Lake Huron
Primary Water Supply System

2022 Compliance Report

Contact Info:

Owner:
Lake Huron Primary Water Supply System Board of Management
c/o City of London, Regional Water Supply Division
235 North Centre Road, Suite 200, London, ON N5X 4E7
519-930-3505

Operating Authority:
Ontario Clean Water Agency
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519-238-8466

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Profile

Who We Are

The Lake Huron Primary Water Supply System (LHPWSS) is owned by a Board of Management who governs the drinking water system. The Board of Management is made up of members appointed from each of the eight (8) member municipalities that are currently supplied with water from the LHPWSS. One of these member municipalities, the City of London, acts as the Administering Municipality. Accordingly, the City of London provides all associated administrative and management services on behalf of the Board. The Board of Management currently contracts the operation and maintenance of the LHPWSS to the Ontario Clean Water Agency (OCWA), an independent Operating Authority.

Operating Authority:

ONTARIO CLEAN WATER AGENCY
AGENCE ONTARIENNE DES EAUX

LHPWSS Board Member Municipalities:

- City of London (Administering Municipality)
- Municipality of Bluewater
- Municipality of Lambton Shores
- Township of Lucan Biddulph
- Municipality of Middlesex Centre
- Municipality of North Middlesex
- Municipality of South Huron
- Municipality of Strathroy-Caradoc

What Is Important

Values of the Water System

The values of the LHPWSS are the inherent beliefs or moral standards that generally reflect what the LHPWSS Board of Management stands for and believes in:

- **Sustainable** - be financially, environmentally, socially, and physically sustainable;
- **Inclusive** - provide access to bulk drinking water for current and prospective members, in accordance with Board policy;
- **Fair and equitable** - balance the interests of individual members with the best interests of all members, as well as the needs of existing members with the needs of new members;
- **Vigilant** - ensure an adequate supply of safe and reasonably priced drinking water is available to members;
- **Innovative** - be receptive to and supportive of new ideas and opportunities for improvement;
- **Cooperative** – be supportive to the needs of the Lake Huron Primary Water Supply System;
- **Open and transparent –** conduct business in a manner that enables member municipalities and the public to review and provide input into major decisions as appropriate;
- **Public Ownership –** retain ownership of the water system in public hands.

What We Do

Water Treatment & Supply

The LHPWSS is responsible for the treatment and transmission of drinking water to eight (8) member municipalities in southwestern Ontario. The population served by this system is approximately 390,000. Water is provided bulk wholesale to the member municipalities who then distribute it to their customers.

The Lake Huron Water Treatment Plant (WTP) has been in operation since 1967. The WTP employs pre-chlorination, screening, powder activated carbon addition (seasonally on an as-required basis), coagulation, flocculation, sedimentation, dual-media filtration, post-chlorination, and sodium hydroxide addition to treat raw water obtained from Lake Huron. After the water is treated it is pumped from the WTP to the member municipalities or to storage reservoirs. The drinking water system is monitored at various locations via a Supervisory Control and Data Acquisition (SCADA) system**.**

The LHPWSS is operated under the Municipal Drinking Water Licence (MDWL) #001-101 and Drinking Water Works Permit (DWWP) #001-201.

LHPWSS Assets:

- 1 water treatment plant
- 1 residuals management facility
- 3 water pumping stations
- 3 in-ground storage reservoirs
- 8 monitoring stations
- 151 km of water main

Figure 1: McGillivray Booster Pumping Station

LHPWSS: At A Glance

Figure 2: LHPWSS Major Infrastructure Locations

The Water Treatment Process

The following figure provides a general overview of the conventional water treatment process. The processes outlined below are very similar to the treatment at the Lake Huron WTP, although they are not an exact representation. Some details may vary.

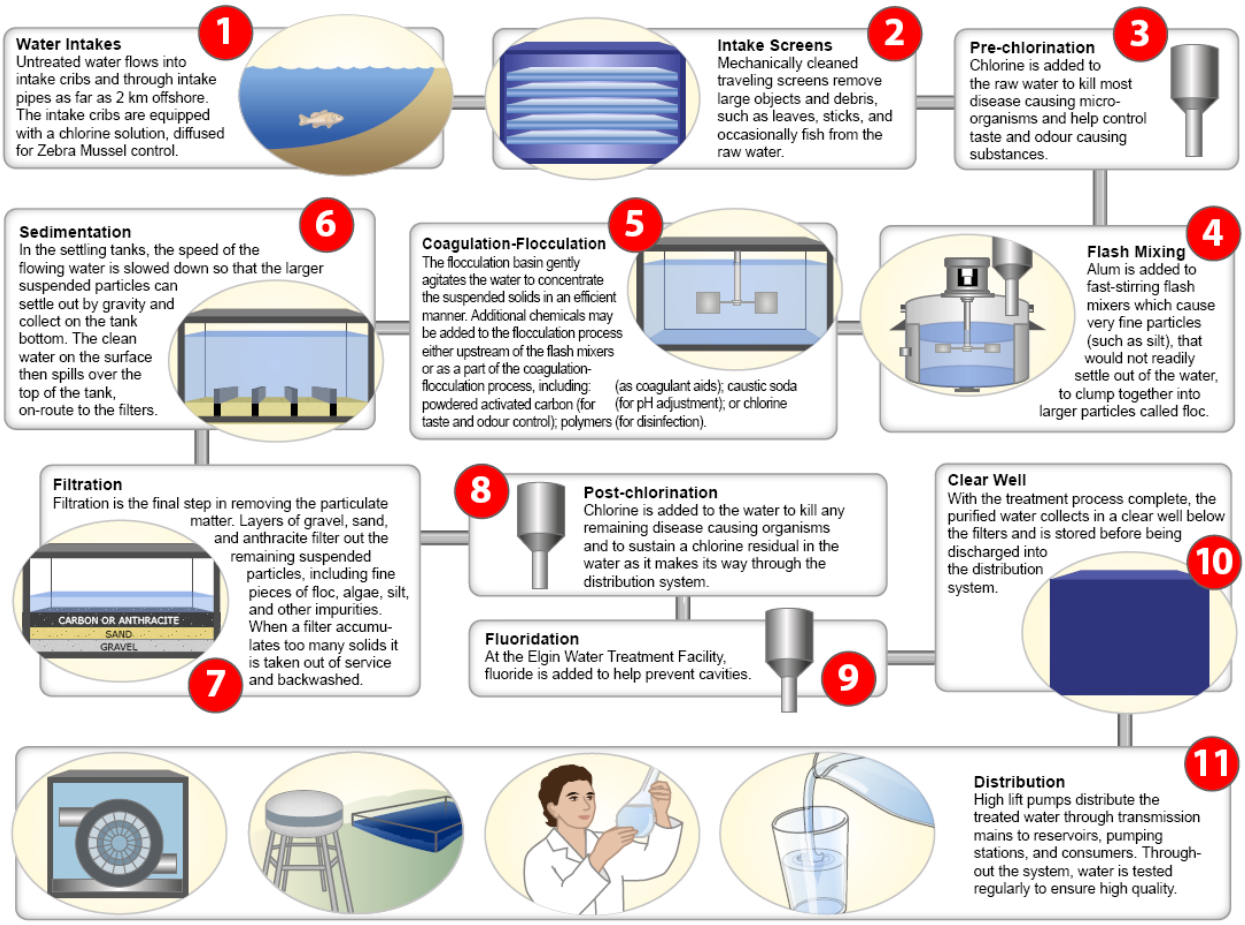

Figure 3: Overview of the Water Treatment Process

At the Lake Huron WTP, Step 9 (Fluoridation) does not take place.

At the Lake Huron WTP, one additional treatment step takes place:

Sodium Hydroxide is added as the treated water leaves the WTP and enters the transmission system (Step 11) to raise the treated water pH, resulting in reduced corrosion potential.

2022 Highlights - General

Climate Change Vulnerability Assessment

The Climate Change Vulnerability Assessment Tool was developed by Conservation Ontario in 2018 to assess well and surface water intake sensitivities and vulnerabilities due to climate change. In 2021 the tool was successfully used to provide helpful recommendations to the Elgin Area Primary Water Supply System (EAPWSS), suggesting that a similar assessment would be beneficial for the LHPWSS.

The LHPWSS utilized the assessment tool to evaluate its climate change exposure, area level sensitivity, intake sensitivity, climate change impact, and adaptive capacity. The area level and intake received an overall vulnerability rating of medium. The tool has demonstrated that the LHPWSS is susceptible to climate change impacts, but the water system has a high adaptive capacity rating.

From the assessment tool, draft recommendations have been developed for consideration by the LHPWSS and the Source Protection Region. The draft recommended opportunities for improvement include reviewing policies surrounding agricultural land use and a review of rainfall intensity-duration-frequency to address potential threats to water quality from increased precipitation and precipitation intensity. Collaboration with local conservation authorities to develop policies related to existing flood plains and potential flooding impacts due to climate change was also recommended.

The assessment tool can also aid in improving existing policies and management practices the LHPWSS has already adopted such as the Environmental Management System (EMS), the Quality Management System (QMS), the Asset Management Policy, and the development of a Climate Action Plan. In addition, the tool can support other activities including the development of capital budgets and plans, process optimization, and risk mitigation strategies. With the aid of the assessment tool the LHPWSS can maintain or potentially improve its resiliency to climate change.

Quality Management System Re-accreditation

The continued utilization and accreditation of a Quality Management System (QMS) is a provincial regulatory requirement under the *Safe Drinking Water Act* and the Municipal Drinking Water Licence Program. The licence framework requires drinking water system owners to obtain a Municipal Drinking Water Licence (MDWL) to operate their drinking water system. In order to obtain a MDWL, a drinking water system must have an accredited operating authority. To become accredited the operating authority must establish and maintain a QMS that meets the minimum requirements of the province’s Drinking Water Quality Management Standard (DWQMS). Operating authorities are accredited by a third-party accreditation body against the requirements of the DWQMS. Re-

accreditation audits take place every three (3) years. OCWA successfully received DWQMS re-accreditation for the LHPWSS in October 2022 and is accredited for another three-year term ending in 2025.

Operating Contract – Term Extension

In 2012 the Board of Management for the LHPWSS, concurrently and jointly with the Board of Management for the Elgin Area Primary Water Supply System (EAPWSS), awarded the contract for the management, operation and maintenance of the drinking water systems to OCWA. OCWA began operating the regional water system on July 1, 2012 for an initial five year term. In 2017 the term was extended for a five year period, ending in 2022.

In 2022 the operating contract was extended for another five year term. An Amended and Restated Operations and Maintenance Services Agreement was developed and approved. The Agreement continues to outline minimum expectations and mutual commitments between the LHPWSS and OCWA, while providing an incentive for superior performance from minimum standards.

The new Agreement is in effect for the period of January 1, 2023 to December 31, 2027.

Asset Management Plan Update

In 2021 the LHPWSS retained Dillon Consulting Ltd. for the completion of the Asset Management Plan (AMP) update. A key piece of the AMP update was the development of an Asset Management Policy which the LHPWSS Board of Management approved on October 7, 2021. Once the Asset Management Policy was established, the Board of Management endorsed the Asset Management Plan Levels of Service Framework, and received the State of the Infrastructure report.

The AMP update is a culmination of these initiatives and brings together the asset management direction, vision, and guiding principles of the utility for the next 5 years and beyond. The final AMP was endorsed by the Board of Management in October 2022.

The 2022 AMP update reflects the utility's continuous efforts to improve asset management planning and level of asset management maturity. It also includes several recommendations intended to support the continuous improvement of asset management practices, and the quality and accuracy of asset-related data.

The 2022 AMP establishes the asset management strategies, risk profiles, and investment activities that will guide the LHPWSS toward achieving the target levels of service to the member municipalities and respond to any changing service requirements from growth and enhancement over the next 25-year planning period. The AMP is an innovative approach to long-term asset management planning in alignment with global best practice standards for Asset Management such as ISO 55000.

Water Quality Facility Plan Update

In 2022 a project was initiated to update the Water Quality Facility Plan (WQFP). The WQFP is updated every five (5) years with the purpose of providing the LHPWSS with new information on WTP performance and treatment capacity as supply conditions change. The final updated WQFP will provide staff with a detailed report on the status of the WTP and residuals management processes and their overall performance. It will also provide recommendations and the framework to prioritize the timing for further sampling programs, studies, capital upgrades and/or operational modifications or changes to improve water treatment efficiency and efficacy. The recommendations will be implemented as future projects over a 10-year planning horizon. In June 2022 the WQFP update project was awarded to Stantec Consulting Ltd. with an estimated completion for mid-2023.

2022 Capital Project Highlights

High Lift Pump Upgrade

The Energy Audit and Pump Optimization Study identified the replacement of the high lift pumps at the Huron WTP as a significant opportunity for energy savings and optimization of pump operations. The existing high lift pump system was largely original to the initial WTP construction in the late 1960's and the pumps were nearing the end of their useful life. The previously existing five-pump configuration was changed to a six-pump configuration. Two (2) existing 3,000hp pumps remained in place. Three (3) existing 3,000hp pumps were removed, being replaced with two new high-capacity pumps and two smaller capacity pumps. The new pumps were sized to meet both current and future water demands.

Detailed engineering for the high lift pump replacement began in November 2018, and the pump pre-selection process was completed in October 2019. The tender for construction was awarded to Kenaidan Contracting Ltd. in 2021.

Existing high lift pumps #4 and #5 were taken out of service in Fall 2021, allowing for the installation of new motor control centres (MCCs), new pumps and the associated control and isolation valves. The new pumps #5 and #6 and existing pump #4 were put back into service in January 2022 with commissioning and testing activities continuing into April 2022.

Existing high lift pumps #1, #2, and #3 were then subsequently taken out of service in April 2022 to install the new MCCs, two new pumps and the associated control and isolation valves. The new pumps #2 and #3 and existing pump #1 were all placed back into service by August 2022.

Substantial performance for this project was issued on September 22, 2022 and the contract is currently in the warranty period. Optimization of the pumping strategy is currently in progress.

In order to receive financial incentives for energy savings associated with this project, it was required that the four (4) new pumps had to be in-service by December 31, 2022. The project met the required deadline. The estimated total financial incentive for this project is $1.32M.

Figure 4: High Lift Pumping Station (September 2022); Original Pumps #1 and #4; New Pumps #2, #3, #5, #6.

Distressed Pipe Replacement

As part of the Acoustic Fiber Optic (AFO) monitoring system installed within the 1200mm transmission pipeline, the LHPWSS determined in 2021 that a pipe in a twinned high pressure section of the transmission main was in poor condition and consequently at high risk of failure. On this basis, and with the concurrence of OCWA and Pure Technologies, LHPWSS staff engaged the services of L82 Construction Ltd. to complete a proactive replacement of Pipe #1-162 which is located south of Gore Road between Highway 21 and B Line Road. With the pipe being located in a twinned section of the transmission main, the preparation work, pipe repair, and recovery was able to be performed over several days in March 2022. This preventive maintenance project successfully mitigated a potential catastrophic failure of the pipeline, which could have otherwise resulted in extensive damage to agricultural lands in the area.

Figure 5: Pure Technologies performing an external electromagnetic verification to confirm the location of distressed pipe #1-162

Figures 6a and 6b: Distressed pipe #1-162 showing significant deterioration and wire breaks

Figure 7: Completed pipe repair

Oneida Transmission Pipeline

At the March 3, 2022 Board meeting, the LHPWSS Board of Management endorsed the request from Oneida Nation of the Thames (Oneida Nation) to supply drinking water to the Oneida Nation settlement from the LHPWSS. Board staff were authorized to negotiate a Water Supply Agreement with Oneida Nation.

Given the location of the Oneida Nation settlement, it is proposed that the existing LHPWSS transmission pipeline, which currently terminates near the community of Mount Brydges, be extended to a connection point located near Muncey Road and Jubilee Drive.

The preliminary design of the transmission pipeline was completed by Stantec Consulting Ltd. The various routing alternatives for the pipeline were presented, along with their evaluation, at the October 6, 2022 Board meeting. The preferred route involves extending the existing transmission pipeline by approximately 21km to a new connection point to the Oneida Nation settlement.

The award of engineering consulting services for detailed design, tendering, and construction administration services is subject to final execution of the Water Supply Agreement between the LHPWSS and Oneida Nation. The Water Supply Agreement is anticipated to be in place in early 2023.

McGillivray Facility Upgrades

The McGillivray Booster Pumping Station (BPS) was constructed in 1976. With much of the original equipment still in place at this facility, the various electrical and mechanical systems, including the heating, ventilation, and air conditioning (HVAC) system, are well past their expected operating life. The electrical and HVAC equipment require replacement as evidenced by the frequency of equipment failures. Many of the replacement components for both electrical and mechanical systems are no longer readily available.

In June 2021, Stantec Consulting Ltd. began the preliminary design for the various electrical and mechanical upgrades required for the McGillivray BPS. The electrical, mechanical and control system improvements were subsequently consolidated into one capital project with Stantec as the lead engineering consultant. The detailed design of these various facility upgrades was completed by Stantec in July 2022. The tender for construction was awarded to Sutherland-Schultz Ltd. in Fall 2022. Construction will start onsite in spring 2023 with anticipated completion in 2024.

WTP Disinfection and Storage Upgrades Class Environmental Assessment

The recently completed LHPWSS Master Water Plan Update (Jacobs, 2020) identified the need to:

- improve disinfection at the Lake Huron WTP due to long-term limitations with the existing disinfection process; and
- add water storage at the plant to improve plant operational flexibility and servicing municipalities in the event of plant shutdowns.

The Lake Huron WTP Disinfection and Storage Upgrades Class Environmental Assessment was initiated to evaluate and identify the preferred solution for both storage and enhanced disinfection at the Lake Huron WTP. The project was initiated in November 2020 with Jacobs being awarded the engineering consulting assignment.

The recommended alternative for disinfection and storage for the Lake Huron WTP consists of a 7 ML below-grade reservoir and an adjacent ultraviolet (UV) disinfection facility. The preferred solution is shown in Figure 8.

The Notice of Completion for this Class Environmental Assessment was filed, and the 30-day review period ended November 21, 2022. The Project File Report, which documents the Class Environmental Assessment process, is available on the drinking water system's website.

Detailed design of the recommended solution is anticipated to begin in late 2023, with construction planned for 2024-2025.

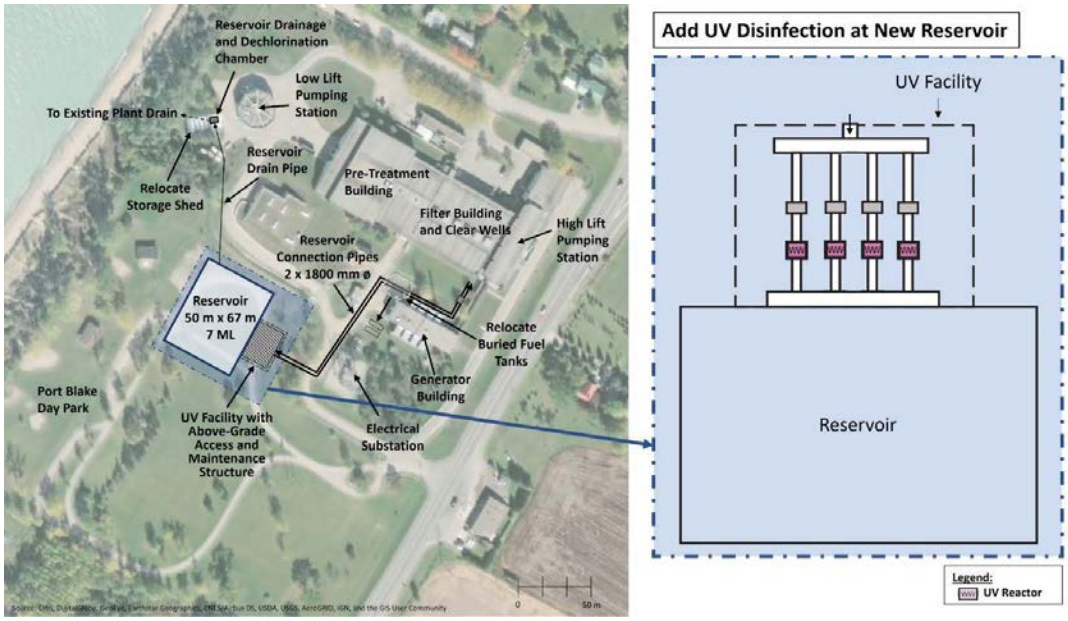

Figure 8: Preferred solution showing the future location of the 7 ML below-grade reservoir and an adjacent UV disinfection facility.

Contractor Site Trailer Pads

For each major capital project being undertaken at the WTP, contractors will bring site trailers for their use as a construction office and for storage of equipment and materials. This often requires operations staff to coordinate a site trailer location and allow the contractor to install temporary electrical connections for their trailer. This project involved the construction of two (2) permanent trailer pads and two (2) permanent electrical pedestal to facilitate ongoing and future construction projects, creating efficiency by eliminating repetitive temporary work to install and remove connections.

Figure 9: Gravel contractor trailer pad with a permanent electrical pedestal.

2022 Flow Summary

As per the water system's current Permit To Take Water (PTTW), the amount of raw water taken into the Lake Huron WTP cannot exceed 454.98 million litres/day or 5266 litres/second.

The 2022 water taking was approved under PTTW #P-300-2068363222.

As per the water system's current Municipal Drinking Water Licence, the rated capacity of the WTP is 340.0 million litres/day, which converts to 3935 litres/second. The maximum daily flow of treated water from the treatment plant into the transmission system shall not exceed this value.

The following table contains a flow summary, with comparison to the system's rated capacity and permit limits in order to assess the capability of the system to meet existing and planned uses.

	Total Daily Flow (ML/day)	**Total Daily Flow (% of Capacity)**	**Daily Instantaneous Peak Flow (ML/day)**
PTTW – permitted raw water taking amount	454.98	100%	454.98
Raw Water Flow – Average Day	132.96	29.2%	211.72
Raw Water Flow – Max. Day	199.09	43.8%	292.79
WTP Rated Capacity	340.0	100%	340.0
Treated Water Flow – Average Day	128.57	37.8%	178.5
Treated Water Flow – Max. Day	188.35	55.4%	264.3

A complete flow summary for the LHPWSS can be found in Appendix A.

Treated Water Flows

The average daily flow from the Lake Huron WTP was 128.6 ML/day, which is a 3.13% increase from the previous year. The maximum daily flow for 2022 was 188.4 ML/day, which is a 3.58% decrease from the previous year.

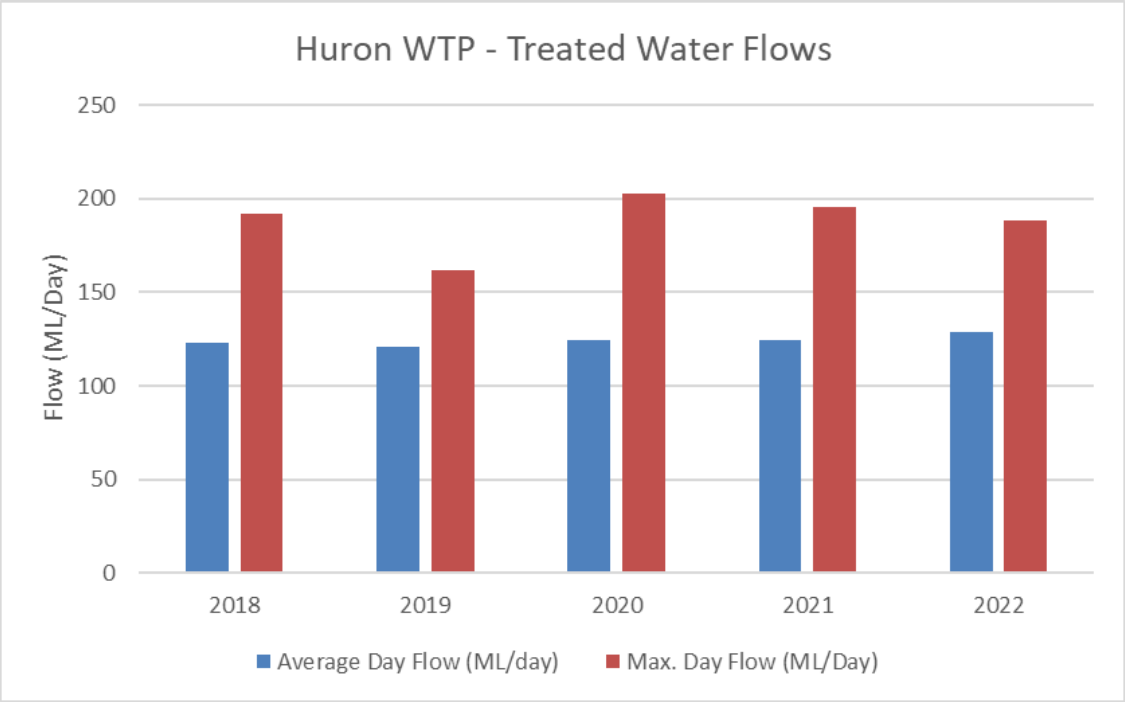

Figure 10: Five Year Treated Water Flow Comparison

The City of London utilizes the largest volume of treated drinking water from the LHPWSS. As shown in Figure 11, the City of London utilizes 82.34% of the volume, with the other seven (7) municipalities utilizing the remaining 17.66% of the volume

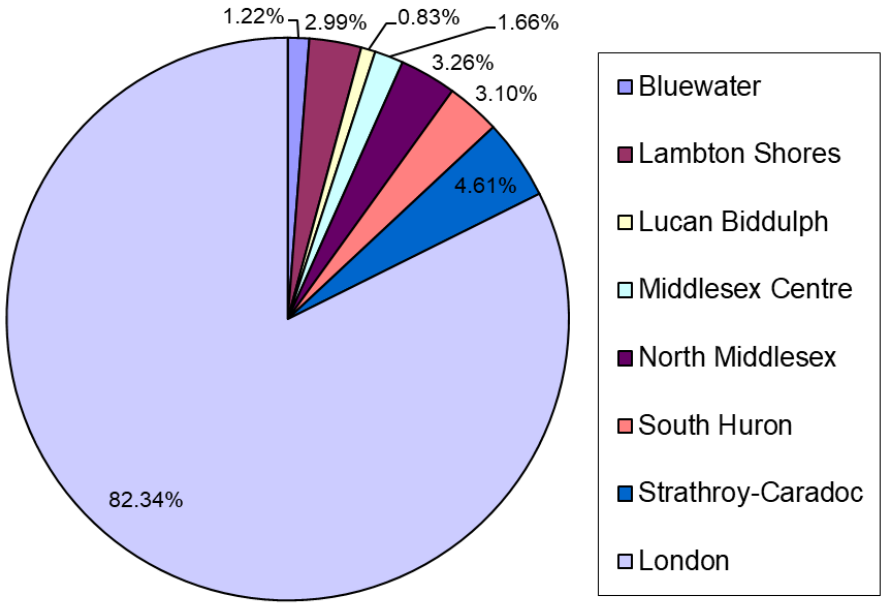

Figure 11: 2022 Treated Water Volumes per Municipality

2022 Chemical Consumption

A variety of water treatment chemicals are used at the Lake Huron WTP to ensure safe, clean drinking water. The following table outlines the chemicals most frequently used for the LHPWSS. As part of the system's registered ISO14001 Environmental Management System, objectives and targets are currently in place to optimize chemical usage.

Chemical	Used for	Total Amount Used in 2022
Aluminum Sulphate	Coagulation	847,456 kg
Powdered Activated Carbon	Taste and odour control (seasonally)	13,227 kg
Chlorine Gas	Mussel control	43,275 kg
Chlorine Gas	Primary disinfection	53,529 kg
Sodium Hydroxide	pH adjustment for corrosion control	604,474 kg
Polymer	Filter aid (used on an as-required basis)	<5 kg
Polymer	Residuals Management Facility – dewatering aid	5,659 kg
Sodium Bisulphite	Residuals Management Facility – dechlorination	75,239 kg

2022 Water Quality Sampling and Monitoring

The LHPWSS consistently provides treated drinking water with water quality above the standards required by provincial regulation. Where applicable, this is a result of the LHPWSS standards being more stringent than what is required by provincial regulation. For example, the target at the Lake Huron WTP for filtered water turbidity (a measure of the cloudiness of water) is 10 times more stringent than the provincial standard. The LHPWSS is utilizing best management practices and continual improvement to ensure that high drinking water standards are maintained and enhanced where possible.

All water quality sampling at the LHPWSS is performed in accordance with the Safe Drinking Water Act and its associated regulations. All samples are collected by licensed operating authority personnel and are submitted to Canadian Association for Laboratory Accreditation (CALA)/Standards Council of Canada (SCC) accredited laboratories for both bacterial and chemical analysis.

In 2022, a total of 668 microbiological samples were collected from raw, treated and distribution system water, and were submitted to the laboratory for E. Coli, total coliforms and heterotrophic plate count (HPC) analysis. There were no

reported incidents of adverse microbiological test results in 2022. For more information please see the Annual Report which is included as Appendix B.

Annual samples are collected and submitted to the laboratory for inorganics (metals) and organics analysis, which include herbicides, pesticides and volatile organic compounds. Quarterly sampling and laboratory analysis is also completed for trihalomethanes and haloacetic acids (disinfection by-products), nitrates and nitrites.

Seasonal samples are collected and submitted to the laboratory for total microcystin from June through to the end of October as part of the Harmful Algal Bloom (HAB) Monitoring and Sampling Program. The purpose of the HAB program is to keep drinking water safe from potential impacts of aquatic algal bacteria overgrowth (i.e. cyanobacteria), which can produce toxins (i.e. cyanotoxins) in the surrounding water when the algal cells are damaged or die. These toxins, which include microcystins, can be harmful to people. A total of 23 raw water samples were collected and submitted to the laboratory for total microcystin analysis. There were no detectable results in the raw water samples.

In addition, the WTP operator samples the raw, in-process and treated water six times per day and carries out an array of physical and chemical analysis for operational control.

As required by regulation, the LHPWSS also prepares an Annual Report which includes a summary of water quality test results and a maintenance report. The 2022 Annual Report can be found in Appendix B.

Research and Partnerships

The LHPWSS acknowledges the importance of scientific research on water quality and the effects on human health. The LHPWSS has partnered with the Natural Sciences and Engineering Research Council (NSERC) Chair in Drinking Water Research at the University of Waterloo and the University of Toronto to pursue research opportunities, as well as Western University. The LHPWSS is a member of the Water Research Foundation (WRF). In addition, the LHPWSS continues to evaluate and conduct specific research on the efficacy of the existing treatment processes, optimizing and improving treatment systems, and evaluating the potential and need of more advanced treatment alternatives.

Ministry Inspection

Annual Inspection

The Ontario Ministry of the Environment, Conservation and Parks (MECP) conducts an inspection of the LHPWSS annually. A MECP inspection took place on October 4 & 5, 2022. The final inspection report was issued on January 3, 2023. A total of three (3) non-compliances and two (2) best management practices were identified in the inspection report. The details of the non-compliances and best management practices can be found in Appendix C. The final inspection rating received for the 2022-2023 reporting year was 91.12%.

Lake Huron
Primary Water Supply System

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Appendix A – 2022 Flow Summary

1. Raw Water Intake – Flow (ML/Day)

Day	January (ML/day)	February (ML/day)	March (ML/day)	April (ML/day)	May (ML/day)	June (ML/day)	July (ML/day)	August (ML/day)	September (ML/day)	October (ML/day)	November (ML/day)	December (ML/day)
1	103.78	127.02	12.48	122.86	121.82	138.14	162.46	158.88	147.89	132.77	122.90	129.44
2	99.90	120.98	172.34	121.97	134.27	122.53	152.14	138.30	142.69	138.82	120.35	137.50
3	107.84	82.78	120.40	122.08	99.46	148.90	166.98	147.49	153.55	133.95	114.48	120.77
4	137.12	134.13	119.98	132.50	139.33	145.12	169.10	137.54	142.08	142.72	123.62	129.04
5	125.38	134.34	123.07	115.39	119.62	151.06	171.36	138.21	127.54	144.10	122.72	129.10
6	125.36	136.19	120.88	124.74	122.24	126.51	151.36	140.40	140.02	140.22	119.42	138.02
7	123.07	86.75	112.29	128.51	124.77	136.96	175.68	146.00	160.11	132.88	120.53	115.01
8	116.27	83.68	118.80	126.22	103.89	130.72	177.65	137.74	147.39	115.36	117.18	116.70
9	130.72	132.43	124.10	117.84	121.79	124.77	170.74	140.59	149.66	115.47	117.17	128.10
10	122.29	128.10	125.34	111.46	139.71	132.98	176.26	142.34	154.54	126.43	131.41	120.90
11	124.86	127.87	125.71	113.89	160.53	132.80	199.09	146.61	148.77	132.50	126.61	121.10
12	136.40	132.38	115.86	129.60	118.59	137.68	136.05	148.74	150.99	119.31	124.26	124.34
13	124.29	138.75	111.22	116.86	135.49	142.72	193.18	163.63	146.56	133.76	119.10	126.18
14	121.31	124.13	117.49	126.16	156.05	151.90	166.06	139.10	141.41	122.75	116.24	123.81
15	114.88	122.24	115.71	116.88	154.99	159.86	177.41	132.86	147.95	119.87	124.26	142.77
16	114.46	121.78	115.92	101.65	141.76	182.75	195.73	150.34	149.02	121.89	112.80	117.78
17	151.31	124.80	126.88	128.50	130.08	169.46	178.32	156.00	167.76	121.12	121.04	114.82
18	87.98	133.89	117.09	112.38	135.17	126.13	141.42	154.72	140.75	125.34	139.44	133.70
19	131.60	118.99	130.11	114.69	112.26	138.72	179.78	161.34	150.02	117.31	119.20	125.31
20	125.09	116.67	114.24	126.05	125.57	159.15	134.27	142.14	122.43	120.26	133.41	128.54
21	125.92	112.13	116.19	120.90	125.92	162.58	154.16	147.46	148.35	119.17	136.22	140.00
22	112.59	136.06	115.90	122.34	107.10	158.21	163.06	128.61	163.10	119.57	138.82	122.56
23	119.10	118.56	118.88	126.32	112.40	191.74	160.14	138.22	108.16	119.60	130.11	120.77
24	124.00	111.84	118.10	122.48	130.38	141.28	141.50	151.55	156.19	131.92	124.85	115.84
25	99.76	112.66	128.58	124.61	136.40	192.06	154.51	154.29	132.80	129.10	131.47	129.15
26	138.94	131.17	118.18	111.34	127.22	155.04	149.50	138.72	148.45	119.71	119.42	123.71
27	144.32	133.63	116.24	150.00	126.30	190.34	139.84	144.30	140.93	126.18	120.96	115.66
28	124.06	166.06	115.39	90.05	125.12	170.42	166.03	141.73	140.74	125.73	127.68	124.56
29	114.98		131.22	141.58	130.78	163.38	155.89	146.82	136.51	118.75	126.93	122.21
30	127.33		112.74	125.78	149.28	150.53	158.88	148.38	144.32	114.85	125.49	98.30
31	120.61		137.87		180.19		157.70	141.92		110.21		120.75
Monthly Total	3775.54	3450.02	3669.18	3645.62	4048.48	4534.42	5076.26	4504.98	4350.69	3891.62	3728.08	3856.43

Day	January (ML/day)	February (ML/day)	March (ML/day)	April (ML/day)	May (ML/day)	June (ML/day)	July (ML/day)	August (ML/day)	September (ML/day)	October (ML/day)	November (ML/day)	December (ML/day)
Monthly Minimum	87.98	82.78	12.48	90.05	99.46	122.53	134.27	128.61	108.16	110.21	112.80	98.30
Monthly Maximum	151.31	166.06	172.34	150.00	180.19	192.06	199.09	163.63	167.76	144.10	139.44	142.77
Monthly Average	121.79	123.21	118.36	121.52	130.60	151.15	163.75	145.32	145.02	125.54	124.27	124.40

Annual Total (ML)	48,531.30
Annual Minimum (ML/day)	12.48
Annual Maximum (ML/day)	199.09
Annual Average (ML/day)	132.96

Note: (i) As per the water system's current Permit To Take Water (PTTW), the amount of raw water taken into the Lake Huron Water Treatment Plant cannot exceed 454.98 million litres/day.

2. Raw Water Instantaneous Peak Flow (ML/day)

Day	January (ML/day)	February (ML/day)	March (ML/day)	April (ML/day)	May (ML/day)	June (ML/day)	July (ML/day)	August (ML/day)	September (ML/day)	October (ML/day)	November (ML/day)	December (ML/day)
1	163.70	163.54	150.71	254.92	250.90	246.04	237.62	239.87	242.26	198.26	160.84	159.07
2	163.08	164.42	244.02	255.11	265.61	241.92	225.25	231.85	247.20	219.70	160.89	160.56
3	161.99	155.92	183.71	165.38	245.33	247.19	251.65	255.98	253.68	162.98	160.83	154.02
4	249.15	163.06	248.20	263.37	249.21	253.48	254.15	255.58	205.56	164.76	165.58	161.28
5	190.13	163.59	238.72	252.12	181.49	252.67	228.27	255.20	254.98	252.89	149.40	258.22
6	182.02	163.26	163.01	182.50	258.54	252.06	257.23	255.24	253.00	253.67	144.88	250.13
7	165.85	157.47	248.45	165.54	166.20	255.27	246.29	250.46	245.95	253.45	157.42	184.02
8	164.35	166.36	251.78	165.14	252.30	253.37	258.28	253.54	246.45	196.89	166.13	163.67
9	165.66	166.88	183.12	161.58	246.16	239.43	249.66	225.45	224.79	250.49	192.99	245.20
10	166.50	165.19	252.27	170.32	244.55	254.55	240.56	253.62	241.34	246.86	232.02	250.72
11	165.45	166.08	226.16	253.11	246.04	227.80	221.01	255.94	239.40	234.66	160.53	238.01
12	166.10	182.44	148.32	185.64	247.32	254.96	257.13	243.90	252.25	224.09	160.93	243.02
13	164.23	162.27	248.81	164.71	249.24	253.21	236.10	245.14	221.11	189.07	153.88	246.35
14	178.28	163.68	245.08	165.72	248.15	224.69	248.00	245.79	253.43	188.04	161.28	251.74
15	163.54	163.01	148.34	154.86	240.84	254.21	248.13	248.69	254.04	166.73	161.24	248.53
16	166.86	164.36	150.47	144.36	195.89	246.98	232.58	203.00	254.08	169.84	158.32	250.56
17	250.35	165.69	245.80	245.44	179.75	226.54	247.50	248.40	212.78	170.15	160.93	267.58
18	181.75	165.95	244.71	160.59	265.34	247.95	255.27	247.13	190.53	247.20	161.62	241.43
19	165.66	153.57	186.85	166.20	243.67	248.04	247.41	254.79	247.98	244.64	161.44	179.87
20	165.52	148.03	153.07	166.22	164.57	278.83	248.81	235.41	233.57	252.27	162.08	249.88
21	164.82	164.80	163.27	251.90	160.58	256.60	238.60	247.00	246.69	243.77	160.12	252.83
22	165.85	163.61	151.53	253.08	167.00	255.15	273.21	199.85	266.04	247.85	160.37	252.12
23	163.96	164.49	160.56	231.02	166.25	248.28	249.66	254.90	173.12	180.13	161.03	254.18
24	164.67	166.16	149.81	164.08	237.97	252.70	248.73	255.61	247.25	161.33	159.77	250.66
25	164.98	145.90	240.50	165.91	247.78	292.79	236.22	247.87	242.24	160.50	158.15	238.50
26	163.14	154.10	159.02	256.94	257.38	255.01	238.12	253.92	247.50	158.43	153.08	186.86
27	167.32	159.63	162.15	235.85	200.02	239.66	248.69	246.22	254.58	160.09	149.83	239.12
28	163.61	240.99	167.04	227.52	164.43	256.79	229.46	253.28	265.08	159.27	159.50	247.57
29	163.82		269.33	244.29	196.12	256.67	268.73	223.19	252.06	157.03	160.43	227.53
30	164.36		249.78	242.51	198.49	249.00	267.30	243.49	245.14	156.70	158.57	146.01
31	163.74		251.06		253.58		256.47	262.08		152.20		238.56

Day	January (ML/day)	February (ML/day)	March (ML/day)	April (ML/day)	May (ML/day)	June (ML/day)	July (ML/day)	August (ML/day)	September (ML/day)	October (ML/day)	November (ML/day)	December (ML/day)
Monthly Minimum	161.99	145.90	148.32	144.36	160.58	224.69	221.01	199.85	173.12	152.20	144.88	146.01
Monthly Maximum	250.35	240.99	269.33	263.37	265.61	292.79	273.21	262.08	266.04	253.67	232.02	267.58
Monthly Average	172.59	165.16	202.76	203.86	222.28	250.73	246.65	244.92	240.47	200.77	162.47	223.80

Annual Minimum (ML/day)	144.36
Annual Maximum (ML/day)	292.79
Annual Average (ML/day)	211.72

Note: (i) As per the water system's current Permit To Take Water (PTTW), the amount of raw water taken into the Lake Huron Water Treatment Plant cannot exceed 454.98 million litres/day. This converts to 5266 litres/second.

3. Treated Water Flow (ML/Day)

Day	January (ML/day)	February (ML/day)	March (ML/day)	April (ML/day)	May (ML/day)	June (ML/day)	July (ML/day)	August (ML/day)	September (ML/day)	October (ML/day)	November (ML/day)	December (ML/day)
1	99.14	120.38	10.43	118.66	117.63	134.34	158.40	156.93	143.87	128.32	116.48	124.80
2	96.32	118.34	167.36	118.27	130.94	119.36	147.84	135.30	141.18	134.59	116.10	133.88
3	104.26	82.75	117.50	119.23	96.64	144.13	163.90	143.42	150.98	129.72	111.17	114.82
4	132.16	130.30	117.57	127.42	134.91	141.12	161.28	133.89	139.78	126.91	118.46	125.25
5	121.02	131.78	120.51	112.26	115.39	147.33	164.35	135.36	124.99	134.72	117.38	119.17
6	120.83	129.54	119.36	121.73	118.91	121.02	146.62	137.60	137.34	136.38	112.83	134.85
7	116.99	86.78	109.63	123.90	120.51	134.91	172.86	142.78	157.38	126.91	115.26	111.30
8	111.49	73.60	115.78	121.02	99.52	127.62	171.46	135.36	143.04	111.55	112.70	111.87
9	124.80	122.62	120.13	115.01	119.68	119.42	165.95	140.29	145.79	111.74	113.98	124.03
10	118.40	117.63	123.65	106.75	135.23	130.11	170.56	136.96	151.49	123.65	125.89	117.06
11	120.00	118.72	123.33	109.31	156.16	129.66	184.77	141.18	145.79	126.98	121.92	116.99
12	126.85	119.04	112.13	125.18	116.16	133.31	131.90	145.54	145.54	115.07	118.59	119.74
13	119.23	135.49	108.67	113.41	132.16	138.37	186.62	157.70	143.30	129.09	113.22	121.98
14	118.72	118.78	114.82	122.05	151.87	147.90	158.78	135.81	137.73	119.17	112.51	119.74
15	106.75	118.08	112.19	112.90	151.87	153.73	168.51	129.41	141.76	117.38	120.26	139.07
16	111.04	118.08	112.26	96.64	137.79	174.78	185.28	146.56	144.58	118.59	105.66	114.11
17	147.97	115.07	124.48	125.06	125.76	161.22	169.47	151.74	158.21	116.93	114.37	110.91
18	83.20	126.27	114.75	109.18	130.24	122.56	133.95	150.66	134.34	121.98	134.66	129.09
19	124.61	115.58	126.53	109.89	107.71	135.10	169.28	155.14	141.89	112.32	114.24	121.40
20	120.70	112.96	106.62	123.58	122.18	155.26	126.08	138.30	115.58	116.22	128.77	124.22
21	118.91	105.92	112.58	112.58	121.47	159.87	149.95	144.26	146.88	121.47	131.33	134.98
22	108.93	132.35	110.34	117.25	102.14	154.30	158.91	125.63	154.94	118.53	133.25	118.85
23	111.49	108.67	112.26	122.18	109.12	188.10	155.52	135.23	102.53	116.93	123.14	118.27
24	121.28	108.48	114.62	119.30	127.10	136.77	139.71	151.04	153.73	129.47	113.09	110.66
25	97.02	110.02	128.83	121.22	131.65	188.35	152.96	156.67	128.70	124.86	125.31	125.70
26	128.45	130.24	112.32	108.86	124.35	150.85	146.50	138.30	145.34	114.05	114.50	120.19
27	144.32	128.58	112.32	144.83	122.56	184.96	135.23	139.84	136.96	122.37	116.35	111.68
28	120.32	165.38	112.64	86.34	122.05	166.46	161.02	139.01	136.58	121.79	122.62	120.06
29	112.06		126.72	139.71	126.72	158.08	152.19	140.67	132.99	114.30	120.32	117.95
30	121.66		108.22	121.73	146.30	147.52	156.80	146.56	141.63	110.34	117.25	93.76
31	114.43		135.23		176.45		155.58	137.47		106.30		116.80
Monthly Total	3623.36	3301.44	3563.78	3525.44	3931.20	4406.53	4902.27	4404.61	4224.83	3758.63	3561.61	3723.18

Day	January (ML/day)	February (ML/day)	March (ML/day)	April (ML/day)	May (ML/day)	June (ML/day)	July (ML/day)	August (ML/day)	September (ML/day)	October (ML/day)	November (ML/day)	December (ML/day)
Monthly Minimum	83.20	73.60	10.43	86.34	96.64	119.36	126.08	125.63	102.53	106.30	105.66	93.76
Monthly Maximum	147.97	165.38	167.36	144.83	176.45	188.35	186.62	157.70	158.21	136.38	134.66	139.07
Monthly Average	116.88	117.91	114.96	117.51	126.81	146.88	158.14	142.08	140.83	121.25	118.72	120.10

Annual Total (ML)	46,926.88
Annual Minimum (ML/day)	10.43
Annual Maximum (ML/day)	188.35
Annual Average (ML/day)	128.57

Note: (i) As per the water system's current Municipal Drinking Water Licence, the rated capacity of the Water Treatment Plant is 340.0 million litres/day. The maximum daily flow of treated water from the treatment plant into the distribution system shall not exceed this value.

4. Treated Water Instantaneous Peak Flow (ML/day)

Day	January (ML/day)	February (ML/day)	March (ML/day)	April (ML/day)	May (ML/day)	June (ML/day)	July (ML/day)	August (ML/day)	September (ML/day)	October (ML/day)	November (ML/day)	December (ML/day)
1	114.48	153.22	145.99	198.50	178.59	196.06	200.74	213.63	207.58	191.67	157.33	136.24
2	114.67	152.24	204.34	170.88	194.79	181.53	196.25	213.82	204.26	193.62	155.37	163.86
3	110.28	155.16	170.19	168.73	188.93	203.57	201.72	208.46	203.00	165.04	158.79	149.03
4	189.42	151.07	183.07	223.87	178.40	203.39	198.89	202.31	205.53	157.71	157.33	157.23
5	163.36	161.02	171.07	200.26	133.99	220.08	201.42	206.30	179.75	164.54	150.20	175.28
6	164.14	159.85	166.10	181.92	190.69	220.94	201.92	226.80	192.34	203.08	145.90	184.45
7	157.60	153.70	176.35	130.19	154.98	196.74	216.16	227.20	203.18	171.46	160.24	181.62
8	115.54	145.70	193.32	133.99	235.18	204.84	212.55	196.35	222.60	170.68	165.02	161.23
9	162.68	144.33	190.30	131.16	241.72	208.35	220.86	198.78	205.43	177.51	160.54	160.55
10	166.49	157.42	190.10	153.90	196.27	192.75	203.48	188.44	190.49	187.66	159.67	154.20
11	157.70	152.72	190.88	193.22	198.59	192.95	210.51	199.76	184.06	203.29	161.22	163.18
12	166.19	147.36	116.33	185.03	197.62	216.25	264.30	188.64	204.85	200.84	154.79	163.57
13	162.98	149.41	180.73	130.38	236.06	216.55	212.46	203.87	207.09	171.86	153.91	166.01
14	164.83	139.65	193.22	162.29	226.11	199.67	208.17	207.66	184.26	171.18	159.07	176.94
15	114.58	149.22	117.79	140.53	201.72	202.01	210.51	208.45	190.21	169.91	163.36	185.42
16	113.60	153.32	115.54	122.38	190.69	202.89	216.65	201.72	206.61	170.98	158.40	160.74
17	166.88	152.24	195.08	183.37	180.44	198.40	206.02	212.95	197.33	163.47	159.95	174.80
18	141.80	146.87	179.75	141.60	245.04	193.81	190.89	223.49	175.58	163.08	167.67	178.80
19	164.04	146.19	188.35	137.99	242.90	185.32	228.36	178.30	198.61	166.01	165.62	183.47
20	160.73	148.82	118.96	128.82	136.63	202.89	224.75	209.73	195.28	163.77	161.41	191.96
21	158.28	146.58	116.72	165.12	127.96	198.99	201.82	208.35	191.38	192.27	161.41	193.23
22	113.60	151.94	116.14	186.49	142.38	213.33	205.53	185.04	195.96	162.59	159.67	160.55
23	151.16	155.85	116.14	190.88	167.46	219.68	227.48	182.40	165.62	163.67	143.95	181.33
24	165.70	155.06	117.99	133.61	166.39	225.05	207.09	198.99	208.75	170.40	143.46	143.95
25	156.54	114.76	180.35	128.91	227.37	221.54	216.07	214.01	195.48	158.60	152.05	159.86
26	155.76	154.19	116.04	190.69	225.23	197.83	204.75	227.00	204.35	159.57	147.66	163.67
27	160.82	154.10	116.33	191.66	173.82	202.69	230.12	198.90	196.74	161.52	150.40	162.20
28	153.12	222.89	137.31	206.31	128.64	248.75	229.82	204.35	194.00	160.06	132.53	175.28
29	114.76		234.89	241.05	191.48	245.93	219.67	200.35	183.76	154.69	159.67	174.20
30	147.85		174.88	174.78	195.56	200.34	258.62	199.57	192.64	155.95	157.13	135.26
31	144.53		232.06		202.40		251.20	201.23		150.99		162.50

Day	January (ML/day)	February (ML/day)	March (ML/day)	April (ML/day)	May (ML/day)	June (ML/day)	July (ML/day)	August (ML/day)	September (ML/day)	October (ML/day)	November (ML/day)	December (ML/day)
Monthly Minimum	110.28	114.76	115.54	122.38	127.96	181.53	190.89	178.30	165.62	150.99	132.53	135.26
Monthly Maximum	189.42	222.89	234.89	241.05	245.04	248.75	264.30	227.20	222.60	203.29	167.67	193.23
Monthly Average	148.20	152.67	162.78	167.62	190.26	207.10	215.44	204.42	196.22	171.54	156.12	167.12

Annual Minimum (ML/day)	110.3
Annual Maximum (ML/day)	264.3
Annual Average (ML/day)	178.5

Note: (i) As per the water system's current Municipal Drinking Water Licence, the rated capacity of the Water Treatment Plant is 340.0 million litres/day. This converts to 3935 litres/second. The maximum daily flow of treated water from the treatment plant into the distribution system shall not exceed this value.

Appendix B – 2022 Annual Report

Ontario

Drinking-Water Systems Regulation O. Reg. 170/03

Drinking-Water System Number:	210000791
Drinking-Water System Name:	**Lake Huron Primary Water Supply System**
Drinking-Water System Owner:	Lake Huron Primary Water Supply System Joint Board of Management
Drinking-Water System Operating Authority:	Ontario Clean Water Agency (OCWA)
Drinking-Water System Category:	Large Municipal Residential
Period being reported:	January 1, 2022 through December 31, 2022

Complete if your Category is Large Municipal Residential or Small Municipal Residential	**Complete for all other Categories.**
Does your Drinking-Water System serve more than 10,000 people? **Yes [X] No [ ]** **Is your annual report available to the public at no charge on a web site on the Internet?** **Yes [X] No [ ]** **Location where Summary Report required under O. Reg. 170/03 Schedule 22 will be available for inspection.** Lake Huron and Elgin Area Water Supply Systems c/o Regional Water Supply Division 235 North Centre Road, Suite 200 London, ON N5X 4E7 https://huronelginwater.ca/ Lake Huron Water Treatment Plant 71155 Bluewater Hwy. Grand Bend, ON	**Number of Designated Facilities served:** N/A **Did you provide a copy of your annual report to all Designated Facilities you serve?** **Yes [ ] No [ ]** **Number of Interested Authorities you report to:** N/A **Did you provide a copy of your annual report to all Interested Authorities you report to for each Designated Facility?** **Yes [ ] No [ ]**

Ontario

Drinking-Water Systems Regulation O. Reg. 170/03

List all Drinking-Water Systems (if any), which receive all of their drinking water from your system:

Systems that receive their drinking water from the LHPWSS:

Drinking Water System Name	Drinking Water System Number
City of London Distribution System	260004917
Municipality of Bluewater (Bluewater Lakeshore Distribution)	260006542
Municipality of Bluewater (Hensall Distribution System)	260091650
Municipality of Lambton Shores (East Lambton Shores Water Distribution System)	260006568
Township of Lucan Biddulph (Lucan Biddulph Distribution System)	260003071
Municipality of Middlesex Centre (Middlesex Centre Distribution System)	260004202
Municipality of North Middlesex (North Middlesex Distribution System)	260006529
Municipality of Strathroy-Caradoc (Strathroy-Caradoc Distribution System)	260080106
Municipality of South Huron (South Huron Water Distribution System)	220001520

Systems that may receive their drinking water from the LHPWSS:

Drinking Water System Name	Drinking Water System Number
Municipality of Lambton Shores (West Lambton Shores Distribution System) *Normally supplied by the Lambton Area Water Supply System (LAWSS) but a connection to the LHPWSS exists	260006581

Did you provide a copy of your annual report to all Drinking-Water System owners that are connected to you and to whom you provide all of its drinking water?

Yes [X] No [ ]

Indicate how you notified system users that your annual report is available, and is free of charge.

- **[X] Public access/notice via the web**
- **[X] Public access/notice via Government Office**
- **[ ] Public access/notice via a newspaper**
- **[ ] Public access/notice via Public Request**

[ ] Public access/notice via a Public Library
[ ] Public access/notice via other method _____

Describe your Drinking-Water System

The Lake Huron Water Treatment Plant (WTP) employs pre-chlorination, screening, powder activated carbon addition (seasonally on an as-required basis), coagulation, flocculation, sedimentation, dual-media filtration, post-chlorination, and pH adjustment using sodium hydroxide to treat raw water obtained from Lake Huron. The WTP intake crib and raw water intake pipe have an estimated gross capacity of 454.6 Megalitres/day (MLD). The WTP rated capacity is 340.0 MLD.

A Residuals Management Facility (RMF) providing equalization, clarification, sediment thickening and dechlorination is also housed in the main complex. Thickened sediment is dewatered by centrifuges and the sediment is sent to the landfill for final disposal. Clarified and dechlorinated liquid streams are sent back to Lake Huron through the plant drain via the diversion chamber.

The transmission system is comprised of the McGillivray Booster Pumping Station and Reservoir, the Exeter-Hensall Booster Pumping Station and Reservoir, Arva Terminal Reservoir, Komoka-Mt. Brydges Booster Pumping Station (PS#4) and associated interconnecting transmission water mains, which includes the primary, Strathroy, Exeter-Hensall, and Komoka-Mt. Brydges transmission water mains.

The drinking water system is monitored at various locations throughout the system via a Supervisory Control and Data Acquisition (SCADA) system.

List all water treatment chemicals used over this reporting period

Filter Aid Polymer (on an as-required basis)
Aluminum Sulphate
Powder Activated Carbon
Chlorine Gas
Sodium Hydroxide
Sodium Hypochlorite (Exeter Hensall Pumping Station)
Dewatering Polymer (Residuals Management Facility)
Sodium Bisulphite (Residuals Management Facility)

Were any significant expenses incurred to?

[X] Install required equipment
[X] Repair required equipment
[X] Replace required equipment

Please provide a brief description and a breakdown of monetary expenses incurred

Capital Projects:

- High Lift Pump Upgrade: Replaced discharge valve on high lift pumps #1 and #4
- High Lift Pump Upgrade: Replaced high lift pumps #2, #3 and #5
- High Lift Pump Upgrade: Installed new high lift pump #6
- McGillivray Booster Station HVAC and Electrical Upgrade: Detailed design
- Oneida Transmission Pipeline: Preliminary design
- Huron WTP Disinfection and Storage Upgrades: Class Environmental Assessment (EA) and preliminary design
- Huron Coagulation System Upgrade
- Asset Management Plan update
- Water Quality Facility Plan update
- Financial Plan update
- Addition of permanent construction site trailer pads
- Security upgrades: installation of cameras and swipe card access
- Powdered activated carbon (PAC) System Upgrade: Preliminary design
- Rebuilt low lift pump #3
- Replaced Clarifier #1 gear box
- North Flocculation walking beam rehabilitation
- Rebuilt North Flocculation gear boxes #1 and #2
- RMF Tank Repairs: Installed North and South equalization tank baffle walls
- Arva Reservoir concrete crack injection
- Replaced Arva Valve House 600V Motor Control Center (MCC)
- Replaced Arva Valve House pressure transmitters
- Installed four (4) Total Suspended Solids (TSS) analyzers in sedimentation area
- Replaced two (2) fire hydrants at the WTP
- Upgraded interior LED lighting at the McGillivray Booster Station
- Upgraded interior LED lighting at the WTP
- Replaced low lift building windows
- Installed low lift grit pump hand rails
- Installed settled water platform guardrails
- Replaced the chlorine building roof and ladder
- Replaced roof drain at the WTP
- Replaced the high lift building overhead door
- Replaced the powdered activated carbon building overhead door
- Replaced HVAC variable frequency drive (VFD)
- Repaired McGillivray booster pump1 spool piece and installed new dresser coupling
- Installed chamber venting on four (4) critical transmission pipeline chambers

Maintenance Projects:

- Repaired pipeline section #1-162
- Replacement of surge tank air compressor motors

- North clearwell concrete rehabilitation
- Filter #11 – 30” butterfly valve replacement
- Service water pumps rehabilitation
- Service water pump bases replacement
- Backwash pump bases replacement
- Caustic soda line insulation
- Installed new air relief valve before caustic pumps
- Installed new suction and discharge valves on service water pump #4
- Installed new spool piece on all service water pumps #1 - #4
- Rebuilt Residual Management Facility (RMF) centrifuge feed pumps
- Rebuilt filters #1 & #12 effluent actuators
- Replaced filter effluent valve shaft seals on filters #3, #5, #7 and #11
- Installed new blind flanges on Komoka-Mt. Brydges pipeline chambers #35 and #37
- Installed new air release valve (ARV) chambers in #32A and #34A
- Repaired McGillivray BSP4 ball valve

Provide details on the notices submitted in accordance with subsection 18(1) of the Safe Drinking-Water Act or section 16-4 of Schedule 16 of O.Reg.170/03 and reported to Spills Action Centre

Incident Date	Parameter	Result	Unit of Measure	Corrective Action	Corrective Action Date
N/A	N/A	N/A	N/A	N/A	N/A

Microbiological testing done under the Schedule 10, 11 or 12 of Regulation 170/03, during this reporting period.

Location	Number of Samples	Range of E. coli Results (CFU/100mL) (min #)-(max #)	Range of Total Coliform Results (CFU/100mL) (min #)-(max #)	Range of HPC Results (CFU/1mL) (min #)-(max #)
Raw Water	105	(0)-(<100)	(0)-(11,900)	(<10)-(1,550)
Treated Water (WTP)	285	(0)-(0)	(0)-(0)	(<10)-(70)
Distribution (McGillivray PS)	56	(0)-(0)	(0)-(0)	(<10)-(10)
Distribution (North Exeter)	56	(0)-(0)	(0)-(0)	(<10)-(10)

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Location	Number of Samples	Range of E. coli Results (CFU/100mL) (min #)-(max #)	Range of Total Coliform Results (CFU/100mL) (min #)-(max #)	Range of HPC Results (CFU/1mL) (min #)-(max #)
Distribution (South Exeter)	54	(0)-(0)	(0)-(0)	(<10)-(20)
Distribution (Exeter-Hensall Reservoir)	52	(0)-(0)	(0)-(0)	(<10)-(10)
Distribution (Komoka-Mt. Brydges PS)	60	(0)-(0)	(0)-(0)	(<10)-(20)

Operational testing done under Schedule 7, 8 or 9 of Regulation 170/03 during the period covered by this Annual Report.

Parameter	Number of Grab Samples	Range of Results (min #)-(max #)
Treated Water Free Chlorine (mg/L)	Continuous Monitoring	(0.66)-(1.76)
Treated Water Free Chlorine (mg/L)	2139	(0.99)-(1.71)
Treated Water Turbidity (NTU)	Continuous Monitoring	(0.019)-(2.00)
Treated Water Turbidity (NTU)	2139	(0.019)-(0.127)
Filter #1 - Filtered Water Turbidity (NTU)	Continuous Monitoring	(0.019)-(0.109)
Filter #2 - Filtered Water Turbidity (NTU)	Continuous Monitoring	(0.037)-(0.409)
Filter #3 - Filtered Water Turbidity (NTU)	Continuous Monitoring	(0.030)-(0.428)
Filter #4 - Filtered Water Turbidity (NTU)	Continuous Monitoring	(0.022)-(0.116)
Filter #5 - Filtered Water Turbidity (NTU)	Continuous Monitoring	(0.031)-(0.568)
Filter #6 - Filtered Water Turbidity (NTU)	Continuous Monitoring	(0.028)-(0.996)
Filter #7 - Filtered Water Turbidity (NTU)	Continuous Monitoring	(0.017)-(0.127)
Filter #8 - Filtered Water Turbidity (NTU)	Continuous Monitoring	(0.030)-(0.772)
Filter #9 - Filtered Water Turbidity (NTU)	Continuous Monitoring	(0.020)-(0.344)
Filter #10- Filtered Water Turbidity (NTU)	Continuous Monitoring	(0.038)-(0.586)
Filter #11- Filtered Water Turbidity (NTU)	Continuous Monitoring	(0.021)-(0.202)
Filter #12- Filtered Water Turbidity (NTU)	Continuous Monitoring	(0.021)-(1.136)*
Combined Filtered Water Turbidity (NTU)	2138	(0.025)-(0.186)

Note: July 20th 2022 **–** Filter #12 effluent turbidity spike following return to service. Through a review of the continuous monitoring data the operating authority verified there was no adverse water quality incident.

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Summary of Inorganic parameters tested during this reporting period

*(*All tests were conducted on treated water leaving the WTP unless otherwise noted)*

Parameter	Sample Date	Result Value	Unit of Measure	Exceedance
Antimony	January 06, 2022	Not Detected	mg/L	NO
Arsenic	January 06, 2022	Not Detected	mg/L	NO
Barium	January 06, 2022	0.0135	mg/L	NO
Boron	January 06, 2022	0.013	mg/L	NO
Cadmium	January 06, 2022	0.000003	mg/L	NO
Chromium	January 06, 2022	0.00022		NO
Lead (Komoka Mt-Brydges Monitoring Station #2)	January 07, 2022 April 06, 2022 July 07, 2022 October 19, 2022	0.00001 0.00013 0.00003 0.00004	mg/L mg/L mg/L mg/L	NO
Mercury	January 06, 2022	Not Detected	mg/L	NO
Selenium	January 06, 2022	0.00012	mg/L	NO
Sodium	January 06, 2022	11.1	mg/L	NO
Uranium	January 06, 2022	0.000045	mg/L	NO
Fluoride	January 06, 2022	Not Detected	mg/L	NO
Nitrite	January 07, 2022 April 06, 2022 July 07, 2022 October 19, 2022	Not Detected Not Detected Not Detected Not Detected	mg/L mg/L mg/L mg/L	NO
Nitrate	January 07, 2022 April 06, 2022 July 07, 2022 October 19, 2022	0.330 0.606 0.313 0.260	mg/L mg/L mg/L mg/L	NO

Summary of Organic parameters sampled during this reporting period or the most recent sample results

*(*All tests were conducted on treated water leaving the WTP unless otherwise noted)*

Parameter	Sample Date	Result Value	Unit of Measure	Exceedance
Alachlor	January 06, 2022	Not Detected	mg/L	NO
Atrazine + N-dealkylated metabolites	January 06, 2022	0.00003	mg/L	NO
Azinphos-methyl	January 06, 2022	Not Detected	mg/L	NO
Benzene	January 06, 2022	Not Detected	mg/L	NO
Benzo(a)pyrene	January 06, 2022	Not Detected	mg/L	NO

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Parameter	Sample Date	Result Value	Unit of Measure	Exceedance
Bromoxynil	January 06, 2022	Not Detected	mg/L	NO
Carbaryl	January 06, 2022	Not Detected	mg/L	NO
Carbofuran	January 06, 2022	Not Detected	mg/L	NO
Carbon Tetrachloride	January 06, 2022	Not Detected	mg/L	NO
Chlorpyrifos	January 06, 2022	Not Detected	mg/L	NO
Diazinon	January 06, 2022	Not Detected	mg/L	NO
Dicamba	January 06, 2022	Not Detected	mg/L	NO
1,2-Dichlorobenzene	January 06, 2022	Not Detected	mg/L	NO
1,4-Dichlorobenzene	January 06, 2022	Not Detected	mg/L	NO
1,2-Dichloroethane	January 06, 2022	Not Detected	mg/L	NO
1,1-Dichloroethylene (vinylidene chloride)	January 06, 2022	Not Detected	mg/L	NO
Dichloromethane	January 06, 2022	Not Detected	mg/L	NO
2-4 Dichlorophenol	January 06, 2022	Not Detected	mg/L	NO
2,4-Dichlorophenoxy acetic acid (2,4-D)	January 06, 2022	Not Detected	mg/L	NO
Diclofop-methyl	January 06, 2022	Not Detected	mg/L	NO
Dimethoate	January 06, 2022	Not Detected	mg/L	NO
Diquat	January 06, 2022	Not Detected	mg/L	NO
Diuron	January 06, 2022	Not Detected	mg/L	NO
Glyphosate	January 06, 2022	Not Detected	mg/L	NO
Haloacetic Acids (HAA's) (Arva Reservoir)	January 07, 2022 April 06, 2022 July 07, 2022 October 19, 2022	Not Detected 0.0113 0.0063 0.0066	mg/L mg/L mg/L mg/L	NO
Haloacetic Acids (HAA's) (Arva Reservoir) Running Annual Average	2022	0.007375	mg/L	NO
Haloacetic Acids (HAA's) (Exeter-Hensall Monitoring Station #3)	January 07, 2022 April 06, 2022 July 07, 2022 October 19, 2022	0.0141 0.0186 0.0167 0.0178	mg/L mg/L mg/L mg/L	NO
Haloacetic Acids (HAA's) (Exeter-Hensall Monitoring Station #3) Running Annual Average	2022	0.0168	mg/L	NO
Haloacetic Acids (HAA's)	January 07, 2022 April 06, 2022 July 07, 2022	0.0122 0.0134 0.0071	mg/L mg/L mg/L	NO

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Parameter	Sample Date	Result Value	Unit of Measure	Exceedance
(Komoka Mt-Brydges Monitoring Station #2)	October 19, 2022	0.0137	mg/L	
Haloacetic Acids (HAA's) (Komoka Mt-Brydges Monitoring Station #2) Running Annual Average	2022	0.0116	mg/L	NO
Haloacetic Acids (HAA's) (Strathroy-Caradoc Monitoring Station #2)	January 07, 2022 April 06, 2022 July 07, 2022 October 19, 2022	0.0055 0.0065 0.0075 0.0068	mg/L mg/L mg/L mg/L	NO
Haloacetic Acids (HAA's) (Strathroy-Caradoc Monitoring Station #2) Running Annual Average	2022	0.006575	mg/L	NO
Malathion	January 06, 2022	Not Detected	mg/L	NO
2-Methyl-4-chlorophenoxyacetic acid	January 06, 2022	Not Detected	mg/L	NO
Metolachlor	January 06, 2022	Not Detected	mg/L	NO
Metribuzin	January 06, 2022	Not Detected	mg/L	NO
Monochlorobenzene	January 06, 2022	Not Detected	mg/L	NO
Paraquat	January 06, 2022	Not Detected	mg/L	NO
Pentachlorophenol	January 06, 2022	Not Detected	mg/L	NO
Phorate	January 06, 2022	Not Detected	mg/L	NO
Picloram	January 06, 2022	Not Detected	mg/L	NO
Polychlorinated Biphenyls (PCB)	January 06, 2022	Not Detected	mg/L	NO
Prometryne	January 06, 2022	Not Detected	mg/L	NO
Simazine	January 06, 2022	Not Detected	mg/L	NO
Total Trihalomethanes (Arva Reservoir)	January 07, 2022 April 06, 2022 July 07, 2022 October 19, 2022	0.018 0.020 0.023 0.026	mg/L mg/L mg/L mg/L	NO
Total Trihalomethanes (THMs) (Arva Reservoir) Running Annual Average	2022	0.022	mg/L	NO

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Parameter	Sample Date	Result Value	Unit of Measure	Exceedance
Total Trihalomethanes (Exeter-Hensall Monitoring Station #3)	January 07, 2022 April 06, 2022 July 07, 2022 October 19, 2022	0.029 0.029 0.037 0.043	mg/L mg/L mg/L mg/L	NO
Total Trihalomethanes (Exeter-Hensall Monitoring Station #3) Running Annual Average	2022	0.035	mg/L	NO
Total Trihalomethanes (Komoka Mt-Brydges Monitoring Station #2)	January 07, 2022 April 06, 2022 July 07, 2022 October 19, 2022	0.022 0.023 0.025 0.033	mg/L mg/L mg/L mg/L	NO
Total Trihalomethanes (Komoka Mt-Brydges Monitoring Station #2) Running Annual Average	2022	0.026	mg/L	NO
Total Trihalomethanes (Strathroy-Caradoc Monitoring Station #2)	January 07, 2022 April 06, 2022 July 07, 2022 October 19, 2022	0.020 0.022 0.025 0.027	mg/L mg/L mg/L mg/L	NO
Total Trihalomethanes (Strathroy-Caradoc Monitoring Station #2) Running Annual Average	2022	0.024	mg/L	NO
Terbufos	January 06, 2022	Not Detected	mg/L	NO
Tetrachloroethylene	January 06, 2022	Not Detected	mg/L	NO
2,3,4,6-Tetrachlorophenol	January 06, 2022	Not Detected	mg/L	NO
Triallate	January 06, 2022	Not Detected	mg/L	NO
Trichloroethylene	January 06, 2022	Not Detected	mg/L	NO
2,4,6-Trichlorophenol	January 06, 2022	Not Detected	mg/L	NO
Trifluralin	January 06, 2022	Not Detected	mg/L	NO
Vinyl Chloride	January 06, 2022	Not Detected	mg/L	NO

NOTE: During 2022, no Inorganic or Organic parameter(s) exceeded half the standard prescribed in Schedule 2 of Ontario Drinking Water Quality Standards.

Appendix C – 2022-23 Ministry of the Environment, Conservation and Parks (MECP) Inspection Summary

Summary of Non-Compliance Items

Non-compliance #1

Question Group: Operations Manuals

Question: Do the operations and maintenance manuals meet the requirements of the DWWP and MDWL issued under Part V of the SDWA?

Legislative Requirement: SDWA | 31 | (1);

Observation/Corrective Action(s):

The operations and maintenance manuals did not meet the requirements of the Drinking Water Works Permit and Municipal Drinking Water Licence issued under Part V of the SDWA.

Municipal Drinking Water Licence #001-101 – Issue #6, Section 16 of Schedule B outline the requirements for the Operations and Maintenance Manuals. The Lake Huron Primary Water Supply System's Operations and Maintenance Manuals contain the aforementioned requirements as stated in the MDWL including but not limited to; contingency plans, procedures to deal with emergencies, procedures for dealing with complaints associated with the drinking water system and copies of the current permit and licence. The manual also includes other information pertinent to the operations of the drinking water system.

However, a review of the Operations and Maintenance Manual indicated that an updated description and procedures for the Exeter-Hensall Pumping Station and Reservoir had not been incorporated into the manual as per Schedule B of Section 16.3 of the current Municipal Drinking Water Licence The current operations and maintenance manual describes seven (7) sodium hypochlorite pumps for rechlorination of treated water entering the reservoir (1 duty, 1 standby), rechlorination of water being discharged to South Exeter (2 duty, 1 standby) and the rechlorination of water being discharged to Hensall and North Exeter (2 duty, 1 standby). During the physical inspection, it was observed that three (3) hypo pumps had been permanently removed.

CORRECTIVE ACTIONS:

From herein, the Owner/Operating Authority shall ensure that any procedures necessary for the operation and maintenance of any alterations to the drinking water system shall be incorporated into the operations and maintenance manual prior to those alterations coming into operation as stipulated in the Municipal Drinking Water Licence #057-101-Issue #2, Section 16.3 of Schedule B. The Owner/Operating Authority shall submit to the undersigned Inspector, documentation that an updated description and procedures for the Exeter-Hensall Pumping Station and Reservoir have been

incorporated into the operations and maintenance manual, no later than January 31, 2023.

Status Update: The corrective action was completed. The operating authority updated the rechlorination section of the Operations & Maintenance Manual and submitted it to the Ministry Inspector on December 28, 2022.

Non-compliance #2

Question Group: Other Inspection Findings

Question: Has the owner ensured that all equipment is installed in accordance with Schedule A and Schedule C of the Drinking Water Works Permit?

Legislative Requirement: SDWA | 31 | (1);

Observation/Corrective Action(s):

The owner had not ensured that all equipment was installed in accordance with Schedule A and Schedule C of the Drinking Water Works Permit.

At the time of the inspection, the equipment and components that are described in the Drinking Water Works Permit #001-201 - Issue #5 under Schedule A and Schedule C were observed for the Lake Huron Primary Water Supply System.

However, the Drinking Water Works Permit references seven (7) sodium hypochlorite metering pumps located at the Exeter-Hensall Reservoir and Pumping station. Observations at the time of the inspection indicated that there were only four (4) sodium hypochlorite metering pumps on site and installed.

CORRECTIVE ACTIONS:

From herein, the Owner/Operating Authority shall ensure that the equipment described in Schedule A and Schedule C in the current Permit is accurate. If an alteration to the Drinking Water Works Permit has taken place, condition 2.4 of Schedule B of the DWWP requires the Owner to notify the director within 30 days of altering the system or placing that equipment into service. It should be noted that upon notification of the aforementioned, the Owners/Operating Authority completed and submitted a Directors Notification on October 26, 2022, for the aforementioned alterations at the Exeter-Hensall Reservoir and Pumping Station.

Status Update: The corrective action was completed during the inspection, prior to the final report being issued. Upon being notified by the Inspector that records had not been completed as required, this was immediately resolved. Staff completed a Form 2 (Record of Minor Modifications or Replacements to the Drinking Water System) to document the change to the chemical metering pumps. The subsequent Director

Notification Form was submitted to the MECP on October 26, 2022. As this was resolved prior to issuing the final inspection report no further action was required.

Non-compliance #3

Question Group: Other Inspection Findings

Question: Do only certified operators make adjustments to the treatment equipment?

Legislative Requirement: SDWA | O. Reg. 170/03 | 1-2 | (2);

Observation/Corrective Action(s):

Persons other than certified operators made adjustments to the treatment system.

The Lake Huron Primary Water Supply System currently employ a number of operators that hold an operator-in-training certification. Under O. Reg 128/04 s. 25(5) a person who holds an operator-in-training's certification shall not be designated as an operator-in-charge, therefore, the Owner/Operating Authority shall designate a person with a Water Treatment Level 1 Certification or higher as an operator-in-charge as per O. Reg 128/04 s 25(1) for the subsystem.

An OIC is defined as a person who is authorized to set operational parameters for the subsystem or for a process that controls the effectiveness or efficiency of the subsystem; and direct or instruct other operators in the subsystem to set such operational parameters.

A review of logbooks submitted indicated that Operators who hold an Operator-in-Training (OIT) certificate were performing duties of an Operator-in-Charge (OIC). OIT's were found to be making operational decisions such as adjusting chemical dosages and pump changes without consulting with an OIC prior to these changes. The Owner/Operating Authority provided a Standard Operating Procedure (SOP) entitled "OSOP-02-Operator in Training" to the Ministry for review. The SOP does provide general operational ranges for a few parameters; however, the SOP does not provide enough details and does not clearly document any decision points and the actions required to a level which removes any/all operational discretion for setting operational parameters.

CORRECTIVE ACTIONS:

From herein, the Owner/Operating Authority shall ensure that only OICs are authorized to conduct the following as prescribed by Ontario Regulation 128/04 – Section 26(1):

(a) set operational parameters for the subsystem or for a process that controls the effectiveness or efficiency of the subsystem; and

(b) direct or instruct other operators in the subsystem to set such operational parameters.

The Owner/Operating Authority shall also ensure the following conditions are met as prescribed by O. Reg. 128/04 – Section 26 (2):

(c) ensure that records are maintained of all adjustments made to the processes within his or her responsibility

(d) ensure that all equipment used in the processes within his or her responsibility is properly monitored, inspected, tested, and evaluated and that records of equipment operating status are prepared and available at the end of every operating shift.

The Owner/Operating Authority shall provide training for all staff on the requirements stipulated in Ontario Regulation 128/04 and shall submit documentation to ensure compliance with the aforementioned including an Operator sign-off sheet to the undersigned inspector; no later than January 31, 2023.

Status Update: The corrective action was completed. The operating authority was required to provide training for all staff on O.Reg. 128/04 (Certification of Drinking Water System Operators and Water Quality Analysts). The operating authority completed the training and provided a copy of the training records and training presentation to the Ministry Inspector on January 24, 2023.

Summary of Best Management Practice Items

Best Management Practice #1

Question: Were the inspection questions sufficient to address other identified best practice issues?

Legislative Requirement: Not applicable

Observation/Corrective Action(s):

1) A review of the Lake Huron Primary Water Supply System's Operations and Maintenance Manual indicated that it did not have a copy of the CT calculations that were used as the basis for primary disinfection under worst case operating conditions. It should be noted that the Owner/Operating Authority provided a separate documentation for the calculations upon request and the facility does utilize an online CT calculator through SCADA.

Recommendations:

1) It is strongly recommended that the Owner/Operating Authority incorporates a description of the primary and secondary disinfection process along with a copy of the CT calculations for the facility into the Operations and Maintenance manuals as stated in the MDWL #001-101 issue #6.

Status Update: The recommendation was addressed. The relevant section of the Operations & Maintenance Manual was updated to include an appendix containing the Technical Memo with the CT calculations at worst case scenario. Comments were provided to the Ministry Inspector to explain that the LHPWSS has moved to a SharePoint electronic document management system, and all documents reside together in a shared Compliance Library. The Inspector has now also been given direct access to this Compliance Library.

Best Management Practice #2

Question: Has the owner provided security measures to protect components of the drinking water system?

Legislative Requirement: Not applicable

Observation/Corrective Action(s):

The owner had not provided security measures to protect components of the drinking water system.

The Lake Huron Water Treatment Plant remains locked at all times and is equipped with a security system which includes intrusion alarms, motion detectors and security

cameras. The intrusion and motion alarms are connected to the SCADA System to alert the Owner/Operating Authority of an unauthorized entry. Operators are also located on site along with a security guard 24 hours a day, 7 days a week. Any visitors to the facility are required to sign in and out of the facility.

In addition to the aforementioned, all facilities are enclosed with security fencing with lockable gates and out stations are visited regularly by staff.

However, at the time of the inspection it was observed that the access for the north clearwell did not have an acceptable watertight hatch that would adequately prevent the ingress of contaminates as well as invertebrates, small animals and arachnids. It was also observed during the inspection that the clearwell access building, which is equipped with metal vents along the walls to allow proper venting to the outside, did not have proper screens that were secured and sealed, which would prevent leaves, small birds, and animals as well as invertebrates and arachnids access to the clearwell.

Recommendations:

It is strongly recommended that the Owner/Operating Authority replace the north clearwell access hatch to ensure a proper watertight seal in order to prevent the ingress of contaminates and invertebrate to the treated water supply as per the "Ten States Standards", which states that each manhole shall be fitted with a solid watertight cover which overlaps a framed opening and extends down around the frame at least two inches. The frame shall be at least four inches high. Each cover shall be hinged on one side and shall have a locking device.

It is also strongly recommended that the vent located in the clearwell access building be fitted with proper sealed screens as per "The Ten States Standards" which states that vents shall exclude birds and animals; as well as insects and dust and shall on groundlevel structures, open downward with the opening at least 24 inches above the roof or sod and covered with twenty-four mesh non-corrodible screen.

Status Update: The recommendation was addressed. Both the north clearwell and south clearwell access hatches have been replaced. The access hatches are now raised and have a watertight seal. The issue regarding vent screens in the clearwell access building was also addressed. The operating authority has cleaned out the access building vents, screens and light. A window gasket seal was added to the back side of the screen to seal off the vents. More screws have also been added to some loose flashing.