

# Lucknow Annual and Summary Report

*For the 2022 Operating Year*

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## 1.0 EXECUTIVE SUMMARY

The purpose of this report is to provide information to system Owners and Stakeholders to satisfy the regulatory requirements of the following:

- *Safe Drinking Water Act (SDWA)*
- Drinking Water Quality Management Standard (DWQMS)
- Section 81 of the Clean Water Act (CWA)
- Reporting required under Ontario Regulation (O. Reg.) 170/03, Section 11
- Reporting required under O. Reg. 170/03, Schedule 22

The Operating Authority (Veolia), on behalf of the Owner (Township of Huron-Kinloss), has prepared this report as a compilation of information that demonstrates the ongoing provision of a safe, consistent supply of high quality drinking water to customers supplied by the Lucknow Drinking Water System.

### **SAFE DRINKING WATER ACT**

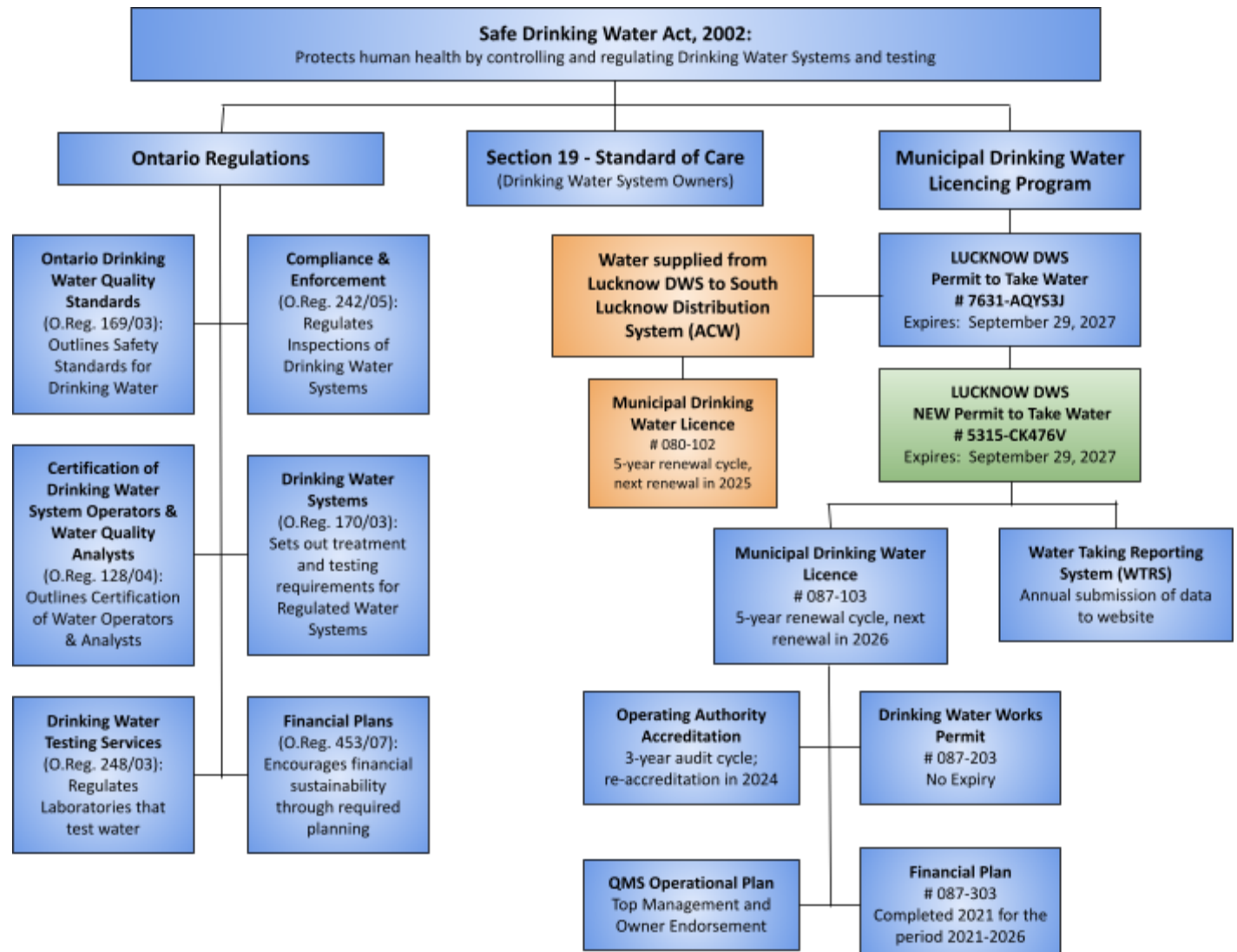
Following the Walkerton Tragedy in 2000, the Ontario Government developed a new, comprehensive legislative paradigm based on a source-to-tap, multi-barrier approach to the protection of drinking water. The *Safe Drinking Water Act (SDWA)*, 2002, and its Regulations, contain requirements for Municipalities that provide potable water to their residents.

Under Section 19 (Standard of Care of the *SDWA*), Owners of a Drinking Water System are required to:

- a) exercise the level of care, diligence and skill in respect of a Municipal Drinking Water System that a reasonably prudent person would be expected to exercise in a similar situation; and
  - b) act honestly, competently and with integrity, with a view to ensuring the protection and safety of the users of the Municipal Drinking Water System.
- 2002, c. 32, s. 19(1).

The following chart outlines key aspects of the *SDWA* that relate to the Lucknow Drinking Water System:

### Legislative Framework for the Lucknow Drinking Water System



**Figure 1**

**NOTE:** PTTW # 5315-CK476V, dated October 12, 2022, replaces PTTW 7631-AQUS3J, dated September 29, 2017.

## 2.0 REPORTING REQUIREMENTS:

This report intends to provide relevant information to help the Township of Huron-Kinloss, its Council, as Owners of the Lucknow Drinking Water System, meet the Standard of Care. Its contents are organized as follows, according to specific reporting requirements under the *SDWA*:

### O. REG. 170/03, SECTION 11 - ANNUAL REPORT

- The Owner shall ensure an annual report is prepared as per O. Reg. 170/03, s. 11(1)
- The Owner of a Drinking Water System (DWS) that supplies water to another DWS shall provide a copy of the annual report to the system that receives the water
- The annual report must cover the period of January 1 to December 31 in a year and must be prepared not later than February 28 of the following year
- The annual report must:
  - Contain a brief description of the DWS, including a list of water treatment chemicals used
  - Summarize any reports made to the Ministry under s.s. 18(1) of the *Act*, or Sch. 16 (16-4)
  - Summarize the results of tests made under O. Reg. 170/03 and the Municipal Drinking Water Licence (MDWL)
  - Describe any corrective actions taken under Sch. 17
  - Describe any major expenses to install, repair or replace required equipment
  - Include a statement of where a report prepared as per Sch. 22 will be available for inspection under s.s. 12(4)
  - Specify the number of points sampled as per s.s. 15.1-4(2) or s.s. 15.1-5(5), the number of samples taken, and the number of points where a sample exceeded the prescribed standard for lead
- The Owner shall ensure that a copy of an annual report for a system is given, without charge, to every person who requests a copy
- If a DWS is connected to and receives all of its drinking water from another DWS, the Owner of the system that receives the water shall ensure that a copy of an annual report for the DWS that supplies water is given, without charge, to every person who requests a copy
- Every time that an annual report is prepared for a DWS, the Owner of the system shall ensure that effective steps are taken to advise users of water from the system that copies of the report are available, without charge, and of how a copy may be obtained.

## **O. REG. 170/03, SCHEDULE 22 - SUMMARY REPORT FOR MUNICIPALITIES**

- The Owner of a DWS shall ensure that, not later than March 31 of each year, a report is prepared as per s.s. (2) and (3) for the preceding year and is given to:
  - in the case of a DWS owned by a Municipality, the members of the Municipal Council;
  - in the case of a DWS owned by a Municipal Service Board established under s. 195 of the *Municipal Act, 2001*, the members of the Municipal Service Board; or
  - in the case of a DWS owned by a Corporation, the Board of Directors of the Corporation
- The summary report must,
  - list the requirements of the *Act*, the Regulations, the system's approval, Drinking Water Works Permit (DWWP), MDWL, and any Orders applicable to the system that were not met at any time during the period covered by the report; and
  - for each requirement referred to above that was not met, specify the duration of the failure and the measures that were taken to correct the failure.
- The summary report must also include the following information for the purpose of enabling the Owner of the DWS to assess the capability of the system to meet existing and planned uses of the system:
  - A summary of the quantities and flow rates of the water supplied during the period covered by the report, including monthly average and maximum daily flows;
  - A comparison of the summary referred to above to the rated capacity and flow rates approved in the system's approval, DWWP or MDWL, or if the system is receiving all of its water from another system under an agreement pursuant to subsection 5(4), to the flow rates specified in the written agreement.
- If a report is prepared under s.s. (1) for a system that supplies water to a Municipality under the terms of the contract, the Owner of the DWS shall give a copy of the report to the Municipality by March 31.

## **MINISTRY OF THE ENVIRONMENT, CONSERVATION AND PARKS (MECP) INSPECTION REPORT**

- In 2006, the MECP introduced a comprehensive inspection program for Municipal Residential Drinking Water Systems. The objectives of this program are to determine compliance with the *SDWA* and associated regulations; to encourage the continuous improvement of the Drinking Water System; and to establish a process to measure these improvements.

## **MUNICIPAL DRINKING WATER MANAGEMENT REVIEW**

- The *SDWA*, through the Municipal Drinking Water System Licensing Program, requires that the Township maintain an accredited Quality Management System (QMS) for its drinking water system. This review communicates to Council the key information related to the QMS and the Municipal Drinking Water Licensing Program.

## QMS OPERATIONAL PLAN

- The *SDWA*, through the Municipal Drinking Water Licensing Program, requires that a Municipal Drinking Water System Owner (Council) endorse the most current version of the QMS Operational Plan. This document, once endorsed, is posted on the Township of Huron-Kinloss website and is available at the Operations Centre.
- An updated Operational Plan was submitted on May 24, 2022 - Revision 15, can be found here:  
<https://www.huronkinloss.com/en/live-here/resources/Operational-Plan---Huron-Kinloss---May-24-2022---Rev-15.pdf>

The Township of Huron-Kinloss is approved by the MECP to operate a Class 2 Distribution and Supply Subsystem through its MDWL # 087-103, and to alter the system through its DWWP # 087-203. The Township of Ashfield-Colborne-Wawanosh is approved by the MECP to operate a Class 1 Distribution System (South Lucknow) through its MDWL # 080-102, and to alter the system through its DWWP # 080-202.

The MECP “Municipal Drinking Water Systems” web portal provides the most current version of the *Act* and its regulations and can be found:

<https://www.ontario.ca/page/municipal-drinking-water-systems-licencing-registration-and-permits>

## 3.0 DESCRIPTION OF WATER SYSTEM (O. Reg. 170/03, s. 11 (6) (a))

A summary of the Lucknow Drinking Water System description is outlined below:

Drinking Water System Number:	220002663
Drinking Water System Name:	Lucknow Water Distribution and Supply
Drinking Water System Owner:	Corporation of the Township of Huron-Kinloss
Drinking Water System Category:	Large Municipal Residential
Drinking Water System Classification:	Water Distribution and Supply Subsystem Class 2
Drinking Water System Certificate No.:	1381
Daily Maximum Water Supply Capacity:	1,500 m <sup>3</sup> (2,000 m <sup>3</sup> beginning Oct 12, 2022)
Disinfection Chemicals:	Sodium Hypochlorite, 12%
Population (Stats Can - 2021):	1,154
Total Number of Service Connections:	670
Estimated Seasonal Population:	1,675 (based on 2021 Census of 2.5 persons per household)
Average Day Demand:	529.71 m <sup>3</sup>
Peak Day Demand:	1,039.88 m <sup>3</sup> (June 16, 2022)
Average Capacity:	35.4%
Peak Capacity:	69.3%
Distribution Network:	15.78 km (from County of Bruce GIS)
Fire Hydrants:	63 (from County of Bruce GIS)
Blow-offs:	6 (from County of Bruce GIS)
Auto-flushing Device:	1 (Stauffer St)

The Lucknow Drinking Water Distribution and Supply Subsystem is characterized as a “secure groundwater system”. It consists of two (2) well supplies and its equipment deliver potable water to the Village of Lucknow and ten (10) Lucknow South properties in the Township of Ashfield-Colborne-Wawanosh in Huron County. The Township of Huron-Kinloss has an agreement with The Township of Ashfield-Colborne-Wawanosh, where the Lucknow South distribution system is treated as part of the Lucknow Drinking Water System (By-Law 60-2014).

Each well supply is located within its own pumphouse in the Village of Lucknow. Both sites are controlled, monitored, and alarmed through a Supervisory Control and Data Acquisition (SCADA) system which is connected to the main controller, autodialer, and server at the Ripley Municipal Office. The desktop computer used by the system’s operators is located at the Ripley Township Shed and is connected remotely to the SCADA server. As a redundancy, each site is also equipped with an auto-dialer that is independent of the SCADA system, and is used to call out alarms in the event of communications/SCADA failure. This SCADA system provides the operator with the ability to monitor current operating status of the supply and treatment equipment throughout the water system at any given time via remote access by computer or Smartphone, and to have control over operations.

The two (2) well supplies are detailed as follows:

**Site: Lucknow Well # 4 - 600 Havelock Street**

- Water Source: Groundwater, Non-GUDI
- Number of Production Wells: 1 (drilled 1957)
- Depth of Wells: 54.8 m
- Well Pumps: 15 hp each (submersible)
- Disinfection: Sodium hypochlorite (12%)
- CT Requirement: 2-log, 5°C, contact watermain (1.0 BF)
- Permit To Take Water: 7631-AQYS3J, expires September 29, 2027

**Site: Lucknow Well # 5 - 381 South Delhi Street**

- Water Source: Groundwater, Non-GUDI
- Number of Production Wells: 1 (drilled 1967)
- Depth of Well: 58.8 m
- Well Pump: 50 hp (submersible)
- Disinfection: Sodium hypochlorite (12%)
- CT Requirement: 2-log, 5°C, contact watermain (1.0 BF)
- Permit To Take Water: 7631-AQYS3J, expires September 29, 2027

Both Lucknow wells are secure, deep bedrock wells that penetrate limestone aquifers. Due to the depth and structure of the aquifers, the water temperature is relatively constant (< 10°C), turbidity is low, and the water is relatively hard. The raw water is also relatively **high in naturally-occurring fluoride**, but the lead content of the raw water is well below the half-MAC (Maximum Allowable Concentration). Those who are supplied from the Lucknow DWS are made aware of the various concentrations in their drinking water by numerous means of communication from the Township of Huron-Kinloss.

Each pumphouse is equipped with a receptacle and manual transfer switch for a portable diesel generator in the event of an extended power outage. A stand-by propane generator is located at the Ripley Municipal Office for back-up power requirements for the office and SCADA server equipment.

The Lucknow DWS currently (December 2022) has a distribution network with a combination of PVC, copper, ductile, and cast iron water mains, in sizes varying between 1-inch and 12-inch diameter. A Standpipe is located at 656 Wheeler Street, is 6.7 m in diameter, 27.5 m high and has a total volume of 996 m<sup>3</sup>. The well pumps at Well # 4 and Well # 5 are automatically controlled by the water level in the Standpipe via communications located at 482 Ross Street (former pumphouse).

The Standpipe was built in 1930, making it approximately 92 years old. The Standpipe is in a state of disrepair, but is currently in operable condition. The Township of Huron-Kinloss was presented with funding from Huron-Bruce M.P.P. Lisa Thompson on Monday, April 25th, 2022 from the Investing in Canada Infrastructure Green Stream. With \$1.9 million in federal funds, another \$1.5 million from the province, and the remaining funds to be provided by the Township itself, this essential infrastructure project includes:

- approximately 225 metres of watermain replacement;
- construction of a new, elevated water storage facility;
- demolition of the existing standpipe.

#### **4.0 SUMMARY OF REPORTS MADE TO THE MINISTRY (O. Reg. 170/03, s. 11 (6) (b))**

- There were two (2) Adverse Water Quality Incidents in the Lucknow DWS in 2022.
  - There were two (2) Adverse Water Quality Indicators (AWQIs) in 2022, related to Fluoride exceedances (AWQI # 159910 and 159911). Fluoride is naturally occurring. Testing will be required again in 2027.
  - A Fluoride Exceedance Report was submitted to the Grey Bruce Health Unit, Huron Perth Public Health, the Ministry, Source Water Protection/Ausable Bayfield Conservation Authority, and the Township of Huron-Kinloss on September 20, 2022. The Grey Bruce Health Unit issued a letter to the Township of Huron-Kinloss for the users of the Lucknow DWS.
- One (1) non-compliance: a distribution residual was missed on December 24, 2022 due to blizzard conditions and road closures. This was reported to the MECP Inspector.
- Monthly volume submissions have been made to the Ministry's Water Taking Reporting System.

#### **5.0 SUMMARY OF WATER QUALITY MONITORING (O. Reg. 170/03, s. 11 (6) (c))**

The purpose of sampling and testing is to confirm that water is safe for human consumption and to provide a comprehensive track record.

**Table 1 - Water Quality Monitoring Requirements:**

Parameter	Description	Required # of Samples	Requirement Source
<b>Chlorine Residual (grab)</b>	For monitoring amount of residual in the Distribution system, and confirming of water quality following maintenance	365/year (1 daily)	O. Reg. 170/03, Sch. 7
<b>Chlorine Residual (continuous monitoring)</b>	Continuous monitoring equipment used to sample and test Treated water at the location where intended contact time has been completed	5 minute intervals, minimum, each POE	O. Reg. 170/03, Sch. 7
<b>Turbidity (NTU) - Raw</b>	To measure the relative clarity or cloudiness of water	24/year (Raw)	O. Reg. 170/03, Sch. 7
<b>E. Coli (EC) Total Coliform (TC) Heterotrophic Plate Count (HPC)</b>	For testing presence of microbiological activity	108/year (Dist) 104/year (Raw) 104/year (Treated)	O. Reg. 170/03, Sch. 10
<b>Inorganics and Organics</b>	For testing presence of metals, pesticides and herbicides	36 month interval	O. Reg. 170, Sch 13, s. 13-2 (Sch 23), and s. 13-4 (Sch 24)
<b>Arsenic</b>	For testing presence of arsenic in the treated water at Point-of-Entry	4/year (quarterly)	O. Reg. 170, Sch 13-5 (increased frequency)
<b>Trihalomethanes (THMs)</b>	For testing presence of disinfection by-products (DBPs) in the Distribution system	4/year (quarterly)	O. Reg. 170/03, Sch. 13, s. 13-6
<b>Lead (Pb)</b>	For testing presence of lead in the Distribution system only - not private side	36 month interval (pH and alkalinity annually)	O. Reg. 170/03, Sch. 15; MDWL #087-102, Sch. D
<b>Haloacetic Acids (HAAs)</b>	For monitoring the formation of disinfection by-products (DBPs) in the Distribution system	4/year (quarterly, near each well supply)	O. Reg. 170/03, Sch. 13, s. 13-6.1
<b>Nitrate and Nitrite</b>	For testing presence of nitrates and nitrites in the Treated water at Point-of-Entry	4/year (quarterly)	O. Reg. 170/03, Sch. 13, s. 13-7
<b>Sodium</b>	For testing presence of sodium in the Treated water at Point-of-Entry	60 month interval	O. Reg. 170/03, Sch. 13, s. 13-8
<b>Fluoride</b>	For testing presence of fluoride in the treated water at Point-of-Entry	60 month interval	O. Reg. 170/03, Sch. 13, s. 13-9

## COMMUNICATIONS WHEN ADVERSE WATER SAMPLES ARE IDENTIFIED

### Requirement - Laboratory

A water sample that does not meet Provincial water quality standards is considered “adverse”. When adverse water quality is detected, the accredited laboratory conducting the testing will immediately notify the Operating Authority, the Spills Action Centre (SAC), and the office of Grey Bruce Health Services, and occasionally the office of Huron Perth Public Health (as necessary, if applicable). This notification is made by telephone through live communication to a person in authority. In addition to the phone calls, a fax of the sample results is sent to these agencies to verify the live communication made earlier.

## Requirement - Drinking Water System Owner/Operating Authority

The SDWA also requires the Drinking Water System Owner/Operating Authority to immediately notify the MECP and the Grey Bruce Health Services office and the Huron Perth Public Health office (if applicable), that the laboratory notice has been received and that “corrective actions” are being initiated. The method of contact is by telephone to a person of authority. The Operating Authority also faxes Form 2A - Notices of Adverse Test Results and Issue Resolution (Schedule 16) within 24 hours to both agencies first to verify previous live communication. Once the issue has been resolved and to confirm that corrective actions have been completed, the Operating Authority also faxes Form 2B - Notices of Adverse Test Results and Issue Resolution (Schedule 16) within 7 days to the agencies. This reporting system provides assurance that the DWS Owner is complying with the applicable regulations and that appropriate corrective actions are being taken and are being reported.

### **5.1 Water Treatment Equipment Operation and Monitoring**

#### **5.1.1 Treated Water (Point of Entry) Free Chlorine Residuals (Grab Samples)**

In 2022, a total of 716 treated water grab samples were collected and analyzed for free chlorine residual at the point of entry (POE) using a Hach pocket chlorine colorimeter. **Table 2** shows the grab samples monthly average of free chlorine residual values. **Table 3** shows the on-line continuous samples monthly average (as collected by SCADA) of the free chlorine residual values.

#### **5.1.2 Distribution Free Chlorine Residuals (Grab Samples)**

In 2022, a total of 479 distribution residuals were collected: 364 daily grab residuals and an additional 115 weekly grab residuals were taken in conjunction with the required weekly microbiological sampling. A summary of all the residuals collected is presented in **Table 2**. South Lucknow in ACW is included in the distribution residuals.

**Table 2 - Average Treated and Distribution Free Chlorine Residuals (Grab Samples)**

Month	Lucknow # 4 Treated Water	Lucknow # 5 Treated Water	Lucknow Distribution
Jan	1.73	1.81	1.65
Feb	1.70	1.70	1.57
Mar	1.53	1.60	1.39
Apr	1.59	1.69	1.36
May	1.67	1.74	1.44
Jun	1.69	1.70	1.40
Jul	1.67	1.62	1.34
Aug	1.68	1.55	1.31
Sep	1.58	1.55	1.25
Oct	1.62	1.59	1.29
Nov	1.78	1.78	1.43
Dec	1.78	1.66	1.47
<b>CT Requirement</b>	<b>0.26</b>	<b>0.27</b>	<b>0.20</b>
Annual Min	1.28	1.34	0.94
Annual Max	1.96	1.97	1.96
Annual Avg	1.67	1.66	1.40
# Samples	353	363	479

**Table 3 - Average Treated Free Chlorine Residuals (On-Line Continuous from SCADA)**

Month	Lucknow # 4 Treated Water	Lucknow # 5 Treated Water
Jan	1.67	1.83
Feb	1.73	1.73
Mar	1.54	1.61
Apr	1.63	1.74
May	1.70	1.76
Jun	1.72	1.70
Jul	1.70	1.62
Aug	1.71	1.57
Sep	1.63	1.58
Oct	1.65	1.72
Nov	1.83	1.83
Dec	1.84	1.69
<b>CT Requirement</b>	<b>0.26</b>	<b>0.27</b>
Annual Min	1.39	0.65
Annual Max	3.89	2.39
Annual Avg	1.70	2.05

### 5.1.3 Raw and Treated Water Turbidity

Raw water and treated water grab samples were collected and analyzed for turbidity using a portable turbidity analyzer. **Table 4** provides a summary of raw and treated water turbidity results for 2022. O. Reg. 170/03 requires raw turbidity samples to be analyzed at least once per month from each well for groundwater systems.

**Table 4 - Raw and Treated Water Turbidity Results (Monthly Average)**

Month	Lucknow # 4		Lucknow # 5	
	Raw	Treated	Raw	Treated
Jan	0.41	–	0.15	–
Feb	0.21	–	0.12	–
Mar	0.17	0.24	0.08	0.19
Apr	0.20	0.17	0.09	0.25
May	0.17	0.25	0.14	0.26
Jun	0.16	–	0.14	–
Jul	0.17	0.26	0.13	0.36
Aug	0.23	0.31	0.18	0.33
Sep	0.20	–	0.14	–
Oct	0.19	0.22	0.15	0.22
Nov	0.12	–	0.12	–
Dec	0.31	–	0.24	–
Annual Min	0.11	0.08	0.08	0.17
Annual Max	0.51	0.32	0.35	0.36
Annual Avg	0.21	0.24	0.18	0.27
# Samples	37	9	36	9

## 5.2 Microbiological Sampling per Schedule 10, O. Reg. 170/03

### 5.2.1 Raw Water Samples

Raw water samples are collected every week. In 2022, a total of 96 samples were collected and analyzed for E. Coli and Total Coliform. **Tables 5 and 6** provide a summary of microbiological results performed on the raw water.

**Table 5 - Microbiological Results for Raw Water - LUCKNOW # 4**

Month	Total Coliform			E. Coli		
	# Samples	# Samples "0"	# Samples $\geq 1$	# Samples	# Samples "0"	# Samples $\geq 1$
Jan	4	4	0	4	4	0
Feb	4	4	0	4	4	0
Mar	5	5	0	5	5	0
Apr	4	4	0	4	4	0
May	5	5	0	5	5	0
Jun	4	4	0	4	4	0
Jul	4	4	0	4	4	0
Aug	5	5	0	5	5	0
Sep	4	4	0	4	4	0
Oct	4	4	0	4	4	0
Nov	5	5	0	5	5	0
Dec	4	4	0	4	4	0
<b>TOTAL</b>	<b>52</b>	<b>52</b>	<b>0</b>	<b>52</b>	<b>52</b>	<b>0</b>

**Table 6 - Microbiological Results for Raw Water - LUCKNOW # 5**

Month	Total Coliform			E. Coli		
	# Samples	# Samples "0"	# Samples $\geq 1$	# Samples	# Samples "0"	# Samples $\geq 1$
Jan	4	4	0	4	4	0
Feb	4	4	0	4	4	0
Mar	5	5	0	5	5	0
Apr	4	4	0	4	4	0
May	5	5	0	5	5	0
Jun	4	4	0	4	4	0
Jul	4	4	0	4	4	0
Aug	5	5	0	5	5	0
Sep	4	4	0	4	4	0
Oct	4	4	0	4	4	0
Nov	5	5	0	5	5	0
Dec	4	4	0	4	4	0
<b>TOTAL</b>	<b>52</b>	<b>52</b>	<b>0</b>	<b>52</b>	<b>52</b>	<b>0</b>

### 5.2.2 Treated Water (Point of Entry) Samples

One (1) treated water sample from each point of entry is taken every week and analyzed for E. Coli, Total Coliform, and Heterotrophic Plate Count (HPC). In 2022, a total of 104 treated water samples were collected and analyzed for the above parameters. All samples had EC and TC results that were 0 cfu/100 mL. The range of HPC results were 0 - 30 cfu/100 mL, however, one Lucknow # 5 TW sample in July 2022 was reported as “NDOGHPC” (No Data - Overgrown with HPC). **Tables 7 and 8** provide a summary of all microbiological results performed on treated water.

**Table 7 - Microbiological Results for Treated Water (Point of Entry) - LUCKNOW # 4**

Month	Total Coliform			E. Coli			HPC		
	# Samples	# Samples “0”	# Samples ≥1	# Samples	# Samples “0”	# Samples ≥1	# Samples	# Samples ≤ 10	# Samples > 10
Jan	4	4	0	4	4	0	4	3	1
Feb	4	4	0	4	4	0	4	4	0
Mar	5	5	0	5	5	0	5	5	0
Apr	4	4	0	4	4	0	4	4	0
May	5	5	0	5	5	0	5	5	0
Jun	4	4	0	4	4	0	4	4	0
Jul	4	4	0	4	4	0	4	4	0
Aug	5	5	0	5	5	0	5	4	1
Sep	4	4	0	4	4	0	4	4	0
Oct	4	4	0	4	4	0	4	4	0
Nov	5	5	0	5	5	0	5	4	1
Dec	4	4	0	4	4	0	4	4	0
<b>TOTAL</b>	<b>52</b>	<b>52</b>	<b>0</b>	<b>52</b>	<b>52</b>	<b>0</b>	<b>52</b>	<b>49</b>	<b>3</b>

**Table 8 - Microbiological Results for Treated Water (Point of Entry) - LUCKNOW # 5**

Month	Total Coliform			E. Coli			HPC		
	# Samples	# Samples “0”	# Samples ≥1	# Samples	# Samples “0”	# Samples ≥1	# Samples	# Samples ≤ 10	# Samples > 10
Jan	4	4	0	4	4	0	4	4	0
Feb	4	4	0	4	4	0	4	4	0
Mar	5	5	0	5	5	0	5	5	0
Apr	4	4	0	4	4	0	4	4	0
May	5	5	0	5	5	0	5	5	0
Jun	4	4	0	4	4	0	4	4	0
Jul	4	4	0	4	4	0	4	3	1
Aug	5	5	0	5	5	0	5	5	0
Sep	4	4	0	4	4	0	4	4	0
Oct	4	4	0	4	4	0	4	4	0
Nov	5	5	0	5	5	0	5	5	0
Dec	4	4	0	4	4	0	4	4	0
<b>TOTAL</b>	<b>52</b>	<b>52</b>	<b>0</b>	<b>52</b>	<b>52</b>	<b>0</b>	<b>52</b>	<b>51</b>	<b>1</b>

### 5.2.3 Distribution Samples

Distribution samples are collected every week and tested for E. Coli, Total Coliform, and 25% of the samples are also analyzed for Heterotrophic Plate Count (HPC). Ontario Regulation 170/03 requires 8 distribution samples plus one additional sample for every 1,000 people served by the system. In 2022, a total of 157 distribution samples were collected and analyzed for TC and EC, which is above the required number of samples (n=108, based on 1,675 potential residents). A total of 104 distribution samples were analyzed for HPC (n=27, 25% of 108). Each TC and EC result from the treated water was 0 cfu/100 mL. The range of HPC results were 0 - 20 cfu/100 mL. **Table 9** provides a summary of all microbiological samples taken in the distribution system.

**Table 9 - Microbiological Results for Distribution System**

Month	Total Coliform			E. Coli			HPC		
	# Samples	# Samples "0"	# Samples $\geq 1$	# Samples	# Samples "0"	# Samples $\geq 1$	# Samples	# Samples $\leq 10$	# Samples 1 - 20
Jan	12	12	0	12	12	0	8	8	0
Feb	12	12	0	12	12	0	8	8	0
Mar	15	15	0	15	15	0	10	10	0
Apr	12	12	0	12	12	0	8	8	0
May	15	15	0	15	15	0	10	10	0
Jun	12	12	0	12	12	0	8	8	0
Jul	12	12	0	12	12	0	8	8	0
Aug	15	15	0	15	15	0	10	10	0
Sep	12	12	0	12	12	0	8	8	0
Oct	13	13	0	13	13	0	8	8	0
Nov	15	15	0	15	15	0	10	10	0
Dec	12	12	0	12	12	0	8	7	1
<b>TOTAL</b>	<b>157</b>	<b>157</b>	<b>0</b>	<b>157</b>	<b>157</b>	<b>0</b>	<b>104</b>	<b>103</b>	<b>1</b>

## 5.3 Chemical Sampling and Testing as per Schedule 13, O. Reg. 170/03

### 5.3.1 Inorganics (Schedule 13, s. 13-2; Schedule 23)

Treated water samples are collected every 36 months (3 years) and analyzed for inorganics. The most recent samples for the Lucknow Drinking Water System were collected on June 22, 2021 and submitted to the laboratory for analysis of inorganics as listed in Schedule 23 (see **Table 10**). All parameters were found to be within compliance, however, the Arsenic level at both Lucknow #4 and Lucknow #5 exceeded the Half-Maximum Allowable Concentration (half-MAC). Any half-MAC exceedance must be sampled on a quarterly basis to comply with O. Reg. 170/03, Schedule 13-5(1) - Increased frequency under s.s 13-2 and 13-4. Inorganics will be sampled and analyzed again in June 2024. **Table 31** (Section 12.0 - Observations and Historical Trends) provides some historical arsenic test results.

**Table 10 - Inorganics (Schedule 13, s. 13-2; Schedule 23) Results**

Parameter	Lucknow # 4 Treated Water (µg/L)	Lucknow # 5 Treated Water (µg/L)	Maximum Allowable Concentration (µg/L)	Exceedance
Antimony	0.9 <MDL	0.9 <MDL	6	No
Arsenic	5.2	5.8	10	No
Barium	304	321	1000	No
Boron	38	39	5000	No
Cadmium	0.003 <MDL	0.003 <MDL	5	No
Chromium	0.28	0.27	50	No
Mercury	0.01 <MDL	0.01 <MDL	1	No
Selenium	0.04 <MDL	0.04 <MDL	50	No
Uranium	1.03	0.874	20	No

\*MDL = Laboratory Minimum Detection Limit

### 5.3.2 Organics (Schedule 13, s. 13-4; Schedule 24)

Treated water samples are collected every 36 months and tested for Schedule 24 organic parameters. The most recent samples were collected on June 22, 2021. All parameters were found to be within compliance. Organics will be sampled and analyzed again in June 2024. Samples results can be found in **Table 11**.

**Table 11 - Organics (Schedule 13, s. 13-4; Schedule 24) Results**

Parameter	Lucknow # 4 Treated Water (µg/L)	Lucknow # 5 Treated Water (µg/L)	Maximum Allowable Concentration (µg/L)	Aesthetic Objective / Operational Guideline (µg/L)	Exceedance
Benzene	0.32 <MDL	0.32 <MDL	1	--	No
Carbon Tetrachloride	0.17 <MDL	0.17 <MDL	2	--	No
1,2-Dichlorobenzene	0.41 <MDL	0.41 <MDL	200	3	No
1,4-Dichlorobenzene	0.36 <MDL	0.36 <MDL	5	1	No
1,1-Dichloroethylene	0.33 <MDL	0.33 <MDL	14	--	No
1,2-Dichloroethane	0.35 <MDL	0.35 <MDL	5	--	No
Dichloromethane	0.35 <MDL	0.35 <MDL	50	--	No
Monochlorobenzene	0.3 <MDL	0.3 <MDL	80	30	No
Tetrachloroethylene	0.35 <MDL	0.35 <MDL	10	--	No
Trichloroethylene	0.44 <MDL	0.44 <MDL	5	--	No
Vinyl Chloride	0.17 <MDL	0.17 <MDL	1	--	No
Diquat	1 <MDL	1 <MDL	70	--	No
Paraquat	1 <MDL	1 <MDL	10	--	No
Glyphosate	1 <MDL	1 <MDL	280	--	No
Polychlorinated Biphenyls	0.04 <MDL	0.04 <MDL	3	--	No

\*MDL = Laboratory Minimum Detection Limit

**Table 11 - Organics (Schedule 13, s. 13-4; Schedule 24) Results - Continued**

Parameter	Lucknow # 4 Treated Water (µg/L)	Lucknow # 5 Treated Water (µg/L)	Maximum Allowable Concentration (µg/L)	Aesthetic Objective / Operational Guideline (µg/L)	Exceedance
Benzo(a)pyrene	0.004 <MDL	0.004 <MDL	0.01	--	No
Alachlor	0.02 <MDL	0.02 <MDL	5	--	No
Atrazine+N-dealkylated metabolites	0.01 <MDL	0.01 <MDL	5	--	No
Atrazine	0.01 <MDL	0.01 <MDL	--	--	No
Desethyl Atrazine	0.01 <MDL	0.01 <MDL	--	--	No
Azinphos-methyl	0.05 <MDL	0.05 <MDL	20	--	No
Carbaryl	0.05 <MDL	0.05 <MDL	90	--	No
Carbofuran	0.01 <MDL	0.01 <MDL	90	--	No
Chlorpyrifos	0.02 <MDL	0.02 <MDL	90	--	No
Diazinon	0.02 <MDL	0.02 <MDL	20	--	No
Dimethoate	0.06 <MDL	0.06 <MDL	20	--	No
Diuron	0.03 <MDL	0.03 <MDL	150	--	No
Malathion	0.02 <MDL	0.02 <MDL	190	--	No
Metolachlor	0.01 <MDL	0.01 <MDL	50	--	No
Metribuzin	0.02 <MDL	0.02 <MDL	80	--	No
Phorate	0.01 <MDL	0.01 <MDL	2	--	No
Prometryne	0.03 <MDL	0.03 <MDL	1	--	No
Simazine	0.01 <MDL	0.01 <MDL	10	--	No
Terbufos	0.01 <MDL	0.01 <MDL	1	--	No
Triallate	0.01 <MDL	0.01 <MDL	230	--	No
Trifluralin	0.02 <MDL	0.02 <MDL	45	--	No
2,4-Dichlorophenoxyacetic acid	0.19 <MDL	0.19 <MDL	100	--	No
Bromoxynil	0.33 <MDL	0.33 <MDL	5	--	No
Dicamba	0.20 <MDL	0.20 <MDL	120	--	No
Diclofop-methyl	0.40 <MDL	0.40 <MDL	9	--	No
MCPA	0.00012 <MDL	0.00012 <MDL	0.1	--	No
Picloram	1 <MDL	1 <MDL	190	--	No
2,4-Dichlorophenol	0.15 <MDL	0.15 <MDL	900	0.3	No
2,4,6-Trichlorophenol	0.25 <MDL	0.25 <MDL	5	2	No
2,3,4,6-Tetrachlorophenol	0.20 <MDL	0.20 <MDL	100	1	No
Pentachlorophenol	0.15 <MDL	0.15 <MDL	60	30	No

\*MDL = Laboratory Minimum Detection Limit

### 5.3.3 Trihalomethanes (Schedule 13, s. 13-6)

Distribution samples are taken every three months from representative points in the distribution system and tested for Trihalomethanes (THMs). The Ontario Drinking Water Quality Standards (ODWQS) have set a Maximum Allowable Concentration (MAC) of 100 µg/L for this parameter and it is expressed as a running annual average (RAA). Refer to **Table 12, 13, and 16**.

**Table 12 - Trihalomethane (Schedule 13, s. 13-6) Results - LUCKNOW # 4**

Month	THMs (µg/L)	Bromodichloro methane (µg/L)	Bromoform (µg/L)	Chloroform (µg/L)	Dibromochloro methane (µg/L)
Feb	6.7	1.3	<0.34	5.4	<0.37
May	6.2	1.0	<0.34	5.2	<0.37
Aug	9.5	1.4	<0.34	8.2	<0.37
Nov	14.0	2.4	<0.34	11.0	0.66
Average	9.1	1.5	<0.34	7.5	0.44
Maximum	14.0	2.4	<0.34	11.0	0.66
MAC (µg/L)	100	---	---	---	---
Exceedance	No	---	---	---	---

**Table 13 - Trihalomethane (Schedule 13, s. 13-6) Results - LUCKNOW # 5**

Month	THMs (µg/L)	Bromodichloro methane (µg/L)	Bromoform (µg/L)	Chloroform (µg/L)	Dibromochloro methane (µg/L)
Feb	8.7	2.0	<0.34	6.1	0.56
May	6.0	1.2	<0.34	4.8	<0.37
Aug	13.0	2.4	<0.34	10.0	0.48
Nov	11.0	2.2	<0.34	8.0	0.58
Average	9.7	2.0	<0.34	7.2	0.50
Maximum	13.0	2.4	<0.34	10.0	0.58
MAC (µg/L)	100	---	---	---	---
Exceedance	No	---	---	---	---

### 5.3.4 Haloacetic Acids (Schedule 13, s. 13-6.1)

Ontario Regulation 170/03 has been amended to include quarterly testing for Haloacetic Acids (HAAs). Distribution samples are taken every three months from representative points in the distribution system and tested for Haloacetic Acids (HAAs). In 2022, samples were collected during the months of February, May, August, and November and results are expressed as a running annual average (RAA). Results are summarized in **Table 14, 15 and 16**.

**Table 14 - Haloacetic Acid (Schedule 13, s. 13-6.1) Results - LUCKNOW # 4**

Month	Total HAAs (µg/L)	Bromo acetic acid (µg/L)	Chloro acetic acid (µg/L)	Dichloro acetic acid (µg/L)	Dibromo acetic acid (µg/L)	Trichloro acetic acid (µg/L)
Feb	<5.3	<4.7	<2.9	<2.6	<2.0	<5.3
May	<5.3	<4.7	<2.9	<2.6	<2.0	<5.3
Aug	<5.3	<4.7	<2.9	<2.6	<2.0	<5.3
Nov	<5.3	<4.7	<2.9	2.9	<2.0	<5.3
Avg	<5.3	<4.7	<2.9	2.6	<2.0	<5.3
Max	<5.3	<4.7	<2.9	2.9	<2.0	<5.3
MAC (µg/L)	80	---	---	---	---	---
Exceedance	No	---	---	---	---	---

**Table 15 - Haloacetic Acid (Schedule 13, s. 13-6.1) Results - LUCKNOW # 5**

Month	Total HAAs (µg/L)	Bromo acetic acid (µg/L)	Chloro acetic acid (µg/L)	Dichloro acetic acid (µg/L)	Dibromo acetic acid (µg/L)	Trichloro acetic acid (µg/L)
Feb	<5.3	<4.7	<2.9	<2.6	<2.0	<5.3
May	<5.3	<4.7	<2.9	<2.6	<2.0	<5.3
Aug	<5.3	<4.7	<2.9	<2.6	<2.0	<5.3
Nov	<5.3	<4.7	<2.9	<2.6	<2.0	<5.3
Avg	<5.3	<4.7	<2.9	<2.6	<2.0	<5.3
Max	<5.3	<4.7	<2.9	<2.6	<2.0	<5.3
MAC (µg/L)	80	---	---	---	---	---
Exceedance	No	---	---	---	---	---

**Table 16 - THMs and HAAs - Rolling Annual Average Summary**

Location	Sample Date	RAA - THMs (µg/L)	RAA - HAAs (µg/L)
LUCKNOW # 4	Feb	8.4	5.6
	May	8.7	5.3
	Aug	8.4	5.3
	Nov	9.1	5.3
LUCKNOW # 5	Feb	11.2	5.3
	May	9.7	5.3
	Aug	9.4	5.3
	Nov	9.7	5.3
RAA		9.3	5.3
MAC (µg/L)		100	80

### 5.3.5 Nitrate and Nitrite (Schedule 12, s. 13-7)

Treated water samples are taken every three months and tested for nitrate and nitrite. In 2022, samples were collected during the months of February, May, August, and November. The Ontario Drinking Water Quality Standards (ODWQS) have set a Maximum Allowable Concentration (MAC) of 10 mg/L for nitrates and 1 mg/L for nitrites. The results were found to be within compliance and are summarized in **Table 17**.

**Table 17 - Nitrate and Nitrite (Schedule 13, s. 13-7) Results**

Month	LUCKNOW # 4		LUCKNOW # 5	
	Nitrite (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Nitrate (mg/L)
Feb	<0.003	<0.006	<0.003	0.007
May	<0.003	<0.006	<0.003	<0.006
Aug	<0.003	0.010	<0.003	<0.006
Nov	<0.003	0.009	<0.003	<0.006
Average	<0.003	0.008	<0.003	0.006
Maximum	<0.003	0.010	<0.003	0.007
MAC (mg/L)	1	10	1	10
Exceedance	No	No	No	No

### 5.3.6 Sodium (Schedule 13, s. 13-8)

One (1) water sample is collected from each Point of Entry (treated water) every 60 months (5 years) and analyzed for Sodium. The Ministry's *Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines, PIBS 4449e01, June 2006*, states: "The aesthetic objective for sodium in drinking water is 200 mg/L. The local Medical Officer of Health should be notified when the sodium concentration exceeds 20 mg/L so that this information may be communicated to local physicians for their use with patients on sodium restricted diets." These samples were collected on July 27, 2021. Results can be found in **Table 18**. The next sampling date for Sodium will be in 2026.

### 5.3.7 Fluoride (Schedule 13, s. 13-9)

One (1) water sample is collected from each Point of Entry (treated water) every 60 months (5 years) and analyzed for Fluoride. The Ontario Drinking Water Quality Standards (ODWQS) have set a Maximum Allowable Concentration (MAC) of 1.5 mg/L. On September 6, 2022, samples were collected for this analysis. Both treated water samples exceeded the MAC due to naturally occurring fluoride in the aquifers. These exceedances were reported to the Grey Bruce Health Unit and the Ministry's Spills Action Centre (AWQI # 159910 and 159911). The results are summarized in **Table 18**. The next sampling date for Fluoride will be in 2027.

**Table 18 - Sodium (Schedule 13, s. 13-8) and Fluoride (Schedule 13, s. 13-9) Results**

Location	Sodium	Fluoride	
	Sample Date: July 27, 2021	Sample Date: September 6, 2022	
	Result (mg/L)	Result (mg/L)	Resample Result (mg/L)
Lucknow # 4 Treated Water	11.1	1.69	1.76
Lucknow # 5 Treated Water	12.8	1.59	1.70
MAC (mg/L)	20	1.50	
Exceedance	No	Yes	

#### 5.3.8 Lead (Schedule 15.1) - (O. Reg. 170/03, s. 11 (6) (g))

Schedule 15.1 of Ontario Regulation 170/03 requires that samples be taken during two seasons: once between December 15 and April 15, and once between June 15 and October 15. Two (2) Lead, pH and alkalinity samples were collected on January 17, 2022. Two (2) Lead, pH and alkalinity samples were collected on July 4, 2022. These parameters are required to be sampled and analyzed again between the months of December and April, and again between June and October. Lead samples are required next in the 2023-2024 sampling season. Results can be found in **Table 19**.

**Table 19 - Lead Sampling Program (Schedule 15.1) Results**

Season	Alkalinity (mg/L)	pH	Lead (µg/L)
Dec-Apr	233	7.64	0.10
	233	7.60	0.09
Jun-Oct	225	7.29	0.15
	225	7.37	0.19
MAC (µg/L)	---	---	10
Exceedance	---	---	No

#### 5.3.9 Non-Regulatory Testing - Aesthetic Objectives and Operational Guidelines (AO/OG)

Samples were collected from each Point of Entry (treated water) on November 21, 2016 and tested for parameters listed in the Ministry's *Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines, June 2006, PIBS 4449e01*. These results are included in **Table 20** for information purposes.

**Table 20 - Aesthetic Objectives and Operational Guideline Results**

Parameter	AO/OG	Lucknow # 4 Treated Water	Lucknow # 5 Treated Water
pH	6.5 - 8.5	7.88	8.03
Alkalinity (mg/L as CaCO <sub>3</sub> )	30 - 500	217	224
Colour (TCU)	5	3	3 <MDL
Total Dissolved Solids (mg/L)	500	280	274
Organic Nitrogen (mg/L)	0.15	0.05 <MDL	0.05 <MDL
Total Kjeldahl Nitrogen (mg/L)	---	0.05 <MDL	0.05 <MDL
Ammonia + Ammonium (mg/L)	---	0.06	0.06
Hydrogen Sulphide (mg/L)	0.05	0.006 <MDL	0.006 <MDL
Sulphide (mg/L)	0.05	0.006 <MDL	0.006 <MDL
Chloride (mg/L)	250	3.7	3.9
Sulphate (mg/L)	500	31	31
Hardness	80 - 100	206	209
Aluminum (µg/L)	100	0.5	2.5
Copper (µg/L)	1000	4.25	1.99
Iron (µg/L)	300	132	264
Manganese (µg/L)	50	8.38	13.8
Zinc (µg/L)	5000	3	4
Dissolved Organic Carbon (mg/L)	5	1 <MDL	1 <MDL
Methane (L/m <sup>3</sup> )	3	0.02 <MDL	0.02 <MDL
Ethylbenzene (µg/L)	2.4	0.33 <MDL	0.33 <MDL
Toluene (µg/L)	24	0.36 <MDL	0.36 <MDL
Xylene (µg/L)	300	0.43 <MDL	0.43 <MDL
m/p-xylene (µg/L)	---	0.43 <MDL	0.43 <MDL
o-xylene (µg/L)	---	0.17 <MDL	0.17 <MDL

\*MDL = Laboratory Minimum Detection Limit

## 6.0 WATER AND CHEMICAL USE (O. Reg. 170/03, s. 11 (6) (a); Schedule 22-2 (3))

### 6.1 Chemical Usage (O. Reg. 170/03, s. 11 (6) (a))

6.1.1 In 2022, the total amount of 12% sodium hypochlorite (NaOCl) used to treat the water supplied by the Lucknow wells is tabulated in **Table 21** with the average chlorine dosage.

**Table 21 - Sodium Hypochlorite Usage**

Month	LUCKNOW # 4		LUCKNOW # 5	
	Usage (kg)	Average Dosage (mg/L)	Usage (kg)	Average Dosage (mg/L)
Jan	14.58	4.40	47.51	4.45
Feb	31.26	4.23	20.18	4.13
Mar	39.53	3.80	18.78	4.93
Apr	39.81	3.99	17.38	4.43
May	48.36	4.14	20.18	4.28
Jun	61.11	4.14	27.33	4.12
Jul	64.89	4.16	25.79	4.19
Aug	53.96	3.93	19.62	4.05
Sep	50.46	4.24	17.10	4.15
Oct	49.06	4.40	17.52	4.22
Nov	37.98	4.02	19.34	4.18
Dec	41.21	3.80	15.56	4.08
<b>TOTAL</b>	532.19	–	266.30	–
<b>Average</b>	–	4.10	–	4.27

**Sodium Hypochlorite Grand Total Usage: 798.49 kg**  
**Sodium Hypochlorite Average Dosage: 4.20 mg/L**

## 6.2 Summary of Flow Rates, Annual Volumes and Capacities (O. Reg. 170/03, Schedule 22-2 (3))

6.2.1 A summary of the water supplied to the distribution system in 2022 from each well supply is provided in **Tables 22 and 23**. The combined annual volumes and capacities are provided in **Table 24**. The volumes reported for each well supply are taken from the SCADA continuous monitoring system. The following flow meters were calibrated on June 15, 2022:

Lucknow # 4: Raw water flow meter  
 Lucknow # 5: Raw water flow meter

**Table 22 - Flow Rates, Annual Volumes, and Capacities - LUCKNOW # 4**

Month	Raw Flow Daily Max (L/s)	Raw Flow Monthly Avg (L/s)	Raw Volume Monthly Total (m³)	Raw Volume Daily Max (m³)	Raw Volume Monthly Avg (m³)	Capacity Monthly (%)
Jan	16.83	12.01	3,479.38	371.67	112.24	12.0%
Feb	13.45	12.21	7,742.73	423.11	276.53	29.6%
Mar	13.34	12.25	10,399.24	457.66	335.46	35.9%
Apr	13.30	12.20	10,175.36	405.82	339.18	36.3%
May	13.21	12.16	11,701.36	504.30	377.46	40.4%
Jun	13.21	12.10	14,900.39	698.24	496.68	53.1%
Jul	13.10	12.03	15,809.02	799.12	509.97	54.5%
Aug	13.10	12.03	13,462.40	728.55	434.27	46.4%
Sep	13.17	12.04	12,092.41	463.17	403.08	43.1%
Oct	14.75	12.03	11,184.70	453.63	360.80	38.6%
Nov	13.83	12.03	9,492.59	448.92	316.42	33.8%
Dec	13.83	12.02	11,063.61	417.33	356.89	38.2%
<b>PTTW Max</b>	<b>14.42</b>	<b>14.42</b>	<b>28,439.58</b>	<b>935.00</b>	---	---
<b>Annual Max</b>	<b>16.83*</b>	—	15,809.02	799.12	—	85.5%
<b>Annual Avg</b>	—	12.10	10,958.60	—	360.28	38.5%
<b>Annual Total</b>	—	—	<b>131,503.19</b>	—	—	—

\*Flow exceedances are due to instantaneous spikes related to pump startup.

**Table 23 - Flow Rates, Annual Volumes, and Capacities - LUCKNOW # 5**

Month	Raw Flow Daily Max (L/s)	Raw Flow Monthly Avg (L/s)	Raw Volume Monthly Total (m³)	Raw Volume Daily Max (m³)	Raw Volume Monthly Avg (m³)	Capacity Monthly (%)
Jan	42.33	30.98	10,376.62	671.43	334.73	22.3%
Feb	43.66	31.51	4,829.52	256.74	172.48	11.5%
Mar	43.80	33.93	3,748.01	191.15	120.90	8.1%
Apr	37.46	36.04	4,011.43	391.66	133.71	8.9%
May	37.54	36.06	4,724.65	478.43	152.41	10.2%
Jun	37.72	36.08	6,659.95	512.56	222.00	14.8%
Jul	37.57	36.01	6,244.14	785.55	201.42	13.4%
Aug	37.71	36.06	4,900.68	466.40	158.09	10.5%
Sep	37.84	36.10	4,187.32	173.64	139.58	9.3%
Oct	37.62	36.20	4,133.88	214.99	133.35	8.9%
Nov	38.14	36.21	4,658.68	305.62	155.29	10.4%
Dec	37.99	36.42	3,895.02	155.50	125.65	8.4%
<b>PTTW Max</b>	<b>37.90</b>	<b>37.90</b>	<b>45,625.00</b>	<b>1,500</b>	---	---
<b>Annual Max</b>	<b>43.80*</b>	—	10,376.26	785.55	—	52.4%
<b>Annual Avg</b>	—	35.19	5,197.49	—	170.88	11.4%
<b>Annual Total</b>	—	—	<b>62,369.90</b>	—	—	—

\*Flow exceedances are due to instantaneous spikes related to pump startup or shutdown.

**Table 24 - Flow Rates, Annual Volumes and Capacities - LUCKNOW # 4 AND # 5 COMBINED**

Month	Raw Volume Monthly Total (m <sup>3</sup> )	Raw Volume Daily Max (m <sup>3</sup> )	Raw Volume Monthly Avg (m <sup>3</sup> )	Capacity Monthly (%)
Jan	13,856.00	687.95	446.97	29.8%
Feb	12,572.25	513.79	433.53	28.9%
Mar	14,147.25	586.79	456.36	30.4%
Apr	14,186.79	689.59	472.89	31.5%
May	16,426.01	646.27	529.87	35.3%
Jun	21,560.34	1,039.88	718.68	47.9%
Jul	22,053.16	851.96	711.39	47.4%
Aug	18,363.08	855.71	592.36	39.5%
Sep	16,279.73	636.81	542.66	36.2%
Oct	15,318.58	607.84	494.15	32.9%
Nov	14,151.27	677.22	471.71	31.4%
Dec	14,958.63	552.44	482.54	32.2%
<b>PTTW Max</b>	<b>45,625.00</b>	<b>1,500.00</b>	---	---
Annual Max	22,053.16	1,039.88	—	69.3%
Annual Avg	16,156.09	—	529.71	35.4%
Annual Total	<b>193,873.09</b>	—	—	—

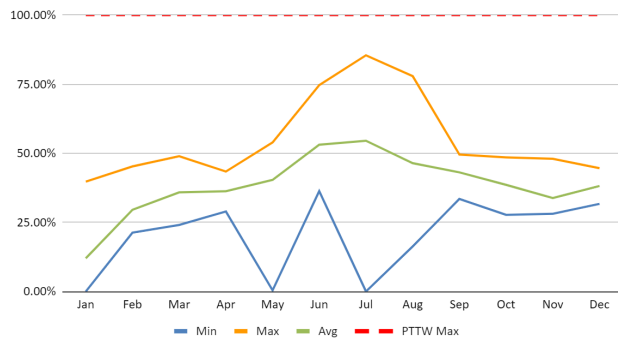
### 6.3 System Capacity (O. Reg. 170/03, Schedule 22-2 (3) Continued)

6.3.1 The following is a comparison of the annual volumes to the rated capacity and flow rates approved in the systems' PTTW, DWWP and MDWL. The total system capacity represents the percentage capacity of the sum of all the water produced in relation to the total system volume permitted. A summary of the totals for all the well supplies is presented in **Table 25**. The visual representations of each well and the Lucknow total capacity are presented in Figures 2 through 4.

**Table 25 - Total Volumes of All Well Supplies**

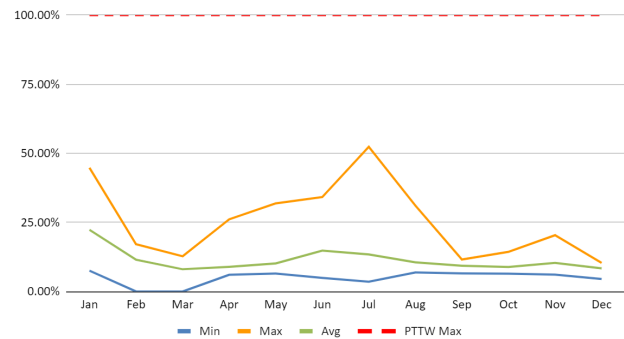
Location (Well Supply)	Total Volume for 2022 (m <sup>3</sup> )
Lucknow Well # 4	131,503.19
Lucknow Well # 5	62,369.90
<b>Total Rated Capacity, PTTW (m<sup>3</sup>)</b>	<b>547,500.00</b>
Grand Total (all well supplies), Actual (m <sup>3</sup> )	<b>193,873.09</b>
Overall Operating Capacity, Actual %	<b>35.4%</b>

**% Capacity - Lucknow # 4 - 2022**



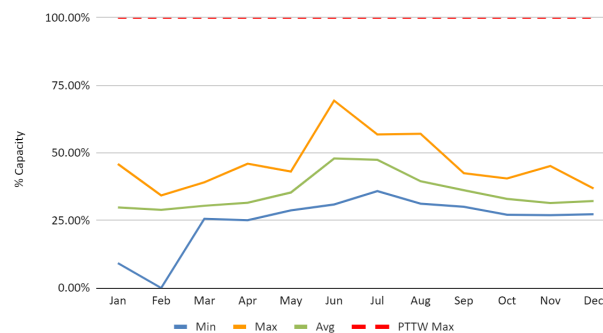
**Figure 2**

**% Capacity - Lucknow # 5 - 2022**



**Figure 3**

**% Capacity - Lucknow Wells Combined - 2022**



**Figure 4**

## 7.0 IMPROVEMENTS TO SYSTEM AND ROUTINE AND PREVENTATIVE MAINTENANCE (s. 11 (6) (e))

The following summarizes water system improvements and routine and preventative maintenance for the Lucknow Drinking Water System Supply:

### Both Sites:

- Routine and preventative maintenance performed as per Jobs Plus schedule.
- Flow meter calibrations completed.
- Georgian Bay Fire and Safety inspections completed.
- Ministry Drinking Water Inspection conducted.
- Semi-annual flushing and annual valve turning completed.
- Backflow preventer testing completed.

**Lucknow # 4:**

January: Replaced sample taps  
New well pump at Lucknow # 4  
February: Replaced tubing on chlorine analyzer  
April: Ministry inspection (Heather Lovely)  
June: Iconix onsite for flow meter calibration  
July: Replaced chlorine analyzer sensor  
August: Backflow preventer verification

**Lucknow # 5:**

February: Site offline for flow testing (Geoff Rether)  
Replaced chlorine pump # 2  
April: Ministry inspection (Heather Lovely)  
June: Iconix onsite for flow meter calibration  
August: Backflow preventer verification

## **8.0 MINISTRY OF THE ENVIRONMENT, CONSERVATION AND PARKS INSPECTIONS AND REGULATORY ISSUES (Schedule 22-2 (2))**

- MECP Drinking Water Inspection was conducted on April 13, 2022 and awarded a rating of 100.00% (previous rating was 95.86%).
- MECP Drinking Water Inspection of South Lucknow (ACW) was conducted on April 13, 2022 and awarded a rating of 100.00% (previous rating was 100.00%).
- A list of Capital Items for 2022 was submitted to the Township of Huron-Kinloss on November 28, 2022.
- DWQMS Management Review was conducted on May 25, 2022.
- DWQMS Internal Audit was conducted between September 9 - 30, 2022.
- DWQMS Complete Risk Assessment was not conducted in 2022 due to staffing issues.
- DWQMS External Audit (off-site) was conducted on July 21, 2022.
- An Emergency Response Exercise was conducted by the Township on June 8, 2022, but Veolia was not asked to participate.

## 9.0 REGULATORY CHANGES

- Proposed amendments to drinking water operator and water quality analyst certification regulations have been issued to address the impacts of emergencies. These include:
  - allowing the Ministry to act quickly to ensure the Province's drinking water is protected during an emergency
  - extending Operator certificates and allowing certain qualified but non-certified staff to temporarily maintain system operations, and would only be enacted during an emergency
  - allowing temporary relief from training and certification requirements

This proposal has been registered with the Environmental Registry of Ontario and the consultation process was closed on July 2, 2021. The outcome of this proposal can be found here:

<https://ero.ontario.ca/index.php/notice/019-3513>

- Proposed updates to the Director's Directions can be found here:

<https://www.ontario.ca/page/directors-directions-minimum-requirements-operational-plans>

## 10.0 WELL LEVELS (PTTW)

The Lucknow DWS has a Permit To Take Water (PTTW), which dictates the capacity that each well is permitted to supply, as well as specific monitoring parameters. In addition to flow, static well levels are taken on a weekly basis to monitor the performance of the aquifer. **Table 26** provides a summary of the static well levels recorded in 2022.

**Table 26 - Static Well Levels (PTTW) - Monthly Averages**

Month	Lucknow Well # 4					Lucknow Well # 5				
Jan	6.14	6.19	6.20	6.22	6.53	6.11	6.25	6.21	6.00	
Feb	7.03	7.17	6.54	6.34	5.95	6.13	6.17	6.08	5.68	
Mar	6.05	5.90	6.01	5.84	5.90	5.91	5.88	5.67	5.56	5.74
Apr	5.80	5.61	6.60	5.96		5.18	5.45	5.60	5.54	
May	6.25	6.85	6.69	5.95		5.78	5.80	5.73	5.93	
Jun	6.56	6.83	7.25	6.20	7.30	5.77	6.97	6.80	6.10	6.40
Jul	6.54	7.23	6.94	7.00		6.31	6.56	6.66	6.26	
Aug	6.84	7.20	8.78	6.92		6.74	6.43	6.48	6.35	6.32
Sep	7.97	8.51	8.78	8.00	6.51		6.29	7.11	6.35	6.51
Oct	7.81	6.86	6.70	6.97		6.41	6.35	6.15	6.60	
Nov	7.24	6.69	8.47	6.72	6.70	6.29	6.43	6.27	6.16	6.15
Dec	6.65	6.72	6.57	6.65		6.80	6.53	6.30	6.10	
Min	5.61					5.18				
Max	8.78					7.11				
Avg	6.78					6.16				

## 11.0 SOURCE WATER PROTECTION (*Clean Water Act, 2006*)

A Drinking Water Source Protection Assessment (DWSPA) Report was generated for the Ausable Bayfield Maitland Valley Source Protection Region by the Conservation Authority Source Protection Office. This report identifies vulnerable areas, recharge areas, and potential threats to help protect existing and future sources of drinking water from contamination and overuse. This report can be found on-line at:

<http://home.waterprotection.ca/source-protection-plan/assessment-reports/saugeen-valley/>

The Well Head Protection Areas (WHPAs) within the Lucknow Drinking Water System have 4 designations:

WHPA-A: 100 m radius around the well head

WHPA-B: 2-year time-of-travel capture zone

WHPA-C: 5-year time-of-travel capture zone

WHPA-D: 25-year time-of-travel capture zone

The Lucknow wells are NOT classified as groundwater under direct influence of surface water (GUDI).

The DWSPA report states: “The WHPA extends south-eastward from the wells to include about 7.7 km along the south Huron-Kinloss border and into Ashfield-Colborne-Wawanosh. WHPA-A, the 100 m radius around the wells, falls entirely within Huron-Kinloss. However, a small portion of WHPA-B, located in ACW, has a vulnerability score of 10. The remainder of WHPA-B has a vulnerability score of 8 or 6. The section of WHPA-C that falls into ACW has a vulnerability score of 8, 6 or 4. Finally, WHPA-D has a vulnerability score of 6 or less.”

**Table 27**, taken from the report, shows a summary of significant drinking water threats within the Lucknow Drinking Water System.

**Table 27 - Lucknow WHPA: Summary of Significant Drinking Water Threats**

Threat (numbered according to <i>Clean Water Act, 2006</i> )		Significant Instances		
		Chemical	Pathogens	DNAPL
1	Waste Disposal Site	1		
2	Sewage System		3	
3	Agricultural Source Material Application		1	
4	Agricultural Source Material Storage		1	
6	Non-Agricultural Source Material Application			
7	Non-Agricultural Source Material Handling/Storage			
8	Commercial Fertilizer Application	2		
9	Commercial Fertilizer Handling/Storage			
10	Pesticide Application	1		
11	Pesticide Handling/Storage			
15	Fuel Handling/Storage	11		
16	Dense Non-Aqueous Phase Liquid Handling/Storage			2
21	Grazing/Pasturing Livestock	2	2	
<b>TOTAL</b>		<b>17</b>	<b>7</b>	<b>2</b>

In conclusion, as stated in the DWSPA Report: “No issues with wells or conditions resulting from past activities were identified within the WHPA.”

## 12.0 OBSERVATIONS AND HISTORICAL TRENDS

### Raw Water Quality

- Microbiological: There were no positive microbiological test results in 2022.

**Table 28 - 10-Year Historical Results - Microbiological**

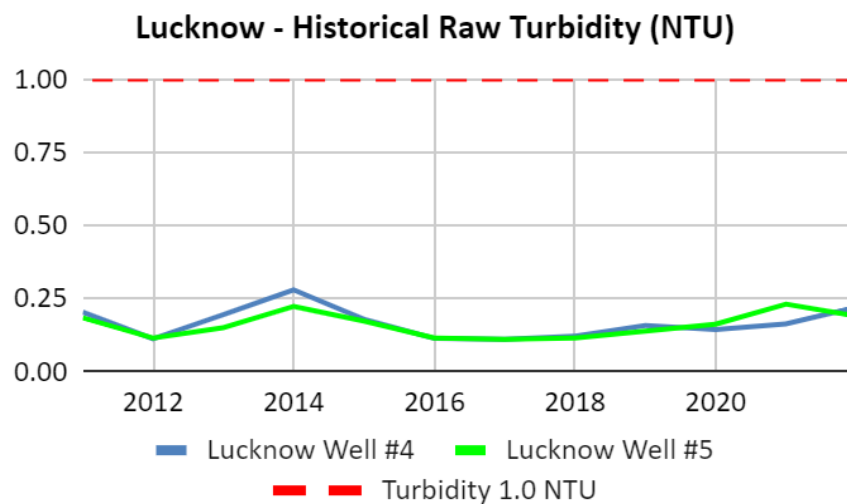
Year	Well Source	Positive microbiological Result
2017 - September 5	Lucknow # 4	1 Total Coliform
2017 - October 17	Lucknow # 4	1 Total Coliform
2021 - April 27	Lucknow # 5	1 Total Coliform
2021 - June 15	Lucknow # 5	1 Total Coliform
2021 - November 30	Lucknow # 5	1 Total Coliform

Due to the infrequent historical results, there are no concerns at this time.

- Raw Turbidity:

**Table 29 - 10-Year Historical Results - Raw Turbidity**

Well Source	10-Year Historical Average (2012 to 2021)	2022 Average	Comments
Lucknow Well # 4	0.17 NTU	0.21 NTU	The raw turbidity has remained consistent based on the 10-year historical average. There is no concern at this time.
Lucknow Well # 5	0.16 NTU	0.18 NTU	The raw turbidity has remained consistent based on the 10-year historical average. There is no concern at this time.



**Figure 5**

#### Treated Water Quality:

- Chemical Parameters: Sodium and Fluoride are naturally occurring and are tested every 60 months (5 years). The results remain consistent since 2006.
  - **Fluoride:** Both Lucknow well sites were sampled for Fluoride in 2022. The results and subsequent resamples were reported as exceedances. The next required sampling is due in September 2027.
  - **Sodium:** Both Lucknow well sites were sampled for Sodium in 2021 and are not due to be sampled again until July 2026.

**Table 30 - 10-Year Historical Results - Sodium and Fluoride**

Year	Lucknow # 4		Lucknow # 5	
	Sodium	Fluoride	Sodium	Fluoride
2006	9.63	1.81	9.49	1.82
2011	8.72	1.82	9.92	1.74
2016	10.8	---	12.8	---
2017	---	1.75, 1.72, 1.75	---	1.78, 1.74, 1.73
2021	11.1	—	12.8	—
2022	—	1.69, 1.76	—	1.59, 1.70

- Arsenic: Arsenic is being monitored at both Lucknow well sites quarterly, since it is just above the half-MAC (maximum allowable concentration). The results remain consistent since 2006.

**Table 31 - 10-Year Historical Results - Arsenic**

Year	Arsenic (µg/L)	
	Lucknow # 4	Lucknow # 5
2006	5.2	5.8
2009	5.1	5.1
2012	4.6	5.8
2015	5.0	6.2
2018	4.8	5.7
2019	4.7, 3.5, 3.1	5.4, 4.9, 3.5
2020	3.7, 4.1, 3.2, 3.6	5.3, 5.5, 4.9, 4.6
2021	3.7, 98.3*, 3.9, 4.0, 2.5	4.6, 4.6, 4.4, 5.2
2022	5.0, 4.6, 5.1, 4.4	4.9, 5.5, 5.5, 4.9

\*Arsenic result was not representative of typical arsenic values. The resample was 3.9 µg/L.

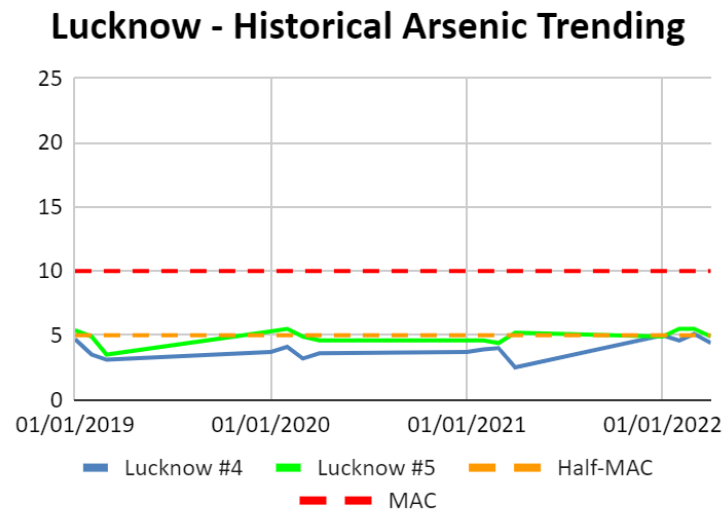


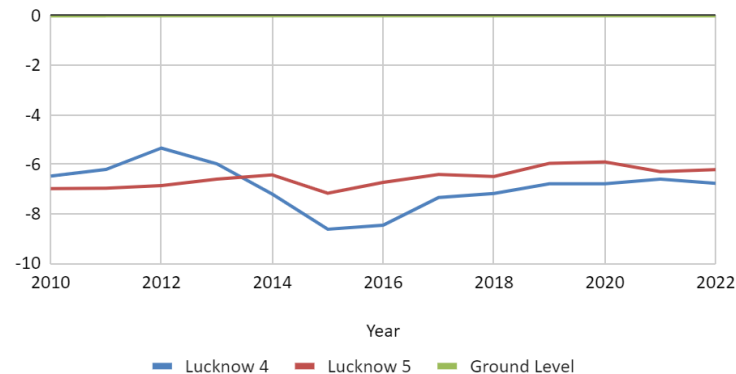
Figure 6

- Well Levels: The Permit to Take Water (PTTW) for Lucknow requires static water levels to be taken weekly at each well. All well levels have remained constant since 2012. Historical well level trending is shown in **Figure 7**.

Table 32 - 10-Year Historical Well Levels

Well Source	10-Year Historical Average (2012 to 2021)	2022 Average	Comments
Lucknow Well # 4	7.35 m below grade	7.18 m below grade	The well level has remained consistent based on the 10-year historical average. There is no concern at this time.
Lucknow Well # 5	6.47 m below grade	6.17 m below grade	The well level has remained consistent based on the 10-year historical average. There is no concern at this time.

**Lucknow - Well Levels (m) - below grade**



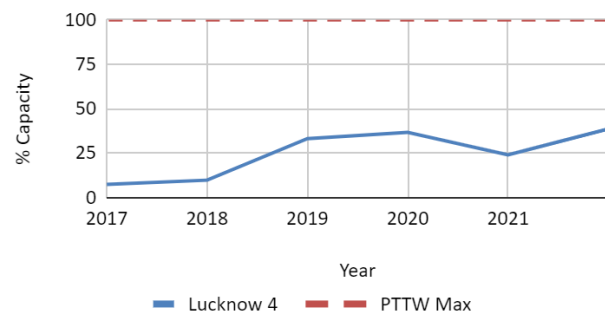
**Figure 7**

- Well Flows and Pump Performance: Well flow rates are monitored through the SCADA system. Both sites continue to remain within capacity. Historical capacities are shown in **Figures 8, 9 and 10**.

**Table 33 - 5-Year Historical - Average Flow and Capacity**

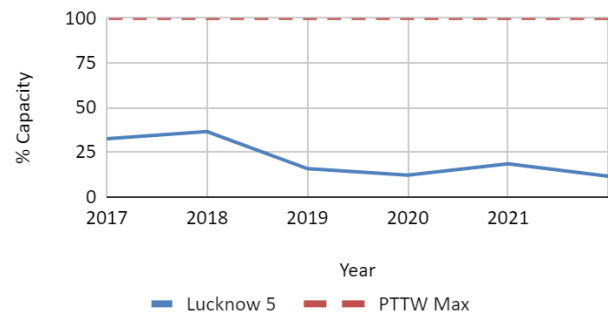
Well Source	5-Year Historical Average (2017 to 2021)	2022 Average	Comments
Lucknow Well # 4	Avg flow: 8.84 L/s Capacity: 22.10%	Avg flow: 12.10 L/s Capacity: 38.53%	Flows are consistent based on the 5-year historical average. The operation of the well cycling has been changed and the capacities are reflective of this change. The new well pump allows for higher flows. There are no concerns at this time.
Lucknow Well # 5	Avg flow: 28.68 L/s Capacity: 22.97%	Avg flow: 35.19L/s Capacity: 11.39%	Flows are consistent based on the 5-year historical average. The operation of the well cycling has been changed and the capacities are reflective of this change. There are no concerns at this time.

**Lucknow 4 - Historical Capacity %**



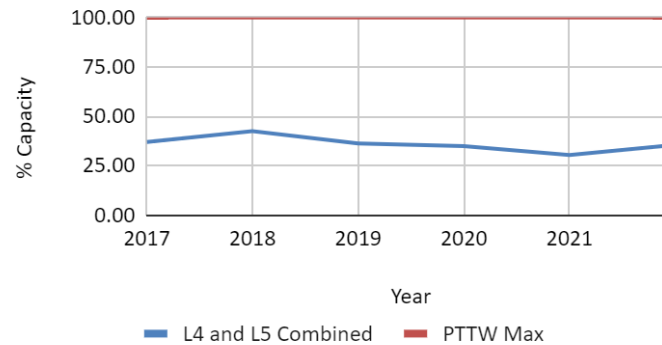
**Figure 8**

**Lucknow 5 - Historical Capacity %**



**Figure 9**

**Lucknow 4 and 5 Combined - Capacity %**



**Figure 10**

## 13.0 SOUTH LUCKNOW - SUMMARY OF DATA

### 13.1 Water Treatment Equipment, Operation and Monitoring

#### 13.1.1 Distribution Free Chlorine Residuals (Grab Samples)

In 2022, a total of 52 distribution residuals were collected in conjunction with weekly microbiological sampling. A summary of all the residuals collected is presented in **Table 34**.

**TABLE 34 - Average Distribution Free Chlorine Residuals - SOUTH LUCKNOW (ACW)**

Month	Residual (mg/L)
Jan	1.61
Feb	1.54
Mar	1.33
Apr	1.20
May	1.36
Jun	1.28
Jul	1.26
Aug	1.19
Sep	1.07
Oct	1.08
Nov	1.27
Dec	1.34
<b>CT REQUIREMENT</b>	<b>0.20</b>
Annual Min	1.04
Annual Max	1.76
Annual Avg	1.30

### 13.1.2 Microbiological Results for Distribution System

Distribution samples are collected every week and tested for E. Coli (EC), Total Coliform (TC), and at least 25% of the samples are also analyzed for Heterotrophic Plate Count (HPC). South Lucknow is regarded as part of the Lucknow Drinking Water System as outlined in ACW Municipal By-Law 60-2014. Results are shown in **Table 35**.

**Table 35 - Microbiological Results - Distribution - SOUTH LUCKNOW (ACW)**

Month	Total Coliform			E. Coli			HPC		
	# Samples	# Samples "0"	# Samples $\geq 1$	# Samples	# Samples "0"	# Samples $\geq 1$	# Samples	# Samples $\leq 10$	# Samples $> 10$
Jan	4	4	0	4	4	0	4	4	0
Feb	4	4	0	4	4	0	4	4	0
Mar	5	5	0	5	5	0	5	5	0
Apr	4	4	0	4	4	0	4	4	0
May	5	5	0	5	5	0	3	3	0
Jun	4	4	0	4	4	0	4	4	0
Jul	4	4	0	4	4	0	4	4	0
Aug	5	5	0	5	5	0	5	5	0
Sep	4	4	0	4	4	0	4	4	0
Oct	4	4	0	4	4	0	3	3	0
Nov	5	5	0	5	5	0	5	5	0
Dec	3	3	0	3	3	0	1	1	0
<b>TOTAL</b>	<b>51</b>	<b>51</b>	<b>0</b>	<b>51</b>	<b>51</b>	<b>0</b>	<b>46</b>	<b>46</b>	<b>0</b>

## 13.2 Chemical Sampling and Testing as per Schedule 13, O. Reg. 170/03

### 13.2.1 Trihalomethane (Schedule 13, s. 13-6)

Distribution samples are taken quarterly (every 3 months) from representative points in the distribution system and tested for Trihalomethanes (THMs). In 2022, samples were collected during the months of February, May, August, and November. The Ontario Drinking Water Quality Standards (ODWQS) have set a Maximum Allowable Concentration (MAC) of 100 µg/L for this parameter and it is expressed as a Running Annual Average (RAA). Refer to **Table 36** for the summary of the THM results and RAA for the South Lucknow samples.

**Table 36 - Trihalomethane (Schedule 13, s. 13-6) Results - SOUTH LUCKNOW (ACW)**

Month	THMs (µg/L)	Bromodichloro methane (µg/L)	Bromoform (µg/L)	Chloroform (µg/L)	Dibromochloro methane (µg/L)	RAA - THMs
Feb	7.6	1.4	<0.34	6.1	<0.37	11.7
May	9.8	1.5	<0.34	8.2	<0.37	11.1
Aug	13.0	2.1	<0.34	10.0	0.44	10.9
Nov	10.0	1.8	<0.34	8.3	0.41	10.1
Average	10.1	1.7	<0.34	8.2	0.40	10.9
Maximum	13.0	2.1	<0.34	10.0	0.44	11.7
MAC (µg/L)	100	---	---	---	---	100
Exceedance	No	---	---	---	---	No

#### 13.2.2 Lead (Schedule 15.1) - O. Reg. 170/03, s. 11 (6) (g)

Schedule 15.1 of Ontario Regulation 170/03 requires that the samples be taken during two (2) seasons: once between December 15 and April 15, and once between June 15 and October 15. By-Law 60-2014 was amended in November 2015 to ensure that this lead sampling requirement is included in the Agreement between Ashfield-Colborne-Wawanosh and Huron-Kinloss. In 2022, samples were collected from South Lucknow and analyzed for lead, pH, and alkalinity. These results are presented in **Table 37**.

**Table 37 - Lead Sampling Program (Schedule 15.1) Results**

Season	Location	Alkalinity	pH	Lead (µg/L)
Dec - Apr (Jan 17)	South Lucknow (ACW)	248	8.35	0.10
Jun - Oct (Jul 4)	South Lucknow (ACW)	224	7.39	0.15
MAC (µg/L)		—	—	10
Exceedance		—	—	No

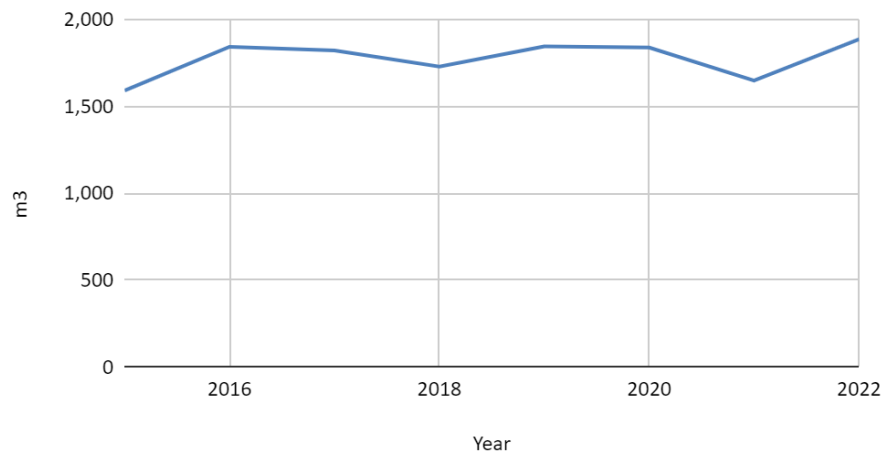
### 13.3 Summary of Flow Rates, Annual Volumes and Capacities (O. Reg. 170/03, Schedule 22-2(3))

Water supplied to South Lucknow in 2022 is monitored by flow meters located at residences on Lucknow Line. These meter readings are viewed quarterly. A summary of these volumes is provided in **Table 38**. The historical usage is presented in **Figure 11**.

**Table 38 - Flow Meter Readings - SOUTH LUCKNOW (ACW)**

Location	Previous	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Annual Usage (m³)
86637	no meter	no meter	no meter	no meter	no meter	no meter
86663	11352	11479	11617	11748	11874	522
86667	10283	10385	10499	40601	10662	379
86673	10602	10644	10686	10731	10772	170
86681	3641	3690	3729	3785	3837	196
86687	4616	4648	4679	4718	4747	131
86699	7316	7343	7368	7394	7422	106
86705	8541	8568	8597	8625	8649	108
86690	6209	6209	6209	6209	6210	1
86658-B	no meter	no meter	no meter	no meter	no meter	no meter
86714-1	876	907	939	977	1009	133
86714-2	1008	1021	1035	1051	1063	55
86714-3	1042	1062	1083	1108	1128	86
GRAND TOTAL						1,887

**South Lucknow - Historical Usage, m3**



**Figure 11**