

Lucknow Annual Report

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1.0 INTRODUCTION AND BACKGROUND

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, 2017. 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.

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 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 iPhone, 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°), turbidity is low, and the water is relatively hard. The raw water is also relatively high in sodium and fluoride, but the lead content of the raw water is well below the half-MAC (Maximum Allowable Concentration). 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 systems.

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 m³. 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 2017, 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.

3.1.2 Distribution (Grab) Free Chlorine Residuals

In 2017, a total of 471 distribution residuals were collected: 365 daily grab residuals and an additional 106 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	1.50	1.49	1.30
Feb	1.65	1.65	1.37
Mar	1.71	1.73	1.44
Apr	1.58	1.66	1.39
May	1.56	1.60	1.40
Jun	1.55	1.56	1.34
Jul	1.62	1.63	1.32
Aug	1.72	1.74	1.33
Sep	1.78	1.79	1.45
Oct	1.66	1.70	1.39
Nov	1.74	1.74	1.44
Dec	1.75	1.82	1.52
Annual Min	1.02	1.39	0.95
Annual Max	2.17	1.96	1.82
Annual Avg	1.65	1.68	1.39
# Samples	365	365	471

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 2** provides a summary of raw and treated turbidity results. The maximum turbidity measured in the raw water was 0.25 NTU and the maximum turbidity measured in the treated water was 0.32 NTU.

Table 2 – Raw and Treated Water Turbidity

Month	Lucknow # 4		Lucknow # 5	
	Raw	Treated	Raw	Treated
Jan	0.15	0.25	0.16	0.28
Feb	0.11	0.19	0.10	0.21
Mar	0.07	0.17	0.14	0.21
Apr	0.08	0.21	0.09	0.21
May	0.10	0.17	0.11	0.23
Jun	0.08	0.18	0.10	0.26
Jul	0.10	0.19	0.13	0.20
Aug	0.14	0.21	0.11	0.21
Sep	0.13	0.20	0.11	0.23
Oct	0.34	0.18	0.12	0.22
Nov	0.09	0.15	0.11	0.17
Dec	0.07	0.13	0.10	0.15
Annual Min	0.07	0.13	0.09	0.15
Annual Max	0.34	0.29	0.17	0.28
Annual Avg	0.12	0.19	0.12	0.22
# Samples	14	16	14	15

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. In 2017, a total of 105 samples were collected and analyzed for E. Coli and Total Coliform. **Table 3** provides a summary of bacteriological results performed on the raw water.

Table 3 – Microbiological (Schedule 10, Section 10-4) Results for Raw Water

Lucknow # 4

Month	E. Coli			Total Coliform		
	# 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	4	4	0	4	4	0
Aug	6	6	0	6	6	0
Sep	4	4	0	4	3	1*
Oct	5	5	0	5	4	1*
Nov	4	4	0	4	4	0
Dec	4	4	0	4	4	0
TOTAL	53	53	0	53	53	0

*Note: Two samples from Lucknow # 4 raw water each tested positive for 1 Total Coliform on September 5, 2017 and October 17, 2017. The treated samples collected from the same day were free of Total Coliform. Raw water is NOT reportable as an adverse water quality incident.

Lucknow # 5

Month	E. Coli			Total Coliform		
	# 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	4	4	0	4	4	0
Aug	5	5	0	5	5	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 E. Coli, Total Coliform, and for Heterotrophic Plate Count (HPC). In 2017, a total of 105 treated water samples were collected and analyzed for the above parameters. One sample from Lucknow # 4 had a Total Coliform of 1 cfu/100 mL, but the resample was all clear. Each E. Coli result from the treated water was 0 cfu/100 mL. The range of HPC results were 0 – 9 cfu/100 mL for both wells. **Table 4** provides a summary of all bacteriological results performed on treated water.

Table 4 – Microbiological (Schedule 10, Section 10-3) Results for Treated Water (Point of Entry)
Lucknow # 4

Month	E.Coli			Total Coliform			HPC		
	# Samples	# Samples "0"	# Samples ≥1	# Samples	# Samples "0"	# Samples ≥1	# Samples	# Samples "0"	# Samples 1 - 9
Jan	5	5	0	5	5	0	5	3	2
Feb	4	4	0	4	4	0	4	2	2
Mar	4	4	0	4	4	0	4	2	2
Apr	4	4	0	4	4	0	4	4	0
May	5	5	0	5	5	0	5	3	2
Jun	4	4	0	4	4	0	4	3	1
Jul	4	4	0	4	4	0	4	2	2
Aug	6	6	0	6	6	1*	5	2	3
Sep	4	4	0	4	4	0	4	4	0
Oct	5	5	0	5	5	0	5	5	0
Nov	4	4	0	4	4	0	4	4	0
Dec	4	4	0	4	4	0	4	4	0
TOTAL	53	53	0	53	53	0	52	38	14

*Note: One sample result from Lucknow # 4 treated water tested positive for 1 Total Coliform on August 29, 2017. This result was reported to the Grey-Bruce Health Unit and MOECC Spills Action Centre as an adverse water quality incident (AWQI # 136218). The resample was free of Total Coliform.

Lucknow # 5

Month	E.Coli			Total Coliform			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	3	1
Mar	4	4	0	4	4	0	4	4	0
Apr	4	4	0	4	4	0	4	4	0
May	5	5	0	5	5	0	5	2	3
Jun	4	4	0	4	4	0	4	2	2
Jul	4	4	0	4	4	0	4	2	2
Aug	5	5	0	5	5	0	5	3	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	3	1
TOTAL	52	52	0	52	52	0	52	37	15

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

Distribution samples are collected every week and tested for E. Coli, Total Coliform, and for Heterotrophic Plate Count (HPC). Ontario Regulation 170/03, Schedule 10, Section 10-2 requires 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 E. Coli and Total Coliform, and 25% of those samples are tested for HPC. In 2017, 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 104 of those samples were tested for HPC. Each E. Coli and Total Coliform result was 0 cfu/100 mL. The range of HPC results were 0 – 54 cfu/100 mL. **Table 5** provides a summary of all bacteriological samples taken in the distribution system.

Table 5 – Microbiological (Schedule 10, Section 10-2) Results for Distribution System

Month	E.Coli			Total Coliform			HPC		
	# Samples	# Samples "0"	# Samples ≥1	# Samples	# Samples "0"	# Samples ≥1	# Samples	# Samples "0"	# Samples 1 – 54
Jan	15	15	0	15	15	0	10	8	2
Feb	12	12	0	12	12	0	8	5	3
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	5	5
Jun	12	12	0	12	12	0	8	4	4
Jul	12	12	0	12	12	0	8	4	4
Aug	16	16	0	16	16	0	10	3	7
Sep	12	12	0	12	12	0	8	5	3
Oct	15	15	0	15	15	0	10	8	2
Nov	12	12	0	12	12	0	8	7	1
Dec	12	12	0	12	12	0	8	6	2
TOTAL	157	157	0	157	157	0	104	67	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 10, 2015 and submitted to the laboratory for analysis of inorganics as listed in Schedule 23. All parameters were found to be within compliance. Inorganics will be sampled and analyzed again on or before June 10, 2018. Results from the June 10, 2015 samples can be found in **Table 6**.

Table 6 – 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	0.02 <MDL	0.02 <MDL	6
Arsenic	5.0	6.2	25*
Barium	301	311	1000
Boron	40.3	37.5	5000
Cadmium	0.003 <MDL	0.003 <MDL	5
Chromium	0.03 <MDL	0.03 <MDL	50
Mercury	0.01 <MDL	0.01 <MDL	1
Selenium	0.04 <MDL	0.04 <MDL	10
Uranium	0.738	0.775	20

Note *: The Arsenic standard changes 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 10, 2015. All parameters were found to be within compliance. Organics will be sampled and analyzed again on or before June 10, 2018. Sample results can be found in **Table 7**.

Table 7 - 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	5	--	No
Carbon Tetrachloride	0.16 <MDL	0.16 <MDL	5	--	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	30	--	No
Trichloroethylene	0.44 <MDL	0.44 <MDL	50	--	No
Vinyl Chloride	0.17 <MDL	0.17 <MDL	2	--	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
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
Aldicarb	0.01 <MDL	0.01 <MDL	9	--	No
Aldrin+Dieldrin	0.01 <MDL	0.01 <MDL	0.7	--	No
Aldrin	0.01 <MDL	0.01 <MDL	--	--	-
Dieldrin	0.01 <MDL	0.01 <MDL	--	--	-
Atrazine+N-dealkylated metabolites	0.01 <MDL	0.01 <MDL	5	--	No
Atrazine	0.01 <MDL	0.01 <MDL	--	--	-
De-ethylated atrazine	0.01 <MDL	0.01 <MDL	--	--	-
Azinphos-methyl	0.05 <MDL	0.05 <MDL	20	--	No
Bendiocarb	0.01 <MDL	0.01 <MDL	40	--	No
Carbaryl	0.05 <MDL	0.05 <MDL	90	--	No
Carbofuran	0.01 <MDL	0.01 <MDL	90	--	No
Chlordane	0.01 <MDL	0.01 <MDL	7	--	No
a-chlordane	0.01 <MDL	0.01 <MDL	--	--	-
g-chlordane	0.01 <MDL	0.01 <MDL	--	--	-
Oxychlordane	0.01 <MDL	0.01 <MDL	--	--	-
Chlorpyrifos	0.02 <MDL	0.02 <MDL	90	--	No
Cyanazine	0.03 <MDL	0.03 <MDL	10	--	No
Diazinon	0.02 <MDL	0.02 <MDL	20	--	No

Table 7 - 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
(DDT)+Metabolites	0.01 <MDL	0.01 <MDL	30	--	No
op-DDT	0.01 <MDL	0.01 <MDL	--	--	-
pp-DDD	0.01 <MDL	0.01 <MDL	--	--	-
pp-DDE	0.01 <MDL	0.01 <MDL	--	--	-
pp-DDT	0.01 <MDL	0.01 <MDL	--	--	-
Dimethoate	0.03 <MDL	0.03 <MDL	20	--	No
Diuron	0.03 <MDL	0.03 <MDL	150	--	No
Heptachlor-Heptachlor Epoxide	0.01 <MDL	0.01 <MDL	3	--	No
Heptachlor	0.01 <MDL	0.01 <MDL	--	--	-
Heptachlor epoxide	0.01 <MDL	0.01 <MDL	--	--	-
Lindane	0.01 <MDL	0.01 <MDL	4	--	No
Malathion	0.02 <MDL	0.02 <MDL	190	--	No
Methoxychlor	0.01 <MDL	0.01 <MDL	900	--	No
Metolachlor	0.01 <MDL	0.01 <MDL	50	--	No
Metribuzin	0.02 <MDL	0.02 <MDL	80	--	No
Parathion	0.02 <MDL	0.02 <MDL	50	--	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
Temephos	0.01 <MDL	0.01 <MDL	280	--	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
2,4,5-trichlorophenoxyacetic acid	0.22 <MDL	0.22 <MDL	280	20	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
Dinoseb	0.36 <MDL	0.36 <MDL	10	--	No
Picloram	1 <MDL	1 <MDL	190	--	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 2017, 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 2017, the average THM was found to be 9.9 µg/L, which is within compliance. Refer to **Table 8** for the summary of trihalomethane results. In 2018, samples will be collected in February, May, August, and November.

Table 8 - 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	5.5	0.88	<0.34	4.6	<0.37	100	No
May	11.0	2.0	<0.34	8.0	0.52	100	No
Aug	12.0	2.1	<0.34	9.3	0.58	100	No
Nov	11.0	2.0	<0.34	8.0	0.49	100	No
Average	9.9	1.88	<0.34	7.5	0.50		
Maximum	12.0	2.4	<0.34	9.3	0.58		

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 2017, 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 9**.

Table 9 - Haloacetic Acid (Schedule 13, Section 13-6.1) Results

Month	Total HAAs	Bromoacetic Acid	Chloroacetic Acid	Dichloroacetic Acid	Dibromoacetic Acid	Trichloroacetic 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
Average	<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 2017, 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 10**. In 2018, samples will be collected in February, May, August, and December.

Table 10 – 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		

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 11**. 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 11**.

Table 11 – 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. Two lead, pH and alkalinity samples were taken on March 31, 2017, and two lead, pH and alkalinity samples on September 12, 2017. These parameters are required to be sampled and analyzed again between the months of December 2017 and April 2018 and again between June and October 2018. Lead samples are required next in the 2020 sampling season. 2017 results can be found in **Table 12**.

Table 12 - Lead Sampling Program (Schedule 15.1) Results

Season	Alkalinity (mg/L)	pH	Lead (mg/L)	Maximum Allowable Concentration - Lead (mg/L)	Exceedance
Dec-Apr	205	7.44	0.00003	0.010	No
	204	7.45	0.00014		No
Jun-Oct	205	7.43	0.00014	0.010	No
	205	7.38	0.00018		No

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 13** for Aesthetic Objective/Operational Guideline results.

Table 13 – 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 2017, 12% sodium hypochlorite (NaOCl) was used to treat the water that was provided to the distribution system. Refer to **Table 14** for sodium hypochlorite usage. Sodium Hypochlorite Grand Total Usage: **825.40 kg**

Table 14 – Sodium Hypochlorite Usage

Month	Lucknow # 4		Lucknow # 5	
	Usage (kg)	Average Dosage (mg/L)	Usage (kg)	Average Dosage (mg/L)
Jan	15.70	4.21	58.31	3.72
Feb	9.95	4.64	55.36	3.83
Mar	4.63	4.83	63.77	3.61
Apr	6.59	4.49	40.23	2.99
May	6.87	4.31	46.67	3.58
Jun	9.81	4.27	55.92	3.71
Jul	10.65	5.51	83.96	5.33
Aug	10.65	4.60	61.53	4.40
Sep	10.93	4.72	56.76	4.13
Oct	5.47	4.67	55.64	3.99
Nov	4.63	4.83	63.77	3.61
Dec	11.07	4.54	76.53	4.01
TOTAL	106.95	--	718.45	--
Average	--	4.64	--	3.91

4.2 Annual Volumes

A summary of the water supplied to the distribution system in 2017 is provided in **Table 15**. 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 17, 2017.

Table 15 – Treated Water Volume

Lucknow # 4

Month	Avg Daily Volume (m ³)	Max Daily Volume (m ³)	Total Monthly Volume (m ³)
Jan	119.62	605.54	3,708.22
Feb	75.16	327.04	2,104.47
Mar	30.13	170.46	934.06
Apr	51.01	271.47	1,530.43
May	54.10	325.78	1,677.25
Jun	85.69	374.23	2,570.75
Jul	55.21	284.13	1,711.50
Aug	75.37	312.15	2,336.53
Sep	78.16	392.93	2,344.88
Oct	43.81	212.97	1,358.07
Nov	73.95	275.05	2,218.47
Dec	77.26	333.10	2,394.91
TOTAL	---	---	24,889.54
Average	68.29	---	---
Maximum	---	605.54	---
PTTW	---	935.00	---

Lucknow # 5

Month	Avg Daily Volume (m ³)	Max Daily Volume (m ³)	Total Monthly Volume (m ³)
Jan	491.66	669.01	15,241.59
Feb	509.11	624.79	14,255.11
Mar	563.76	687.90	17,476.48
Apr	445.23	754.46	13,357.04
May	410.55	625.48	12,727.16
Jun	497.15	703.22	14,914.43
Jul	505.07	666.16	15,657.05
Aug	443.16	632.80	13,738.09
Sep	454.65	752.50	13,639.46
Oct	439.30	552.12	13,618.59
Nov	459.43	640.90	13,783.00
Dec	613.00	816.96	19,003.02
TOTAL	---	---	177,411.02
Average	486.01	---	---
Maximum	---	816.96	---
PTTW	---	1,500.00	---

Combined (Lucknow # 4 + Lucknow # 5)

Month	Avg Daily Volume (m ³)	Max Daily Volume (m ³)	Total Monthly Volume (m ³)
Jan	611.28	682.46	18,949.81
Feb	584.27	624.79	16,359.58
Mar	593.89	687.90	18,410.54
Apr	496.25	819.25	14,887.47
May	464.66	625.48	14,404.41
Jun	582.84	851.31	17,485.18
Jul	560.28	673.79	17,368.55
Aug	518.54	675.40	16,074.62
Sep	532.81	794.75	15,984.34
Oct	483.12	563.14	14,976.66
Nov	533.38	640.90	16,001.47
Dec	690.26	820.51	21,397.93
TOTAL	---	---	202,300.56
Average	554.30	---	---
Maximum	---	851.31	---
PTTW	---	1,500.00	---

Parameters	Total Volume for 2017
Annual Total Flow, Actual (m ³)	202,300.56m³
Annual Rated Capacity, PTTW (m ³)	315,360.00 m ³
Operating Capacity, Actual %	36.95%

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 2017:	Phone line repaired Watermain break at corner of Rose St and Outram St
March 2017:	New autodialer and UPS at Lucknow # 4
April-May 2017:	Eramosa visited sites for SCADA system field audit
April-June 2017:	MOECC Drinking Water Inspection
May 2017:	New emergency lights at Lucknow # 5
June 2017:	SCADA Field Audit Report delivered to Township Chlorine pump # 2 at Lucknow # 5 failed and taken off-line Communications modem and dehumidifier replaced at Lucknow # 5
July 2017:	Flow meter calibrations Data gap due to a clock sync New chlorine analyzer installed at Lucknow # 4 SCADA Field Audit review meeting with Eramosa
August 2017:	Georgian Bay Fire and Safety on-site for annual service of fire extinguishers and emergency lights Backflow preventers were certified
October 2017:	Eramosa delivered SCADA upgrade progress report
November 2017:	Eramosa visited sites with HVAC engineer
December 2017:	Internal audit completed

6.0 MINISTRY OF THE ENVIRONMENT AND CLIMATE CHANGE INSPECTIONS AND REGULATORY ISSUES

- An MOECC Drinking Water Inspection was conducted on April 26, 2017 and awarded a rating of 100.00% (previous rating was 97.44%).
- Flow meter calibration was conducted on July 31st, 2017.
- A list of Capital Items was submitted to the Township of Huron-Kinloss of October 31st, 2017.
- DWQMS Internal Audit was conducted on December 5th and 6th, 2017.
- Emergency Response Exercise was conducted on December 20th, 2017, and related to chemical spills around the wellhead.
- A 36-month Risk Assessment was completed on October 20, 2016. The annual review was not started until January 2018.

Three adverse water quality events occurred at the Lucknow DWS during 2017:

- **AWQI # 133325:** June 10, 2017 – chlorine pump failure, low chlorine
- **AWQI # 135642:** August 18, 2017 - fluoride exceedance on the treated water
- **AWQI # 136218:** August 31, 2017 – Lucknow # 4 treated water tested positive for 1 Total Coliform

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. These are:

- Strengthen standards for Carbon Tetrachloride, Benzene, and Vinyl Chloride;
- Adopt new standards for Chlorate, Chlorite, 1-Methyl-4-Chlorophenoxyacetic acid (MCPA) and Haloacetic Acids (HAAs); (NOTE: Chlorate and Chlorite testing is only required for Municipal Drinking Water Systems using Chlorine Dioxide treatment equipment.)
- Clarify/optimize testing, sampling and reporting requirements for Trihalomethanes (THMs) and HAAs; and
- Remove 13 pesticides from testing requirements.

Some of the aforementioned amendments have been phased in, and over the next few years, the following amendments will be added. Refer to **Table 16** for the new Regulatory Requirements. Subsequent phase-in dates are:

- January 1, 2018: Updates to standards for Arsenic come into effect / require reporting
- January 1, 2020: New standards for HAAs and HAAs testing optimization rule for smaller systems will come into effect / require reporting.

Table 16 – Regulatory Requirements

Parameter	Current Requirement		Amended Requirement	
	MAC	½ MAC	*New MAC	*New ½ MAC
Arsenic	25 µg/L	12.5 µg/L	10 µg/L	5 µg/L
Benzene	5 µg/L	2.5 µg/L	1 µg/L	0.5 µg/L
Carbon Tetrachloride	5 µg/L	2.5 µg/L	2 µg/L	1 µg/L
Vinyl Chloride	2 µg/L	1 µg/L	1 µg/L	0.5 µg/L

7.1 ARSENIC REVIEW

Historic Arsenic values were reviewed from 2003 to 2015 and are shown in **Table 17**.

Table 17 – Historic Arsenic Values

Date	Lucknow # 4 Treated Water (µg/L)	Lucknow # 5 Treated Water (µg/L)
Feb 2003	3.0	4.0
Jun 2003	3.0	3.0
Jun 2006	5.2	5.8
Jan 2008	3.8	5.6
Jun 2009	5.1	5.1
Nov 2010	5.4	5.9
Dec 2010	4.8	5.0
Aug 2011	4.9	5.3
Nov 2011	4.9	5.8
Aug 2012	4.7	5.4
Nov 2012	4.6	5.8
Sep 2013	4.8	5.7
Nov 2013	10.9	6.3
Sep 2014	4.9	5.6
Dec 2014	5.5	6.1
Jun 2015	5.0	6.2

7.1.1 ARSENIC SAMPLING IMPACT

A review of the sample results between 2003 and 2015 indicates that Arsenic may be in exceedance of the amended ½ MAC requirements at the Lucknow facility (highlighted in yellow). This would require quarterly sampling to be conducted (see note below).

Historic values of the other parameters (Benzene, Carbon Tetrachloride, and Vinyl Chloride), are all below the amended standards prescribed.

Arsenic testing will commence in the first quarter of 2018.

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, 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 well levels recorded for 2017.

Table 18 - Well Levels

Month	Lucknow # 4 (ft)					Lucknow # 5 (ft)				
	Jan	29	28	28	27		22	22	23	21
Feb	27	27	26	27		22	23	22	22	
Mar	26	26	15	26	26	21	21	22	21	21
Apr	23	24	23	23		20	20	20	20	
May	24	22	23	23	24	21	23	22	23	22
Jun	22	23	22	22		20	21	20	20	
Jul	23	22	23	23		20	20	20	19	
Aug	24	23	24	24	24	20	21	19	21	21
Sep	23	24	23	24		22	21	20	23	
Oct	23	24	24	25		20	21	22	19	
Nov	24	23	24	24	24	20	21	23	22	22
Dec	23	24	24	24		20	21	20	21	
Min	15					19				
Max	29					23				
Avg	24					21				