of surface water
HPC	Heterotrophic plate count
m^3	Cubic metres
m^3/d	Cubic metres per day
mg/L	Milligram per litre (part per million)
ML	Megalitre (1000 m3)
NTU	Nephelometric turbidity unit
O. Reg. 170/03	Ontario Regulation 170/03
PTTW	Permit to take water
SCADA	Supervisory control and data acquisition
TC	Total coliforms
THM	Trihalomethane
µg/L	Microgram per litre (part per billion)
WD	Water distribution
WT	Water treatment
WTP	Water treatment plant