



**Ontario Clean Water Agency**  
**Agence Ontarienne Des Eaux**

Charlton Drinking Water System

# 2015 ANNUAL/SUMMARY REPORT

Prepared by the Ontario Clean Water Agency  
on behalf of the Municipality of Charlton and Dack



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## INTRODUCTION

Municipalities throughout Ontario have been required to comply with Ontario Regulation 170/03 made under the Safe Drinking Water Act (SDWA) since June 2003. The Act was enacted following recommendations made by Commissioner O'Conner after the Walkerton Inquiry. The Act's purpose is to protect human health through the control and regulation of drinking water systems. O. Reg. 170/03 regulates drinking water testing, use of licensed laboratories, treatment requirements and reporting requirements.

Section 11 of Regulation 170/03 requires the owner to produce an Annual Report. This report must include the following:

1. Description of system & chemical(s) used
2. Summary of any adverse water quality reports and corrective actions
3. Summary of all required testing
4. Description of any major expenses incurred to install, repair or replace equipment

This annual report must be completed by February 28th of each year.

Section 22 of the regulation also requires a Summary Report which must be presented & accepted by Council by March 31<sup>st</sup> of each year for the preceding calendar year.

The report must list the requirements of the Act, its regulations, the system's Drinking Water Works Permit (DWWP), Municipal Drinking Water Licence (MDWL), Certificate of Approval (if applicable), and any Provincial Officer Order the system failed to meet during the reporting period. The report must also specify the duration of the failure, and for each failure referred to, describe the measures that were taken to correct the failure.

The Safe Drinking Water Act (2002) and the drinking water regulations can be viewed at the following website: <http://www.e-laws.gov.on.ca>.

To enable the Owner to assess the rated capacity of their system to meet existing and future planned water uses, the following information is also required in the report.

1. A summary of the quantities and flow rates of water supplied during the reporting period, including the monthly average and the maximum daily flows.
2. A comparison of the summary to the rated capacity and flow rates approved in the systems approval, drinking water works permit or municipal drinking water licence or a written agreement if the system is receiving all its water from another system under an agreement.

The reports have been prepared by the Ontario Clean Water Agency (OCWA) on behalf of the Owner and presented to council as the 2015 Annual/Summary Report.



Charlton Drinking Water System

Section 11

# 2015 ANNUAL REPORT



Section 11

**ANNUAL REPORT**

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**1.0 INTRODUCTION**

|  |  |
|--|--|
| <b>Drinking-Water System Name:</b>     | <b>CHARLTON DRINKING WATER SYSTEM</b>                    |
| <b>Drinking-Water System No.:</b>      | 220005768  |
| <b>Drinking-Water System Owner:</b>    | The Corporation of the Municipality of Charlton and Dack |
| <b>Drinking-Water System Category:</b> | Large Municipal, Residential System                      |
| <b>Period being reported:</b>          | January 1, 2015 to December 31, 2015                     |

**Does your Drinking Water System serve more than 10,000 people?** No

**Is your annual report available to the public at no charge on a web site on the Internet?** Yes at [www.charltonanddack.com/](http://www.charltonanddack.com/)

**Location where Report required under O. Reg. 170/03 Schedule 22 will be available for inspection.**

Municipality of Charlton & Dack  
#287237 Sprucegrove Road  
Englehart ON P0J 1H0

***Drinking Water Systems that receive drinking water from the Charlton Drinking Water System:***

The Charlton Drinking Water System provides all drinking water to the community of Charlton.

***The Annual Report was not provided to any other Drinking Water System owners.***

The Ontario Clean Water Agency prepared the 2015 Annual/Summary Report for the Charlton Drinking Water System and provided a copy to the system owner; the Municipality of Charlton & Dack. The Charlton Drinking Water System is a stand-alone system that does not receive water from or send water to another system.

***Notification to system users that the Annual Report is available for viewing is accomplished through:***

- A notice which will be posted on Charlton and Dack’s Community Bulletin (CJBB radio)
- Discussions during public council meetings.



## 2.0 DESCRIPTION OF THE DRINKING WATER SYSTEM

The Charlton Drinking Water System is owned by the Corporation of the Municipality of Charlton and Dack and consists of a Class 3 water treatment subsystem and a Class 1 water distribution subsystem. The Ontario Clean Water Agency is designated as the Overall Responsible Operator for both the water treatment and water distribution facilities. It is a standalone system that is not connected to any other drinking water system.

### **Description of the Charlton Drinking Water System (DWS# 220005768)**

#### ***Raw Water Supply***

The water treatment plant is located on the on the west bank of the Englehart River on Bay Street in the Town of Charlton. The raw water intake system consists of an 83 m long, 200 mm diameter pipe that extends approximately 70 meters into the Englehart River. The pipe is equipped with a vertical intake riser, with manual height adjustment and perforated with 150 mm diameter holes which are covered with 20 mm diameter high density polyethylene mesh. A sand bag weighted drum secures the pipe to the river bed. The intake pipe supplies a 13.6 cubic meter low lift pumping station equipped with three submersible pumps each rated at 3.25 litres per second (L/s). The maximum rated capacity of the plant is 561 m<sup>3</sup>/day.

#### ***Water Treatment***

The treatment process consists of chemically assisted filtration using a single train “*Ecodyne Monoplant*” package treatment system housed in a 15 m by 16 m building. The process involves pH adjustment with soda ash, flash mixing/coagulation with alum, flocculation with the assistance of polymer, upflow clarification using settling tubes, pre-chlorination using sodium hypochlorite and dual media filtration through two sand and anthracite filters. As the water exits the common filter underdrain the water is post-chlorinated using sodium hypochlorite.

#### ***Water Storage and Pumping Capabilities***

The filtered water enters a 133 m<sup>3</sup> chlorine contact chamber then flows to a 227 m<sup>3</sup> clearwell. Ammonium sulphate is added at the discharge of the chlorine contact tank to produce a combined chlorine residual before entering the distribution system.

There are three high lift pumps each rated at 4.85 L/s that can direct water to the distribution system. High lift pump #1 is not in service because it is located in the chlorine contact tank. Water pumped from this location does not meet chlorine contact time (CT) requirements. A hydro-pneumatic tank having a volume of 1500 L provides pressure to the distribution system. The treated water is monitored for total and free chlorine residual using continuous on-line analyzers. An on-line turbidimeter is used to monitor the turbidity off the filters.

#### ***Waste Management***

Residue management consists of one 50 cubic meter wastewater/backwash surge tank, equipped with a sludge pump rated at 5.1 L/s and a 29.7 cubic meter settling tank with a sludge pump that transfers sludge to a tanker truck for disposal. The supernatant is discharged by an



effluent weir to the Englehart River. Composite samples of the effluent are collected using an autosampler.

### ***Emergency Power***

An 80 kW standby diesel generator set is available on-site to provide power to the water treatment facility during power failures.

### ***Distribution System***

The Charlton Water Supply System is classified as a Large Municipal Residential Drinking Water System which serves a population of approximately 250 residents through an estimated 110 service connections. The distribution system is comprised of 6" PVC-constructed ("Blue Brute") lines which were approved for installation in 1988. Other than the clearwell in the water plant, there is no off-site water storage facility associated with the system.

## **3.0 LIST OF WATER TREATMENT CHEMICALS USED OVER THE REPORTING PERIOD**

The following chemicals were used in the treatment process at the Charlton Water Treatment Plant.

- Sodium Hypochlorite – Disinfection
- Ammonium Sulphate – Chloramination
- Sodium Carbonate (Soda Ash) - pH Adjustment
- Alum (Aluminum Sulphate) - Coagulation/Flocculation
- Poly Electrolyte - Coagulant Aid

## **4.0 SIGNIFICANT EXPENSES INCURRED IN THE DRINKING WATER SYSTEM**

OCWA is committed to maintaining the assets of the drinking water system and maintains a program of scheduled inspection and maintenance activities using a computerized Work Management System (WMS). All routine maintenance activities conducted at the water treatment plant were accomplished in 2015.

Significant expenses incurred in the drinking water system include:

- a new polymer pump
- two (2) spare parts kits for ammonia pump
- a spare parts kits for post hypochlorite pump
- a spare parts kits for alum pump
- a peristaltic pump head
- a new motor for the slow mixer



## 5.0 DETAILS ON NOTICES OF ADVERSE TEST RESULTS AND OTHER PROBLEMS REPORTED TO & SUBMITTED TO THE SPILLS ACTION CENTER

Based on information kept on record by OCWA, two (2) adverse water quality incidents were reported to the MOE's Spills Action Centre in 2015.

|                           |   |
|---------------------------|---|
| <b>AWQI #</b>             | 125384  |
| <b>Parameter</b>          | Turbidity off the Filters   |
| <b>Date of Incident</b>   | July 28 to 31, 2015   |
| <b>Result</b>             | No accurate turbidity data recorded from July 28 at approximately 1:17 PM to July 30th at 12:10 PM.   |
| <b>Details</b>            | The turbidimeter was analyzing the turbidity, but the data was not being recorded every 15 minutes as required in Schedule 6 of O. Reg. 170/03. Also, the plant could not shut down or alarm during a high turbidity event. This was caused after the turbidimeter was calibrated and Instrumentation staff forgot to release the outputs from the turbidity analyzer |
| <b>Corrective Actions</b> | On July 30 <sup>th</sup> at approximately 11:00 AM, an operator discovered the turbidimeter was not reading data accurately and fixed the issue.<br><br>Instrumentation staff will record in the log book when they hold the outputs as a reminder to turn them back on before leaving the plant.   |

|                           |   |
|---------------------------|---|
| <b>AWQI #</b>             | 126794  |
| <b>Parameter</b>          | Sodium Exceedance   |
| <b>Date of Sample</b>     | October 5, 2015   |
| <b>Result</b>             | 21.9 mg/L   |
| <b>Standard</b>           | 20 mg/L   |
| <b>Details</b>            | Testmark Laboratories contacted OCWA indicating that a treated water sample exceeded the maximum allowable concentration (MAC) for sodium having a result of 21.9 mg/L. The Health Unit, MOE SAC and the Owner were notified of the result. |
| <b>Corrective Actions</b> | A re-sample was collected on October 13 <sup>th</sup> . A result of 23.1 mg/L was detected. MOH - Public Health Inspector was notified of the re-sample result on October 21, 2015 at 1345 hours.   |

## 6.0 MICROBIOLOGICAL TESTING PERFORMED DURING THE REPORTING PERIOD

### Summary of Microbiological Data

| Sample Type  | # of Samples | Range of <i>E. coli</i> Results<br>(min to max) | Range of Total Coliform Results<br>(min to max) | # of HPC Samples | Range of HPC Results<br>(min to max) |
|--------------|--------------|---|---|------------------|--------------------------------------|
| Raw (River)  | 52           | <2 to 62  | <2 to 300                                       | 0                | N/A                                  |
| Treated      | 52           | 0 to 0  | 0 to 0  | 52               | <10 to <10                           |
| Distribution | 105          | 0 to 0  | 0 to 0  | 53               | <10 to 580                           |

Maximum Allowable Concentration (MAC) for *E. coli* = 0 Counts/100 mL  
 MAC for Total Coliforms = 0 Counts/100 mL

Refer to *Appendix A* for a monthly summary of microbiological test results.



## 7.0 OPERATIONAL TESTING PERFORMED DURING THE REPORTING PERIOD

### *Continuous Monitoring in the Treatment Process*

| Parameter                              | # of Samples | Range of Results<br>(min to max) | Unit of Measure |
|--|--------------|----------------------------------|-----------------|
| <b>Turbidity*</b>                      | 8760         | 0.01 to 1.82                     | NTU             |
| <b>Free Chlorine</b> (contact chamber) | 8760         | 0.42 to 3.91                     | mg/L            |
| <b>Total Chlorine</b> (clearwell)      | 8760         | 0.51 to 3.17                     | mg/L            |

**Notes:** For continuous monitors, 8760 is used as the number of samples.

\* The Charlton water treatment process automatically shuts down if the filter effluent turbidity reaches 0.8 NTU after 72 seconds.

### *Summary of Chlorine Residual Data in the Distribution System*

| Parameter                             | # of Samples | Range of Results<br>(min to max) | Unit of Measure | Standard |
|---------------------------------------|--------------|----------------------------------|-----------------|----------|
| <b>Combined Chlorine</b> (Location 1) | 105          | 0.76 to 2.04                     | mg/L            | <0.25    |
| <b>Combined Chlorine</b> (Location 2) | 105          | 0.55 to 1.57                     |                 |          |
| <b>Combined Chlorine</b> (Location 3) | 105          | 0.60 to 2.11                     |                 |          |
| <b>Combined Chlorine</b> (Location 4) | 52           | 0.40 to 1.34                     |                 |          |

**Note:** A total of seven operational checks for chlorine residual in the distribution system are collected each week. Four (4) samples were tested one day and three (3) on a second day. The sample sets were collected at least 48-hours apart and samples collected on the same day are from different locations.

Refer to *Appendix B* for a monthly summary of the above operational data.

### *Summary of Nitrate & Nitrite Data (sampled at the water treatment plant)*

| Date of Sample | Nitrate Result Value | Nitrite Result Value | Unit of Measure | Exceedance |
|----------------|----------------------|----------------------|-----------------|------------|
| January 8      | <0.1                 | <0.05                | mg/L            | No         |
| April 10       | 0.35                 | <0.03                | mg/L            | No         |
| July 13        | 0.21                 | <0.03                | mg/L            | No         |
| October 5      | <0.1                 | <0.03                | mg/L            | No         |

Maximum Allowable Concentration (MAC) for Nitrate = 10 mg/L  
MAC for Nitrite = 1 mg/L

### *Summary of Total Trihalomethane Data (sampled in the distribution system)*

| Date of Sample | Result Value | Unit of Measure | Running Average | Exceedance |
|----------------|--------------|-----------------|-----------------|------------|
| January 8      | 31.6         | ug/L            | 49.5            | No         |
| April 10       | 37.6         | ug/L            |                 |            |
| July 13        | 60.2         | ug/L            |                 |            |
| October 5      | 67.7         | ug/L            |                 |            |

Maximum Allowable Concentration (MAC) for Total Trihalomethanes = 100 ug/L (Four Quarter Running Average)



**Summary of Most Recent Lead Data**

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

The Charlton Drinking Water System was eligible to follow the “Exemption from Plumbing Sampling” as described in section 15.1-5(9) and 15.1-5(10) of Schedule 15.1 of Ontario Regulation 170/03. The exemption applies to a drinking water system if, in two consecutive periods at reduced sampling, not more than 10% of all samples from plumbing exceed the maximum allowable concentration (MAC) of 10 ug/L for lead. As such, the system was required to test for total alkalinity and pH in one distribution sample collected during the periods of December 15 to April 15 (winter period) and June 15 to October 15 (summer period). This testing is required in every 12-month period with lead testing in every third 12-month period.

Two rounds of alkalinity and pH testing were carried out on April 10<sup>th</sup> and October 2<sup>nd</sup> of 2015. Results are summarized in the table below.

**Summary of pH & Alkalinity Data** (sampled in the distribution system)

| Date of Sample | # of Samples | Field pH Results | Field Temperature (°C) | Alkalinity Results (mg/L) |
|----------------|--------------|------------------|------------------------|---------------------------|
| April 10       | 1            | 6.25             | 5.5                    | 82.5                      |
| October 2      | 1            | 6.75             | 11.2                   | 79.6                      |

**Most Recent Schedule 23 Inorganic Data Tested at the Water Treatment Plant**

| Parameter | Result Value | Unit of Measure | Standard | Exceedance |
|-----------|--------------|-----------------|----------|------------|
| Antimony  | < 0.5        | ug/L            | 6        | No         |
| Arsenic   | < 1.0        | ug/L            | 25       | No         |
| Barium    | 12.5         | ug/L            | 1000     | No         |
| Boron     | 9.9          | ug/L            | 5000     | No         |
| Cadmium   | < 0.1        | ug/L            | 5        | No         |
| Chromium  | 1.2          | ug/L            | 50       | No         |
| Mercury   | < 0.1        | ug/L            | 1        | No         |
| Selenium  | < 1.0        | ug/L            | 10       | No         |
| Uranium   | < 1.0        | ug/L            | 20       | No         |

Note: Sample required every 12 months (sample date = October 5, 2015)

**Most Recent Schedule 24 Organic Data Tested at the Water Treatment Plant**

| Parameter                            | Result Value | Unit of Measure | Standard | Exceedance |
|--------------------------------------|--------------|-----------------|----------|------------|
| Alachlor                             | < 0.4        | ug/L            | 5        | No         |
| Aldicarb                             | < 0.6        | ug/L            | 9        | No         |
| Aldrin + Dieldrin                    | < 0.004      | ug/L            | 0.7      | No         |
| Atrazine + N-dealkylated metabolites | < 0.9        | ug/L            | 5        | No         |
| Azinphos-methyl                      | < 0.3        | ug/L            | 20       | No         |
| Bendiocarb                           | < 1.0        | ug/L            | 40       | No         |



**Most Recent Schedule 24 Organic Data Tested at the Water Treatment Plant**

| Parameter  | Result Value | Unit of Measure | Standard | Exceedance |
|--|--------------|-----------------|----------|------------|
| Benzene  | < 0.2        | ug/L            | 5        | No         |
| Benzo(a)pyrene                                       | < 0.005      | ug/L            | 0.01     | No         |
| Bromoxynil   | < 0.09       | ug/L            | 5        | No         |
| Carbaryl   | < 1.0        | ug/L            | 90       | No         |
| Carbofuran   | < 1.0        | ug/L            | 90       | No         |
| Carbon Tetrachloride                                 | < 0.2        | ug/L            | 5        | No         |
| Chlordane (Total)                                    | < 0.004      | ug/L            | 7        | No         |
| Chlorpyrifos   | < 0.3        | ug/L            | 90       | No         |
| Cyanzine   | < 0.3        | ug/L            | 10       | No         |
| Diazinon   | < 0.3        | ug/L            | 20       | No         |
| Dicamba  | < 0.08       | ug/L            | 120      | No         |
| 1,2-Dichlorobenzene                                  | < 0.2        | ug/L            | 200      | No         |
| 1,4-Dichlorobenzene                                  | < 0.2        | ug/L            | 5        | No         |
| Dichlorodiphenyl trichloroethane (DDT) + metabolites | < 0.005      | ug/L            | 30       | No         |
| 1,2-Dichloroethane                                   | < 0.2        | ug/L            | 5        | No         |
| 1,1-Dichloroethylene (vinylidene chloride)           | < 0.2        | ug/L            | 14       | No         |
| Dichloromethane                                      | < 1.0        | ug/L            | 50       | No         |
| 2-4 Dichlorophenol                                   | < 0.2        | ug/L            | 900      | No         |
| 2,4-Dichlorophenoxy acetic acid (2,4-D)              | < 0.08       | ug/L            | 100      | No         |
| Diclofop-methyl                                      | < 0.08       | ug/L            | 9        | No         |
| Dimethoate   | < 0.3        | ug/L            | 20       | No         |
| Dinoseb  | < 0.07       | ug/L            | 10       | No         |
| Diquat   | < 7.0        | ug/L            | 70       | No         |
| Diuron   | < 6.0        | ug/L            | 150      | No         |
| Glyphosate   | < 20.0       | ug/L            | 280      | No         |
| Heptachlor + Heptachlor Epoxide                      | < 0.004      | ug/L            | 3        | No         |
| Lindane (Total)                                      | < 0.0004     | ug/L            | 4        | No         |
| Malathion  | < 0.3        | ug/L            | 190      | No         |
| Methoxychlor   | < 0.001      | ug/L            | 900      | No         |
| Metolachlor  | < 0.2        | ug/L            | 50       | No         |
| Metribuzin   | < 0.2        | ug/L            | 80       | No         |
| Monochlorobenzene                                    | < 0.2        | ug/L            | 80       | No         |
| Paraquat   | < 1.0        | ug/L            | 10       | No         |
| Parathion  | < 0.2        | ug/L            | 50       | No         |
| Polychlorinated Biphenyls (PCB)                      | < 0.07       | ug/L            | 3        | No         |
| Pentachlorophenol                                    | < 0.05       | ug/L            | 60       | No         |
| Phorate  | < 0.2        | ug/L            | 2        | No         |
| Picloram   | < 0.08       | ug/L            | 190      | No         |
| Prometryne   | < 0.1        | ug/L            | 1        | No         |



**Most Recent Schedule 24 Organic Data Tested at the Water Treatment Plant**

| Parameter                                    | Result Value | Unit of Measure | Standard | Exceedance |
|--|--------------|-----------------|----------|------------|
| Simazine                                     | < 0.3        | ug/L            | 10       | No         |
| Temephos                                     | < 20.0       | ug/L            | 280      | No         |
| Terbufos                                     | < 0.1        | ug/L            | 1        | No         |
| Tetrachloroethylene                          | < 0.2        | ug/L            | 30       | No         |
| 2,3,4,6-Tetrachlorophenol                    | < 0.05       | ug/L            | 100      | No         |
| Triallate                                    | < 0.2        | ug/L            | 230      | No         |
| Trichloroethylene                            | < 0.2        | ug/L            | 50       | No         |
| 2,4,6-Trichlorophenol                        | < 0.5        | ug/L            | 5        | No         |
| 2,4,5-Trichlorophenoxy acetic acid (2,4,5-T) | < 0.09       | ug/L            | 280      | No         |
| Trifluralin                                  | < 0.2        | ug/L            | 45       | No         |
| Vinyl Chloride                               | < 0.2        | ug/L            | 2        | No         |

**Note:** Sample required every 12 months (sample date = October 5, 2015).

**Inorganic or Organic Test Results that Exceeded Half the Standard Prescribed in Schedule 2 of the Ontario Drinking Water Quality Standards.**

No inorganic or organic parameter(s) listed in Schedule 23 and 24 of Ontario Regulation 170/03 exceeded half the standard found in Schedule 2 of the Ontario Drinking Water Standard (O. Reg. 169/03) during the reporting period.

**Most Recent Sodium Data Sampled at the Water Treatment Plant**

| Date of Sample               | # of Samples | Result Value | Unit of Measure | Standard | Exceedance |
|------------------------------|--------------|--------------|-----------------|----------|------------|
| October 5, 2015              | 1            | 21.9         | mg/L            | 20       | Yes        |
| October 13, 2015 (re-sample) | 1            | 23.1         |                 |          |            |

**Note:** Sample required every 60 months. Next sampling scheduled for October 2020

The aesthetic objective for sodium in drinking water is 200 mg/L at which it can be detected by a salty taste. It is required that the local Medical Officer of Health be notified when the concentration exceeds 20 mg/L so that persons on sodium restricted diets can be notified by their physicians. The adverse sodium result was reported to MOE SAC and the Timiskaming Health Unit on October 8, 2015 as required under Schedule 16 of O. Reg. 170/03 (AWQI# 98813).

**Most Recent Fluoride Data Sampled at the Water Treatment Plant**

| Date of Sample  | # of Samples | Result Value | Unit of Measure | Standard | Exceedance |
|-----------------|--------------|--------------|-----------------|----------|------------|
| October 5, 2015 | 1            | <0.1         | mg/L            | 1.5      | No         |

**Note:** Sample required every 60 months. Next sampling scheduled for October 2020



**Summary of Additional Testing Performed in Accordance with a Legal Instrument.**

Condition 1.5 of Schedule C to Municipal Drinking Water Licence (MDWL) #271-101 requires that the annual average concentration of total suspended solids (TSS) from the effluent discharged to the Englehart River not exceed 25 mg/L. Further, Condition 4.4 of Schedule C to the MDWL requires that composite samples are collected every month.

The Charlton water treatment plant did not exceed this limit in 2015.

**Summary of Total Suspended Solids Data from the Effluent Discharge**

| Date of Sample | # of Samples | Result Value | Unit of Measure | Annual Average | Limit |
|----------------|--------------|--------------|-----------------|----------------|-------|
| January 5      | 1            | 6.5          | mg/L            | 7.2            | 25    |
| February 5     | 1            | 19.5         |                 |                |       |
| March 2        | 1            | 11.0         |                 |                |       |
| April 7        | 1            | 3.5          |                 |                |       |
| May 4          | 1            | 4.5          |                 |                |       |
| June 1         | 1            | 3.0          |                 |                |       |
| July 6         | 1            | 6.0          |                 |                |       |
| August 4       | 1            | 8.5          |                 |                |       |
| September 8    | 2            | 1.8          |                 |                |       |
| October 5      | 1            | 2.8          |                 |                |       |
| November 2     | 1            | 10.5         |                 |                |       |
| December 7     | 1            | 8.5          |                 |                |       |



Charlton Drinking Water System

Schedule 22

# 2015 SUMMARY REPORT

## FOR MUNICIPALITIES



Schedule 22

## SUMMARY REPORTS FOR MUNICIPALITIES

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### 1.0 INTRODUCTION

|   |                                       |
|---|---------------------------------------|
| <b>Drinking-Water System Name:</b>                  | <b>CHARLTON DRINKING WATER SYSTEM</b> |
| <b>Municipal Drinking Water Licence (MDWL) No.:</b> | 271-101 (issued March 11, 2011)       |
| <b>Drinking Water Work Permit (DWWP) No.:</b>       | 271-201 (issued March 3, 2011)        |
| <b>Permit to Take Water (PTTW) No.:</b>             | 5485-6UJNT7 (issued October 13, 2006) |
| <b>Period being reported:</b>                       | January 1, 2015 to December 31, 2015  |

### 2.0 REQUIREMENTS THE SYSTEM FAILED TO MEET

According to information kept on record by OCWA, the Charlton Drinking Water System failed to meet the following legislative and /or regulative requirements:

1. Section 6-5 (1) 1(i) and (ii) of Schedule 6 to Ontario Regulation 170/03 requires that continuous monitoring equipment must, except when no water is being directed to users test for turbidity with at least the minimum frequency specified in the table (15 minutes) for the parameter and record the date, time, sampling location and results of the parameter.

The system failed to meet this requirement on July 28<sup>th</sup> when no accurate turbidity data was recorded from approximately 1:17 PM to 12:10 PM on July 30<sup>th</sup>. The turbidimeter was analyzing the turbidity, but there were not outputs (readings). This type of issue would not cause the plant to shutdown or alarm during a high turbidity event. The incident was reported as an Adverse Water Quality Incident (AWQI) and the problem was resolved soon after it was discovered.

2. The system failed to meet the sodium standard of 20 mg/L having a result of 21.9 mg/L. This result was reported as an Adverse Water Quality Incident (AWQI) as required under Section 16-3 (1) 8 of Schedule 16 to Ontario Regulation 170/03

Refer to Section 5.0 - DETAILS ON NOTICES OF ADVERSE TEST RESULTS AND OTHER PROBLEMS REPORTED TO & SUBMITTED TO THE SPILLS ACTION CENTER on page 6 of this report for additional details.

### 3.0 SUMMARY OF QUANTITIES & FLOW RATES

#### *Water Usage*

The following water usage tables summarize the quantities and flow rates of water taken and produced during the 2015 reporting period, including total monthly volumes, average monthly volumes, maximum monthly volumes, and maximum flow rates.



## Raw Water

### 2015 - Monthly Summary of Water Takings from the Source (Englehart River)

Governed by Permit to Take Water (PTTW) #5485-6UJNT7, issued October 13, 2006

|   | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  | Year to Date |
|---|------|------|------|------|------|------|------|------|------|------|------|------|--------------|
| Total Volume (m <sup>3</sup> )                        | 3322 | 2844 | 3910 | 3375 | 3753 | 3234 | 4032 | 3497 | 3460 | 4122 | 4281 | 4617 | 44447        |
| Average Volume (m <sup>3</sup> /d)                    | 107  | 102  | 126  | 113  | 121  | 108  | 130  | 113  | 115  | 133  | 143  | 149  | 122          |
| Maximum Volume (m <sup>3</sup> /d)                    | 133  | 117  | 164  | 224  | 171  | 143  | 223  | 140  | 165  | 200  | 204  | 175  | 224          |
| PTTW - Maximum Allowable Volume (m <sup>3</sup> /day) | 842  | 842  | 842  | 842  | 842  | 842  | 842  | 842  | 842  | 842  | 842  | 842  | 842          |
| Maximum Flow Rate (L/min)                             | 191  | 190  | 194  | 181  | 204  | 190  | 191  | 192  | 191  | 186  | 187  | 186  | 204          |
| PTTW - Maximum Allowable Flow Rate (L/min)            | 585  | 585  | 585  | 585  | 585  | 585  | 585  | 585  | 585  | 585  | 585  | 585  | 585          |

## Treated Water

### 2015 - Monthly Summary of Treated Water Supplied to the Distribution System

Governed by Municipal Drinking Water Licence (MDWL) #271-101, issued March 11, 2011

|   | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  | Year to Date |
|---|------|------|------|------|------|------|------|------|------|------|------|------|--------------|
| Total Volume (m <sup>3</sup> )              | 2869 | 2496 | 3397 | 2939 | 3417 | 2917 | 3566 | 3167 | 3142 | 3695 | 3867 | 4127 | 39599        |
| Average Volume (m <sup>3</sup> /d)          | 93   | 89   | 110  | 98   | 110  | 97   | 115  | 102  | 105  | 119  | 129  | 133  | 108          |
| Maximum Volume (m <sup>3</sup> /d)          | 118  | 98   | 145  | 131  | 152  | 114  | 154  | 125  | 139  | 139  | 168  | 161  | 168          |
| MDWL - Rated Capacity (m <sup>3</sup> /day) | 561  | 561  | 561  | 561  | 561  | 561  | 561  | 561  | 561  | 561  | 561  | 561  | 561          |

## Flow Monitoring

MDWL No. 271-101 requires the owner to install a sufficient number of flow measuring devices to permit the continuous measurement and recording of:

- the flow rate and daily volume of treated water that flows from the treatment subsystem to the distribution system, and
- the flow rate and daily volume of water that flows into the treatment subsystem.

The flow monitoring equipment identified in the MDWL is present and operating as required. These flow meters are calibrated on an annual basis as specified in the manufacturers' instructions.

### Comparison of the Flow Summary to the Rated Capacity & Flow Rates Allowed in the Systems Permit & Licence

The system's Permit to Take Water #5485-6UJNT7, allows the Municipality to withdraw a maximum volume of 842.4 cubic meters from the Englehart River per day. A review of the raw





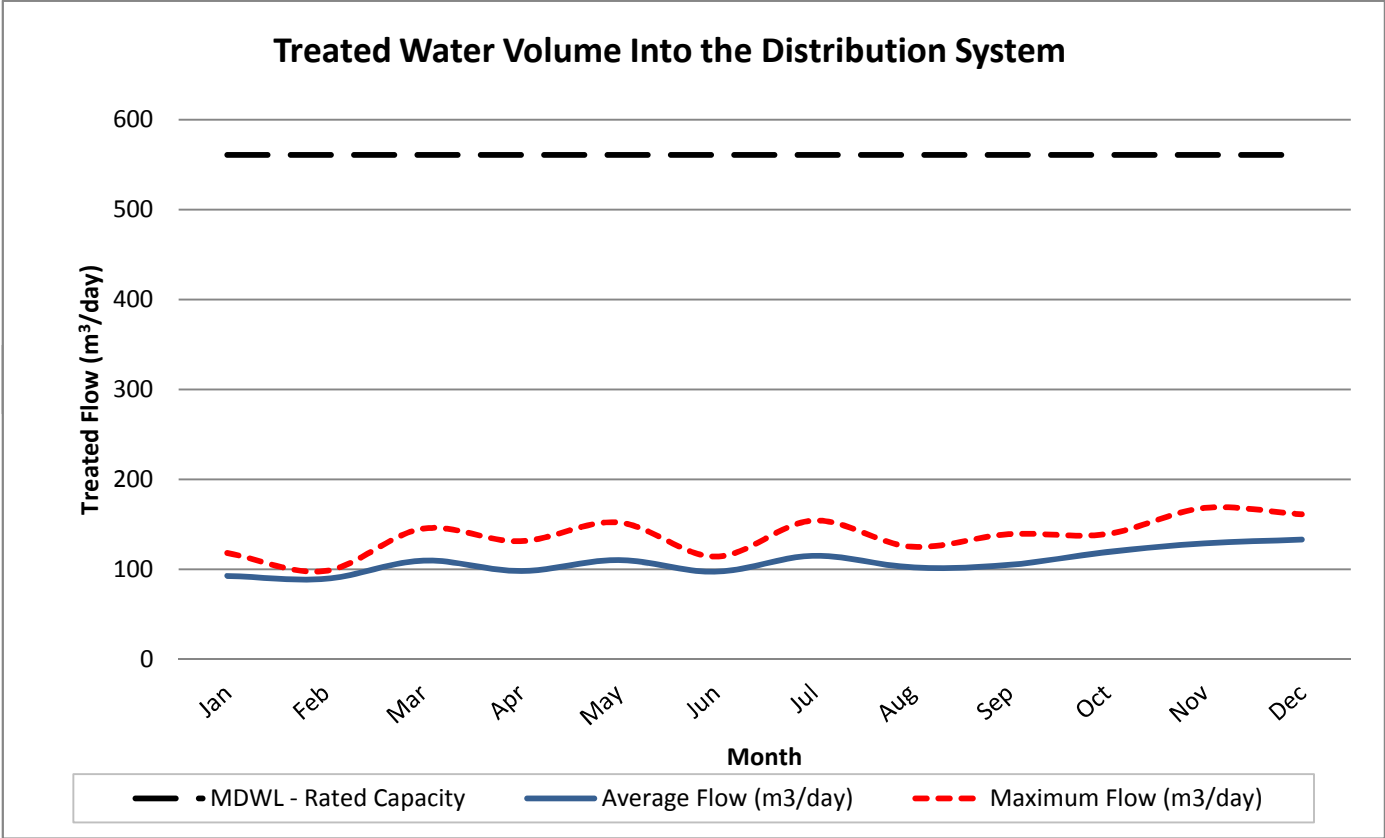
water flow data indicates that the maximum volume taken was 224 m<sup>3</sup> on April 13<sup>th</sup>. The Permit also allows a maximum flow rate of 585 L/minute. At no point during the reporting period did the system exceed this rate having a maximum recorded flow of 204 L/minute on April 19, 2015.

Schedule C, Section 1.1 of MDWL No. 271-101 states that the maximum daily volume of treated water that flows from the treatment subsystem to the distribution system shall not exceed a maximum flow rate of 561 m<sup>3</sup> on any calendar day. The Charlton DWS complied with this limit having a recorded maximum volume of 168 m<sup>3</sup>/day on November 29, 2015.

Figure 1 compares the average and maximum treated flow rates to the rated capacity of the system identified in the MDWL. This information enables the Owner to assess the system's existing and future planned water usage needs.

**Figure 1: 2015 - Daily Volume of Treated Water into the Distribution System**

|                                    | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Average Flow (m <sup>3</sup> /day) | 93  | 89  | 110 | 98  | 110 | 97  | 115 | 102 | 105 | 119 | 129 | 133 |
| Maximum Flow (m <sup>3</sup> /day) | 118 | 98  | 145 | 131 | 152 | 114 | 154 | 125 | 139 | 139 | 168 | 161 |
| MDWL - Rated Capacity              | 561 | 561 | 561 | 561 | 561 | 561 | 561 | 561 | 561 | 561 | 561 | 561 |
| % Rated Capacity                   | 21  | 17  | 26  | 23  | 27  | 20  | 27  | 22  | 25  | 25  | 30  | 29  |





## 4.0 CONCLUSION

In 2015, the Charlton drinking water system (DWS) provided safe and reliable drinking water to the community of Charlton while meeting the terms and conditions outlined in its site specific drinking water works permit and municipal drinking water licence.

The system was able to operate within the water taking limits of the permit and in accordance with the rated capacity of the licence while meeting the community's demand for water use.

The system did however fail to accurately record turbidity data every 15 minutes as required under Ontario Regulation 170-03 due to an instrumentation issue. The incident was reported as an Adverse Water Quality Incident and resolved soon after it was discovered.

The system also failed to meet the sodium standard of 20 mg/L having a result of 21.9 mg/L in the treated water. The result was reported as an Adverse Water Quality Incident to the Ministry's Spills Action Center (SAC) and the local Ministry of Health (MOH). The MOH is notified when sodium concentrations exceed 20 mg/L so that persons on sodium restricted diets can be notified by their physicians.



# **APPENDIX A**

Monthly Summary of Microbiological Test Results

## MONTHLY MICROBIOLOGICAL REPORT

**Facility Org Number:** 5049  
**Facility Works Number:** 220005768  
**Facility Name:** CHARLTON DRINKING WATER SYSTEM  
**Facility Owner:** Municipality: Municipality of Charlton and Dack  
**Facility Classification:** Class 3 Water Treatment  
**Service Population:** 250  
**Total Design Capacity:** 561.0 m3/day  
**From:** 01/01/2015 to 31/12/2015

|  | 01/2015 | 02/2015 | 03/2015 | 04/2015 | 05/2015 | 06/2015 | 07/2015 | 08/2015 | 09/2015 | 10/2015 | 11/2015 | 12/2015 | Total | Avg     | Max   | Min  |
|--|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|-------|---------|-------|------|
| <b>Raw Water</b>                                     |         |         |         |         |         |         |         |         |         |         |         |         |       |         |       |      |
| Englehart River / Total Coliform: TC - cfu/100mL     |         |         |         |         |         |         |         |         |         |         |         |         |       |         |       |      |
| Count Lab  | 4       | 4       | 5       | 4       | 4       | 5       | 4       | 5       | 4       | 4       | 5       | 4       | 52    |         |       |      |
| Max Lab  | 58      | 38      | 32      | > 300   | 90      | 126     | 14      | 76      | 188     | 214     | > 300   | > 300   |       |         | > 300 |      |
| Mean Lab   | 41.5    | 27.5    | 21.6    | > 251.5 | < 48    | 52.8    | < 7.5   | < 19.6  | < 67.5  | 98      | > 184.8 | > 232   | ?     | 86.308  |       |      |
| Min Lab  | 6       | 16      | 4       | 172     | < 2     | 12      | < 2     | < 2     | < 2     | 36      | 98      | 152     |       |         |       | < 2  |
| Englehart River / E. Coli: EC - cfu/100mL            |         |         |         |         |         |         |         |         |         |         |         |         |       |         |       |      |
| Count Lab  | 4       | 4       | 5       | 4       | 4       | 5       | 4       | 5       | 4       | 4       | 5       | 4       | 52    |         |       |      |
| Max Lab  | < 2     | < 2     | < 2     | 16      | < 5     | 6       | 6       | 6       | 62      | 16      | 28      | 24      |       |         | < 62  |      |
| Mean Lab   | < 2     | < 2     | < 2     | 9.25    | < 3.5   | < 2.8   | < 3.5   | < 3.6   | < 25.5  | < 6.5   | 11.6    | < 8     |       | < 6.558 |       |      |
| Min Lab  | < 2     | < 2     | < 2     | 4       | < 2     | < 2     | < 2     | < 2     | < 2     | < 2     | 2       | < 2     |       |         |       | < 2  |
| <b>Treated Water</b>                                 |         |         |         |         |         |         |         |         |         |         |         |         |       |         |       |      |
| Treated Water (POE) / Total Coliform: TC - cfu/100mL |         |         |         |         |         |         |         |         |         |         |         |         |       |         |       |      |
| Count Lab  | 4       | 4       | 5       | 4       | 4       | 5       | 4       | 5       | 4       | 4       | 5       | 4       | 52    |         |       |      |
| Max Lab  | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     |       |         | < 0   |      |
| Mean Lab   | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     |       | < 0     |       |      |
| Min Lab  | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     |       |         |       | < 0  |
| Treated Water (POE) / E. Coli: EC - cfu/100mL        |         |         |         |         |         |         |         |         |         |         |         |         |       |         |       |      |
| Count Lab  | 4       | 4       | 5       | 4       | 4       | 5       | 4       | 5       | 4       | 4       | 5       | 4       | 52    |         |       |      |
| Max Lab  | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     |       |         | < 0   |      |
| Mean Lab   | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     |       | < 0     |       |      |
| Min Lab  | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     |       |         |       | < 0  |
| Treated Water (POE) / HPC - cfu/mL                   |         |         |         |         |         |         |         |         |         |         |         |         |       |         |       |      |
| Count Lab  | 4       | 4       | 5       | 4       | 4       | 5       | 4       | 5       | 4       | 4       | 5       | 4       | 52    |         |       |      |
| Max Lab  | < 10    | < 10    | < 10    | < 10    | < 10    | < 10    | < 10    | < 10    | < 10    | < 10    | < 10    | < 10    |       |         | < 10  |      |
| Mean Lab   | < 10    | < 10    | < 10    | < 10    | < 10    | < 10    | < 10    | < 10    | < 10    | < 10    | < 10    | < 10    |       | < 10    |       |      |
| Min Lab  | < 10    | < 10    | < 10    | < 10    | < 10    | < 10    | < 10    | < 10    | < 10    | < 10    | < 10    | < 10    |       |         |       | < 10 |

## MONTHLY MICROBIOLOGICAL REPORT

**Facility Org Number:** 5049  
**Facility Works Number:** 220005768  
**Facility Name:** CHARLTON DRINKING WATER SYSTEM  
**Facility Owner:** Municipality: Municipality of Charlton and Dack  
**Facility Classification:** Class 3 Water Treatment  
**Service Population:** 250  
**Total Design Capacity:** 561.0 m3/day  
**From:** 01/01/2015 to 31/12/2015

|  | 01/2015 | 02/2015 | 03/2015 | 04/2015 | 05/2015 | 06/2015 | 07/2015 | 08/2015 | 09/2015 | 10/2015 | 11/2015 | 12/2015 | Total | Avg      | Max   | Min  |
|--|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|-------|----------|-------|------|
| <b><i>Distribution System Water</i></b>              |         |         |         |         |         |         |         |         |         |         |         |         |       |          |       |      |
| <b>Distribution / Total Coliform: TC - cfu/100mL</b> |         |         |         |         |         |         |         |         |         |         |         |         |       |          |       |      |
| Count Lab  | 8       | 8       | 10      | 8       | 8       | 11      | 8       | 10      | 8       | 8       | 10      | 8       | 105   |          |       |      |
| Max Lab  | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     |       |          | < 0   |      |
| Mean Lab   | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     |       | < 0      |       |      |
| Min Lab  | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     |       |          |       | < 0  |
| <b>Distribution / E. Coli - cfu/100mL</b>            |         |         |         |         |         |         |         |         |         |         |         |         |       |          |       |      |
| Count Lab  | 8       | 8       | 10      | 8       | 8       | 11      | 8       | 10      | 8       | 8       | 10      | 8       | 105   |          |       |      |
| Max Lab  | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     |       |          | < 0   |      |
| Mean Lab   | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     |       | < 0      |       |      |
| Min Lab  | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     | < 0     |       |          |       | < 0  |
| <b>Distribution / HPC - cfu/mL</b>                   |         |         |         |         |         |         |         |         |         |         |         |         |       |          |       |      |
| Count Lab  | 4       | 4       | 5       | 4       | 4       | 6       | 4       | 5       | 4       | 4       | 5       | 4       | 53    |          |       |      |
| Max Lab  | 580     | < 10    | < 10    | 30      | < 10    | < 10    | < 10    | < 10    | < 10    | 80      | < 10    | < 10    |       |          | < 580 |      |
| Mean Lab   | < 152.5 | < 10    | < 10    | < 15    | < 10    | < 10    | < 10    | < 10    | < 10    | < 27.5  | < 10    | < 10    |       | < 22.453 |       |      |
| Min Lab  | < 10    | < 10    | < 10    | < 10    | < 10    | < 10    | < 10    | < 10    | < 10    | < 10    | < 10    | < 10    |       |          |       | < 10 |



# **APPENDIX B**

Monthly Summary of Operational Data

## MONTHLY SUMMARY OF OPERATIONAL DATA

**Facility Org Number:** 5049  
**Facility Works Number:** 220005768  
**Facility Name:** CHARLTON DRINKING WATER SYSTEM  
**Facility Owner:** Municipality of Charlton and Dack  
**Facility Classification:** Class 3 Water Treatment  
**Service Population:** 250  
**Total Design Capacity:** 561.0 m3/day  
**From:** 01/01/2015 to 31/12/2015

|   | 01/2015 | 02/2015 | 03/2015 | 04/2015 | 05/2015 | 06/2015 | 07/2015 | 08/2015 | 09/2015 | 10/2015 | 11/2015 | 12/2015 | Avg  | Max  | Min  |
|---|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|------|------|------|
| <b>Filtration / Turbidity - NTU</b>               |         |         |         |         |         |         |         |         |         |         |         |         |      |      |      |
| Max OL  | 0.76    | 0.88    | 0.83    | 1.60    | 0.50    | 0.74    | 0.98    | 0.72    | 0.49    | 1.38    | 0.80    | 1.82    |      | 1.82 |      |
| Mean OL   | 0.06    | 0.06    | 0.07    | 0.08    | 0.05    | 0.05    | 0.07    | 0.06    | 0.06    | 0.08    | 0.09    | 0.09    | 0.07 |      |      |
| Min OL  | 0.03    | 0.04    | 0.04    | 0.03    | 0.03    | 0.03    | 0.01    | 0.03    | 0.04    | 0.02    | 0.05    | 0.05    |      |      | 0.01 |
| <b>Contact Chamber / CI Residual: Free - mg/L</b> |         |         |         |         |         |         |         |         |         |         |         |         |      |      |      |
| Max OL  | 3.44    | 2.38    | 3.91    | 2.61    | 3.59    | 2.17    | 1.69    | 3.30    | 2.31    | 3.01    | 2.48    | 2.71    |      | 3.91 |      |
| Mean OL   | 2.00    | 2.13    | 1.91    | 2.09    | 1.95    | 1.46    | 1.29    | 1.26    | 1.47    | 1.63    | 1.94    | 1.60    | 1.73 |      |      |
| Min OL  | 0.75    | 1.86    | 1.52    | 1.60    | 1.69    | 0.94    | 0.76    | 0.42    | 0.90    | 0.96    | 0.85    | 1.07    |      |      | 0.42 |
| <b>Clearwell / CI Residual: Total - mg/L</b>      |         |         |         |         |         |         |         |         |         |         |         |         |      |      |      |
| Max OL  | 2.37    | 2.42    | 2.52    | 2.56    | 2.27    | 2.02    | 1.97    | 2.02    | 2.02    | 2.52    | 3.12    | 3.17    |      | 3.17 |      |
| Mean OL   | 1.76    | 1.90    | 1.82    | 2.09    | 1.89    | 1.44    | 1.17    | 1.30    | 1.50    | 1.75    | 1.88    | 1.86    | 1.70 |      |      |
| Min OL  | 1.16    | 0.91    | 0.91    | 1.06    | 1.31    | 0.96    | 0.56    | 0.66    | 1.11    | 1.01    | 0.96    | 0.51    |      |      | 0.51 |

### *Distribution System*

|  | 01/2015 | 02/2015 | 03/2015 | 04/2015 | 05/2015 | 06/2015 | 07/2015 | 08/2015 | 09/2015 | 10/2015 | 11/2015 | 12/2015 | Total | Avg   | Max  | Min  |
|--|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|-------|-------|------|------|
| <b>Residual No. 1 / CI Residual: Combined - mg/L</b> |         |         |         |         |         |         |         |         |         |         |         |         |       |       |      |      |
| Count IH   | 9       | 8       | 9       | 9       | 8       | 9       | 9       | 9       | 8       | 9       | 9       | 9       | 105   |       |      |      |
| Max IH   | 2       | 2.01    | 2.03    | 2.01    | 1.96    | 1.51    | 1.3     | 1.7     | 1.54    | 2.04    | 1.97    | 1.97    |       |       | 2.04 |      |
| Mean IH  | 1.446   | 1.766   | 1.683   | 1.712   | 1.614   | 1.262   | 1.104   | 1.214   | 1.246   | 1.391   | 1.673   | 1.643   |       | 1.478 |      |      |
| Min IH   | 0.83    | 1.47    | 1.45    | 1.53    | 1.08    | 1.01    | 0.88    | 0.76    | 1       | 1.04    | 1.42    | 1.2     |       |       |      | 0.76 |
| <b>Residual No. 2 / CI Residual: Combined - mg/L</b> |         |         |         |         |         |         |         |         |         |         |         |         |       |       |      |      |
| Count IH   | 9       | 8       | 9       | 9       | 8       | 9       | 9       | 9       | 8       | 9       | 9       | 9       | 105   |       |      |      |
| Max IH   | 2.09    | 2.09    | 2       | 2.13    | 1.87    | 1.87    | 1.32    | 1.65    | 1.97    | 2.02    | 2.1     | 1.97    |       |       | 2.13 |      |
| Mean IH  | 1.648   | 1.706   | 1.713   | 1.907   | 1.576   | 1.419   | 1.144   | 1.188   | 1.479   | 1.568   | 1.876   | 1.662   |       | 1.573 |      |      |
| Min IH   | 1.14    | 1.23    | 1.39    | 1.59    | 0.55    | 1.02    | 1.03    | 0.64    | 1.19    | 1.23    | 1.15    | 1.31    |       |       |      | 0.55 |
| <b>Residual No. 3 / CI Residual: Combined - mg/L</b> |         |         |         |         |         |         |         |         |         |         |         |         |       |       |      |      |
| Count IH   | 9       | 8       | 9       | 9       | 8       | 9       | 9       | 9       | 8       | 9       | 9       | 9       | 105   |       |      |      |
| Max IH   | 2.01    | 2.01    | 2.06    | 2.04    | 1.86    | 1.87    | 1.2     | 1.56    | 1.57    | 1.9     | 2.11    | 1.91    |       |       | 2.11 |      |
| Mean IH  | 1.762   | 1.76    | 1.74    | 1.929   | 1.706   | 1.421   | 1.063   | 1.103   | 1.28    | 1.599   | 1.911   | 1.734   |       | 1.584 |      |      |
| Min IH   | 1.18    | 0.97    | 1.43    | 1.72    | 1.32    | 1.03    | 0.9     | 0.6     | 1       | 1.22    | 1.73    | 1.25    |       |       |      | 0.6  |
| <b>Residual No. 4 / CI Residual: Combined - mg/L</b> |         |         |         |         |         |         |         |         |         |         |         |         |       |       |      |      |
| Count IH   | 4       | 4       | 5       | 4       | 4       | 5       | 4       | 5       | 4       | 4       | 5       | 4       | 52    |       |      |      |
| Max IH   | 1.35    | 1.96    | 1.5     | 2.01    | 1.74    | 1.82    | 0.94    | 1.51    | 1.49    | 1.97    | 2.12    | 1.97    |       |       | 2.12 |      |
| Mean IH  | 1.015   | 1.652   | 1.318   | 1.2     | 1.598   | 1.024   | 0.85    | 0.968   | 1.253   | 1.683   | 1.946   | 1.59    |       | 1.339 |      |      |
| Min IH   | 0.68    | 1.23    | 0.91    | 0.4     | 1.4     | 0.42    | 0.72    | 0.6     | 1.05    | 1.15    | 1.83    | 1.2     |       |       |      | 0.4  |