

MACTIER WATER SUMMARY 2015 REPORT



DRINKING WATER WORKS PERMIT: 143-207
MUNICIPAL DRINKING WATER LICENCE: 143-107

M.O.E. WATERWORKS#: 220004224

INTRODUCTION

The Beech Avenue Water Treatment Plant (W.T.P.) in MacTier is owned and operated by the District Municipality of Muskoka.

The plant operates under Municipal Drinking Water Licence 143-107 and Drinking Water Permit 143-207, issued on October 6th 2015, under the Municipal Drinking Water Licensing Program. . The plant also operates under MOE Permit to Take Water #7510-7LHTS6 which permits the operation of up to 1,428.5 cubic metres per day (m³/d). Stewart Lake is the raw water source for the treatment facility.

The water treatment plant began treating and supplying potable water to the town of MacTier in March of 1995 and has a rated capacity of 1,904 cubic meters per day. The waterworks currently serves a population of approximately 740 persons.

The treatment process consists of raw water inlet screens and low lift pumps, which deliver raw water to a twin train package treatment plant. The package treatment plant consists of two process trains, each provided with chemically assisted coagulation, flocculation, sedimentation and filtration processes. The treated water then enters the clearwell. High lift pumps deliver the finished water from the clearwell to the distribution system. Chemical treatment consists of Sodium Permanganate, Sodium Hypochlorite, Polyaluminum Chloride, Hydrated Lime, Carbon Dioxide, Sodium Hydroxide and Fluoride.

All treatment control systems use a Supervisory Control And Data Acquisition (SCADA) system for process control and monitoring.

Legislation Requirements

Safe Drinking Water Act

In the Part Two Report of the Walkerton Inquiry, Commissioner Dennis O'Connor recommended that the Ontario Government enact a Safe Drinking Water Act to deal with matters related to treatment and distribution of drinking water. The Safe Drinking Water Act received royal assent in December 2002.

The purpose of the Act is to gather in one place all legislation and regulations relating to the treatment and distribution of drinking water. The Act serves to protect human health through the control and regulation of drinking water systems and drinking water testing.

The foundation provisions of the Safe Drinking Water Act include:

- Purpose of the Act
- Definitions
- Minister's Powers and Duties
- Inspections
- Compliance and Enforcement
- Appeals and Offences

Ontario Regulations

The Ontario Government has enacted several supporting regulations under the Safe Drinking Water Act (2000) SDWA. These regulations combine previous requirements under the Ontario Water Resources Act and the new requirements under the SDWA. Key components of the regulations include:

- System Categories
- Groundwater Under Direct Influence Of Surface Water (GUDI)
- Exemptions
- Approval of Systems
- Treatment
- Testing and Operational Checks (General Rules)
- Operational Checks
- Microbiological Testing
- Chemical Testing
- Adverse Conditions
- Corrective Action
- Engineer's and Summary Reports

Municipal Drinking Water Licences / Certificates of Approval

The Municipal Drinking Water Licencing Program has replaced the Certificate of Approval program for municipal residential drinking water systems. The Ontario Government has implemented the Municipal Drinking Water Licencing Program (MDWLP) as recommended by Justice O'Connor in the Part II Report of the Walkerton Inquiry. Justice O'Connor recommended a new approvals framework for municipal drinking water systems, which would require owners to obtain a licence to operate their systems as well as incorporate the concept of quality management into their operations.

A municipal drinking water licence is an approval that is issued by the MOE to owners under the Safe Drinking Water Act, 2002 for the operation of municipal residential drinking water systems. The District of Muskoka operated under various Certificates of Approval until October 2010 when the operating licences were issued.

Previous Certificates of Approval were required for the establishment, replacement or alteration of all municipal drinking water systems. The Ministry of Environment (MOE) issued Certificates of Approval to ensure that all undertakings comply with the legislation (i.e. Acts and Regulations) and the Ministry's Environmental Guidelines and Procedures developed to provide consistency of approach to various aspects of environmental protection throughout the province.

Municipal Drinking Water Licences and Permits similar to previous Certificates of Approval provide specific details about the drinking water system including:

Drinking Water System Description

Definitions and Information

General Information – Compliance, Other Legal Requirements, Adverse Affects, Inspections

Performance – Rated Capacity, Management of Residue

Monitoring and Recording – Flow Measuring Devices, Sampling

Operations and Maintenance

Comparison to Rated Capacity and Flow Rates

The Beech Avenue water treatment plant has a rated capacity of 1,904 m³/day. In 2015, the average flow for the year was 212 m³/day. The maximum day flow for the year was 634 m³/day, however, the 3 year average for maximum day flow is 593 m³/day, which represents 31% of the plant design capacity. (No problems have been associated with this flow).

Monthly flows are shown in the attached table.

The Permit to Take Water (PTTW #7510-7LHTS6) permits 1,428.5 m³/day; therefore there were no exceedances of this permit.

Summary of Analytical Results

A total of 645 microbiological regulatory tests were performed in 2015 and compliance with Provincial standards was achieved throughout with one exception.

On July 1st a routine distribution microbiological sample indicated a positive Total Coliform count of 1 CFU (coliform forming unit) per 100 ml. Resamples were collected immediately and the test result was not repeatable. Regulatory reporting protocols were followed and all sample results were satisfactory.

There were 160 free chlorine residual tests performed in the distribution system and all results were satisfactory.

A summary of other analytical results is also shown in this report.

Summary of Treatment Chemicals

The following chemicals are used for the treatment of drinking water at the Beech Avenue Water Treatment Plant:

Sodium Permanganate: Manganese control
Sodium Hypochlorite: Disinfectant
Polyaluminum Chloride (SternPAC): Primary coagulant
Hydrated Lime: Alkalinity and pH adjustment
Carbon Dioxide: pH adjustment
Sodium Hydroxide: Final pH adjustment
Hydrofluosilicic Acid: Fluoride to prevent dental decay.

A table summarizing the chemical use and average dosages is included in this report.

Documentation of System Repairs and Upgrades

No significant capital expenses were incurred to conduct system repairs or upgrades in 2015.

External Audits

MOE Inspection

A MOE inspection was completed on January 8, 2016 and is attached to this report. The overall rating was 100%.

DWQMS Audit

In 2015 all drinking water systems had an external recertification audit performed. There were seven (7) minor non-conformances reported, all have subsequently been addressed and as a result all drinking water systems have been recertified. Overall, all drinking water systems are performing satisfactorily.



OPTIONAL ANNUAL REPORT TEMPLATE

Drinking-Water System Number:	220004224
Drinking-Water System Name:	MacTier (Beech Avenue) Drinking Water System
Drinking-Water System Owner:	District Municipality of Muskoka
Drinking-Water System Category:	Large Municipal Residential
Period being reported:	January 01 to December 31, 2015

<p><u>Complete if your Category is Large Municipal Residential or Small Municipal Residential</u></p> <p>Does your Drinking-Water System serve more than 10,000 people? Yes [] No [X]</p> <p>Is your annual report available to the public at no charge on a web site on the Internet? Yes [X] No []</p> <p>Location where Summary Report required under O. Reg. 170/03 Schedule 22 will be available for inspection.</p> <div style="border: 1px solid black; padding: 5px;"> <p>District Municipality of Muskoka 70 Pine Street Bracebridge, Ontario P1L 1N3 (705) 645-6764 www.muskoka.on.ca</p> </div>	<p><u>Complete for all other Categories.</u></p> <p>Number of Designated Facilities served: <div style="border: 1px solid black; padding: 2px; width: 100px; text-align: center;">N.A.</div> </p> <p>Did you provide a copy of your annual report to all Designated Facilities you serve? Yes [] No []</p> <p>Number of Interested Authorities you report to: <div style="border: 1px solid black; padding: 2px; width: 100px; text-align: center;">N.A.</div> </p> <p>Did you provide a copy of your annual report to all Interested Authorities you report to for each Designated Facility? Yes [] No []</p>
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Note: For the following tables below, additional rows or columns may be added or an appendix may be attached to the report

List all Drinking-Water Systems (if any), which receive all of their drinking water from your system:

Drinking Water System Name	Drinking Water System Number
N.A.	

Did you provide a copy of your annual report to all Drinking-Water System owners that are connected to you and to whom you provide all of its drinking water?
Yes [] No []



Indicate how you notified system users that your annual report is available, and is free of charge.

- Public access/notice via the web
- Public access/notice via Government Office
- Public access/notice via a newspaper
- Public access/notice via Public Request
- Public access/notice via a Public Library
- Public access/notice via other method _____

Describe your Drinking-Water System

The water treatment plant serving the community of MacTier was constructed in 1995. The treatment process consists of chemically assisted coagulation-flocculation, sedimentation and filtration using multi-media filters with a combination of gravel, sand and anthracite coal. Disinfection in a post-treatment chlorine contact chamber is followed by final pH adjustment before the treated water is pumped to our customers. Our waterworks currently serves a population of approximately 740 persons. The rated water production capacity of the plant is 1,904 cubic meters per day. Our raw water source is Stewart Lake and the intake is located 1.5 meters above the lakebed at a depth of 11 meters and about 220 meters from shore.

List all water treatment chemicals used over this reporting period

Sodium Hypochlorite, , Polyaluminum Chloride Sodium Hydroxide, Carbon Dioxide, Hydrated Lime, Fluoride , Sodium Permanganate

Were any significant expenses incurred to?

- Install required equipment
- Repair required equipment
- Replace required equipment

Please provide a brief description and a breakdown of monetary expenses incurred

Provide details on the notices submitted in accordance with subsection 18(1) of the Safe Drinking-Water Act or section 16-4 of Schedule 16 of O.Reg.170/03 and reported to Spills Action Centre

Incident Date	Parameter	Result	Unit of Measure	Corrective Action	Corrective Action Date
July 1, 2015	Total Coliform – (Distribution system)	1	CFU/100 ml	Resample	July 2, 2015



Microbiological testing done under the Schedule 10, 11 or 12 of Regulation 170/03, during this reporting period.

	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 #)
Raw	52	0 - 4	0 - 52	0	NA
Treated	52	0 - 0	0 - 0	52	0 - 4
Distribution	159	0 - 0	0 - 1	52	0 - 3

Operational testing done under Schedule 7, 8 or 9 of Regulation 170/03 during the period covered by this Annual Report.

	Number of Grab Samples	Range of Results (min #)-(max #)	Geometric Average
Turbidity	8760	0.02 - 0.05 NTU	0.026 NTU
Chlorine	8760	1.38 - 2.11 mg/L	1.77 mg/L
Fluoride (If the DWS provides fluoridation)	8760	0.06 - 0.69 mg/L	0.53 mg/L

***NOTE:** For continuous monitors use 8760 as the number of samples.*

Summary of additional testing and sampling carried out in accordance with the requirement of an approval, order or other legal instrument.

Date of legal instrument issued	Parameter	Date Sampled	Result	Unit of Measure
N.A.				

Summary of Inorganic parameters tested during this reporting period or the most recent sample results

Parameter	Sample Date	Result Value	Unit of Measure	Exceedance
Antimony	May 11/15	0.08	µg/L	No
Arsenic	May 11/15	0.2<MDL	µg/L	No
Barium	May 11/15	12.5	µg/L	No
Boron	May 11/15	13.5	µg/L	No
Cadmium	May 11/15	0.007	µg/L	No
Chromium	May 11/15	0.03<MD	µg/L	No
*Lead	May 11/15		µg/L	No
Mercury	May 11/15	0.06	µg/L	No
Selenium	May 11/15	1<MDL	µg/L	No
Sodium	May 11/15	23.6	mg/L	Yes
Uranium	May 11/15	0.06	µg/L	No
Fluoride	May 11/15	0.54	mg/L	No
Nitrite	Feb 2/15	0.003<MDL	mg/L	No
Nitrate	Feb 2/15	0.129	mg/L	No
Nitrite	May 11/15	0.003<MDL	mg/L	No
Nitrate	May 11/15	0.184	mg/L	No



Nitrite	Aug 10/15	0.003<MDL	mg/L	No
Nitrate	Aug 10/15	0.219	mg/L	No
Nitrite	Nov 02/15	0.003<MDL	mg/L	No
Nitrate	Nov 02/15	0.072	mg/L	No

*only for drinking water systems testing under Schedule 15.2; this includes large municipal non-residential systems, small municipal non-residential systems, non-municipal seasonal residential systems, large non-municipal non-residential systems, and small non-municipal non-residential systems

Summary of lead testing under Schedule 15.1 during this reporting period

(applicable to the following drinking water systems; large municipal residential systems, small municipal residential systems, and non-municipal year-round residential systems)

Location Type	Number of Samples	Range of Lead Results (min#) – (max #)	Unit of Measure	Number of Exceedances
Plumbing	0			
Distribution	2	0.01 - 0.03	µg/L	No

Summary of Organic parameters sampled during this reporting period or the most recent sample results

Parameter	Sample Date	Result Value	Unit of Measure	Exceedance
Alachlor	May 11/15	0.02<MDL	µg/L	No
Aldicarb	May 11/15	0.01<MDL	µg/L	No
Aldrin + Dieldrin	May 11/15	0.01<MDL	µg/L	No
Atrazine + N-dealkylated metabolites	May 11/15	0.01<MDL	µg/L	No
Azinphos-methyl	May 11/15	0.05<MDL	µg/L	No
Bendiocarb	May 11/15	0.01<MDL	µg/L	No
Benzene	May 11/15	0.32<MDL	µg/L	No
Benzo(a)pyrene	May 11/15	0.004<MDL	µg/L	No
Bromoxynil	May 11/15	0.33<MDL	µg/L	No
Carbaryl	May 11/15	0.05<MDL	µg/L	No
Carbofuran	May 11/15	0.01<MDL	µg/L	No
Carbon Tetrachloride	May 11/15	0.16<MDL	µg/L	No
Chlordane (Total)	May 11/15	0.01<MDL	µg/L	No
Chlorpyrifos	May 11/15	0.02<MDL	µg/L	No
Cyanazine	May 11/15	0.03<MDL	µg/L	No
Diazinon	May 11/15	0.02<MDL	µg/L	No
Dicamba	May 11/15	0.20<MDL	µg/L	No
1,2-Dichlorobenzene	May 11/15	0.41<MDL	µg/L	No
1,4-Dichlorobenzene	May 11/15	0.36<MDL	µg/L	No
Dichlorodiphenyltrichloroethane (DDT) + metabolites	May 11/15	0.01<MDL	µg/L	No
1,2-Dichloroethane	May 11/15	0.35<MDL	µg/L	No
1,1-Dichloroethylene (vinylidene chloride)	May 11/15	0.33<MDL	µg/L	No
Dichloromethane	May 11/15	0.35<MDL	µg/L	No
2-4 Dichlorophenol	May 11/15	0.15<MDL	µg/L	No
2,4-Dichlorophenoxy acetic acid (2,4-D)	May 11/15	0.19<MDL	µg/L	No
Diclofop-methyl	May 11/15	0.40<MDL	µg/L	No
Dimethoate	May 11/15	0.03<MDL	µg/L	No



Dinoseb	May 11/15	0.36<MDL	µg/L	No
Diquat	May 11/15	1<MDL	µg/L	No
Diuron	May 11/15	0.03<MDL	µg/L	No
Glyphosate	May 11/15	1<MDL	µg/L	No
Heptachlor + Heptachlor Epoxide	May 11/15	0.01<MDL	µg/L	No
Lindane (Total)	May 11/15	0.01<MDL	µg/L	No
Malathion	May 11/15	0.02<MDL	µg/L	No
Methoxychlor	May 11/15	0.01<MDL	µg/L	No
Metolachlor	May 11/15	0.01<MDL	µg/L	No
Metribuzin	May 11/15	0.02<MDL	µg/L	No
Monochlorobenzene	May 11/15	0.30<MDL	µg/L	No
Paraquat	May 11/15	1<MDL	µg/L	No
Parathion	May 11/15	0.02<MDL	µg/L	No
Pentachlorophenol	May 11/15	0.15<MDL	µg/L	No
Phorate	May 11/15	0.01<MDL	µg/L	No
Picloram	May 11/15	1<MDL	µg/L	No
Polychlorinated Biphenyls(PCB)	May 11/15	0.04<MDL	µg/L	No
Prometryne	May 11/15	0.03<MDL	µg/L	No
Simazine	May 11/15	0.01<MDL	µg/L	No
THM (NOTE: Annual average of 4 samples – Distribution system)	May 11/15	73	µg/L	No
Temephos	May 11/15	0.01<MDL	µg/L	No
Terbufos	May 11/15	0.01<MDL	µg/L	No
Tetrachloroethylene	May 11/15	0.35<MDL	µg/L	No
2,3,4,6-Tetrachlorophenol	May 11/15	0.20<MDL	µg/L	No
Triallate	May 11/15	0.01<MDL	µg/L	No
Trichloroethylene	May 11/15	0.44<MDL	µg/L	No
2,4,6-Trichlorophenol	May 11/15	0.25<MDL	µg/L	No
2,4,5-Trichlorophenoxy acetic acid (2,4,5-T)	May 11/15	0.22<MDL	µg/L	No
Trifluralin	May 11/15	0.02<MDL	µg/L	No
Vinyl Chloride	May 11/15	0.17<MDL	µg/L	No

List any Inorganic or Organic parameter(s) that exceeded half the standard prescribed in Schedule 2 of Ontario Drinking Water Quality Standards.

Parameter	Result Value	Unit of Measure	Date of Sample

District of Muskoka - Beach Ave. WTP - Mactier

1.0 Water Flow Summary - 2015

Month	Total Monthly (m ³)	Average Day Flow (m ³ /d)	Maximum Day Flow (m ³ /d)	Minimum Day Flow (m ³ /d)	Comments
January	6,044	195	280	134	
February	5,068	181	270	88	
March	6,626	214	295	127	
April	5,542	185	269	108	
May	7,802	252	634	124	
June	6,768	226	318	178	
July	7,635	246	309	179	
August	7,259	234	280	183	
September	6,594	220	354	149	
October	6,415	207	497	114	
November	5,690	190	327	106	
December	5,967	192	256	122	

Total 77,409

Average Day 211.7

Maximum Day 634.2

Minimum Day 87.9

District of Muskoka - Beach Ave. WTP - Mactier

2.0 Raw Water Monthly Analysis Summary - 2015

Month	Alkalinity	Hardness	pH	Turbidity	True Colour	Temperature	Conductivity	Langliers Saturation Index	Total Coliform	E-coli	Total Number of Samples
<i>Parameter</i>	<i>mg/l</i>	<i>mg/l</i>	<i>pH</i>	<i>ntu</i>	<i>tcu</i>	<i>Celcius</i>	<i>uS/cm</i>		<i>CFU/100ml</i>	<i>CFU/100ml</i>	
January	27	30	6.8	0.8	47	6.1	118	-2.3	6	0	4
February	27	30	6.7	0.7	50	6.7	117	-2.3	3	0	4
March	29	30	6.7	0.5	48	6.9	118	-2.4	2	0	5
April	27	29	6.7	0.6	40	7.0	117	-2.2	10	<1	4
May	25	26	6.9	0.6	42	8.4	116	-2.3	3	0	4
June	24	28	6.7	0.5	39	8.7	114	-2.4	1	<1	5
July	25	27	6.7	0.4	38	9.0	113	-2.6	2	<1	4
August	25	28	6.5	0.4	41	9.3	114	-2.6	2	<1	5
September	24	27	6.5	0.6	39	10.3	113	-2.7	3	<1	4
October	27	29	6.6	1.0	41	10.6	115	-2.4	20	1	4
November	25	29	7.0	1.3	25	10.7	107	-2.1	30	3	5
December	26	29	7.1	1.4	33	7.6	121	-1.8	41	1	4
Average	26	28	6.8	0.7	40	8.4	115	-2.3	10	<1	4

District of Muskoka - Beach Ave. WTP - Mactier

9.0 Chemical Usage Summary - 2015

Month	Powdered Activated Carbon		CO2		Hydrated Lime		Coagulant	
	Average Dosage mg/L	Total kg	Average Dosage mg/L	Total kg	Average Dosage mg/L	Total kg	Average Dosage mg/L	Total Kg
January	0	0	29.5	187.9	13.5	86.6	30.0	191.9
February	0	0	36.1	193.6	13.5	72.3	30.0	160.1
March	0	0	31.4	219.3	13.5	93.7	30.0	207.7
April	0	0	21.8	128.8	13.5	79.1	30.0	175.1
May	0	0	21.8	178.8	13.5	109.7	30.0	243.0
June	0	0	19.4	136.7	13.5	95.5	30.0	211.5
July	0	0	18.6	147.3	13.5	108.0	30.0	239.3
August	0	0	21.2	159.3	13.5	102.4	30.0	226.8
September	0	0	18.7	134.4	13.5	95.8	30.0	212.3
October	0	0	14.2	96.2	13.5	93.4	30.0	206.9
November	0	0	18.8	112.9	13.5	81.5	30.0	180.5
December	0	0	19.4	122.6	13.5	85.5	30.0	189.4
Average Monthly	0	0	22.6	151.5	13.5	92.0	30.0	203.7
Total Yearly		0		1,818		1,104		2,445

Month	Sodium Hydroxide		Fluoride		Chlorine		Soda Ash	
	Average Dosage mg/L	Total Kg	Average Dosage mg/L	Total kg	Average Dosage mg/L	Total Kg	Average Dosage mg/L	Total Kg
January	12.7	76.9	0.80	4.5	4.03	23.8	0	0
February	12.7	64.5	0.74	3.2	4.03	19.9	0	0
March	12.7	84.3	0.64	4.1	4.03	25.8	0	0
April	12.7	70.6	0.61	3.3	4.03	21.7	0	0
May	12.7	99.3	0.66	4.8	4.03	30.2	0	0
June	12.7	86.2	0.61	3.9	4.03	26.3	0	0
July	12.7	97.2	0.66	4.7	4.03	29.7	0	0
August	12.7	92.4	0.72	5.0	4.03	28.2	0	0
September	12.7	83.9	0.74	4.8	4.03	26.2	0	0
October	12.7	81.7	0.60	3.9	4.03	25.5	0	0
November	12.7	72.4	0.63	3.5	4.03	22.3	0	0
December	12.7	76.0	0.66	3.9	4.03	23.4	0	0
Average Monthly	12.7	82.1	0.67	4.1	4.03	26	0	0
Total Yearly		985		50		303		0

Month	Sodium Permanganate		Polymer	
	Average Dosage mg/L	Total Kg	Average Dosage mg/L	Total Kg
January	0.6	3.6	0	0
February	0.4	1.9	0	0
March	0	0	0	0
April	0	0	0	0
May	0	0	0	0
June	0	0	0	0
July	0	0	0	0
August	0	0	0	0
September	0.1	0.7	0	0
October	0.7	5.0	0	0
November	1.1	6.7	0	0
December	0.6	3.5	0	0
Average Monthly	0.6	3.6	0	0
Total Yearly		21		0

2015 MACTIER WATER DISTRIBUTION SUMMARY

New Services:

No new customers applied for a permit to connect to existing municipal water services in 2015.

Broken Watermains:

There were no broken watermains to report.

Service Leaks

There was 1 service leak reported that was the District of Muskoka's responsibility. The curb stop was excavated and replaced at a total cost of approximately \$1,500.00.

Frozen Services

There were 6 (six) frozen water services within the municipal road allowances in 2015. All 6 affected customers were provided water by feeding overland services from an adjacent property.

New Watermains:

There were no new water mains installed.

Valve Replacement:

There were no new valves installed and all 68 valves were operated.

Fire Hydrants:

Routine fire hydrant maintenance was performed which includes, inspecting, operating and greasing each hydrant, seasonal flushing, scoping, and snow removal numerous times through the winter months. There are 56 fire hydrants in the community of MacTier.

Meter Installations:

A total of 19 (nineteen) water meters were repaired and 1 (one) water meter was replaced in 2015.

Air Vacuum Release Valves:

All 5 Air Vacuum release valves were drained, operated, and inspected. One valve was determined to be faulty and is scheduled to be replaced in 2016.

Locates:

Staff addressed 32 locate requests in 2015.

Ministry of the Environment and
Climate Change

Safe Drinking Water
Branch

Director's Office
2nd floor
40 St. Clair Ave West
Toronto ON M4V 1M2

Ministère de l'Environnement

Direction du contrôle de la qualité de l'eau
potable

Bureau du directeur
2^e étage
40, avenue St. Clair Ouest
Toronto (Ontario) M4V 1M2



January 21, 2016

The District Municipality of Muskoka
70 Pine Street
Bracebridge, Ontario
P1L 1N3

Attention: Mr. Marcus Firman, Director of Water and Wastewater Engineering

**RE: 2015 Drinking Water Inspection Report
Mactier (Beech) Drinking Water System (DWS#220004224)
Date of MOECC inspection: January 8, 2016**

Please find enclosed the Ministry of the Environment and Climate Change's 2015 Inspection Report for the Mactier (Beech) Drinking Water System (DWS#220004224), following an inspection of the water treatment plant and distribution system on January 8, 2016.

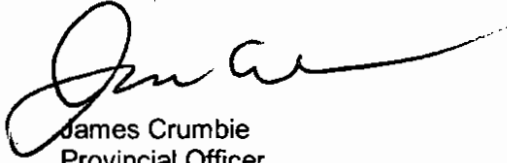
The primary focus of this inspection was to confirm compliance with Ministry of the Environment and Climate Change legislation and control documents, as well as conformance with Ministry drinking water related policies for the inspection period. The Ministry is implementing a rigorous and comprehensive approach in the inspection of water systems that focuses on the source, treatment, and distribution components as well as water system management practices.

In order to measure individual inspection results, the Ministry has established an inspection compliance risk framework based on the principles of the Inspection, Investigation & Enforcement (II&E) Secretariat and advice of internal and risk experts. The Inspection Summary Rating Record (IRR), included as Appendix D of the inspection report, provides the Ministry, the system Owner and the associated Public Health Units with a summarized quantitative measure of the drinking water system's annual inspection and regulated water quality testing performance. IRR ratings are published (for the previous inspection year) in the Ministry's Chief Drinking Water Inspector's Annual Report. If you have any questions or concerns regarding the rating, please contact Craig Seabrook, Water Program Supervisor, at 705-739-6392.

Section 19 of the Safe Drinking Water Act (Standard of Care) creates a number of obligations for individuals who exercise decision-making authority over municipal drinking water systems. Please be aware that the Ministry has encouraged such individuals, particularly municipal councillors, to take steps to be better informed about the drinking water systems over which they have decision-making authority. These steps could include asking for a copy of this inspection report and a review of its findings. Further information about Section 19 can be found in the Ministry's publication "Taking Care of Your Drinking Water: A guide for members of municipal council" found under the "Resources" tab on the Ministry's Drinking Water Ontario website at www.ontario.ca/drinkingwater.

If you have any questions or concerns regarding this inspection report, please contact the undersigned at 705-739-6379.

Respectfully,



James Crumbie
Provincial Officer
Ministry of the Environment and Climate Change
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Medical Officer of Health, Simcoe Muskoka District Health Unit
Barrie District Office File, Ministry of the Environment and Climate Change



Ministry of the Environment and Climate Change

**MACTIER (BEECH) DRINKING WATER SYSTEM
Inspection Report**

Site Number:	220004224
Inspection Number:	1-BYLIZ
Date of Inspection:	Jan 08, 2016
Inspected By:	James Crumbie

OWNER INFORMATION:

Company Name: MUSKOKA, THE CORPORATION OF THE DISTRICT MUNICIPALITY OF
Street Number: 70 **Unit Identifier:** District Office
Street Name: PINE St N
City: BRACEBRIDGE
Province: ON **Postal Code:** P1L 1N3

CONTACT INFORMATION

Type: Main Contact **Name:** Lee Gillan
Phone: (705) 687-8956 **Fax:** (705) 687-8972
Email: lgillan@muskoka.on.ca
Title: Manager of Water & Sewer Operations

INSPECTION DETAILS:

Site Name: MACTIER (BEECH) DRINKING WATER SYSTEM
Site Address: 18 BEECH AVE MACTIER P0C 1H0
County/District: Georgian Bay
MOECC District/Area Office: Barrie District
Health Unit: SIMCOE MUSKOKA DISTRICT HEALTH UNIT
Conservation Authority: N/A
MNR Office: N/A
Category: Large Municipal Residential
Site Number: 220004224
Inspection Type: Announced
Inspection Number: 1-BYLIZ
Date of Inspection: Jan 08, 2016
Date of Previous Inspection: Sep 19, 2014

COMPONENTS DESCRIPTION

Site (Name): MOE DWS Mapping
Type: DWS Mapping Point **Sub Type:**
Comments:
Not Applicable

Site (Name): RAW @ PLANT
Type: Source **Sub Type:** Surface

Comments:

The MacTier Water Treatment Plant (WTP) commenced treating and supplying potable water to the community of MacTier in 1995. Stewart Lake, located adjacent to the WTP is the raw water source. The raw water intake works, the treatment works and process residual management equipment are all contained within a single structure located at 18 Beech Avenue in MacTier, District Municipality of Muskoka.

Raw Water - Low Lift Pumping Station (LLPS)

The intake structure is located approximately 220 m offshore in Stewart Lake, 1.5 m above the lakebed at a depth of approximately 11 m. The intake consists of an intake hood, stainless steel screen with 25 mm openings, and an unused chlorine solution diffuser ring with a 25 mm diameter, 220 m long poly vinyl chloride (PVC) chlorine solution supply line for zebra mussel control which runs inside the intake main, all of which is secured within a timber crib. A 250 mm diameter, 220 m long polyethylene transmission main, weighted with concrete collars, extends from the intake structure to the LLPS.

The LLPS is comprised of an underground intake well and low lift pump well (LLPW). The raw water transmission main is equipped with an isolation valve where it enters the intake well. Provision for prechlorination also exists at this point. Separating the intake well and the LLPW are two in-line stationary intake screens with 10 mm openings. A continuously monitored dissolved oxygen sensor and a level sensor are located in the LLPW. Four submersible low lift pumps (LLP's) located in the LLPW discharge into the raw water header leading to the treatment equipment. Each submersible pump has a rated capacity of 5.5 L/s (litres per second) at 7 m total dynamic head (TDH). Two of the pumps have constant speed drives and the other two have variable frequency drives (VFD's). Each pump discharge is equipped with a continuously monitored pressure sensor, an isolation valve, backflow prevention and a pressure gauge. The pumps operate on filter level.

The raw water discharge header is equipped with a valved return line to the LLPW, a raw water sample tap, an air release valve, on-line turbidity and pH analysers, an on-line temperature probe, injection points for hydrated lime slurry, carbon dioxide (CO₂), sodium hypochlorite (Cl₂), and sodium permanganate (NaMnO₄), a static mixer, and a 150 mm on-line magnetic flow meter.

A pH analyser is located in each of the two filter pretreatment cells. A NaMnO₄ analyser probe is located in each of the two second pretreatment cells. Typically, both cells operate simultaneously and each is equipped with an isolation valve at the point of entry.

Although not currently operational, there is a system designed to recycle process wastewater by combining the raw water from Stewart Lake with supernatant from the sludge thickener. The thickener receives (received) backwash water from the backwash holding tanks (BWHT's) which, in turn, collect backwash water from the facility's filters. Up to 10% of the total raw water flow volume can be recycled. Supernatant and wastewater is currently all directed to the sanitary sewers. Supernatant can be directed to Stewart Lake on an emergency basis. However, if recycling is occurring, supernatant is returned to the LLPW from the sludge thickener. The supply can be controlled with automated flow valves which are currently not in use but are typically operated manually.

Access to the screens, pumps and tanks in the LLPS is achieved through plate metal hatches which are on raised concrete pads.

Site (Name): PRE-TREATMENT**Type:** Treated Water POE**Sub Type:** Treatment Facility**Comments:**

Water from the raw water header can be directed into two parallel 7.6 m³ pre-treatment basins, each of which is divided into two cells and a flash mixing tank. Each cell is equipped with a 0.25 kW variable speed mixer. The first cell in each basin is equipped with an on-line level sensor, a powdered activated carbon (PAC) injection point (unused) and a hydrated lime injection point (unused). Each pre-treatment basin and the first stage flocculation tanks are equipped with pH monitoring. The coagulant "SternPAC" (poly aluminum chloride) is added at the point of entry to the third pre-treatment cell - the flash mixing tank. Each of the two 0.25 m³ flash mixing tanks are equipped with 0.75 kW

variable speed mixers. Coagulant addition produces floc. Both pretreatment trains are typically operated. The addition of CO₂ and lime is completed in the raw water header prior to the flow meter. Water leaving the pre-treatment portion of the WTP is valved in such a way as to direct it to both treatment trains. Flow valves on the common line between the two trains maintain level. Water enters the flocculation chambers of the two conventional package treatment plants at this point.

Site (Name): TREATMENT

Type: Treated Water POE

Sub Type: Treatment Facility

Comments:

The two parallel package conventional water treatment plants are each rated at 952 cubic metres per day (m³/d) with a total capacity of 1,904 m³/d. Each unit consists of a 20.2 m³ flocculation chamber, a 22.2 m³ tube settling chamber, and an anthracite-sand gravity filter.

Water leaving the pretreatment section of the WTP passes unused polymer injection points and enters the three stage flocculation chamber, providing a total hydraulic retention time (HRT) of 30 minutes. Each stage (or tank) is equipped with a paddle mixer and variable speed drive providing tapered mixing speed (fast to slow) through each stage of flocculation. The flocculated water is then directed into the settling chamber where consolidated solid particles (floc) are separated from the water by gravity with the help of upflow "tube settlers". Tube settlers are bundles of small-bore vertical tubes, installed at a 60 degree incline within the settling chamber, which aid in the sedimentation process prior to conventional filtration. The settling chamber provides a 34 minute HRT and is equipped with gravity desludge piping and automated valves which direct removed sediment to the sludge holding tank. All sludge generated at the facility is now directed to the sanitary sewers and then on to the MacTier STP for disposal. Water leaves the settling chambers by way of troughs and is directed through automated flow valves and into anthracite-sand rapid gravity filters having surface areas of 6.6 m² and complete with surface wash systems and automated backwash capabilities. On-line level sensors are located in each filter unit which control LLP starts. The 6 m/h filtration rate dual-media filters are comprised of a 460 mm layer of anthracite coal, a 230 mm layer of sand, and a 560 mm layer of supporting gravel covering the underdrains. Gravity filtration forces particles remaining within the water to be removed and retained by the filter media. Two vertical turbine pumps, rated at 90 L/s at 15 m TDH, draw from the high lift pump well (HLPW) and are used for filter backwashing. Backwashes can be automated but are typically initiated manually. Filter backwash water and filter to waste water is directed to the BWHT's. On-line turbidity analysers draw from the effluent lines of both filters. Each effluent line is equipped with a 100 mm, on-line magnetic flow meter and a Cl₂ injection point for disinfection prior to entering the 190 m³ below grade, concrete, baffled chlorine contact chamber (CCC). A 140 m³ clearwell is located adjacent to the CCC. A 300 mm pipe connects the CCC/ clearwell to the 105 m³ HLPW. Continuous free chlorine residual, pH and temperature monitoring is conducted at this location, with samples being supplied to the analyzers by a peristaltic pump. One screened vent pipe is located within the WTP for these tanks.

Four vertical turbine high lift pumps (HLP's) are located within the HLPW in addition to the two backwash pumps. There are two rated at 5.5 L/s at 55 m TDH which are equipped with VFD's and two rated at 11 L/s at 55 m TDH which are equipped with constant speed drives. These pumps deliver treated water to the distribution system and are triggered by water tower level. The HLPW is equipped with an on-line level sensor and an overflow with air break which empties to the lake. The HLP discharges are all equipped with isolation valves, pressure sensors, pressure gauges, backflow prevention and a pressure relief valve on the common header which will dump back into the HLPW if system pressure gets too high. A discharge for wasting outside the plant is provided. A post chlorine (Cl₂) residual pump rated at 3.6 L/h injects into the common discharge header at programmed Cl₂ concentrations. The fluoride injection is located on the common discharge header. Also, a NaOH injection point is installed on the HLP discharge header. A pressure transmitter and a 150 mm on-line magnetic flow meter are also installed on the high-lift pump discharge pipe. Water leaves the WTP and enters the distribution system at this point. A water service line returns from the distribution main and is used to supply on-line analysers for monitoring treated drinking water pH, temperature, free chlorine residual, turbidity and fluoride.

Automatic control and monitoring of the various system components, on and off site, is achieved by the process logic controllers (PLC's) throughout the system, and the SCADA system at the WTP.

Phone lines link the remote components of the system to the WTP. The system can be run manually if desired.

A finished water sample tap is located on the HLP discharge.

Access to the various below grade tanks is achieved through plate metal hatches on raised concrete pads.

Standby Power

Standby power consists of a 150 kW diesel power generator set located within the WTP. It provides emergency standby power for the WTP. Fuel is stored in two 910 L tanks with secondary containment within the generator room. Fuel level is continuously monitored by the SCADA system and with a manual gauge.

Site (Name): BACKWASH PROCESS RESIDUALS - TREATMENT & RECIRCULATION SYSTEM

Type: Treated Water POE

Sub Type: Treatment Facility

Comments:

The backwash process residuals treatment and recirculation system consists of two 100 m³ BWHT's, with sloped bottoms, which settle out suspended solids from filter backwash water. The BWHT's are equipped with on-line level sensors, isolation and flow valves, an emergency overflow provision to the outfall (return to Stewart Lake), and a decant valve to allow for backwash supernatant recycling to the LLPW (currently not in use). Submersible sludge pumps in each tank with rated capacities of 4.4 L/s at 11 m TDH discharge collected backwash waste from the bottom of each BWHT to the sludge thickener. The pumps operate automatically on tank level. Only one tank is typically emptied at a time. The BWHT discharge line is equipped with an on-line magnetic flow meter.

The 5.4 m³ sludge thickener is no longer in service, however backwash wastewater is still directed to the sludge thickener tank, from where it flows by gravity to the sanitary sewer.

All waste water from the BWHT's is directed to the sanitary sewers. Floor drains also empty into the sewers.

Site (Name): CHEMICAL STORAGE & FEED SYSTEMS

Type: Treated Water POE

Sub Type: Treatment Facility

Comments:

Sodium Permanganate - NaMnO₄

A NaMnO₄ storage and feed system, that consists of two duty and one standby peristaltic chemical metering pumps, each rated at of 500mL/min, injects the permanganate solution into the raw water header for manganese control (required seasonally). The system includes a dilution and batching/mixing system, a solution heater, an uninterruptible power source (UPS), and containers for undiluted 20% solution and a day tank for diluted 5% solution. Secondary containment is provided.

Hydrated Lime and Powdered Activated Carbon (PAC)

The lime and powdered activated carbon (PAC) storage and feed systems are comprised of a communal 700 kg bulk bag unloading system equipped with a screw feed/hopper and pneumatic (vacuum) blower system to transfer lime and PAC to their respective hoppers.

The unused PAC storage and feed system consists of a 2.8 m³ storage hopper, a 2.5 m³/hr volumetric dry feeder, and a 300 L solution tank equipped with a mechanical mixer and level sensor. Two (1 duty, 1 standby) positive displacement metering pumps rated at 134 L/h inject the PAC solution into the chemical pre-treatment basins for provisional taste and odour control (if required).

The hydrated lime storage and feed system is comprised of a 2.8 m³ storage hopper, a 41 kg/min (kilogram per minute) volumetric dry feeder, and a 330 L solution tank equipped with a mechanical mixer and level sensor. Two (1 duty, 1 standby) peristaltic metering pumps that are capable of producing 0-960L/hr, inject the lime slurry into the raw water header for alkalinity adjustment.

Dust collection and air dryers are provided for both the PAC and lime systems.

Carbon Dioxide - CO₂

The CO₂ gas feed system consists of two (1 duty, 1 standby) mini-bulk 340 kg cylinders complete with internal vapourizer and a truck fill line to the outside of the WTP. Each cylinder is connected to a common manifold for automatic vacuum changeover and sits on a continuously monitored weigh scale. An alarmed ambient CO₂ monitor is in place. The gas delivery system injects CO₂ into the raw water header for pH adjustment.

Coagulant - SternPAC

The coagulant storage and feed system is comprised of a contained 5 m³ bulk storage tank with a level sensor, a 450 L day tank with containment, level alarm and gravity transfer line from the bulk tank, and two (two duty, and an additional shelf spare) positive displacement metering pumps rated at 9.5 L/h which inject the coagulant, which acts as a flocculant and filter aid, into the flash mixing compartments of the pre-treatment facilities.

Polymer (unused)

The polymer storage and feed system consists of a 0.22 m³ storage hopper, a rotary dry volumetric feeder, and a 95 L dissolving and solution tank equipped with a mechanical mixing system, level sensors and alarms, and a flow controlled domestic water supply. Two (1 duty, 1 standby) positive displacement metering pumps rated at 9.5 L/h inject the polymer for use as either a coagulant aid during flocculation or for sludge thickening. This system is provisional and is currently not in use.

Sodium Hypochlorite

The sodium hypochlorite solution system is comprised of a 2 m³ bulk storage tank (currently not in use) with a level sensor, containment and gravity feed line to the day tank, a 200 L day tank with containment and level alarm, and three (1 duty, 1 standby duty and post, one duty post-chlorination (trim)) chemical metering pumps capable of producing 0-27 L/hr with alarmed flow monitors that inject sodium hypochlorite into the filtered and/or finished water for disinfection. Provision for prechlorination is provided. A flow failure will shut down the WTP, the HLP's and the chemical pumps.

Sodium Hydroxide - NaOH

The NaOH storage and feed system consists of a contained 450 L solution tank with a mixer and level alarm, and two (1 duty, 1 standby) positive displacement metering pumps rated at 9.5 L/h which inject NaOH at the point of entry to the HLPW for pH adjustment and corrosion control.

Hydrofluosilicic Acid - Fluoride

The fluoride storage and feed system is located in its own room with ventilation and alarms. It is comprised of a 110 L, double walled day tank, with weigh scale, level sensor and containment, and two (1 duty, 1 standby) positive displacement metering pumps rated at 1.6 L/h which inject the hydrofluosilicic acid into the HLP discharge header for tooth decay control. Chemical line flow sensors will alarm and shut down this system on a flow failure.

All of the chemical pumps are flow paced and are equipped with backflow prevention. There is no automatic switch-over capability for the chemical pumps except for the CO₂ tanks.

The following systems, if operational, are triggered by LLP flows: NaMnO₄, CO₂, lime, polymer, PAC, and coagulant.

The post filter chlorination system is triggered by filter flow.

The NaOH system is triggered by HLP flow.

The fluoride system is triggered by HLP flows and post chlorination is triggered by HLP flows and chlorine residual concentration, when required.

Site (Name): DISTRIBUTION (WATER INSPECTION)

Type: Other

Sub Type: Other

Comments:

There is currently an estimated 7683 m of watermain within the distribution system. The watermains are composed of various sizes ranging from 150 mm to 250 mm in diameter and are almost exclusively composed of polyvinyl chloride (PVC) with a small amount of high density polyethylene (HDPE) pipe. There has been no recent large scale expansion of the distribution system.

There are 56 fire hydrants, 68 main valves and five air relief valves.

The water system currently serves a population of approximately 740 residents with seasonal fluctuations. The system includes 278 total connections with approximately 245 residential services, 15 commercial services, 16 institutional services and two industrial services.

The water tower on Elizabeth Street is the only notable structure located within the distribution system.

Site (Name): WATER TOWER**Type:** Treated Water POE**Sub Type:** Reservoir**Comments:**

The elevated water storage tower, constructed at 6 Elizabeth Street, has a rated capacity of 1200 m³. It is located within a fenced area at the top of a hill in the centre of the distribution system.

The water tower is composed of an elevated steel storage tank on an approximately 30 m high concrete base. The structure has a locked, double steel door with an entry alarm. The tank is accessed by way of ladders inside the concrete base with catwalks and access hatches from the bottom and through the centre of the tank. There is a common inlet/outlet pipe connected to the distribution system by a 250 mm diameter watermain. The tower is also equipped with an overflow pipe which discharges from the tower to a nearby surface drainage ditch. The overflow pipe is connected to the inlet/outlet pipe by a normally closed valve. Isolation valves are located within the tower and in a valve chamber outside of the tower on the watermain. The vents at the top of the tower are reportedly screened.

A continuously monitored and alarmed, electronic free chlorine residual analyser draws water from the inlet/outlet pipe at the base of the tower.

Rechlorination facilities are available at the tower. A chemical pump rated at 1.6 L/hr may be used to inject 12% sodium hypochlorite solution into the common inlet/outlet pipe. It draws from a 100 L day tank. Although the rechlorination system may be automated through SCADA, it is typically operated manually when chlorine residuals within the distribution system warrant. Operational staff will operate the chlorine pump when the tower is filling to achieve a desired residual. A spare pump is kept on site. Automated leveling equipment connected to the SCADA system initiates HLP starts and stops at the WTP at programmed water levels in the tank.

A sample tap is located in the base of the tower on the inlet/outlet pipe.

The elevated tower received routine maintenance and was repainted in 2012.

INSPECTION SUMMARY

INTRODUCTION

- * The primary focus of this inspection is to confirm compliance with Ministry of the Environment and Climate Change (MOECC) legislation as well as evaluating conformance with ministry drinking water related policies and guidelines during the inspection period. The ministry utilizes a comprehensive, multi-barrier approach in the inspection of water systems that focuses on the source, treatment and distribution components as well as management practices.

This drinking water system is subject to the legislative requirements of the Safe Drinking Water Act, 2002 (SDWA) and regulations made therein, including Ontario Regulation 170/03, "Drinking Water Systems" (O.Reg. 170/03). This inspection has been conducted pursuant to Section 81 of the SDWA.

This report is based on a "focused" inspection of the system. Although the inspection involved fewer activities than those normally undertaken in a detailed inspection, it contained critical elements required to assess key compliance issues. This system was chosen for a focused inspection because the system's performance met the ministry's criteria, most importantly that there were no deficiencies as identified in O.Reg. 172/03 over the past 3 years. The undertaking of a focused inspection at this drinking water system does not ensure that a similar type of inspection will be conducted at any point in the future.

This inspection report does not suggest that all applicable legislation and regulations were evaluated. It remains the responsibility of the owner to ensure compliance with all applicable legislative and regulatory requirements.

The MacTier (Beech) drinking water system serves the Town of MacTier, in Georgian Bay Township, located along the west boundary of the District Municipality of Muskoka, accessible via Provincial Highway 400. The drinking water system serves an estimated population of 740 persons. There are approximately 278 total service connections, of which approximately 245 are residential services; 15 are commercial services; 16 are institutional services; and two are industrial services. There is no significant residential or commercial development anticipated for the community.

The MacTier (Beech) drinking water system is owned and operated by the Corporation of the District Municipality of Muskoka. The Corporation of the District Municipality of Muskoka is referred to as the Owner, Operator and Municipality for the purposes of this inspection report.

Drinking water for the Mactier community is obtained from Stewart Lake. The Mactier (Beech) drinking water treatment plant (WTP) commenced operation in March 1995. The drinking water treatment process consists of chemically assisted coagulation-flocculation, sedimentation and filtration, using multi-media filters with a combination of gravel, sand and anthracite coal. Disinfection is achieved by chlorination, through the use of sodium hypochlorite solution. Pre-treatment Alkalinity and pH adjustment is provided to enhance on the coagulant (SternPAC) process, through the addition of hydrated lime and carbon dioxide. Seasonal pre-treatment manganese control, is achieved through the addition of sodium permanganate. A Powdered Activated Carbon pre-treatment system also exists, and may be used in response to any taste and odour related issues, however operation of this system has not been necessary. Sodium hydroxide is added to aid in pH and corrosion control within the distribution system and fluoridation occurs through the addition of Hydrofluorosilicic Acid prior to the treated water being conveyed to the distribution system.

INTRODUCTION

The Mactier (Beech) drinking water system is categorized as a Large Municipal Residential drinking water system and is regulated by the Safe Drinking Water Act, 2002 (SDWA) and regulations made therein, including Ontario Regulation (O.Reg.)170/03.

Operation of the Mactier (Beech) drinking water system is authorized under Municipal Drinking Water Licence #143-107 (Licence) and Drinking Water Works Permit 143-207 (Permit) which were originally issued to the District of Muskoka, respectively as Licence Issue#1 on October 14, 2010, and Permit Issue#1 on October 13, 2010. In 2014, the Municipality submitted a Directors Notification to request corrections be made to the descriptions of the works, as a number of discrepancies had been identified, and the Permit was subsequently amended and re-issued as Permit Issue 2 on March 18, 2014.

On February 3, 2015, an application was submitted, by the Owner, to renew the Licence with the Ministry of the Environment and Climate Change (Ministry), and the Ministry renewed the Licence and re-issued Licence Issue #2 and Permit Issue #3 on October 6, 2015.

Water takings from Stewart Lake are permitted in accordance with Permit to Take Water (PTTW)# 7510-7LHTS6 issued November 27, 2008. The PTTW allows the Owner to take a maximum of 1428500 Litres per day (L/d) from Stewart Lake, at a rate not exceeding 1320 Litres per minute (L/min). The PTTW expires on November 30, 2018. Compliance with the PTTW was not assessed during the course of this inspection, however, the Owner is aware that water takings must be done in accordance with the conditions of a valid PTTW.

The Mactier (Beech) Drinking Water System was last inspected by the Ministry on Sep 19, 2014. Findings associated with that 2014/2015 inspection were detailed in Inspection Report # 1-BBVKE, issued to the Owner on October 9, 2015.

The January 8, 2016 inspection, to which this inspection report pertains, encompasses an inspection review period between September 19, 2014 and January 8, 2016. The January 8, 2016 inspection included a physical inspection of the water treatment equipment and facilities; interviews with operational staff; and a review of relevant documents for the inspection review period. A physical inspection of the Elevated Water Tower was also undertaken.

CAPACITY ASSESSMENT

- **There was sufficient monitoring of flow as required by the Permit and Licence or Approval issued under Part V of the SDWA**

Condition 2.1, Schedule C of the Licence requires the Owner to ensure the continuous flow measurement and recording be undertaken for the flow rate and daily volume of water conveyed into the treatment system and the flow rate and daily volume of water conveyed from the treatment system into the distribution system.

To comply with this condition, the Owner has installed magnetic flow measuring devices on the combined raw water header prior to the two separate filter train inlets, one on each of the filter train outlets, and one on the plant discharge header entering the distribution system. A flow meter is also installed to measure the filter backwash/sludge wastewater being pumped from the WTP to the sanitary sewer.

Instantaneous flow rates are measured by each flow measuring device and continuously trended and recorded on the Supervisory Control and Data Acquisition (SCADA) system associated with the drinking water system. Totalized daily flows are calculated by SCADA, and transcribed to record keeping mechanisms for reporting purposes. Several of the flow meters are also used for process control purposes.

All flow measuring devices were most recently calibrated between October 28 and 30, 2015.

There were reportedly no concerns identified with the calibrations.

CAPACITY ASSESSMENT

- ★ **The owner was in compliance with the conditions associated with maximum flow rate or the rated capacity conditions in the Permit and Licence or Approval issued under Part V of the SDWA.**

Condition 1.1, Schedule C of the Licence stipulates that the maximum daily volume of treated water that flows from the Mactier (Beech) water treatment plant to the distribution system shall not exceed 1900 cubic metres per day (m³/d).

In 2014 the maximum day demand occurred on January 16, 2014 when a total daily flow of 630m³ or 33% of the rated capacity was noted to have occurred. The average day demand for 2014 was reported to be approximately 279.4m³/d or 15% of the plant rated capacity.

In 2015 the maximum day demand occurred on May 27, 2015 when a total daily flow of 634m³ or 33% of the rated capacity was noted to have occurred. The average day demand for 2015 was reported to be approximately 211.7m³/d or 11% of the plant rated capacity.

During water production, the rate of flow into the treatment system is governed by the variable frequency drive low lift pumps and actuated valving installed on each of the filtration train inlets and outlets. Low lift pump operation and valving control is done through the PLC and SCADA, based on maintaining a sufficient water level in the filters and the reservoir. A review of records made during this inspection review period indicates that the Mactier (Beech) drinking water system was not operated to exceed the plant rated capacity set out in the Licence. Similarly, records indicate that the filters were not operated in excess of their design capacities (952m³/d) during the production of water. The filters are typically operated in unison, each at a filtration rate of 10m³/hr. During this inspection review period, the maximum filter production volumes occurred on May 27, 2015, when Filter 1 produced 286.42m³ and Filter 2 produced 289.32m³.

TREATMENT PROCESSES

- ★ **The owner had ensured that all equipment was installed in accordance with Schedule A and Schedule C of the Drinking Water Works Permit.**

A review of the equipment installed at the Mactier (Beech) water treatment plant was referenced and found to compare favourably to the equipment listed in the Permit issued for the Mactier (Beech) Drinking Water System.

As previously discussed, a Form 2 – Record of Minor Modification document and subsequent Director Notification form was submitted in early 2014 to update the descriptions of the sodium hydroxide feed panel, the coagulant feed panel, low lift pumping modifications, modifications to the clearwell chlorine feed system, and the pump feeding the treated water analysers. As a result of that submission, the Permit was subsequently re-issued as Permit Issue 2 on March 18, 2014.

On February 3, 2015, the Municipality also submitted an application to renew the Licence with the Ministry, as the licence was set to expire in October 2015. The Ministry renewed the Licence and re-issued Licence Issue #2 and Permit Issue #3 on October 6, 2015.

During this inspection review period, the sodium permanganate feed pumps and pump panel was replaced on August 26, 2015 and a Form 2 – Record of Minor Modification document was prepared on August 27, 2015. The pump panel is now comprised of “chem-flare” type tubing and fittings, and the three positive displacement pumps (two duty, one standby) were replaced with three peristaltic chemical metering pumps. As the Permit describes the two duty and the standby metering pumps as being capable of respectively pumping at 3.1L/h and 3.6L/h, and all three of the new peristaltic pumps are all capable of pumping up to 30L/h, there was no need for a Director Notification to be submitted in conjunction with this alteration. The Permit description of the sodium permanganate feed systems remains accurate.

There were reportedly no other alterations to the drinking water system during this inspection review period, that required the completion of Form 2 document or necessitated the need for an alteration of the description of the drinking water system components. Similarly, there were

TREATMENT PROCESSES

reportedly no watermain additions or modifications to necessitate the completion of any Form 1 documents, nor were there reportedly any minor modifications undertaken or additions made which required the completion of any Form 3 documents, during this inspection review period.

A Form 1 document was prepared, prior to the Ministry's previous inspection in 2014, following the installation of a new section of watermain that had been installed in conjunction with the CP rail underpass project.

- **The owner/operating authority was in compliance with the requirement to prepare Form 2 documents as required by their Drinking Water Works Permit during the inspection period.**
- **Records indicated that the treatment equipment was operated in a manner that achieved the design capabilities required under Ontario Regulation 170/03 or a Permit, Licence or Approval issued under Part V of the SDWA at all times that water was being supplied to consumers.**

O.Reg.170/03 requires that treatment for a surface water source consist of chemically assisted filtration and disinfection capable of achieving at a minimum 2-log removal or inactivation of *Cryptosporidium* oocysts, 3-log removal or inactivation of *Giardia* cysts, and, 4-log removal or inactivation of viruses.

These requirements are reportedly met by conventional filtration followed by chlorination, with sodium hypochlorite, for both primary and secondary disinfection purposes.

According to the Ministry's Procedure for Disinfection and Schedule E of the Licence, the filtration process is credited with 2.5 log *Giardia* cyst removal, 2.0 log *Cryptosporidium* oocyst removal and 2.0 log virus removal credits, if the filtration process meets the following criteria:

- use a chemical coagulant at all times when the treatment plant is in operation;
- monitor and adjust chemical dosages in response to variations in raw water quality;
- maintain effective backwash procedures, including filter-to-waste or an equivalent procedure during filter ripening to ensure that the effluent turbidity requirements are met at all times;
- continuously monitor filtrate turbidity from each filter; and,
- meet the performance criterion for filtered water turbidity of less than or equal to 0.3 NTU in 95% of the measurements each month.

To ensure these criteria are met, the Owner has installed a chemical coagulation system comprised of chemical metering pumps dedicated to each filter train, each linked to SCADA for alarming purposes. In the event the chemical pumping system fails, the filter inlet and outlet valves close, such that water production ceases until such time the metering pump(s) are returned to service.

Continuous turbidimeters installed on each filter train outlet are configured to trigger an alarm and shut down the respective filter (inlet and outlet valves close), should filter effluent turbidity exceed 0.3NTU, or should the turbidimeter register a signal loss/malfunction.

The multimedia filters are backwashed manually by operational staff on a weekly basis, at a minimum, using SCADA controls and formalized filter backwashing and filter waste procedures are available within the Operations and Maintenance Manual. The filters are also capable of being backwashed automatically through SCADA based on run times, however, operational staff prefer to be on-site during the backwash process to observe for any abnormal conditions. Following a backwash cycle, water is filtered to waste. By design, water is not directed further into the treatment process until the filtrate turbidity is below 0.3 NTU.

Records indicate that the filters met the performance criterion of less than 0.3 NTU in 95% of the tests conducted each month during this inspection review period. SCADA is programmed to alarm should the trending results at the end of each month be out of compliance with the performance criteria. Records also indicate that the coagulant system was in operation when water was being produced, and backwash procedures were followed during this inspection review period.

TREATMENT PROCESSES

To achieve the remaining 0.5-log Giardia cysts and 2-log Virus removal or inactivation, a free available chlorine disinfection system is utilized and the CT disinfection concept is used to quantify the capability of the disinfection system for primary disinfection purposes. Free chlorine residual is achieved through the addition of a sodium hypochlorite solution to the filtered water being directed to the chlorine contact chamber where the contact time required for CT is afforded. The chlorine contact chamber has a baffle factor of 0.5 and provides, at the lowest operating level, a dedicated chlorine contact volume of 37.36m³. Based on normal chlorine contact/reservoir operating levels, the system is operated to target a free chlorine residual of 1.8mg/L at the end of the chlorine contact chamber, prior to the highlift pump chamber, and the addition of sodium hydroxide and hydrofluorosilicic acid on the high lift pump header. The chlorine analyzer used for primary disinfection monitoring, is provided samples from the inlet to the high lift pump chamber and is configured to trigger an alarm sequence should chlorine residuals fall below 1.30mg/L. Should the chlorine residual fall below 1.20mg/L the filters and high-lift pumps will shut down, ceasing water conveyance from the plant until operational staff respond to the site and resolve any issues.

A chlorine residual analyzer is also installed to measure the free available chlorine residual in the treated water being conveyed from the plant. A service line returns from the distribution main to supply this analyzer. The plant is operated to target a free chlorine residual of 1.8 mg/L in the finished water being conveyed to the distribution system. The finished water chlorine analyzer is configured to initiate an alarm should the chlorine residual drop below 0.90mg/L, and will shut down the filters and high-lift pumps if the chlorine residual falls below 0.8mg/L.

The SCADA system is also configured to calculate CT continuously and will alarm if CT is not met. A CT calculation spreadsheet is also available for operators to verify CT under varying operating conditions. Supporting documentation related to CT is available in the operations and maintenance manual.

Records reviewed, indicate that the water treatment plant was operated to achieve the necessary CT requirements for primary disinfection purposes during this inspection review period.

- * **Records confirmed that the water treatment equipment which provides chlorination or chloramination for secondary disinfection purposes was operated so that at all times and all locations in the distribution system the chlorine residual was never less than 0.05 mg/l free or 0.25 mg/l combined.**

Following the completion of the intended chlorine contact time for primary disinfection purposes, free available chlorine residual is maintained out and into the distribution system for secondary disinfection purposes to reduce the potential for microbial re-growth within the distribution system, and in accordance with section 1-5 of Schedule 1, O.Reg.170/03. The Mactier (Beech) water treatment plant is designed to target a free chlorine residual of 1.8mg/L at the point of entry into the distribution system, which should ensure a minimum free chlorine residual of 0.2mg/L is maintained throughout the distribution system, as is recommended in the Ministry's Procedure for Disinfection. The free chlorine residual analyzer installed on the plant discharge is configured to initiate an alarm notification if the free available chlorine residual drops below 0.90mg/L, and the filters and high-lift pumps will shut down should the chlorine residual drop below 0.80mg/L. A trim chlorination system is installed and may be used to increase the chlorine residual in the treated water being conveyed to the distribution system; however, operation of this system has not been necessary.

A continuous analyzer is installed at the Mactier Elevated Water Tower to measure free chlorine residual for secondary disinfection purposes. The analyzer is configured to alarm if the free chlorine residual falls below 0.35mg/L. A rechlorination system also exists at the Mactier Elevated Water Tower and may be used to increase the chlorine residual within the distribution system at this location, however, is not used on a regular basis. The chemical metering pump is capable of being controlled by the analyzer at the tower, however, operation of the rechlorination system, when it has been operated, is typically done manually by operational staff. If chlorine residuals are found to be below optimal concentrations at the tower, operational staff will engage the chemical metering pump when the tower is being filled.

TREATMENT PROCESSES

In addition, chlorine residuals are measured during microbiological sampling and maintenance activities throughout the distribution system. System wide hydrant flushing is conducted each spring and dead end hydrant flushing is conducted each fall or in response to any issues.

Records indicate that free chlorine residuals were maintained at or above the 0.2mg/L throughout the distribution system during this inspection review period; and, there were no records which indicated free chlorine residuals less than 0.05 mg/L at any time during the inspection review period. The recorded distribution system free chlorine residual concentrations ranged between 0.29mg/L and 1.94g/L.

- **The Operator-in-Charge had ensured that all equipment used in the processes was monitored, inspected, and evaluated.**

Operators evaluate the system processes at the Mactier (Beech) water treatment plant daily, Monday through Friday. They verify the operating conditions through SCADA trending and record any departures from normal operating conditions. Weekends and holidays are also considered, to ensure that the review of the continuous monitoring data does not exceed 72 hours in duration. The specific operating conditions are recorded on their checklists and also stored electronically in Excel spreadsheets. Records of the checks are written in the log book at the water treatment plant.

TREATMENT PROCESS MONITORING

- **Primary disinfection chlorine monitoring was being conducted at a location approved by Permit, Licence or Approval issued under Part V of the SDWA, or at/near a location where the intended CT had just been achieved.**

The primary disinfection chlorine monitoring point is currently located at the inlet to the highlift pumping chamber, downstream of the chlorine contact chamber and reservoir. The chlorine analyser is supplied samples by a peristaltic pump. This location is prior to the sodium hydroxide and hydrofluorosilicic acid injection which occurs on the high-lift pump discharge header. The analyzer is linked to SCADA for continuous monitoring, trending and alarming purposes, and is used by SCADA and operational staff to calculate CT provisions.

- **Continuous monitoring of each filter effluent line was being performed for turbidity.**

In accordance with subsection 7-3(2)(b) of Schedule 7, O.Reg.170/03 the Owner has installed continuous turbidimeters on each filter train. The turbidimeters are supplied with continuous samples from each of the separate filter outlet lines. The location of the analyzers do not permit turbidity to be measured in the filter being directed to waste following a filter backwash, but do permit filter turbidity to be continuously monitored during water production, as is required.

For operational purposes, the Owner has also installed continuous turbidimeters for the purpose of measuring the turbidity of the raw water and the finished drinking water conveyed to the distribution system. All four of the turbidimeters are linked to the SCADA system for continuous trending, monitoring and alarm purposes.

The high turbidity alarm set points on the two filter trains is set at 0.30 NTU. SCADA is also configured to initiate an alarm should turbidity measure a low analog output (4mA), which might suggest a turbidimeter malfunction. Should either a high or low turbidity alarm condition occur, the filter inlet and outlet valves close, ceasing the production of water. The filter train alarms are present to help ensure compliance with the Procedure for Disinfection of Drinking Water in Ontario effluent turbidity requirements of being less than or equal to 0.30 NTU in 95% of the measurements recorded each month on each filter effluent line.

The turbidimeter installed to measure the treated water is configured to initiate an alarm should treated water turbidity exceed 0.8NTU, and the raw turbidimeter is configured to trigger an alarm if raw water turbidity exceeds 15.00NTU.

TREATMENT PROCESS MONITORING

- ★ **The secondary disinfectant residual was measured as required for the distribution system.**

The free chlorine residual concentration within the distribution system is being measured by a continuous analyzer installed at the Mactier elevated water tower. The distribution chlorine residual analyzer is configured to trigger an alarm if chlorine residual drops below 0.35mg/L. In addition, chlorine residuals are measured during microbiological sampling and maintenance activities throughout the distribution system.

The recorded distribution system free chlorine residual concentrations ranged between 0.29mg/L and 1.94mg/L, during this inspection review period.

- ★ **Operators were examining continuous monitoring test results and they were examining the results within 72 hours of the test.**

The data review is completed daily Monday through Friday. Weekends and holidays are considered. Operators are scheduled to conduct a data review so that the time between checks does not exceed the 72 hour regulatory requirement.

The weekend results of the continuous monitoring equipment are being reviewed on Mondays, or the day after in the case of a holiday and documented in the log book in order to satisfy Schedule 6, O.Reg.170/03 requirements for examination of continuous monitoring data.

- ★ **All continuous monitoring equipment utilized for sampling and testing required by O. Reg. 170/03, or approval or order, were equipped with alarms or shut-off mechanisms that satisfied the standards described in Schedule 6.**

Continuous monitors are used to assess primary disinfection chlorine residual concentrations, secondary disinfection chlorine residual concentrations, and turbidity on each filter effluent. At the time of inspection, the analyzer used for primary disinfection monitoring had a low chlorine alarm set point of 1.30mg/L and a low/low chlorine alarm set point of 1.20mg/L. The high and high/high chlorine alarm set points were at 2.40 and 2.50mg/L. By activating the low or high setpoints an alarm notification process is initiated and an operator responds to the site. By activating the low/low or high/high alarm, the filters and high-lift pumping capabilities will cease and allow time for an operator to intervene.

As previously discussed, secondary disinfection is also monitored in the distribution system at the Mactier Elevated Water Tower. The distribution chlorine analyzer is configured to trigger an alarm notification if chlorine residual drops below 0.35mg/L.

The filter effluent turbidity high set point alarms are set at 0.30(NTU), and SCADA is configured to alarm if the turbidimeter generates a low analog signal (4mA). Should either the low or high turbidity alarms be triggered, the filter inlet and outlet valves shut down, ceasing the production of water, until rectified. By design, water is not directed to the chlorine contact chamber until filtrate turbidity is below 0.3NTU.

- ★ **Continuous monitoring equipment that was being utilized to fulfill O. Reg. 170/03 requirements was performing tests for the parameters with at least the minimum frequency specified in the Table in Schedule 6 of O. Reg. 170/03 and recording data with the prescribed format.**

Schedule 6 of O.Reg.170/03 outlines the recording frequency requirements for continuous on line analysers. It requires that the free chlorine residual for primary disinfection be tested and recorded with a frequency of every five minutes. Turbidity monitoring must be performed with a minimum frequency of 15 minutes. If secondary disinfection monitoring uses continuous analysers, as is the case for secondary disinfection monitoring conducted at the Elevated Water Tower, the free chlorine residual in a distribution sample must have a minimum recording frequency of 1 hour.

TREATMENT PROCESS MONITORING

Complying with these requirements, continuous monitoring data is recorded and trended on the SCADA system at ten second intervals.

The chlorine residual is being recorded in milligrams per litre(mg/L) and the turbidity is being recorded in Nephelometric Turbidity Units(NTU) in order to comply with the requirements contained in Schedule 6.

- **All continuous analysers were calibrated, maintained, and operated, in accordance with the manufacturer's instructions or the regulation.**

The Mactier (Beech) water treatment plant is equipped with continuous analysers for pH, chlorine residual, turbidity and fluoride. Calibrations are completed a minimum of at least once per month, exceeding the manufacturer's recommendations to ensure effective operation and accuracy.

Procedures are available in the operations and maintenance manual for the calibration of the continuous analyzers.

The continuous chlorine analysers are calibrated when the unit reads 5% above or below in-house titration results. Records of each calibration are made in the daily log book and the maintenance log book at the treatment plant. Handheld colorimeters are verified against titration tests on a weekly basis, and the hand held unit is used to verify the calibration of the analyzer at the Mactier Elevated Water Tower.

The turbidity and pH meters are calibrated on a monthly frequency and a record is made in the daily log book and the maintenance log book at the treatment plant.

OPERATIONS MANUALS

- **The operations and maintenance manuals contained plans, drawings and process descriptions sufficient for the safe and efficient operation of the system.**

An operations and maintenance manual has been created and is available on-site for the utility operator's use at the water treatment plant. The operations manual is reviewed annually. The contingency plans were last fully reviewed in May 2013, and were reportedly under review at the time of this inspection.

The contents of the manuals appear to be sufficient, enabling staff to safely operate the drinking water system. Process flow diagrams included in Schedule D of the Permit also appear to be accurate, with one minor exception. The process flow diagram suggests that potassium permanganate addition occurs at the plant, however it is actually sodium permanganate that is used for manganese control on a seasonal basis at the plant, a fact that is clearly identified in Schedule A of the Permit.

- **The operations and maintenance manuals did meet the requirements of the Permit and Licence or Approval issued under Part V of the SDWA.**

Condition 16, Schedule B of the Licence prescribes that the operations and maintenance manual include at a minimum:

- the requirements of the licence and associated procedures;
- the requirements of the drinking water works permit for the drinking water system;
- a description of the processes used to achieve primary and secondary disinfection within the drinking water system, including a copy of the CT calculations that were used as the basis for primary disinfection under worst case operating conditions.
- procedures for monitoring and recording the in-process parameters necessary for the control of any treatment subsystem and for assessing the performance of the drinking water system;
- procedures for the operation and maintenance of monitoring equipment;
- contingency plans and procedures for the provision of adequate equipment and material to deal with emergencies, upset conditions and equipment breakdown; and,

OPERATIONS MANUALS

-procedures for the dealing with complaints related to the drinking water system, including the recording of the nature of the complaint and any investigation and corrective action taken in respect of the complaint.

Procedures necessary for the operation and maintenance of any alterations to the drinking water system must also be incorporated into the operations and maintenance manual prior to the alterations coming into operation.

The operations manual and the contingency plans for the drinking water system appear to address all of these topics sufficiently, providing the utility operators enough information to effectively operate the drinking water system.

The requirement for the operations manual to include a description of the processes used to achieve primary and secondary disinfection within the drinking water system, is a new condition, Condition 16.2.3, Schedule B), of the Licence that was issued on October 6, 2015 and the Owner has until April 13, 2016 to comply with this condition.

In review of the information provided for this inspection, all of the information would appear to be available to satisfy this condition. The SCADA system is also configured to calculate CT continuously to ensure adequate disinfection is provided and will alarm if CT is not met, and a CT calculating spreadsheet is also installed on the computer in the control room which allows operators to verify CT under various conditions.

LOGBOOKS

- * **Records or other record keeping mechanisms confirmed that operational testing not performed by continuous monitoring equipment was being done by a certified operator, water quality analyst, or person who suffices the requirements of O. Reg. 170/03 7-5.**

Records reviewed, indicate that only the certified utility operators are the individuals that are performing the operational tests throughout the system. Operator certification was verified with the Ontario Water Wastewater Certification Office and all operators were in possession of valid certificates.

SECURITY

- * **The owner had provided security measures to protect components of the drinking-water system.**

Security measures in place throughout the Mactier (Beech) drinking water system includes fencing and locked gates at the elevated tower and secure entrance doors and security systems at both the plant and the tower. The security alarms utilized are connected to the alarm dialer system. The on call operator is alerted to an alarm condition, must acknowledge it, and determine the appropriate response to the situation.

The owner reported no concerns with security or vandalism over the inspection review period.

CERTIFICATION AND TRAINING

- * **The overall responsible operator had been designated for each subsystem.**

In accordance with Ontario Regulation 128/04 (Certification of Drinking Water System Operators and Water Quality Analysts) made under the SDWA, the Mactier (Beech) Water Treatment Plant is classified as a Class 4 Water Treatment Subsystem (#2471 issued May 25, 2005), while the Mactier (Beech) Water Distribution System is classified as a Class 1 Water Distribution Subsystem (#1088 issued September 6, 2005).

At the time of this inspection, individuals possessing Class 4 Water Treatment Subsystem and Class 3 Water Distribution certificates, at a minimum, have been designated to act in the capacity of Overall Responsible Operator (ORO). Other operators, who possess, at a minimum, Class 2 Water Treatment and Distribution certification, are also available and may serve in the ORO capacity, if required.

CERTIFICATION AND TRAINING

Records identifying the name of the individual serving in the capacity of ORO are documented within facility logbooks on a daily basis. There were no records to indicate that individuals other than sufficiently certified operators were acting in the capacity of ORO during this inspection review period.

The water treatment plant, distribution system and operator certificates are prominently displayed at the water treatment plant.

- * **Operators in charge had been designated for all subsystems which comprised the drinking-water system.**

The Owner has designated the operators who possess the appropriate level of certification to act as Operator-in-Charge (OIC) as required. Typically, the operator doing facility checks is considered the OIC of the facility on that particular day.

- * **Only certified operators made adjustments to the treatment equipment.**

Records provided for review indicate that the District of Muskoka utility operators appear to be the only persons who are adjusting water treatment equipment and processes at the water treatment plant. Operator certification was verified with the Ontario Water Wastewater Certification Office and all operators were in possession of valid certificates.

WATER QUALITY MONITORING

- * **All microbiological water quality monitoring requirements for distribution samples were being met.**

The owner of a large municipal residential drinking water system shall ensure that if the system serves a population of 100,000 or less, at least eight distribution samples plus one for every thousand people served by the system are taken every month. At least one of the samples must be taken each week. As Mactier's population is estimated to be 740 residents, eight samples must be collected monthly as a minimum requirement from the distribution system. These samples are required to be tested for E.Coli. and total coliform; and at least 25 percent of the samples are required to be tested for general bacteria populations expressed as colony counts on a heterotrophic plate count.

Records reviewed in the course of this inspection indicate that the Owner complied with these requirements, collecting a minimum of three distribution samples each week, in order to comply with, and exceed, the regulatory requirement. Each of those samples were tested for E.Coli., total coliform, and at least one of the three samples collected were tested for general bacteria populations expressed as colony counts on a heterotrophic plate count.

The results of microbiological sampling are discussed in more detail in a later section of this inspection report.

- * **All microbiological water quality monitoring requirements for treated samples were being met.**

Section 10-3 of Schedule 10, O.Reg.170/03 requires the Owner to ensure samples are collected at least once every week from the system's treated water at the point of entry into the distribution system. The samples collected are required to be tested for E.Coli and total coliform, and general bacteria populations expressed as colony counts on a heterotrophic plate count.

Records reviewed in the course of this inspection indicate that the Owner complied with these requirements.

WATER QUALITY MONITORING

- **All inorganic water quality monitoring requirements prescribed by legislation were conducted within the required frequency.**

Section 13-2 of Schedule 13, O.Reg.170/03 requires the Owner and the operating authority to ensure that at least one water sample is taken every 12 months if the system obtains water from a raw water supply that is surface water, and have those samples tested for every inorganic parameter set out in Schedule 23, O.Reg.170/03.

Complying with these requirements, the Owner last conducted this sampling on May 11, 2015. Prior to that, this sampling was last conducted May 5, 2014. There were no concerns identified with the results obtained.

- **All organic water quality monitoring requirements prescribed by legislation were conducted within the required frequency.**

Section 13-4 of Schedule 13, O.Reg.170/03 requires the Owner and the operating authority to ensure that at least one water sample is taken every 12 months if the system obtains water from a raw water supply that is surface water, and have those samples tested for every organic parameter set out in Schedule 24, O.Reg.170/03.

Complying with these requirements, the Owner last conducted this sampling on May 11, 2015. Prior to that, this sampling was last conducted May 5, 2014. There were no concerns identified with the results obtained.

- **All trihalomethanes water quality monitoring requirements prescribed by legislation were conducted within the required frequency.**

Section 13-6 of Schedule 13, O.Reg.170/03 requires the Owner and the operating authority to ensure that at least one distribution sample is taken every 3 months from a point in the drinking water system's distribution system, or in plumbing that is connected to the drinking water system, that is likely to have an elevated potential for the formation of Trihalomethanes (THMs), and tested for THMs. Section 6-1.1 of Schedule 6, O.Reg.170/03 requires that these samples be taken at least 60 days, and not more than 120 days, after a sample was taken for that purpose in the previous three month period.

Complying with these requirements, the Owner conducted this quarterly sampling on November 3, 2014; February 2, 2015; May 11, 2015; August 10, 2015 and November 2, 2015.

THM results during this inspection review period ranged between 65 and 88 micrograms per Litre (ug/L). The running annual average of the samples collected is 72.8ug/L, below the Ontario Drinking Water Quality Standard of 100ug/L.

- **All nitrate/nitrite water quality monitoring requirements prescribed by legislation were conducted within the required frequency for the DWS.**

Section 13-7 of Schedule 13, O.Reg.170/03 requires the Owner and the operating authority to ensure that at least one water sample is taken every three months and tested for nitrates and nitrites. Section 6-1.1 of Schedule 6, O.Reg.170/03 requires that these samples be taken at least 60 days, and not more than 120 days, after a sample was taken for that purpose in the previous three month period. Complying with these requirements, the Owner conducted this sampling on November 3, 2014; February 2, 2015; May 11, 2015; August 10, 2015 and November 2, 2015. There were no concerns identified with the results obtained.

- **All sodium water quality monitoring requirements prescribed by legislation were conducted within the required frequency.**

Section 13-8 of Schedule 13, O.Reg.170/03 requires that the owner of a municipal residential drinking-water system ensure that a treated water sample is taken every 60 months and is tested for sodium. Records, provided by the Owner and reviewed during the course of this inspection, indicate that the Owner conducted sampling for sodium on May 11, 2015 and May 21, 2015. Prior to that, sampling for sodium had been undertaken May 5, 2014.

Results of Sodium sampling are discussed in more detail in a later section of this inspection report.

WATER QUALITY MONITORING

- * **The required daily samples were being taken at the end of the fluoridation process.**

As previously discussed, the Mactier (Beech) Drinking Water System practices fluoridation through the addition of Hydrofluorosilicic Acid. Hydrofluorosilicic Acid addition is flow paced and injected into the high-lift pump discharge header prior to water being conveyed to the distribution system. As fluoridation is practiced, section 7-4 of Schedule 7, O.Reg. 170/03 requires the owner to ensure that a water sample is taken at the end of the fluoridation process at least once every day and is tested for fluoride. Where fluoride is added to drinking water, it is recommended that the concentration be adjusted to 0.5 - 0.8 mg/L, the optimum level for the control of tooth decay. A result indicating that the concentration of fluoride exceeds 1.5mg/L is considered an adverse drinking water test, and is required to be reported the Ministry and the Simcoe Muskoka District Health Unit.

Complying with the fluoride monitoring requirements, the owner has ensured fluoride concentrations are measured using a continuous analyser which is supplied with treated water being conveyed from the plant. A service line returns from the distribution main to supply this analyzer. The continuous analyzer is linked to the SCADA system for continuous monitoring, trending and alarming purposes. To ensure fluoride levels remain within the optimal range, the analyzer, through SCADA is configured to initiate an alarm notification, if fluoride levels rise above 1.35mg/L. Should fluoride levels increase above 1.40mg/L, the high lift pumps and fluoridation system are configured to shut down. Fluoride measurements are trended on SCADA every 10 seconds, however an alarm delay of two minutes is programmed into SCADA, to compensate for spikes and dips which occur on high-lift pump start up.

Records reviewed, indicate that fluoride concentrations were typically maintained around 0.6mg/L during this inspection review period. It is acknowledged that spikes do occur on high-lift pump start up. The spikes typically last for less than two minutes, and are followed by a dip, before the analyzer stabilizes. These spikes and dips are believed to be associated with pressure fluctuations. If after two minutes the fluoride readings have not stabilized, and remain above 1.4mg/L, the high-lift pump would shut down, as previously described. In the past, the Ministry has provided direction requesting that the Owner document all fluoride spikes in the treatment plant log book and to report as an adverse event in accordance with Schedule 16, any fluoride spike above 1.5mg/L that exceeds 5 minutes in duration. There were no fluoride exceedances identified that exceeded 5 minutes, following a review of the data set for the inspection review period.

- * **All sampling requirements for lead prescribed by schedule 15.1 of O. Reg. 170/03 were being met.**

Based on the results of historical lead sampling, the Owner is exempt from the requirement to sample lead within the plumbing of the private residences in the Mactier community. Instead, the Owner must ensure to test for total alkalinity and pH during each of the prescribed sampling periods (December 15 to April 15 and June 15 and October 15), and must ensure lead is sampled within the distribution system in each of the prescribed sampling periods in every third 12 month period. Based on the estimated population (740) of the Mactier community, the Owner is required to ensure this sampling is conducted from two locations within the distribution system. Typically, the Owner continues to sample for lead at two locations within the distribution system on an annual basis, during each sampling period. Alkalinity and pH sampling is also undertaken at one location within the distribution system on a weekly basis as part of the Langelier Saturation Index (LSI) sampling implemented by the Owner.

During this inspection review period, sampling for lead occurred from two locations within the distribution system on February 2, 2015 and August 24, 2015.

The Lead results ranged between 0.01 and 0.06ug/L, well within the Ontario Drinking Water Quality Standard of 10ug/L. Alkalinity results ranged between 44 and 72mg/L and pH ranged between 7.00 and 7.94.

WATER QUALITY MONITORING

- **Records confirmed that chlorine residual tests were being conducted at the same time and at the same location that microbiological samples were obtained.**

Subsection 6-3 (1) of Schedule 6, O.Reg.170/03 prescribes that if a microbiological sample required by the regulation is taken, that another sample must be taken at the same time from the same location and tested immediately for free chlorine residual. Records reviewed during the course of this inspection indicate that the Owner ensured that the free chlorine residual was tested at the time of all microbiological samples. Operational staff recorded the free available chlorine residual tests directly on the Laboratory Sample Submission / Chain of Custody Form at the same time that microbiological samples were obtained. The chlorine residuals associated with microbiological sample were then included by the laboratory on the analytical report associated with results of the microbiological test.

WATER QUALITY ASSESSMENT

- **The audit samples collected by the inspector met the applicable Ontario Drinking Water Quality Standards and/or the aesthetic objectives or operation guidelines. The results of the audit sampling are summarized as follows:**

The free available chlorine residual within the distribution system, on the date of inspection, was found to be acceptable with a concentration of 0.96mg/L being measured at the distribution bleeder located at the end of Cemetary Road; and, a concentration of 1.09mg/L being measured at the Elevated Water Tower.

Microbiological and chemical audit samples were not collected as part of this inspection.

- **Records show that water sample results taken during the review period met the Ontario Drinking Water Quality Standards (O. Reg. 169/03), with the following exceptions:**

1.A sample collected June 29, 2015 within the distribution system indicated the presence of Total coliform bacteria (1CFU/100ml) above the limits identified in the Ontario Drinking Water Quality Standards (ODWQS). The Owner made all appropriate notifications (AWQI#124601) to the Ministry and the Simcoe Muskoka District Health Unit (SMDHU), and re-samples collected, July 2, 2015, showed no further indication of adverse water quality at the time of collection.

Samples collected from the Mactier (Beech) drinking water system have, historically, also indicated elevated levels of Sodium in the treated drinking water. Where the concentration of sodium exceeds 20mg/L in a drinking water sample, the Owner is required to make a report in accordance with subsection 16-3(1) of Schedule 16, O.Reg.170/03, if such a report had not been made in the previous 60 months. The Owner last made the required notifications in May 2013 when a sample collected May 14, 2013 rendered a sodium result of 22.0mg/L, and a resample collected May 22, 2013 confirmed the elevated sodium levels with a result of 24.1mg/L being reported. In accordance with Schedule 17, O.Reg.170/03 requirements, the results were reported to the SMDHU.

Results of sodium sampling undertaken on May 5, 2014 and May 11, 2015, continue to indicate elevated levels of sodium in the treated water with respective results of 28.1 and 23.6mg/L. The aesthetic objective for sodium in drinking water is 200 mg/L at which it can be detected by a salty taste. Consumption of sodium in excess of 10 grams per day by normal adults does not result in any apparent adverse health effects. In addition, the average intake of sodium from water is only a small fraction of that consumed in a normal diet. A maximum acceptable concentration for sodium in drinking water has, therefore, not been specified. Persons suffering from hypertension or congestive heart disease may require a sodium-restricted diet, in which case, the intake of sodium from drinking water could become significant. The local Medical Officer of Health is required to be notified when the sodium concentration exceeds 20 mg/L, so that this information may be passed on to local physicians.

REPORTING & CORRECTIVE ACTIONS

REPORTING & CORRECTIVE ACTIONS

- * **Corrective actions (as per Schedule 17) had been taken to address adverse conditions, including any other steps that were directed by the Medical Officer of Health.**

- * **All required notifications of adverse water quality incidents were immediately provided as per O. Reg. 170/03 16-6.**

- * **Where required continuous monitoring equipment used for the monitoring of chlorine residual and/or turbidity triggered an alarm or an automatic shut-off, a qualified person responded in a timely manner and took appropriate actions.**

A review of the continuous monitoring data and the log books was performed for any alarm conditions and actions taken by operators in response to incidents at the water treatment plant. Any after hours alarm calls appear to have been responded to in a timely fashion by the utility operators and notes have been entered in the log book of their actions taken for each instance. Explanations appear to have been consistently provided for power interruptions, maintenance activities, process operation alarm calls, and any communication errors that triggered alarms.

NON-COMPLIANCE WITH REGULATORY REQUIREMENTS AND ACTIONS REQUIRED

This section provides a summary of all non-compliance with regulatory requirements identified during the inspection period, as well as actions required to address these issues. Further details pertaining to these items can be found in the body of the inspection report.

Not Applicable

SUMMARY OF RECOMMENDATIONS AND BEST PRACTICE ISSUES

This section provides a summary of all recommendations and best practice issues identified during the inspection period. Details pertaining to these items can be found in the body of the inspection report. In the interest of continuous improvement in the interim, it is recommended that owners and operators develop an awareness of the following issues and consider measures to address them.

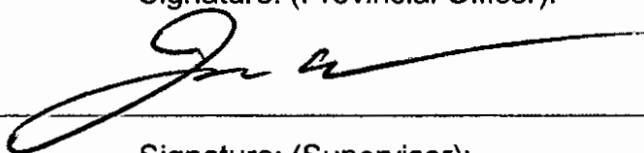
Not Applicable

SIGNATURES

Inspected By:

James Crumbie

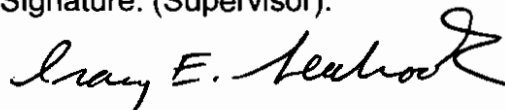
Signature: (Provincial Officer):



Reviewed & Approved By:

Craig Seabrook

Signature: (Supervisor):



Review & Approval Date:

2016-01-21

Note: This inspection does not in any way suggest that there is or has been compliance with applicable legislation and regulations as they apply or may apply to this facility. It is, and remains, the responsibility of the owner and/or operating authority to ensure compliance with all applicable legislative and regulatory requirements.



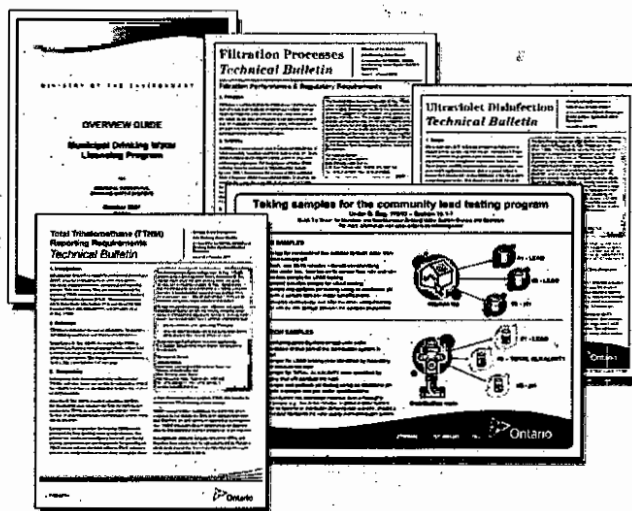
Stakeholder Appendix

Key Reference and Guidance Material for Municipal Residential Drinking Water Systems

Many useful materials are posted on the Ministry of the Environment's Drinking Water Ontario website at www.ontario.ca/drinkingwater to help in the operation of your drinking water system.

Below is a list of key materials frequently used by owners and operators of municipal drinking water systems. To read or download these materials, go to **Drinking Water Ontario** and search in the **Resources** section by **Publication Number**.

Visit **Drinking Water Ontario** for more useful materials. Contact the Public Information Centre if you need assistance or have questions at 1-800-565-4923/416-325-4000 or picemail.moe@ontario.ca.



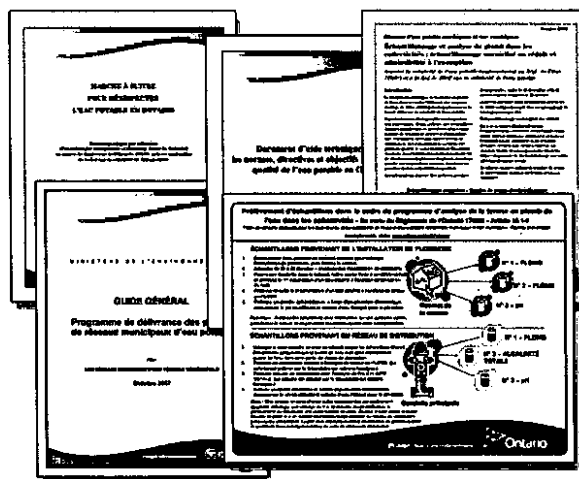
PUBLICATION NUMBER	PUBLICATION TITLE
4448e01	Procedure for Disinfection of Drinking Water in Ontario
7152e	Strategies for Minimizing the Disinfection Products Trihalomethanes and Haloacetic Acids
7467	Filtration Processes Technical Bulletin
7685	Ultraviolet Disinfection Technical Bulletin
8215	Total Trihalomethane (TTHM) Reporting Requirements Technical Bulletin (February 2011)
2601e	Overview Guide: Municipal Drinking Water Licensing Program
0000	Municipal Drinking Water Licensing Program Bulletin, Issue 1, January 2011
0000	Certification Guide for Operators and Water Quality Analysts
6560e	Taking Samples for the Community Lead Testing Program
7423e	Community Sampling and Testing for Lead: Standard and Reduced Sampling and Eligibility for Exemption
7128e	Drinking Water System Contact List
4449e01	Technical Support Document for Ontario Drinking Water Quality Standards

ontario.ca/drinkingwater

Principaux guides et documents de référence sur les réseaux résidentiels municipaux d'eau potable

Beaucoup de documentation sur le fonctionnement d'un réseau d'eau potable se trouve sur le site Web du **ministère de l'Environnement**.

Vous trouverez ci-dessous la liste des principaux documents que les propriétaires et les exploitants de réseaux municipaux d'eau potable utilisent fréquemment. Pour lire ou télécharger ces documents, allez sur le site Web du Ministère, et effectuez une recherche par numéro de publication dans la section RESSOURCES.



Consultez le site d'**Eau potable Ontario** pour obtenir d'autre documentation. Communiquez avec le Centre d'information du public au 1 800 565-4923

ou au 416 325-4000, ou encore à picemail.moe@ontario.ca si vous avez des questions ou besoin d'aide.

NUMÉRO DE PUBLICATION	TITRE DE LA PUBLICATION
4448f01	Marche à suivre pour désinfecter l'eau potable en Ontario
7152e	Strategies for Minimizing the Disinfection Products Trihalomethanes and Haloacetic Acids (en anglais seulement)
7467	Filtration Processes Technical Bulletin (en anglais seulement)
7685	Ultraviolet Disinfection Technical Bulletin (en anglais seulement)
8215	Total Trihalomethane (TTHM) Reporting Requirements Technical Bulletin (février 2011) (en anglais seulement)
2601f	Guide général - Programme de délivrance des permis de réseaux municipaux d'eau potable
0000	Bulletin du Programme des permis de réseaux municipaux d'eau potable, numéro 1, janvier 2011
0000	Guide sur l'accréditation des exploitants de réseaux d'eau potable et des analystes de la qualité de l'eau de réseaux d'eau potable
6560f	Prélèvement d'échantillons dans le cadre du programme d'analyse de la teneur en plomb de l'eau dans les collectivités
7423f	Échantillonnage et analyse du plomb dans les collectivités : échantillonnage normalisé ou réduit et admissibilité à l'exemption
7128f	Liste des personnes-ressources du réseau d'eau potable
4449f01	Document d'aide technique pour les normes, directives et objectifs associés à la qualité de l'eau potable en Ontario

ontario.ca/drinkingwater

MOE Audit Sample Results

Not Applicable



Provincial Officer's Report & Order

Not Applicable



Inspection Rating Record

Ministry of the Environment - Inspection Summary Rating Record (Reporting Year - 2015-2016)

DWS Name: MACTIER (BEECH) DRINKING WATER SYSTEM
DWS Number: 220004224
DWS Owner: Muskoka, The Corporation Of The District Municipality Of
Municipal Location: Georgian Bay
Regulation: O.REG 170/03
Category: Large Municipal Residential System
Type Of Inspection: Focused
Inspection Date: January 8, 2016
Ministry Office: Barrie District

Maximum Question Rating: 492

Inspection Module	Non-Compliance Rating
Capacity Assessment	0 / 30
Treatment Processes	0 / 81
Operations Manuals	0 / 28
Logbooks	0 / 14
Certification and Training	0 / 28
Water Quality Monitoring	0 / 112
Reporting & Corrective Actions	0 / 66
Treatment Process Monitoring	0 / 133
TOTAL	0 / 492

Inspection Risk Rating	0.00%
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FINAL INSPECTION RATING:	100.00%
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Ministry of the Environment - Detailed Inspection Rating Record (Reporting Year - 2015-2016)

DWS Name: MACTIER (BEECH) DRINKING WATER SYSTEM
DWS Number: 220004224
DWS Owner: Muskoka, The Corporation Of The District Municipality Of
Municipal Location: Georgian Bay

Regulation: O.REG 170/03
Category: Large Municipal Residential System
Type Of Inspection: Focused
Inspection Date: January 8, 2016
Ministry Office: Barrie District

Maximum Question Rating: 492

Inspection Risk Rating | 0.00%

FINAL INSPECTION RATING: | 100.00%