

## **The Regional Municipality of Durham**

### **Newcastle Drinking Water System 2016 Annual Report**

**Drinking Water System Number:** 220004787

**Municipal Drinking Water License Number:** 003-109

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

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

This Annual Report for the calendar year 2016 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**

Newcastle Drinking Water System provides potable water to consumers in the Communities of Newcastle and Newtonville in the Municipality of Clarington. Located in Newcastle, the water supply plant is a Class Two Water Treatment Plant with an approved capacity of 8,173 cubic metres per day (m<sup>3</sup>/d). Newcastle Water Treatment Plant feeds a Class One Distribution System and has a Class Two Trunk Distribution System. The treatment and distribution system are owned and operated by the Regional Municipality of Durham.

The source water for the treatment process is drawn from Lake Ontario. The water supply system includes the following nine processes:

- Zebra mussel control (chlorine),
- Screening,
- Low lift pumping,
- Coagulation (polyaluminum chloride),
- Flocculation,
- Filtration,
- Disinfection (chlorine),
- Distribution,
- Water storage and high lift pumping.

## **Raw Water Supply**

Water is drawn from Lake Ontario through a 610 millimetre (mm) diameter intake pipe extending 1,070 metres (m) into the lake. The intake structure is located at a depth of approximately 10 m. The water is drawn into the raw water well where screening takes place to remove large solids. Chlorine is also added at the raw water intake for zebra mussel control and to provide initial disinfection. The pre-chlorine residual and turbidity are continuously measured as the raw water enters the water supply plant.

## **Coagulation/Flocculation**

The water flows through travelling screens to remove large solids and continues towards the low lift pumps. Polyaluminum chloride (PACl) is added into a mechanical mixer upstream of the flocculation tanks. After rapid mixing, the water discharges into two flocculation tanks where flocculated particles are developed by slow mixing action.

## **Filtration**

Particulate matter present in the raw water is captured by the coagulation filtration process and deposited on the top of the filters. The water supply plant has two filters to remove flocculated particles. Both filters are sand/anthracite dual media filters. Filter effluent turbidity and head loss are continuously monitored to indicate filter effectiveness. Filtered water passes through the filter under-drain into a clear well.

The backwash system consists of an air scour system and a two celled backwash wastewater holding tank that discharges the backwash water to the sanitary sewer.

## **Disinfection**

Disinfection is achieved by the addition of chlorine at multiple application points throughout the plant. The free chlorine residual and turbidity are monitored continuously by online analyzers.

## **Distribution System**

The high lift pumps deliver treated water to the distribution system. The distribution system delivers the treated water through approximately 61.2 kilometres of watermains in two pressure zones, and includes a 1,817 cubic metre reservoir, a 900 cubic metre elevated storage tank, and two booster stations. Additional chlorination is applied at the Newtonville Pumping Station.

## **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:

- Replacement of polybutylene service connections - \$1,636,526
- Replaced low lift vertical turbine - \$25,969

## Tables

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

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

Summary of all Adverse Water Quality Incidents (AWQI) in 2016 Reported to Spills Action Centre in Accordance with Schedule 16-3 and 16-4 of O. Reg. 170/03.

No adverse water quality incidents occurred in 2016.

| Incident Date       | Parameter | Result | Corrective Action | Corrective Action Date |
|---------------------|-----------|--------|-------------------|------------------------|
| Not Available (N/A) | N/A       | N/A    | N/A               | N/A                    |

### Newcastle 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            | 200               | Non-Detect (ND) - 4   | ND - 1,400   |
| Treated        | 13                | ND  | ND   |
| Distribution   | 20                | ND  | ND   |

### Newcastle 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        | 200               | Absence (A)                              | A                                       |
| Distribution   | 309               | A  | A                                       |

#### Newcastle 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        | 213               | Non-Detect (ND) - 26                                     |
| Distribution   | 165               | ND - 33  |

#### Newcastle 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   |
|------------------------------|-------------------|------------------|-------------------------------------|---|
| Turbidity - Filter Effluent  | Continuous        | 0.02 - 0.19      | Nephelometric Turbidity Units (NTU) | Turbidity is a measure of particles in water.   |
| Free Chlorine - Plant        | Continuous        | 1.58 - 3.39*     | Milligram per Litre (mg/L)          | Must be sufficient to ensure disinfection has been achieved.  |
| Free Chlorine - Distribution | Continuous        | 0.45 - 3.56*     | 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.

#### Newcastle DWS Table 6

##### Summary of Additional Testing and Sampling Carried Out in Accordance With the Requirement of an Approval, Order or Other Legal Instrument.

| Type of Sample | Parameter  | Date Sampled       | Result      | MAC  | Unit of Measure             |
|----------------|------------|--------------------|-------------|------|-----------------------------|
| Raw Water      | Gross Beta | January - December | 0.07 - 0.13 | N/A  | Becquerels per Litre (Bq/L) |
| Raw Water      | Tritium    | January - December | 1.1 - 10.1  | N/A  | Bq/L                        |
| Treated Water  | Tritium    | January - December | ND - 10.0*  | 7000 | Bq/L                        |

\*Not all radionuclide results from the Ministry of Labour were available at the time of printing.

## Newcastle DWS Table 7

### 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>                          |
|---------------------|-------------------|-----------------|-------|----------------------------|----------------|---|
| Antimony            | 14                | Non-Detect (ND) | 0.006 | Milligram per Litre (mg/L) | No             | Fire retardants, ceramics, electronics, solder.         |
| Arsenic             | 14                | ND              | 0.025 | mg/L                       | No             | Mining.   |
| Barium              | 2                 | 0.0217 - 0.0231 | 1.0   | mg/L                       | No             | Metal refineries, oil drilling.                         |
| Boron               | 2                 | 0.0242 - 0.0257 | 5.0   | mg/L                       | No             | Industrial.   |
| Cadmium             | 14                | ND              | 0.005 | mg/L                       | No             | Industrial.   |
| Chromium            | 14                | ND              | 0.05  | mg/L                       | No             | Industrial.   |
| Mercury             | 2                 | ND              | 0.001 | mg/L                       | No             | Industrial.   |
| Selenium            | 14                | ND              | 0.01  | mg/L                       | No             | Refineries, mines, chemical manufacturing.              |
| Sodium <sup>2</sup> | 12                | 13.8 - 16.5     | 20    | mg/L                       | No             | Runoff from road salt.                                  |
| Uranium             | 2                 | ND              | 0.02  | mg/L                       | No             | Power generation.                                       |
| Fluoride            | 12                | 0.075 - 0.110   | 1.5   | mg/L                       | No             | Mining.   |
| Nitrite             | 12                | ND              | 1.0   | mg/L                       | No             | Agriculture runoff, landfill leachate and animal waste. |
| Nitrate             | 12                | 0.146 - 0.362   | 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 to the Medical Officer of Health as per Schedule 16-3 (8) of O. Reg. 170/03.

### Newcastle DWS Table 8

Summary of Lead Testing Under Schedule 15.1 of O. Reg. 170/03. No lead samples from plumbing were required in 2016.

| Location Type | Number of Samples | Range of Lead Results<br>Milligram per Litre | MAC  | Number of Exceedances | pH          | Alkalinity<br>Milligram per Litre |
|---------------|-------------------|--|------|-----------------------|-------------|-----------------------------------|
| Plumbing      | 0                 | N/A  | 0.01 | 0                     | N/A         | N/A                               |
| Distribution  | 8                 | ND   | 0.01 | 0                     | 7.64 - 7.96 | 88.2 - 96.5                       |

### Newcastle DWS Table 9

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                 | Non-Detect (ND) | 5    | Microgram per Litre (ug/L) | No             | Agricultural herbicide.                               |
| Atrazine + N-dealkylated metabolites | 2                 | ND              | 5    | ug/L                       | No             | Agricultural herbicide.                               |
| Azinphos-methyl                      | 2                 | ND              | 20   | 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.                               |
| Carbaryl                             | 2                 | ND              | 90   | ug/L                       | No             | Agricultural, forestry, household insecticide.        |

**Newcastle DWS Table 9 continued**

| <b>Parameter</b>                                  | <b>Number of Samples</b> | <b>Results Range</b> | <b>MAC</b> | <b>Unit of Measure</b>     | <b>MAC Exceedance</b> | <b>Potential Sources</b>                                     |
|---|--------------------------|----------------------|------------|----------------------------|-----------------------|--|
| <b>Carbofuran</b>                                 | 2                        | Non-Detect (ND)      | 90         | Microgram per Litre (ug/L) | No                    | Agricultural insecticide.                                    |
| <b>Carbon Tetrachloride</b>                       | 2                        | ND                   | 5          | ug/L                       | No                    | Chemical and industrial activities.                          |
| <b>Chlorpyrifos</b>                               | 2                        | ND                   | 90         | ug/L                       | No                    | Agricultural, household insecticide.                         |
| <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>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.                               |
| <b>Dichloromethane</b>                            | 2                        | ND                   | 50         | ug/L                       | No                    | Pharmaceutical and chemical factories.                       |
| <b>2,4-dichlorophenol</b>                         | 2                        | ND                   | 900        | ug/L                       | No                    | Industrial contamination, reaction with chlorine.            |
| <b>2,4-Dichlorophenoxy acetic acid (2,4-D)</b>    | 2                        | ND                   | 100        | ug/L                       | No                    | Agricultural, residential herbicide.                         |

Newcastle DWS Table 9 continued

| Parameter                                  | Number of Samples | Results Range   | MAC | Unit of Measure            | MAC Exceedance | Potential Sources   |
|--|-------------------|-----------------|-----|----------------------------|----------------|---|
| Diclofop-methyl                            | 2                 | Non-Detect (ND) | 9   | Microgram per Litre (ug/L) | No             | Agricultural herbicide.   |
| Dimethoate                                 | 2                 | ND              | 20  | ug/L                       | No             | Agricultural, livestock, operation, residential insecticide.                |
| 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.                                |
| Malathion                                  | 2                 | ND              | 190 | ug/L                       | No             | Pest control insecticide.   |
| 2-Methyl-4-chlorophenoxyacetic acid (MCPA) | 2                 | ND              | 100 | ug/L                       | No             | Agricultural herbicide.   |
| Metolachlor                                | 2                 | ND              | 50  | ug/L                       | No             | Agricultural herbicide.   |
| Metribuzin                                 | 2                 | ND              | 80  | ug/L                       | No             | Agricultural herbicide.   |
| Monochlorobenzene                          | 2                 | ND              | 80  | ug/L                       | No             | Industrial and agricultural chemical factories and dry cleaning facilities. |
| Paraquat                                   | 2                 | ND              | 10  | ug/L                       | No             | Agricultural, aquatic herbicide.  |
| Pentachlorophenol                          | 2                 | ND              | 60  | ug/L                       | No             | Pesticide, wood preservative residue.                                       |



Newcastle DWS Table 9 continued

| Parameter                                      | Number of Samples | Results Range   | MAC | Unit of Measure            | MAC Exceedance | Potential Sources   |
|--|-------------------|-----------------|-----|----------------------------|----------------|---|
| <b>Phorate</b>                                 | 2                 | Non-Detect (ND) | 2   | Microgram per Litre (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>THM - Distribution (annual average)</b>     | 12                | 57.2            | 100 | ug/L                       | No             | By-product of chlorination of drinking water.   |
| <b>Terbufos</b>                                | 2                 | ND              | 1   | ug/L                       | No             | Agricultural insecticide.   |
| <b>Tetrachloroethylene (perchloroethylene)</b> | 2                 | ND              | 30  | ug/L                       | No             | Leaching from PVC pipes; discharge from factories; dry cleaners and auto shops (metal degreaser). |
| <b>2,3,4,6 - Tetrachlorophenol</b>             | 2                 | 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.  |

**Newcastle DWS Table 9 continued**

| Parameter             | Number of Samples | Results Range   | MAC | Unit of Measure            | MAC Exceedance | Potential Sources   |
|-----------------------|-------------------|-----------------|-----|----------------------------|----------------|---|
| <b>Trifluralin</b>    | 2                 | Non-Detect (ND) | 45  | Microgram per Litre (ug/L) | No             | Agricultural herbicide.                                     |
| <b>Vinyl Chloride</b> | 2                 | ND              | 2   | ug/L                       | No             | Leaching from PVC pipes; discharge from plastics factories. |

**Newcastle DWS Table 10**

**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 2016.

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