Lucknow 2018
Annual Report

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1.0 EXECUTIVE SUMMARY

The Operating Authority, on behalf of the Owner, the Township of Huron-Kinloss, has prepared this report to satisfy the requirements of Section 11 (1) of Ontario Regulation 170/03. Section 11 (1) requires that the Owner of a drinking water system ensure that a report is prepared in accordance with Subsections (3) and (6) for the preceding calendar year, which covers from the period of January 1 to December 31, 2018. The annual report must be prepared no later than February 28 of each year. A copy of this report will be submitted to the Owner to be made available to the residents.

This report is a collection of information that demonstrates the production of safe and high-quality drinking water for the residents of the Lucknow Drinking Water System. At no point during 2018 was improperly disinfected water directed to consumers. The Lucknow Drinking Water System met all compliance requirements of the Safe Drinking Water Act (SDWA). There were no Adverse Water Quality Indicator (AWQI) events in 2018.

In January 2018, O. Reg. 169/03 – Ontario Drinking Water Quality Standard for Arsenic was changed to 0.010 mg/L from 0.025 mg/L, making the new Half-MAC (maximum allowable concentration) 0.005 mg/L. Lucknow Well # 5 is the only Lucknow well that had a sample exceed the Arsenic Half-MAC (0.0057 mg/L), and therefore was resampled after 3 months to satisfy O. Reg. 170/03, Schedule 13-5(1) – Increased frequency under s.s 13-2 and 13-4. The resample, however, was below the Half-MAC (0.0046 mg/L), so therefore it was NOT required to continue with the increased sampling frequency.

In order to prevent equipment failures from occurring, Veolia utilizes a preventative maintenance program that is managed using a Computerized Maintenance Management System (CMMS). Also, as part of the Drinking Water Quality Management Standard (DWQMS), Veolia has developed a Contingency Plan that includes procedures that can be followed for a number of emergency situations. These procedures are reviewed by staff annually as part of our Emergency Exercise in order to continually improve our emergency responses. In addition, the Lucknow Drinking Water System has a number of redundancies in the event of equipment failure to ensure that the residents are always supplied with safe drinking water.

In December of 2018, both of the Lucknow well sites were upgraded with new and more robust instrumentation and control equipment, including a more streamlined SCADA component to replace the deteriorating and outdated control equipment. These sites have passed their subsequent ESA (Electrical Safety Authority) inspections.

The Township of Huron-Kinloss Council Members have responsibilities to ensure safe drinking water is supplied to the Lucknow community. Under Section 19 of the Safe Drinking Act, “the Owners of a Drinking Water System shall exercise a 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 act honestly, competently and with integrity, with a view to ensuring the protection and safety of the users of the Municipal Drinking Water System.” Council Members can learn more about their role and responsibilities in ensuring safe drinking water by reading “Taking Care of Your Drinking Water: A Guide for Municipal Councilors”, a publication written by the Ministry of the Environment, Conservation and Parks (MECP). A copy of this document can be provided upon request. Additionally, the Walkerton Clean Water Centre (WCWC) offers a course called, “Standard of Care: Safe Drinking Water Act”, where Council Members and Officials can learn more about their oversight responsibilities under Section 19 of the Safe Drinking Water Act.

2.0 DESCRIPTION OF WATER SYSTEM

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^3
Population:	1,100
Total Number of Service Connections:	665
Estimated Potential Population:	1,729 (based on Census of 2.6 people per household)

The Lucknow Drinking Water Distribution and Supply System is characterized as a "secure groundwater system". It consists of two (2) wells and its equipment delivers potable water to the Village of Lucknow and ten (10) Lucknow South properties in the Municipality of Ashfield-Colborne-Wawanosh in Huron County.

Each well 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 computer and server at the Ripley Municipal Office. As a redundancy, each pumphouse 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) wells are described as follows:

Site: Lucknow Well # 4 – 600 Havelock Street

- Water Source: Groundwater, Non-GUDI
- Number of Production Wells: 1 (drilled 1957)
- Depth of Wells: 54.8m
- Well Pump: 15hp, vertical turbine
- Disinfection: Sodium hypochlorite (12%)
- CT Requirement: 2-log, 5°C, contact watermain (1.0 BF)
- Permit To Take Water: 0685-70YR9J, expires December 17, 2017
  7631-AQYS3J, expires September 29, 2027
- Municipal Drinking Water Licence: 087-104, #2, expires May 19, 2021
- Drinking Water Works Permit: 087-204, #2, issued May 20, 2016

Site: Lucknow Well # 5 – 381 South Delhi Street

- Water Source: Groundwater, Non-GUDI
- Number of Production Wells: 1 (drilled 1967)
- Depth of Wells: 58.8m
- Well Pump: 40hp, submersible (2009)
- Disinfection: Sodium hypochlorite (12%)
- CT Requirement: 2-log, 5°C, contact watermain (1.0 BF)
- Permit To Take Water: 0685-70YR9J, expires December 17, 2017
  7631-AQYS3J, expires September 29, 2027
- Municipal Drinking Water Licence: 087-104, #2, expires May 19, 2021
- Drinking Water Works Permit: 087-204, #2, issued May 20, 2016

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 sodium and fluoride, but the lead content of the raw water is well below the half-Maximum Allowable Concentration (MAC). Those who are supplied water from the Lucknow WDSS 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 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.

A standpipe located at 656 Wheeler Street and is constructed of bolted steel. It is 6.7 m in diameter, 27.5 m high, and has a total volume of 996 m^3. 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 and is in a delicate, but operable condition. As it is risky to perform aggressive cleaning without compromising its structure, engineers have prepared proposals for its replacement in the near future.

3.0 SUMMARY OF WATER QUALITY MONITORING

3.1 Water Treatment Equipment Operation and Monitoring

3.1.1 Treated Water (Point of Entry) Chlorine Residuals

In 2018, a total of 730 treated water samples were collected and analyzed for Free Chlorine Residual at the Point of Entry (POE) water using a HACH pocket chlorine colorimeter. **Table 1** shows the grab sample monthly average of free chlorine residual values. **Table 2** shows the on-line continuous samples monthly average of the free chlorine residual values.

3.1.2 Distribution (Grab) Free Chlorine Residuals

In 2018, a total of 469 distribution residuals were collected: 365 daily grab residuals and an additional 104 weekly grab residuals were taken in conjunction with the required weekly micro bacteriological sampling. A summary of all the residuals collected is presented in **Table 1**.

Table 1 – Average Treated and Distribution Free Chlorine (Grab) Residuals

Month	Lucknow # 4 Treated Water	Lucknow # 5 Treated Water	Lucknow Distribution
Jan	1.78	1.77	1.53
Feb	1.71	1.70	1.44
Mar	1.71	1.71	1.49
Apr	1.72	1.74	1.52
May	1.62	1.62	1.41
Jun	1.57	1.63	1.39
Jul	1.50	1.52	1.29
Aug	1.63	1.62	1.34
Sep	1.45	1.55	1.28
Oct	1.59	1.63	1.34
Nov	1.55	1.62	1.35
Dec	1.55	1.55	1.36
Annual Min	0.53	1.27	0.96
Annual Max	2.49	2.06	1.94
Annual Avg	1.62	1.64	1.39
# Samples	364*	365	469

*Lucknow 4 was off-line on December 3, 2018, due to SCADA upgrades, so a grab residual was not taken that day.

Table 2 - Average Treated Free Chlorine (On-Line) Residuals

Month	Lucknow # 4 Treated Water	Lucknow # 5 Treated Water
Jan	1.79	1.78
Feb	1.74	1.72
Mar	1.73	1.74
Apr	1.72	1.76
May	1.62	1.63
Jun	1.57	1.65
Jul	1.50	1.53
Aug	1.60	1.63
Sep	1.45	1.55
Oct	1.59	1.66
Nov	1.54	1.64
Dec	1.59	1.56
Annual Min	0.53	1.09
Annual Max	4.95	3.97
Annual Avg	1.62	1.65

3.1.3 Turbidity

Drinking water turbidity was measured by a portable turbidity analyzer. Raw and treated water grab samples were collected and analyzed for turbidity. **Table 3** provides a summary of raw and treated turbidity results. The maximum turbidity measured in the raw water was 0.29 NTU and the maximum turbidity measured in the treated water was 0.36 NTU.

Table 3 – Raw and Treated Water Turbidity

Month	Lucknow # 4		Lucknow # 5	
	Raw	Treated	Raw	Treated
Jan	0.24	0.19	0.29	0.32
Feb	0.12	0.18	0.14	0.36
Mar	0.15	0.26	0.08	0.23
Apr	0.13	0.18	0.10	0.23
May	0.15	0.16	0.17	0.28
Jun	0.14	0.28	0.08	0.23
Jul	0.21	0.23	0.14	0.24
Aug	0.09	0.15	0.11	0.17
Sep	0.18	0.27	0.15	0.27
Oct	0.17	0.23	0.17	0.30
Nov	0.11	0.21	0.09	0.22
Dec	0.20	0.28	0.14	0.23
Annual Min	0.09	0.15	0.08	0.17
Annual Max	0.24	0.28	0.29	0.36
Annual Avg	0.16	0.22	0.14	0.26
# Samples	12	12	12	12

3.2 Microbiological Sampling as per Schedule 10, Ontario Regulation 170/03

3.2.1 Raw Water Samples (Schedule 10, Section 10-4)

Raw water samples are collected every week from each well as indicated in Schedule 10, Section 10-4 of O. Reg. 170/03. In 2018, a total of 104 samples were collected and analyzed for Total Coliform and E. Coli. **Table 4** provides a summary of bacteriological results performed on the raw water.

Table 4 – Microbiological (Schedule 10, Section 10-4) Results for Raw Water

Lucknow # 4

Month	Total Coliform			E. Coli		
	# Samples	# Samples "0"	# Samples ≥1	# Samples	# Samples "0"	# Samples ≥1
Jan	5	5	0	5	5	0
Feb	4	4	0	4	4	0
Mar	4	4	0	4	4	0
Apr	4	4	0	4	4	0
May	5	5	0	5	5	0
Jun	4	4	0	4	4	0
Jul	5	5	0	5	5	0
Aug	4	4	0	4	4	0
Sep	4	4	0	4	4	0
Oct	5	5	0	5	5	0
Nov	4	4	0	4	4	0
Dec	4	4	0	4	4	0
TOTAL	52	52	0	52	52	0

Lucknow # 5

Month	Total Coliform			E. Coli		
	# Samples	# Samples "0"	# Samples ≥1	# Samples	# Samples "0"	# Samples ≥1
Jan	5	5	0	5	5	0
Feb	4	4	0	4	4	0
Mar	4	4	0	4	4	0
Apr	4	4	0	4	4	0
May	5	5	0	5	5	0
Jun	4	4	0	4	4	0
Jul	5	5	0	5	5	0
Aug	4	4	0	4	4	0
Sep	4	4	0	4	4	0
Oct	5	5	0	5	5	0
Nov	4	4	0	4	4	0
Dec	4	4	0	4	4	0
TOTAL	52	52	0	52	52	0

3.2.2 Treated Water (Point of Entry) Samples (Schedule 10, Section 10-3)

One (1) treated water sample from each point of entry is taken every week and analyzed for Total Coliform, E. Coli, and for Heterotrophic Plate Count (HPC) as indicated in Schedule 10, Section 10-3 of O. Reg. 170/03. In 2018, a total of 104 treated water samples were collected and analyzed for the above parameters. Each Total Coliform and E. Coli result from the treated water was 0 cfu/100 mL. The range of HPC results were 0 – 3 cfu/100 mL for both treated water sources. **Table 5** provides a summary of all bacteriological results performed on treated water.

Table 5 – Microbiological (Schedule 10, Section 10-3) 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 "0"	# Samples 1 - 3
Jan	5	5	0	5	5	0	5	4	1
Feb	4	4	0	4	4	0	4	4	0
Mar	4	4	0	4	4	0	4	3	1
Apr	4	4	0	4	4	0	4	3	1
May	5	5	0	5	5	0	5	4	1
Jun	4	4	0	4	4	0	4	4	0
Jul	5	5	0	5	5	0	5	4	1
Aug	4	4	0	4	4	**0**	4	2	2
Sep	4	4	0	4	4	0	4	2	2
Oct	5	5	0	5	5	0	5	4	1
Nov	4	4	0	4	4	0	4	4	0
Dec	4	4	0	4	4	0	4	4	0
TOTAL	52	52	0	52	52	0	52	42	10

Table 5 – Microbiological (Schedule 10, Section 10-3) Results for Treated Water (Point of Entry) - Continued

Lucknow # 5

Month	Total Coliform			E. Coli			HPC		
	# Samples	# Samples "0"	# Samples ≥1	# Samples	# Samples "0"	# Samples ≥1	# Samples	# Samples "0"	# Samples 1 - 3
Jan	5	5	0	5	5	0	5	3	2
Feb	4	4	0	4	4	0	4	4	0
Mar	4	4	0	4	4	0	4	3	1
Apr	4	4	0	4	4	0	4	4	0
May	5	5	0	5	5	0	5	4	1
Jun	4	4	0	4	4	0	4	4	0
Jul	5	5	0	5	5	0	5	2	3
Aug	4	4	0	4	4	**0**	4	1	3
Sep	4	4	0	4	4	0	4	3	1
Oct	5	5	0	5	5	0	5	5	0
Nov	4	4	0	4	4	0	4	3	1
Dec	4	4	0	4	4	0	4	3	1
TOTAL	52	52	0	52	52	0	52	39	13

3.2.3 Distribution Samples (Schedule 10, Section 10-2)

Distribution samples are collected every week and tested for Total Coliform, E. Coli, and for Heterotrophic Plate Count (HPC). Ontario Regulation 170/03, Schedule 10, Section 10-2 requires eight (8) distribution samples each month for systems serving 100,000 people or less, plus one additional sample for every 1,000 people served by the system to be tested for Total Coliform and E. Coli, and 25% of those samples are tested for HPC. In 2018, a total of 157 distribution samples were collected and analyzed for the above parameters, which is above the required number of samples (n=108, based on 1,100 residents), and 107 of those samples were tested for HPC. Each Total Coliform and E. Coli result was 0 cfu/100 mL. The range of HPC results were 0 – 96 cfu/100 mL. **Table 6** provides a summary of all bacteriological samples taken in the distribution system.

Table 6 – Microbiological (Schedule 10, Section 10-2) Results for Distribution System

Month	Total Coliform			E. Coli			HPC		
	# Samples	# Samples "0"	# Samples ≥1	# Samples	# Samples "0"	# Samples ≥1	# Samples	# Samples "0"	# Samples 1 – 96
Jan	15	15	0	15	15	0	11	7	4
Feb	12	12	0	12	12	0	8	4	4
Mar	12	12	0	12	12	0	8	7	1
Apr	12	12	0	12	12	0	8	5	3
May	15	15	0	15	15	0	10	6	4
Jun	12	12	0	12	12	0	8	6	2
Jul	15	15	0	15	15	0	10	9	1
Aug	13	13	0	13	13	0	9	5	4
Sep	12	12	0	12	12	0	9	4	5
Oct	15	15	0	15	15	0	10	6	4
Nov	12	12	0	12	12	0	8	6	2
Dec	12	12	0	12	12	0	8	5	3
TOTAL	157	157	0	157	157	0	107	70	37

3.3 Chemical Sampling & Testing as per Schedule 13, Ontario Regulation 170/03

3.3.1 Inorganics (Schedule 13, Section 13-2; Schedule 23)

Treated water samples are collected every 36 months and tested for inorganics. The most recent samples were collected on June 4, 2018 and submitted to the laboratory for analysis of inorganics as listed in Schedule 23 (see **Table 7**). All parameters were found to be within compliance; however, the Arsenic level at Lucknow Well # 5 exceeded the Half-Maximum Allowable Concentration of 0.005 mg/L (0.0056 mg/L). This site was sampled to satisfy O. Reg. 170/03, Schedule 13-5(1) – Increased frequency under s.s 13-2 and 13-4. The resample, however, was below the Half-MAC (0.0046 mg/L), so therefore it was NOT required to continue with the increased sampling frequency. Inorganics will be sampled and analyzed again on or before June 4, 2021.

Table 7 – Inorganics (Schedule 13, Section 13-2; Schedule 23) Results

Parameter	Lucknow # 4 Treated Water (µg/L)	Lucknow # 5 Treated Water (µg/L)	Maximum Allowable Concentration (µg/L)
Antimony	0.05	0.07	6
Arsenic	4.8	5.7	10
Barium	302	332	1000
Boron	39	34	5000
Cadmium	0.003<MDL	0.003<MDL	5
Chromium	0.07	0.47	50
Mercury	0.01<MDL	0.01<MDL	1
Selenium	0.04<MDL	0.04<MDL	50
Uranium	0.832	0.697	20

Note *: The Arsenic standard changed from a MAC of 25 µg/L to 10 µg/L in January 2018.

3.3.2 Organics (Schedule 13, Section 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 4, 2018. All parameters were found to be within compliance. Organics will be sampled and analyzed again on or before June 4, 2021. Sample results can be found in **Table 8.**

Table 8 - Organics (Schedule 13, Section 13-4; Schedule 24) Results

Parameter	Lucknow #4 Treated Water	Lucknow # 5 Treated Water	Maximum Allowable Concentration (µg/L)	Aesthetic Objective / Operational Guideline (µg/L)	Exceedance
Benzene	0.32 <MDL	0.32 <MDL	1	--	No
Carbon Tetrachloride	0.16 <MDL	0.16 <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

Table 8 - Organics (Schedule 13, Section 13-4; Schedule 24) Results - Continued

Parameter	Lucknow #4 Treated Water	Lucknow # 5 Treated Water	Maximum Allowable Concentration (µg/L)	Aesthetic Objective / Operational Guideline (µg/L)	Exceedance
Polychlorinated Biphenyls	0.04 <MDL	0.04 <MDL	3	--	No
Benzo(a)pyrene	0.004 <MDL	0.004 <MDL	0.01	--	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
2,3,4,5-tetrachlorophenol	0.20 <MDL	0.20 <MDL	100	1	No
Pentachlorophenol	0.15 <MDL	0.15 <MDL	60	30	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	--	--	-
Desethyl atrazine	0.01 <MDL	0.01 <MDL	--	--	-
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	0.03 <MDL	0.03 <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-dichlorophenoxy acetic 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

Table 8 - Organics (Schedule 13, Section 13-4; Schedule 24) Results - Continued

Parameter	Lucknow #4 Treated Water	Lucknow # 5 Treated Water	Maximum Allowable Concentration (µg/L)	Aesthetic Objective / Operational Guideline (µg/L)	Exceedance
Diclofop-methyl	0.40 <MDL	0.40 <MDL	9	--	No
MCPA (mg/L)	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-tetrachloro phenol	0.20 <MDL	0.20 <MDL	100	1	No
Pentachlorophenol	0.15 <MDL	0.15 <MDL	60	30	No

3.3.3 Trihalomethanes (Schedule 13, Section 13-6)

Distribution samples are taken every three months from representative points in the distribution system and tested for Trihalomethanes (THMs). In 2018, samples were collected during the months of February, May, August, and November. The Ontario Drinking Water Quality Standard (ODWQS) have set a Maximum Allowable Concentration (MAC) of 100 µg/L for this parameter and it is expressed as a running annual average. In 2018, the average THM was found to be 6.1 µg/L, which is within compliance. Refer to **Table 9** for the summary of trihalomethane results.

Table 9 - Trihalomethane (Schedule 13, Section 13-6) Results

Month	THMs	Bromodichloro methane	Bromoform	Chloroform	Dibromochloro methane	Maximum Allowable Concentration	Exceedance
	Result (µg/L)	Result (µg/L)	Result (µg/L)	Result (µg/L)	Result (µg/L)	(µg/L)	
Feb	6.0	1.10	<0.34	4.9	<0.37	100	No
May	9.0	1.7	<0.34	6.8	0.49	100	No
Aug	6.0	0.9	<0.34	5.2	<0.37	100	No
Nov	3.2	0.6	<0.34	2.7	<0.37	100	No
Average	6.1	1.1	<0.34	4.9	0.40		
Maximum	9.0	1.7	<0.34	6.8	0.49		

3.3.4 Haloacetic Acids (Schedule 13, Section 13-6.1)

Ontario Regulation 170/03 has been amended to include quarterly testing for Haloacetic acids (HAAs). One distribution sample are taken every three months from representative points in the distribution system and tested for Haloacetic Acids (HAAs). In 2018, samples were collected during the months of February, May, August, and November and results are expressed as a running annual average. Results are summarized in **Table 10**.

Table 10 - Haloacetic Acid (Schedule 13, Section 13-6.1) Results

Month	Total HAAs	Bromo acetic Acid	Chloro acetic Acid	Dichloro acetic Acid	Dibromo acetic Acid	Trichloro acetic Acid	Maximum Allowable Concentration	Exceedance
	Result (µg/L)	Result (µg/L)	Result (µg/L)	Result (µg/L)	Result (µg/L)	Result (µg/L)	(µg/L)	
Feb	<5.3	<2.9	<4.7	<2.6	<2.0	<5.3	80	No
May	<5.3	<2.9	<4.7	<2.6	<2.0	<5.3	80	No
Aug	<5.3	<2.9	<4.7	<2.6	<2.0	<5.3	80	No
Nov	<5.3	<2.9	<4.7	4.2	<2.0	<5.3	80	No
Avg	<5.3	<2.9	<4.7	3.0	<2.0	<5.3		
Max	<5.3	<2.9	<4.7	4.2	<2.0	<5.3		

3.3.5 Nitrate & Nitrite (Schedule 13, Section 13-7)

One treated water sample is collected every three months and tested for nitrate and nitrite. In 2018, samples were collected during the months of February, May, August, and December. The Ontario Drinking Water Quality Standard (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. Refer to **Table 11.**

Table 11 – Nitrate and Nitrite (Schedule 13, Section 13-7) Results

Lucknow # 4

Month	Nitrite	Maximum Allowable Concentration	Exceedance	Nitrate	Maximum Allowable Concentration	Exceedance
	Result (mg/L)	(mg/L)		Result (mg/L)	(mg/L)	
Feb	<0.003	1	No	<0.006	10	No
May	<0.003	1	No	<0.006	10	No
Aug	<0.003	1	No	<0.006	10	No
Nov	<0.003	1	No	<0.006	10	No
Average	<0.003			<0.006		
Maximum	<0.003			<0.006		

Table 11 – Nitrate and Nitrite (Schedule 13, Section 13-7) Results - Continued

Lucknow # 5

Month	Nitrite	Maximum Allowable Concentration	Exceedance	Nitrate	Maximum Allowable Concentration	Exceedance
	Result (mg/L)	(mg/L)		Result (mg/L)	(mg/L)	
Feb	<0.003	1	No	<0.006	10	No
May	<0.003	1	No	<0.006	10	No
Aug	<0.003	1	No	<0.006	10	No
Nov	<0.003	1	No	<0.006	10	No
Average	<0.003			<0.006		
Maximum	<0.003			<0.006		

3.3.6 Sodium (Schedule 13, Section 13-8)

One water sample is collected from each point of entry every 60 months and tested for Sodium. The Ontario Drinking Water Standards (ODWQS) have set a Maximum Acceptable concentration (MAC) of 200 mg/L for Sodium and requires the Medical Officer of Health be notified if the concentration exceeds 20 mg/L. This sample was collected on June 21, 2016. Refer to **Table 12**. The next water sample for Sodium will be collected and analyzed on or before June 21, 2021.

3.3.7 Fluoride (Schedule 13, Section 13-9)

One water sample is collected from each point of entry at least once in every 60 months and tested for Fluoride. The Ontario Drinking Water Quality Standards (ODWQS) have set a MAC of 1.5 mg/L. On August 15, 2017, samples were collected for this analysis. The sample exceeded the Maximum Allowable Concentration (MAC) and was reported as an adverse water quality incident (AWQI #135642). This is due to naturally occurring fluoride in the aquifer. The next water sample for Fluoride will be collected and analyzed on or before August 15, 2022. Refer to **Table 12.**

Table 12 – Sodium (Schedule 13, Section 13-8) and Fluoride (Schedule 13, Section 13-9) Results

Location	Sodium			Fluoride		
	Result (mg/L)	Maximum Allowable Concentration (mg/L)	Exceedance	Result (mg/L)	Maximum Allowable Concentration (mg/L)	Exceedance
Lucknow # 4 Treated Water	10.8	20.0	No	**1.75**	1.50	**Yes**
Lucknow # 5 Treated Water	12.8	20.0	No	**1.78**	1.50	**Yes**

3.3.8 Lead (Schedule 15.1)

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. The Lucknow DWS is currently under a reduced sampling program for lead where lead, pH and alkalinity are sampled in each season every 3 years. In the interim, pH and alkalinity are tested during each sampling season. Three pH and alkalinity samples were taken on March 26, 2018, and three pH and alkalinity samples on October 4, 2018. NOTE: Two of the three samples that were collected on October 4, 2018 were missed being processed by the laboratory within the holding time of 14 days and were labeled as "UAL – Unreliable: Sample Age Exceeds Normal Limit". Two additional samples were collected on October 24, 2018, which was outside the lead sampling window of June 15 – October 15. These parameters are required to be sampled and analyzed again between the months of December 2018 and April 2019 and again between June and October 2019. Lead samples are required next in the 2020 sampling season. 2018 results can be found in **Table 13**.

Table 13 - Lead Sampling Program (Schedule 15.1) Results

Season	Alkalinity (mg/L)	pH	Lead (mg/L)	Maximum Allowable Concentration - Lead (mg/L)	Exceedance
Dec-Apr	220 224 221	7.50 7.63 7.56	Not required until 2020	0.010	--
Jun-Oct	231 229 UAL 226 UAL 231 228	7.62 7.56 7.61 7.48 7.52	Not required until 2020	0.010	--

3.3.9 Non-Regulatory Testing – Aesthetic Objectives and Operational Guidelines

Samples were collected on November 21, 2016 and tested for parameters listed in the *MOECC Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines, June 2006, PIBS 4449e01*. Refer to **Table 14** for Aesthetic Objective/Operational Guideline results.

Table 14 – 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 $CaCO_3$)	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 (mg/L as $CaCO_3$)	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^3)	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

* NOTE: AO/OG – aesthetic objective / operational guideline
MDL – laboratory method detection limit

4.0 WATER AND CHEMICAL USAGE

4.1 Chemical Usage

In 2018, 12% sodium hypochlorite (NaOCl) was used to treat the water that was provided to the distribution system. Refer to **Table 15** for sodium hypochlorite usage. Sodium Hypochlorite Grand Total Usage: **928.29 kg**

Table 15 – Sodium Hypochlorite Usage

Month	Lucknow # 4		Lucknow # 5	
	Usage (kg)	Average Dosage (mg/L)	Usage (kg)	Average Dosage (mg/L)
Jan	9.25	4.79	101.20	3.91
Feb	7.15	4.29	92.51	4.00
Mar	11.35	4.33	73.16	3.93
Apr	8.69	4.16	76.81	3.75
May	9.81	4.24	62.37	3.65
Jun	8.55	4.49	82.27	3.93
Jul	7.71	4.56	76.81	3.93
Aug	14.58	4.52	56.62	4.22
Sep	4.06	4.79	62.23	4.03
Oct	9.67	4.55	49.20	3.79
Nov	7.43	4.25	41.35	3.66
Dec	41.49	3.98	14.02	3.59
TOTAL	139.74	--	788.55	--
Average	--	4.41	--	3.87

4.2 Annual Volumes

A summary of the water supplied to the distribution system in 2018 is provided in **Table 16.** This Table provides a breakdown of the monthly volumes provided to the distribution system. Each well has a flow meter. The annual calibration was performed by Corix Water Meter Service on July 18, 2018.

Table 16 – Treated Water Volume

Lucknow # 4

Month	Avg Daily Volume (m^3)	Max Daily Volume (m^3)	Total Monthly Volume (m^3)
Jan	63.42	296.24	1,966.14
Feb	65.79	292.52	18.42.07
Mar	76.88	322.96	2,383.19
Apr	68.81	321.88	2,064.38
May	83.57	362.17	2,590.66
Jun	54.24	274.52	1,627.10
Jul	57.27	246.09	1,775.26
Aug	111.66	372.75	3,461.38
Sep	21.87	277.74	656.12
Oct	67.13	261.19	2,081.02
Nov	58.86	252.25	1765.92
Dec	343.91	506.64	10,661.33
TOTAL	---	---	**32,874.57**
Average	89.45	---	---
Maximum	---	506.64	---
PTTW	---	935.00	---

Lucknow # 5

Month	Avg Daily Volume (m^3)	Max Daily Volume (m^3)	Total Monthly Volume (m^3)
Jan	820.07	1,069.00	25,422.22
Feb	808.12	1,026.41	22,627.37
Mar	603.51	724.62	18,708.81
Apr	667.74	1,018.54	20,032.11
May	538.54	750.35	16,694.80
Jun	700.63	1,078.16	21,018.97
Jul	611.88	905.47	18,968.40
Aug	421.56	643.82	13,068.25
Sep	517.48	890.86	15,524.33
Oct	405.55	861.43	12,572.15
Nov	373.53	524.83	11,206.00
Dec	117.90	687.52	3,654.92
TOTAL	---	---	**199,498.33**
Average	524.22	---	---
Maximum	---	1,078.16	---
PTTW	---	1,500.00	---

Table 16 – Treated Water Volume - Continued

Combined (Lucknow # 4 + Lucknow # 5)

Month	Avg Daily Volume (m^3)	Max Daily Volume (m^3)	Total Monthly Volume (m^3)
Jan	883.5	1,069.00	27,388.36
Feb	873.91	1,059.01	24,469.44
Mar	680.39	725.23	21,092.00
Apr	736.55	1,018.54	22,096.49
May	622.11	750.35	19,285.46
Jun	754.87	1,078.16	22,646.07
Jul	669.15	905.47	20,743.66
Aug	533.21	647.80	16,529.63
Sep	539.35	923.23	16,180.45
Oct	472.68	898.26	14,653.17
Nov	432.40	545.95	12,971.92
Dec	461.81	687.52	14,316.25
TOTAL	---	---	**232,372.90**
Average	616.04	---	---
Maximum	---	1,078.16	---
PTTW	---	1,500.00	---

Parameters	Total Volume for 2017
Annual Total Flow, Actual (m^3)	**232,372.90 m^3**
Annual Rated Capacity, PTTW (m^3)	547,500.00 m^3
Operating Capacity, Actual %	42.44%

5.0 IMPROVEMENTS TO SYSTEM AND ROUTINE AND PREVENTATIVE MAINTENANCE

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

Routine and preventative maintenance performed as per Jobs Plus schedule.
Semi-annual flushing in April and again in September.

January 2018:	Frozen water line at Ross St building resulting in faulty pressure signals – water tower overflowed
	Flow test conducted for Georgian Bay Fire and Safety
February 2018:	Watermain break on Wheeler St
April 2018:	Power outage at Lucknow Well # 4 – 2 hours
	Construction project starts: Willoughby and Outram Sts
May 2018:	MECP Drinking Water Inspection
June 2018:	Watermain break on Canning St
	Hydrant repair
	Eramosa conducted site inspections for SCADA upgrade design
July 2018:	Flow meter calibrations
August 2018:	SAI External Audit for DWQMS
	Georgian Bay Fire and Safety on-site for annual service of fire extinguishers and emergency lights
	Backflow preventers were certified
September 2018:	Construction project starts: Victoria St
	Eramosa submitted Process Control Narrative for operator review of tentative SCADA upgrades
October 2018:	Process Control Narrative reviewed and resubmitted to Eramosa
November 2018:	Veolia attended Factory Acceptance Test at Eramosa Office
December 2018:	SCADA and site upgrades completed at both well houses

6.0 MINISTRY OF THE ENVIRONMENT, CONSERVATION AND PARKS INSPECTIONS AND REGULATORY ISSUES

- An MECP Drinking Water Inspection was conducted on April 4, 2018 and awarded a rating of 95.76% (previous rating was 100.00%).
- Flow meter calibration was conducted on July 18th, 2018.
- A list of Capital Items was submitted to the Township of Huron-Kinloss of November 1st, 2018.
- DWQMS Accreditation Audit was conducted on August 8-9th, 2018. There were 2 minor non-conformities.
- Emergency Response Exercise was conducted as a follow-up response to a major watermain break that happened in Goderich on August 21-23, 2018, where many utilities were involved. An “After Action Report” was submitted to the utilities involved following the tabletop incident review.
- DWQMS Management Review was conducted on May 11, 2018.

7.0 REGULATORY CHANGES

Changes to Ontario Regulation 170/03 and Ontario Regulation 169/03 that strengthen standards and clarify testing requirements, new sampling and testing parameters, reporting and re-sampling requirements, and the removal of 13 pesticides came into effect January 1, 2016. Updates to standards and reporting requirements for Arsenic came into effect January 1, 2018. Over the next few years, the following amendments will be added. Subsequent phase-in dates are:

- January 1, 2020: New standards for HAAs and HAAs testing optimization rule for smaller systems will come into effect / require reporting.

7.1 Arsenic Sampling

In January 2018, O. Reg. 169/03 – Ontario Drinking Water Quality Standard for Arsenic was changed to 0.010 mg/L from 0.025 mg/L, making the new Half-MAC (maximum allowable concentration) 0.005 mg/L. Both Lucknow wells were sampled and analyzed for Arsenic in June 2018. Lucknow Well # 5 exceeded the Half-MAC and was resampled as per O. Reg. 170/03, Schedule 13-5(1) – Increased frequency under s.s 13-2 and 13-4. The resample, however, was below the Half-MAC (0.0046 mg/L), so therefore it was NOT required to continue with the increased sampling frequency. See **Table 17** for Lucknow Arsenic results.

Table 17 - Lucknow Arsenic Results

Date	Arsenic Result, mg/L		Maximum Allowable Concentration, mg/L	Exceedance
	Lucknow Well # 4	Lucknow Well # 5		
June 4, 2018	0.0048	0.0057	0.010	No
October 16, 2018	0.0043	0.0046	0.010	No

NOTE:
O. Reg. 170/03, Schedule 13: Increased frequency under ss. 13-2 and 13-4
13-5. (1) If a test result obtained under section 13-2 or 13-4 for a parameter ***exceeds half of the standard prescribed*** *for the parameter in Schedule 2 to the Ontario Drinking Water Quality Standards, the frequency of sampling and testing for that parameter under that section shall be* ***increased*** *so that at least one water sample is taken and tested* ***every three months****.*

8.0 WELL LEVELS

Lucknow's Permit To Take Water, which dictates the capacity in which each well supply is permitted to supply, also indicates specific monitoring parameters. In addition to flow, static well levels are taken on a weekly basis to monitor the performance of the aquifer. **Table 18** provides a summary of the static well levels recorded for 2018.

Table 18 - Static Well Levels

Month	Lucknow # 4 (m)					Lucknow # 5 (m)				
Jan	6.71	6.40	6.71	7.01	6.71	7.01	7.01	7.01	6.71	7.01
Feb	7.01	7.92	7.62	6.71		6.40	6.40	6.71	6.10	
Mar	7.62	7.01	7.32	7.01		5.79	6.10	5.79	5.79	
Apr	6.40	7.01	7.32	7.32		6.71	6.40	6.71	6.40	
May	7.32	7.01	7.32	7.62	7.32	6.40	6.10	5.79	6.10	6.71
Jun	7.31	7.01	7.31	7.31		6.71	7.01	7.01	6.71	
Jul	7.31	7.92	7.62	7.31		7.01	7.32	6.71	6.71	
Aug	7.62	7.31	7.31	7.62	7.01	6.10	6.40	6.71	5.79	6.40
Sep	7.01	7.31	7.01	7.31		6.40	6.71	6.71	7.01	
Oct	7.31	7.01	7.01	6.71		7.32	6.71	7.01	6.40	
Nov	7.62	7.32	7.32	7.32	7.01	6.10	6.71	6.40	6.40	6.40
Dec	6.71	7.31	6.71	7.01		5.79	6.10	5.79	5.49	
Min	6.40					5.49				
Max	7.92					7.32				
Avg	7.18					6.48				

9.0 SOURCE WATER PROTECTION

A drinking Water Source Protection Assessment Report was generated for the Ausable Bayfield Maitland Valley Source Protection Region by the Conservation Authority Source Protection Office. This report identifies vulnerable 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:
https://www.sourcewaterinfo.on.ca/portfolio/maitland-valley-source-protection-area-assessment-report/

The Well Head Protection Areas (WHPAs) within the Lucknow Drinking Water System have 4 designations:
WHPA-A: 100m 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).

This 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. In Huron-Kinloss, a vulnerability score of 10 applies to WHPA-A for both Lucknow Wells # 4 and # 5, as well as a small part of WHPA-B for Well # 5. The remainder of WHPA-B for Well # 4 and Well # 5 has vulnerability scores of 8 or 6. WHPA-C has vulnerability scores of 8, 6 and 4, and WHPA-D has vulnerability scores of 6, 4 and 2." **Table 19**, taken from the report, shows a summary of significant drinking water threats within the Lucknow Drinking Water System.

Table 19 - Lucknow WHPA: Enumeration of Potential Significant Threats

Threat (numbered according to Clean Water Act, 2006)		Significant Instances		
		Chemicals	**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	
Total		**17**	**7**	**2**

In conclusion, as stated in the report: "No issues with wells or conditions resulting from past activities were identified within the WHPA."

Drinking Water Issue	**Parameter**
None	None
Drinking Water Condition	**Threat**
None	None