

## **The Regional Municipality of Durham**

### **Beaverton Drinking Water System 2015 Annual Report**

**Drinking Water System Number:** 220004929

**Municipal Drinking Water License Number:** 003-107

**Drinking Water System Owner:** The Regional Municipality of Durham

**Drinking Water System Category:** Large Municipal Residential

This Annual Report for the calendar year 2015 is designed to inform you about your drinking water system. This report has been prepared to satisfy Section 11 of Ontario Regulation (O. Reg.) 170/03. O. Reg. 170/03 sets requirements for drinking water systems with regard to sampling and testing, levels of treatment, certification of staff, and notification of authorities and the public about water quality. Hard copies of this report are available at the Regional Municipality of Durham Headquarters building located at 605 Rossland Road East, Whitby or on the [Region of Durham's website](http://www.durham.ca) at [www.durham.ca](http://www.durham.ca). Further information on the Drinking Water Regulations can be found on the [Ministry of the Environment and Climate Change's website](http://www.ontario.ca/ministry-environment-and-climate-change) at [www.ontario.ca/ministry-environment-and-climate-change](http://www.ontario.ca/ministry-environment-and-climate-change).

#### **Drinking Water System Process Description**

##### **General**

The Beaverton Drinking Water System provides potable water to consumers in the Community of Beaverton in the Township of Brock. The water supply plant is a Class Three Water Treatment Plant with an approved capacity of 7,300 cubic metres per day (m<sup>3</sup>/d). Beaverton Water Supply Plant feeds a Class One Distribution System and Class One Trunk Distribution System. The treatment and distribution system is owned and operated by the Regional Municipality of Durham.

The source water for the treatment process is drawn from Lake Simcoe. The water supply plant includes the following 11 processes:

- Zebra mussel control (chlorine),
- Screening,
- Pre-chlorination,
- Low lift pumping,
- Coagulation (aluminum sulphate),
- Flocculation,
- Direct filtration,
- Post filtration chlorination,
- Ultraviolet (UV) disinfection,
- Distribution,
- Water storage and high lift pumping.

## **Raw Water Supply**

Raw water is drawn from Lake Simcoe through a 500 millimetre (mm) diameter intake pipe extending 986 metre (m.) into the lake. The intake structure is located at a depth of approximately 4.6 m. The intake pipe is equipped with two 31 mm diameter internal lines. One line is used for raw water sampling while the other line is dedicated to the delivery of chlorine solution to a chlorine diffuser that is used for disinfection and control of zebra mussels. The chlorine residual and turbidity are continuously monitored by online analyzers as the raw water enters the treatment plant.

## **Coagulation/Flocculation**

The water flows through a traveling screen to remove large solids and continues towards the low lift pumps. Raw water is pumped through the plant by the low lift pumps. Aluminum sulphate (alum) is added to the incoming water upstream from the flocculation tanks. Gentle mixing of the alum with the water occurs as the water passes through a static mixer to the three sets of hydraulic spiral up-flow flocculation tanks. Each tank contains two flocculation cells.

## **Filtration**

Particulate matter present in the raw water is captured by the flocculation process and deposited on the top of the filters. The water supply plant has two filters to remove flocculated particles. Both are dual media filters containing granular activated carbon (GAC) and sand. Each filter is equipped with two surface water agitators as well as a shared backwash pump.

The backwash system consists of one celled backwash tank and one constant head tank that discharges the backwash water to the sanitary sewer.

## **Residual Management Facility**

The filter backwash treatment includes isolation of the filter cell, reversal of flow through the media, air scouring or surface water agitation and discharge of the treated backwash water to the Lake Simcoe Water Pollution Control Plant.

## **Disinfection**

Disinfection is achieved by the addition of chlorine at multiple application points throughout the plant. In addition to chlorination, ultraviolet disinfection is applied to the filter effluent. Consistent disinfection is ensured by continuous online monitoring of the free chlorine residual. The UV and chlorination systems will shut down the pumps if an alarm occurs. This ensures the water is disinfected.

## **Distribution System**

The water then flows to a high lift pumping station equipped with four constant speed pumps. The distribution system delivers the treated water through approximately 25.6 kilometres of watermains in a single pressure zone and includes a standpipe for storage and pressure equalization with a storage capacity of 1,717 cubic metres.

**Major Monetary expenses(above \$10,000)**

Under Section 11 of O. Reg. 170/03, a description of any major expenses incurred during this reporting period to install, repair or replace required equipment must be included in the annual report. The details of major expenses for this drinking water system are as follows:

- Supervisory Control And Data Acquisition (SCADA) upgrades - \$241,849
- Replaced Granular Activated Carbon in filters at the water treatment plant - \$27,355
- Foam swabbing of watermains - \$40,000

## Tables

For a description of terms and abbreviations in all tables, refer to the glossary at the end of the report.

### Beaverton Drinking Water System (DWS) Table 1

Summary of all Adverse Water Quality Incidents (AWQI) in 2015 Reported to Spills Action Centre in Accordance with Schedule 16-3 and 16-4 of O. Reg. 170/03.

| Incident Date | Parameter                      | Result                                      | Corrective Action   | Corrective Action Date |
|---------------|--------------------------------|---|---|------------------------|
| October 2     | Total Coliforms (Distribution) | 53 Colony Forming Units per 100 millilitres | Flushed, resampled. Results met Ontario Drinking Water Quality Standards (ODWQS). | October 2              |

### Beaverton DWS Table 2

Membrane Filtration (MF) Testing Under Schedule 10 of O. Reg. 170/03.

| Type of Sample | Number of Samples | Range of Escherichia Coli MF Colony Forming Units per 100 millilitres | Range of Total Coliforms MF Colony Forming Units per 100 millilitres |
|----------------|-------------------|---|--|
| Raw            | 52                | Non-Detect (ND) - 90  | ND - 500   |
| Treated        | 5                 | ND  | ND   |
| Distribution   | 22                | ND  | ND - 53(1)*  |

\* Number in parenthesis represents number of exceedance(s).

### Beaverton DWS Table 3

Presence Absence (P/A) Testing Under Schedule 10 of O. Reg. 170/03.

| Type of Sample | Number of Samples | Escherichia Coli P/A per 100 millilitres | Total Coliforms P/A per 100 millilitres |
|----------------|-------------------|--|---|
| Treated        | 52                | Absence (A)                              | A                                       |
| Distribution   | 202               | A  | A                                       |

**Beaverton DWS Table 4**

**Heterotrophic Plate Count (HPC) Testing Under Schedule 10 of O. Reg. 170/03.**

| Type of Sample | Number of Samples | Range of HPC Samples Colony Forming Units per millilitre |
|----------------|-------------------|--|
| Treated        | 57                | Non-Detect (ND) - 14                                     |
| Distribution   | 118               | ND - 60  |

**Beaverton DWS Table 5**

**Operational Testing Done Under Schedule 7 of O. Reg. 170/03.**

| Test                                | Number of Samples | Range of Results | Unit of Measure                     | Parameter Description   |
|-------------------------------------|-------------------|------------------|-------------------------------------|---|
| <b>Turbidity - Filter Effluent</b>  | Continuous        | 0.02 - 0.22      | Nephelometric Turbidity Units (NTU) | Turbidity is a measure of particles in water.   |
| <b>Free Chlorine - Plant</b>        | Continuous        | 1.00 - 1.99*     | mg/L                                | Must be sufficient to ensure disinfection has been achieved.  |
| <b>Free Chlorine - Distribution</b> | Continuous        | 0.05 - 1.78*     | mg/L                                | Recommended level of at least 0.20 mg/L in the distribution system to maintain secondary disinfection, 0.05 mg/L is the minimum required. |

\*Results include all analyzers and grab samples.

## Beaverton DWS Table 6

### Summary of Treated Water Inorganic Parameters Tested Under Schedule 13 and 23 of O. Reg. 170/03.

| Parameter                 | Number of Samples | Results Range            | MAC   | Unit of Measure            | MAC Exceedance        | Potential Sources <sup>1</sup>                          |
|---------------------------|-------------------|--------------------------|-------|----------------------------|-----------------------|---|
| <b>Antimony</b>           | 14                | 0.0004 - 0.0012          | 0.006 | Milligram per Litre (mg/L) | No                    | Fire retardants, ceramics, electronics, solder.         |
| <b>Arsenic</b>            | 14                | Non-Detect (ND) - 0.0012 | 0.025 | mg/L                       | No                    | Mining.   |
| <b>Barium</b>             | 2                 | 0.0276 - 0.0291          | 1.0   | mg/L                       | No                    | Metal refineries, oil drilling.                         |
| <b>Boron</b>              | 2                 | 0.020 - 0.024            | 5.0   | mg/L                       | No                    | Industrial.   |
| <b>Cadmium</b>            | 14                | ND                       | 0.005 | mg/L                       | No                    | Industrial.   |
| <b>Chromium</b>           | 14                | ND - 0.0018              | 0.05  | mg/L                       | No                    | Industrial.   |
| <b>Mercury</b>            | 2                 | ND                       | 0.001 | mg/L                       | No                    | Industrial.   |
| <b>Selenium</b>           | 14                | ND - 0.0007              | 0.01  | mg/L                       | No                    | Refineries, mines, chemical manufacturing.              |
| <b>Sodium<sup>2</sup></b> | 12                | 22.4 - 28.4              | 20    | mg/L                       | Yes (12) <sup>3</sup> | Runoff from road salt.                                  |
| <b>Uranium</b>            | 2                 | ND - 0.0003              | 0.02  | mg/L                       | No                    | Power generation.                                       |
| <b>Fluoride</b>           | 12                | 0.046 – 0.050            | 1.5   | mg/L                       | No                    | Mining  |
| <b>Nitrite</b>            | 12                | ND                       | 1.0   | mg/L                       | No                    | Agriculture runoff, landfill leachate and animal waste. |
| <b>Nitrate</b>            | 12                | ND - 0.325               | 10.0  | mg/L                       | No                    | Fertilizer.   |

1 Parameters may occur naturally in the environment.

2 Sodium does not have a Maximum Acceptable Concentration (MAC); only an aesthetic objective of 200 mg/L Sodium results exceeding 20 mg/L are to be reported as per the Medical Officer of Health Schedule 16-3 (8) of O. Reg. 170/03.

3 Number in parenthesis represents number of exceedance(s).

**Beaverton DWS Table 7**

**Summary of Lead Testing Under Schedule 15.1 of O. Reg. 170/03. No plumbing samples were required to be taken in 2015.**

| Location Type | Number of Samples | Range of Lead Results milligram per litre | MAC  | Number of Exceedences | pH          | Alkalinity milligrams per litre |
|---------------|-------------------|---|------|-----------------------|-------------|---------------------------------|
| Plumbing      | 0                 | N/A                                       | 0.01 | 0                     | N/A         | N/A                             |
| Distribution  | 6                 | Non-Detect (ND) - 0.0062                  | 0.01 | 0                     | 7.71 - 7.87 | 94.1 - 111                      |

**Beaverton DWS Table 8**

**Summary of Treated Water Organic Parameters Tested Under Schedule 24 of O. Reg. 170/03.**

| Parameter                            | Number of Samples | Results Range | MAC  | Unit of Measure        | MAC Exceedance | Potential Sources                                     |
|--------------------------------------|-------------------|---------------|------|------------------------|----------------|---|
| Alachlor                             | 2                 | ND            | 5    | microgram/litre (ug/L) | No             | Agricultural herbicide.                               |
| Aldicarb                             | 2                 | ND            | 9    | ug/L                   | No             | Agricultural insecticide.                             |
| Aldrin + Dieldrin                    | 2                 | ND            | 0.7  | ug/L                   | No             | Residue from banned insecticide.                      |
| Atrazine + N-dealkylated metabolites | 2                 | ND            | 5    | ug/L                   | No             | Agricultural herbicide.                               |
| Azinphos-methyl                      | 2                 | ND            | 20   | ug/L                   | No             | Insecticide.  |
| Bendiocarb                           | 2                 | ND            | 40   | ug/L                   | No             | Insecticide.  |
| Benzene                              | 2                 | ND            | 5    | ug/L                   | No             | Plastics manufacturing, leaking fuel tanks.           |
| Benzo(a)pyrene                       | 2                 | ND            | 0.01 | ug/L                   | No             | Formed from the incomplete burning of organic matter. |
| Bromoxynil                           | 2                 | ND            | 5    | ug/L                   | No             | Agricultural herbicide.                               |

| Parameter  | Number of Samples | Results Range   | MAC | Unit of Measure | MAC Exceedance | Potential Sources  |
|--|-------------------|-----------------|-----|-----------------|----------------|--|
| <b>Carbaryl</b>  | 2                 | Non-Detect (ND) | 90  | ug/L            | No             | Agricultural, forestry, household insecticide.               |
| <b>Carbofuran</b>  | 2                 | ND              | 90  | ug/L            | No             | Agricultural insecticide.                                    |
| <b>Carbon Tetrachloride</b>                                | 2                 | ND              | 5   | ug/L            | No             | Chemical and industrial activities.                          |
| <b>Chlordane (Total)</b>                                   | 2                 | ND              | 7   | ug/L            | No             | Residue from banned insecticide.                             |
| <b>Chlorpyrifos</b>  | 2                 | ND              | 90  | ug/L            | No             | Agricultural, household insecticide.                         |
| <b>Cyanazine</b>   | 2                 | ND              | 10  | ug/L            | No             | Agricultural, residential herbicide.                         |
| <b>Diazinon</b>  | 2                 | ND              | 20  | ug/L            | No             | Agricultural, livestock, operation, residential insecticide. |
| <b>Dicamba</b>   | 2                 | ND              | 120 | ug/L            | No             | Agricultural herbicide.                                      |
| <b>1,2-Dichlorobenzene</b>                                 | 2                 | ND              | 200 | ug/L            | No             | Chemical and industrial factories.                           |
| <b>1,4-Dichlorobenzene</b>                                 | 2                 | ND              | 5   | ug/L            | No             | Chemical and industrial factories.                           |
| <b>Dichlorodiphenyltrichloroethane (DDT) + metabolites</b> | 2                 | ND              | 30  | ug/L            | No             | Residue from banned insecticide.                             |
| <b>1,2-Dichloroethane</b>                                  | 2                 | ND              | 5   | ug/L            | No             | Industrial chemical factories.                               |
| <b>1,1-Dichloroethylene (vinylidene chloride)</b>          | 2                 | ND              | 14  | ug/L            | No             | Industrial chemical factories.                               |



| Parameter                               | Number of Samples | Results Range   | MAC | Unit of Measure | MAC Exceedance | Potential Sources  |
|---|-------------------|-----------------|-----|-----------------|----------------|--|
| Dichloromethane                         | 2                 | Non-Detect (ND) | 50  | ug/L            | No             | Pharmaceutical and chemical factories.                       |
| 2,4-dichlorophenol                      | 2                 | ND              | 900 | ug/L            | No             | Industrial contamination, reaction with chlorine.            |
| 2,4-Dichlorophenoxy acetic acid (2,4-D) | 2                 | ND              | 100 | ug/L            | No             | Agricultural, residential herbicide.                         |
| Diclofop-methy1                         | 2                 | ND              | 9   | ug/L            | No             | Agricultural herbicide.                                      |
| Dimethoate                              | 2                 | ND              | 20  | ug/L            | No             | Agricultural, livestock, operation, residential insecticide. |
| Dinoseb                                 | 2                 | ND              | 10  | ug/L            | No             | Herbicide residue.   |
| Diquat                                  | 2                 | ND              | 70  | ug/L            | No             | Agricultural, aquatic herbicide.                             |
| Diuron                                  | 2                 | ND              | 150 | ug/L            | No             | Agricultural, industrial herbicide.                          |
| Glyphosate                              | 2                 | ND              | 280 | ug/L            | No             | Agricultural, forestry, household herbicide.                 |
| Heptachlor + Heptachlor Epoxide         | 2                 | ND              | 3   | ug/L            | No             | Residue from banned insecticide.                             |
| Lindane (Total)                         | 2                 | ND              | 4   | ug/L            | No             | Agricultural, pharmaceutical insecticide.                    |
| Malathion                               | 2                 | ND              | 190 | ug/L            | No             | Pest control insecticide.                                    |
| Methoxychlor                            | 2                 | ND              | 900 | ug/L            | No             | Agricultural, livestock, operation, residential insecticide. |
| Metolachlor                             | 2                 | ND              | 50  | ug/L            | No             | Agricultural herbicide.                                      |

| Parameter   | Number of Samples | Results Range   | MAC | Unit of Measure | MAC Exceedance | Potential Sources   |
|---|-------------------|-----------------|-----|-----------------|----------------|---|
| <b>Metribuzin</b>   | 2                 | Non-Detect (ND) | 80  | ug/L            | No             | Agricultural herbicide.   |
| <b>Monochlorobenzene</b>                                    | 2                 | ND              | 80  | ug/L            | No             | Industrial and agricultural chemical factories and dry cleaning facilities.                       |
| <b>Paraquat</b>   | 2                 | ND              | 10  | ug/L            | No             | Agricultural, aquatic herbicide.  |
| <b>Parathion</b>  | 2                 | ND              | 50  | ug/L            | No             | Agricultural insecticide.   |
| <b>Pentachlorophenol</b>                                    | 2                 | ND              | 60  | ug/L            | No             | Pesticide, wood preservative residue.   |
| <b>Phorate</b>  | 2                 | ND              | 2   | ug/L            | No             | Agricultural insecticide.   |
| <b>Picloram</b>   | 2                 | ND              | 190 | ug/L            | No             | Industrial herbicide.   |
| <b>Polychlorinated Biphenyls (PCB)</b>                      | 2                 | ND              | 3   | ug/L            | No             | Residue from various industrial uses.   |
| <b>Prometryne</b>   | 2                 | ND              | 1   | ug/L            | No             | Agricultural herbicide.   |
| <b>Simazine</b>   | 2                 | ND              | 10  | ug/L            | No             | Agricultural herbicide.   |
| <b>Trihalomethane (THM) - Distribution (annual average)</b> | 12                | 66.9            | 100 | ug/L            | No             | By-product of chlorination of drinking water.   |
| <b>Temephos</b>   | 2                 | ND              | 280 | ug/L            | No             | Insecticide for mosquito, black fly control.  |
| <b>Terbufos</b>   | 2                 | ND              | 1   | ug/L            | No             | Agricultural insecticide.   |
| <b>Tetrachloroethylene</b>                                  | 2                 | ND              | 30  | ug/L            | No             | Leaching from PVC pipes; discharge from factories; dry cleaners and auto shops (metal degreaser). |

| Parameter   | Number of Samples | Results Range   | MAC | Unit of Measure | MAC Exceedance | Potential Sources   |
|---|-------------------|-----------------|-----|-----------------|----------------|---|
| <b>2,3,4,6 - Tetrachlorophenol</b>                  | 2                 | Non-Detect (ND) | 100 | ug/L            | No             | Wood preservative.  |
| <b>Triallate</b>                                    | 2                 | ND              | 230 | ug/L            | No             | Agricultural herbicide.                                     |
| <b>Trichloroethylene</b>                            | 2                 | ND              | 5   | ug/L            | No             | Metal degreasing sites and other factories.                 |
| <b>2,4,6-Trichlorophenol</b>                        | 2                 | ND              | 5   | ug/L            | No             | Pesticide manufacturing.                                    |
| <b>2,4,5-Trichlorophenoxy acetic acid (2,4,5-T)</b> | 2                 | ND              | 280 | ug/L            | No             | Industrial herbicide residue.                               |
| <b>Trifluralin</b>                                  | 2                 | ND              | 45  | ug/L            | No             | Agricultural herbicide.                                     |
| <b>Vinyl Chloride</b>                               | 2                 | ND              | 2   | ug/L            | No             | Leaching from PVC pipes; discharge from plastics factories. |

**Beaverton DWS Table 9**

**Inorganic or Organic Parameter(s) that Exceed Half the Standard Prescribed in Schedule 2 of the Ontario Drinking Water Quality Standards. No inorganic or organic parameters exceeded half the maximum allowable concentration in 2015.**

| Parameter                   | Result | Unit of Measure | Date of Sample |
|-----------------------------|--------|-----------------|----------------|
| <b>Not Applicable (N/A)</b> | N/A    | N/A             | N/A            |