



Energy Conservation and Demand Management Plan

Electricity Act O. Reg. 25/23

June 20, 2024

Revision 2

Table of Revisions

Revision #	Date	Description of Revision
0	June 26, 2014	Initial Issue of Document
1	June 24, 2019	Five-year review and update of entire document
2	June 20, 2024	Five-year review and update of entire document



June 13, 2024

Ministry of Energy 77 Grenville Street Toronto ON M7A 2C1

Dear Sir/Madam;

We are pleased to submit the five-year review and update of the energy Conservation and Demand Management Plan for the Lake Huron Primary Water Supply System (LHPWSS).

The attached Plan summarizes our annual energy consumption information, as well as our goals, objectives and proposed measures with respect to energy conservation and demand management. The Plan also provides a report of the actual results achieved during the period 2018–2023.

Acting as the Owner Representative on behalf of the LHPWSS Board of Management, I confirm that this Plan has been approved by senior management. The LHPWSS is committed to implementing and maintaining energy conservation and demand management measures in accordance with this Plan.

Should you require any further information, please feel free to contact our office at your earliest convenience.

Sincerely,

Andrew Henry, P.Eng. Director, Regional Water Supply LHPWSS

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TABLE OF CONTENTS

1.	.0 EXECUTIVE SUMMARY	6
2.	.0 INTRODUCTION	7
	Vision Statement	7
	Background	7
	ISO 14001 Environmental Management System	8
3.	.0 SCOPE	
	Lake Huron Primary Water Supply System	
	Lake Huron Water Treatment Plant	
4.	.0 CDM PLAN RESULTS & CURRENT STATE	
	Equipment Efficiency - Capital Projects	
	Data Management	15
	Supply Management	15
	Organizational & Behavioural Integration	
	Renewable Energy	
	New Energy Consumption Baseline (2016)	
	Energy Consumption Performance (2018-2023)	
	Data Analysis	
	Forecast	
5.	.0 ENERGY GOALS AND OBJECTIVES	21
	Measurements of Success	21
6.	.0 ENERGY MANAGEMENT TEAM	
7.	.0 CURRENT AND PROPOSED MEASURES	
	Equipment Efficiency - Capital Projects	
	Process Optimization	
	Energy Awareness & Promotion	
	Monitoring and Reporting	
	Future Work	

- APPENDIX A: Environmental and Quality Policy
- APPENDIX B: Scheduled Actions, Environmental Management Program, 2023-2027
- APPENDIX C: Energy Performance Trends, 2018-2023

Acronyms

CDM	Conservation and Demand Management
EMS	Environmental Management System
GHG	Greenhouse Gas
HLP	High Lift Pump
HVAC	Heating, Ventilation and Air Conditioning
IESO	Independent Electricity System Operator
LHPWSS	Lake Huron Primary Water Supply System
LLP	Low Lift Pump
ML	Mega Litres
OCWA	Ontario Clean Water Agency
RMF	Residuals Management Facility
RWS	Regional Water Supply
WTP	Water Treatment Plant

1.0 EXECUTIVE SUMMARY

The Ontario Provincial Government has committed to help public agencies better understand and manage their energy consumption. As part of this commitment, O. Reg. 25/23 under the *Electricity Act, 1998* requires public agencies to report on their energy consumption and greenhouse gas (GHG) emissions annually, and to develop and implement energy Conservation and Demand Management (CDM) Plans. This regulatory requirement was first implemented in 2014, with required updates to the CDM Plan every five (5) years. As part of the regulatory requirements, energy consumption and GHG emissions have been reported annually since 2011.

The purpose of the initial Lake Huron Primary Water Supply System (LHPWSS) CDM Plan (dated June 26, 2014) was to develop a framework in order to understand the historical impact of its operations on GHG emissions, and to act by setting reduction targets, goals and objectives consistent with the utility's Environmental Management System (EMS). A baseline was established for performance to be measured against. This updated CDM Plan builds on the LHPWSS's previous Plans developed in 2014 and 2019, and the experience gained over the last five (5) years.

The strategic approach to energy management supports the LHPWSS's Business Plan, which encompasses asset management, financial, operational and capital plans.

The purpose of this update to the CDM Plan is to provide the following:

- A summary of the data on the Energy Consumption and GHG Emissions Templates that were submitted and published for 2018–2023,
- An analysis of the actual results achieved,
- A description of current and proposed measures for conserving and otherwise reducing energy consumption and managing demand for energy,
- A revised forecast of the expected results of the current and proposed measures, and
- A description of any proposed changes to be made to assist the drinking water system in reaching any targets it has established or forecasts it has made.

2.0 INTRODUCTION

Vision Statement

The vision statement of the LHPWSS Board of Management for the administration and operation of the water system, as initially adopted by the Board in 2000, is as follows:

"The Lake Huron Water Board strives to operate and to continually improve the sustainable, environmentally friendly utility that provides safe drinking water at stable and reasonable prices to current and future member municipalities."

Background

Achieving a balance between the environment, society and the economy is considered essential to meet the needs of the present without compromising the ability of future generations to meet their needs. Sustainable development as a goal is achieved by balancing the three pillars of sustainability.

- Environmental Sustainability: Managing the effects of human activity so that it does not permanently harm the natural environment.
- **Economic Sustainability:** Managing the financial transactions associated with human activities so that they can be sustained over the long term without incurring unacceptable human hardship.
- **Social/Cultural Sustainability:** Allowing human activity to proceed in such a way that social relationships between people and the many different cultures around the world are not adversely affected or irreversibly degraded.

The CDM Plan is the sum of measures planned and carried out to achieve the objective of using the minimal possible energy while maintaining water production rates, as well as comfort levels (e.g. in offices). It can be applied to any process or facility where energy use is required.

Energy efficiency and the wise use of energy are two of the lowest cost options for meeting energy demands, while providing many other environmental, economic and social benefits, including reducing GHG emissions, cost avoidance and savings. Energy efficient capital upgrades and operating process improvements are key components which are outlined within the CDM Plan.

The LHPWSS recognizes the importance of decarbonization of public facilities and infrastructure in accordance with federal climate change policy. Board staff worked with a Western University Masters in Environment and Sustainability student group in early 2024 to assess various decarbonization opportunities and plans for the regional water supply system, including but not limited to green building/project certification (e.g. Leadership in Energy and Environmental Design (LEED)), zero carbon building design, carbon offset opportunities and funding options.

ISO 14001 Environmental Management System

The LHPWSS has committed to integrating the management of environmental issues with all other aspects of its core business, which is the provision of safe drinking water to customers. The implementation of an Environmental Management System (EMS) which adheres to the principles of the ISO 14001:2015 Standard has been used to accomplish these commitments.

Consistent with the LHPWSS Environmental and Quality Policy (see Appendix A), the intended outcomes of the EMS are:

- enhancement of environmental performance,
- fulfilment of compliance obligations, and
- achievement of environmental objectives.

Maintaining the EMS ensures that the LHPWSS continues to conduct its business in a proactive, environmentally accountable, and socially acceptable manner. The comprehensive EMS manages environmental risks and opportunities and integrates environmental matters into overall administration of the LHPWSS. The EMS serves as a planning tool to allow the LHPWSS to continually improve its operations.

The LHPWSS has operated under the guidance of an ISO 14001 registered Environmental Management System (EMS) since 2003. The continued utilization and registration of the EMS to the ISO 14001 Standard is a requirement of the Service Agreement with Ontario Clean Water Agency (OCWA), the contracted operating authority for the LHPWSS.

Through the EMS, energy consumption has been identified as a significant environmental aspect. Since the implementation of the EMS, the LHPWSS has established and maintained an objective, target and program related to energy reduction, specifically electricity.

The LHPWSS strives to demonstrate leadership in water resource management and utilizes a continual improvement cycle to control its impact on the environment. Reducing energy consumption, associated costs and secondary environmental impacts is at the forefront of all planning and operating activities from the LHPWSS Board of Management down to everyday operations.

Mechanisms exist within the ISO 14001 EMS to allow employees to provide feedback and input to top management regarding suggested system and process improvements. As part of the EMS, employees are provided with training on new processes and procedures to ensure effectiveness and efficiency of any newly implemented system improvement. The EMS drives internal actions and reviews, and since energy consumption is recognized as a significant environmental aspect within the EMS its mechanisms will support ongoing projects and reviews. A copy of the current EMS environmental management program can be found in Appendix B. The continued implementation of the recommended processes and programs will result in an improved understanding and awareness of energy consumption. This will allow for improved decision making and greater success with future energy projects.

3.0 SCOPE

Lake Huron Primary Water Supply System

The Lake Huron Primary Water Supply System Board of Management is the owner and provides governance for the LHPWSS. The LHPWSS is responsible for the treatment and transmission of drinking water to the following eight (8) municipalities: City of London, Municipality of Bluewater, Municipality of Lambton Shores, Township of Lucan Biddulph, Municipality of Middlesex Centre, Municipality of North Middlesex, Municipality of South Huron, and the Municipality of Strathroy-Caradoc.

The population served by this system is approximately 390,000 (as per the 2020 Master Water Plan Update) and water is provided bulk wholesale to the municipalities who then distribute it to their customers.

The water system is operated and maintained by OCWA under contract to the Board of Management. The current contract with OCWA is in effect from January 1, 2023 to December 31, 2027. Goals and objectives for the EMS were set to coincide with this five (5) year operating term.

The LHPWSS includes one (1) facility that fall under the mandatory monitoring and reporting requirements for O. Reg. 25/23.

Table 1: LHPWSS Facilities – General Information

Facility	Operation Type	Address	Municipality
Lake Huron Water Treatment Plant	Facilities related to the treatment of water	71155 Bluewater Highway	South Huron

At this time, energy reporting for facilities related to the pumping of water (i.e. pump stations) remains voluntary. The LHPWSS is currently collecting data and monitoring the energy consumption at the following facilities for consideration in future reporting:

- McGillivray Pump Station (4064 McGillivray Drive, North Middlesex),
- Exeter-Hensall Pump Station (39590 Huron Street, South Huron),
- Komoka-Mt. Brydges Pump Station (13964 Medway Road, Middlesex Centre).

Lake Huron Water Treatment Plant

The Lake Huron Water Treatment Plant (WTP) and primary transmission main were constructed in the late 1960's and began operating in 1967. It is a conventional WTP with a rated capacity of 340 Mega Litres/day (MLD). After water is treated, it is pumped from the WTP to various communities or to storage reservoirs. The original primary transmission main is 47 km in length, with a total of 28.1 km of the pipeline being twinned.

Major electricity consuming equipment within the WTP includes:

- six (6) low lift pumps,
- two (2) flash mix chambers,
- two (2) banks of flocculation tanks,
- four (4) backwash pumps,
- six (6) high lift pumps,
- four (4) service water pumps,
- various chemical systems,
- air compressors,
- A Residuals Management Facility (RMF) which includes sludge transfer pumps, waste sludge pumps, centrifuge feed pumps, two (2) centrifuges, and various chemical systems,

Major natural gas consuming equipment within the WTP includes Heating, Ventilation and Air Conditioning (HVAC) building systems including boilers, dehumidifiers, and air handling units.

Other sources of GHG emission on the WTP site are combustion source based including diesel fuel for standby/emergency power needs, other process related fuel and oil consumption, and fleet vehicles. These fuel sources are not considered in the annual reporting due to limitations in the Ministry's reporting software.

4.0 CDM PLAN RESULTS & CURRENT STATE

Equipment Efficiency - Capital Projects

Since the CDM Plan was first developed in 2014, the LHPWSS has pursued many measures to improve the energy efficiency of their equipment. The focus has generally been on equipment rehabilitation, equipment replacement, and process optimization. Several capital projects recently completed at the Lake Huron WTP in 2018–2023 have contributed to energy conservation and demand reductions.

Project #LH1230 - High Lift Pump (HLP) Replacement

Cost: \$10,865,506 with an estimated \$648,552 in financial incentives through IESO's Industrial Accelerator Program (IAP)

Status: Completed (September 2022)

Scope: The Energy Audit and Pump Optimization Study identified the replacement of the high lift pumps at the Lake 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 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. Existing pump #4 and new pumps #5 and #6 were put back into service in January 2022 with commissioning and testing activities continuing into April. 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. Existing pump #1 and new pumps #2 and #3 were all placed back into service by August 2022.

Substantial performance for this project was issued on September 22, 2022.

Optimization of the pumping strategy is currently in progress.

Estimated Savings: The predicted annual energy consumption savings is 2000 MWh/year.

Awards: The Lake Huron and Elgin Area Water Treatment Plant High Lift Pump Replacement Projects received an Ontario Water Works Association (OWWA) Water and Energy Efficiency Committee 2023 Award of Excellence.



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

Project #LH1219 - Filter Backwash Turbidity Meters

Cost: \$233,241

Status: Completed (2023)

Scope: An assessment of the filter backwash process recommended that a turbidity analyzer be installed on each of the twelve (12) filters, to measure the turbidity in the filter backwash water as it enters the backwash trough. Monitoring the cleanliness of the wastewater during the backwash process allows for optimization opportunities. The intent of installing these new backwash turbidimeters was to optimize the filter backwash program to terminate the backwash based on a defined turbidity value (i.e. when the filter is clean) instead of on a timer program.

Modifying the backwash process in this manner optimized the time and amount of water required for effective backwashing. Energy savings are realized due to shorter backwash pump run times. Preliminary data from 2023 indicates that the average filter backwash water volume has been reduced by over 30%. As a result of the reduced water usage, a reduced volume of water is being sent to the Residuals Management Facility (RMF) for further treatment which results in energy savings within the RMF as well. This project has resulted in significant water conservation and electricity savings.



Figure 2: The display panel for two (2) new instruments; a filter backwash turbidimeter and a filter level meter.

Project #LH1244 - Building Exterior Condition Assessment

Cost: \$78,814

Status: Completed (2019)

Scope: This project involved undertaking a comprehensive condition assessment of the building structures, including the slab walls, windows and glazing. Following the results of the condition assessment, future capital projects were identified to implement recommended repairs or replacements. This assessment provided future opportunities to install energy efficient windows, reduce heat losses, and improve the overall energy efficiency of the facility. See Projects #LH1246 and #LH1207.

Project #LH1246 – Low Lift Building Curtain Wall and Clearstory Window Replacement

Cost: \$382,042 **Status:** Completed (2022)

Scope: This project is linked to Project #LH1244 (Building Exterior Condition Assessment) and included the replacement of all windows at the Low Lift Building. This project contributes to the overall building energy efficiency.

Project #LH1207 – Concrete Crack Injection

Cost: \$216,647 (spending to date)

Status: Project still ongoing in 2024 (multi-year project)

Scope: This project is linked to Project #LH1244 (Building Exterior Condition Assessment) and involves injecting leak sealants and expandable plugs to seal cracks in concrete. This program addresses cracks and leaks in various areas of the facilities, some of which are on the building exterior, helping to improve overall energy efficiency.

Data Management

LHPWSS has a comprehensive program in place for collecting and analyzing monthly energy billing information and ensuring staff are informed about energy consumption. Currently, LHPWSS utilizes the service of a consultant (VIP Energy) to assist with monitoring electricity consumption. If there is an anticipated critical peak, the consultant will provide a notification which is forwarded to OCWA. In addition, a website has been made available to monitor electricity and consumption costs (Utilismart). OCWA has also contracted an outside vendor to provide email notifications to staff when there is a forecasted anticipated Ontario energy critical peak. OCWA monitors Ontario energy demands through the Independent Electricity System Operator (IESO) website, and weather conditions.

These efforts allow for monitoring excessive variations, targeting facility follow-up evaluations, and highlighting areas for improved conservation or asset renewal.

Supply Management

LHPWSS has currently adopted a strategy of procuring its electricity from Hydro One Networks Inc. LHPWSS has chosen to contract its natural gas through Enbridge Gas Inc. (formerly Union Gas). This strategy is reviewed annually during the budgeting process. VIP Energy provides monthly ongoing support for electricity supply management, guidance and assistance of future pricing decisions, ongoing support for Independent Electricity System Operator (IESO) services, and various other guidance and assistance.

Organizational & Behavioural Integration

Day to day operational management of energy has been primarily the responsibility of the operating authority for the LHPWSS, which is currently OCWA. Current practices have been enhanced, including:

- Improved coordination of operational activities through further development of the <u>energy management team</u>,
- Improved energy monitoring and feedback, and
- Interactive energy training and awareness.

In October 2023, LHPWSS and OCWA staff were presented with an energy orientation/refresher training workshop entitled "Ontario Electricity Market Overview Training". The purpose of the workshop was to develop an understanding of how actions affect the electricity bills. The challenge of energy management and energy management benefits were also discussed.

Staff are directed to ensure water pumping in off peak hours (when possible), to utilize full pump capacity before activating additional pumps, and make efficient use of interior and exterior lighting.

As the understanding of energy consumption improves, LHPWSS staff are better equipped with the knowledge necessary to make informed decisions on asset management.

Renewable Energy

The LHPWSS currently has no renewable energy generation (e.g. solar energy, ground source energy, wind, biogas), therefore there is no energy production to report on an annual basis.

New Energy Consumption Baseline (2016)

Effectively managing energy requires implementing appropriate energy monitoring procedures. The establishment of an accurate energy baseline is essential in this process. It assists with energy conservation and GHG reduction target setting, energy procurement and budgeting, bill verification, energy awareness, and the selection and assessment of potential energy projects.

LHPWSS originally utilized the consumption data from 2012 to represent its baseline energy consumption performance, as 2012 coincided with the start of OCWA's operating term.

In 2014-2015, a major HVAC Replacement Project took place at the Lake Huron WTP. Natural gas boilers were installed, replacing electric heat through most of the facility. The new natural gas boilers were fully in-service in November 2014. Natural gas dehumidification systems were installed, replacing electric dehumidification. The new natural gas dehumidification systems were fully in-service in July 2015. This new equipment contributed to overall reductions in electricity consumption, but a corresponding increase in natural gas consumption.

As a result of the HVAC Replacement Project, the baseline energy consumption year has been re-established, with 2016 being utilized as the new baseline year. 2016 represents the new baseline year for energy consumption as well as GHG emissions.

It is imperative to understand the energy characteristics of the WTP. After establishing a baseline, future retrofits and improvements to the facility can be monitored and tracked to ensure that the intended benefits are fully realized.

In the future, consideration should be given to re-establish the baseline energy consumption year to 2023. This represents the first full year of data with the new HLP in operation (i.e. new steady state for high lift pumping).

Energy Consumption Performance (2018-2023)

In 2024, the LHPWSS's most recent energy consumption reporting was submitted to the Ministry of Energy for 2022 & 2023. The table below summarizes the WTP energy consumption and GHG emissions as reported annually to the Ministry of Energy. These energy performance trends are also presented graphically in Appendix C.

Year	Annual Average Total Total Na		Total Natural	GHG	Energy	Electricity	
	Treated	Flow	Electricity	Gas	Emissions	Intensity	Intensity
	Water	(m³/day)	Consumption	Consumption	(kg) *	(ekWh/ML) *	(kWh/ML)
	Flow (ML)		(kWh)	(m ³)			
2012	49,169		34,817,540	82,434	3,499,728	725.94	708.12
2013	45,373		30,839,730	90,487	2,515,267	700.89	679.70
2014	44,286		29,905,395	91,832	1,370,165	697.31	675.27
2015	43,722		30,364,363	143,090	1,501,744	729.26	694.48
2016	44,763		30,887,393	198,562	1,473,392	737.16	690.02
(New Baseline)							
2017	44,422		30,580,591	251,199	1,003,907	748.52	688.42
2018	44,822		29,775,542	296,907	1,441,147	734.71	664.31
2019	44,267		28,922,425	310,951	1,469,245	728.03	653.37
2020	45,515		29,954,884	264,063	1,261,536	719.79	658.13
2021**	45,516	124,700	30,375,927	180,293	1,229,300	Not available	667.37
2022**	46,927	128,570	30,934,961	195,788	1,244,500	Not available	659.22
2023**	48,013	131,540	29,791,776	186,265	1,194,100	Not available	620.49

Table 2: Annual WTP Energy Consumption and GHG Emissions

* Calculated within the Ministry's Reporting Software ** Effective 2021: Reporting is through the new Energy Star Portfolio Manager® application

Data Analysis

As a result of the HVAC Replacement Project, the baseline energy consumption year has been re-established, with 2016 being utilized as the new baseline year.

From 2016 to 2023, both the total electricity consumption and total natural gas consumption decreased overall.

The total electricity consumption decreased from 30,887,393 kWh to 29,791,776 kWh, which represents a **3.5% decrease**. When the electricity consumption is normalized to take into account the total treated water flow that left the WTP (i.e. electricity consumption analyzed on a kWh/ML basis) the performance improves. The electricity intensity decreased from 690.02 kWh/ML to 620.49 kWh/ML, representing a **10.1% decrease**.

A major operational change at the Lake Huron WTP in recent years likely contributed to the improvement in electricity consumption. In 2022, the High Lift Pump (HLP) replacement project at the WTP was fully completed. The new pumps are more energy efficient and were sized to meet current and future water demands. The HLP replacement project has contributed to the significant reduction in electricity consumption.

The total natural gas consumption decreased from 198,562 m³ to 186,265 m³, which represents an overall **6.2% decrease**. However, this analysis does not currently factor in weather normalization of the data, as natural gas consumption at the Lake Huron WTP is mainly required for heating and dehumidification. The natural gas consumption increased significantly in the years immediately following the HVAC upgrade. Operational efforts were made to optimize the building automation system (BAS) programming and the natural gas consumption is now in a steadier state.

The total GHG emissions decreased from 1,473,392 kg to 1,194,100 kg, which is an **18.6% decrease.** For a comprehensive list of equipment that contributes to GHG emissions, refer to <u>Section 3.0 (Scope)</u>.

Graphs depicting the total electricity consumption, electricity intensity, total natural gas consumption, and total GHG emissions from 2018-2023, as compared to the 2016 baseline, can be found in Appendix C.

In the future, consideration should be given to re-establish the baseline energy consumption year to 2023. This represents the first full year of data with the new HLP in operation (i.e. new steady state for high lift pumping).

Forecast

Over the next five (5) year period, there are planned capital upgrades and optimization projects that may have an impact on energy consumption, particularly the electricity

consumption. For a list of approved projects, refer to <u>Section 7.0 (Current and Proposed</u> <u>Measures)</u>.

As an addition to the program, energy monitoring at the pumping stations is currently underway to establish an electricity consumption baseline for each facility. Future consideration will be given to start reporting on these facilities and establishing programs for reducing the electricity consumption.

5.0 ENERGY GOALS AND OBJECTIVES

It is of the utmost importance that LHPWSS improve energy efficiency, minimize operating costs and reduce its impact on the environment, all without adversely impacting operations and quality.

This CDM Plan has the following goals and objectives:

- Achieve a reduction in GHG emissions over the duration of the CDM Plan (as compared to the 2016 baseline year, with future consideration for a 2023 baseline year),
- Maintain registration of the ISO 14001 EMS, which includes energy related objectives, targets and programs (see Appendix B for current details),
- Maintain regulatory compliance,
- Improve the management of LHPWSS's energy consumption, and
- Improve LHPWSS's understanding of energy consumption which is essential for LHPWSS to meet its energy management goals.

Measurements of Success

The measurements of success will be based on a variety of indicators:

- Achieving the energy related objectives and targets as identified in the ISO 14001 EMS (see Appendix B for current details), specifically the electricity consumption target,
- Reaching the CDM Plan's general energy conservation targets,
- Achieving the savings, where estimates are available, and
- Imbedding energy management in LHPWSS's capital and operations decisionmaking process.

6.0 ENERGY MANAGEMENT TEAM

All staff have an essential role in the success of this CDM Plan and it is the responsibility of the energy management team to ensure that energy management measures are properly communicated and effectively implemented.

Energy management is the responsibility of both LHPWSS staff, and OCWA staff as they are responsible for the day-to-day operations and maintenance of the facilities. There is a key linkage for energy management activities between the Regional Water Supply (RWS) Operations Manager and OCWA's Senior Operations Manager, mainly with respect to coordination of operational and maintenance activities and the implementation of capital projects.

The RWS Director, acting as the owner representative for the LHPWSS Board of Management, has key responsibilities for energy management with respect to approving goals and objectives, and through the annual budget approval process.



Regional Water Supply

Figure 3: Structure of Energy Management Team

Historically, LHPWSS addressed energy conservation and demand management on a project-by-project basis. Strategic directives have been provided by the LHPWSS Board of Management and senior management.

This CDM Plan outlines a commitment to integrate Energy Conservation and Demand Management into the operations of the LHPWSS, as indicated in the covering letter from senior management.

Within the duration of the CDM Plan, CDM planned activities will become an integral component of the annual budgeting process. A collaborative effort will be undertaken to achieve this integration, involving:

- Internal Staff,
- Advisement from the Ministry of Energy, where applicable, and
- Consultations with Energy Management experts.

OCWA has dedicated energy management team resources that provide support to all OCWA staff through training and programs. OCWA has a corporate sustainable energy plan and can help their clients achieve efficiencies and savings through OCWA's energy program. OCWA will undertake client energy audits and energy studies where required, support the delivery of energy-related upgrades, and assist in identifying and quantifying energy savings in other capital projects.

7.0 CURRENT AND PROPOSED MEASURES

Measures are the actions taken to save energy and help achieve the goals and objectives of the LHPWSS. The energy saving measures identified in this CDM Plan fall into three categories: technical, organizational, and behavioural.

- **Technical** measures are operational and/or technological changes. They generally relate to energy consuming equipment, and includes re-commissioning of buildings and equipment, and demand response (i.e. shifting energy usage from times of peak demand to off-peak times through operational adjustments).
- **Organizational** measures involve working together to build an energy management culture. This includes utilization of policies, procurement practices, and design standards.
- **Behavioural** measures relate to awareness, improving habits, procedures and feedback. This includes informing staff of potential savings associated with their actions, and employee engagement programs.

The economic feasibility of proposed actions plays a large role in the prioritization of the processes, programs, and projects. Equally important in this prioritization is the evaluation of LHPWSS's internal capacity to complete the proposed initiatives.

Areas of focus for the period covered by this CDM Plan include:

- Equipment replacements and/or rehabilitation to address efficiency (e.g. capital projects),
- Process optimization,
- Energy awareness and promotion, and
- Monitoring and reporting.

Equipment Efficiency - Capital Projects

The following projects are either currently in progress or planned to be undertaken within the next five (5) years. These projects are projected to optimize and/or improve the energy efficiency of equipment and subsequently contribute to energy conservation and demand reductions.

Project LH1901 - Water Quality Facility Plan Update

Budget: \$130,599

Scope: The WQFP update provides the LHPWSS with new information on WTP performance and treatment capacity as supply conditions change. The final 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. This study commenced in June 2022 with anticipated completion in October 2024.

Potential Savings: To be determined. Future projects recommended by this study should contribute to future chemical efficiency and backwash optimization, which has a direct correlation to electricity savings.

Project #LH1021 – Low Lift Pump (LLP) Rebuild

Budget: \$415,000

Scope: Intended for long service life, the LLPs require periodic rebuilding of the pump impellers, seals, bearings, and other high-wear components. This is a multi-year rebuild program, with one (1) LLP being rebuilt per year over a six-year period, with 2026 anticipated to be the final year of the program. The rebuilds of LLPs #3, #4, #5, #6 are complete. Low Lift Pumps #1 and #2 are still to be done.

Potential Savings: To be determined. The rebuilt pumps will be more energy efficient.

Project #LH1251 – Powdered Activated Carbon (PAC) System Pump Replacements

Budget: \$1,300,000

Scope: The PAC system, including the transfer and dosing pumps, is in poor condition and has reached the end of its useful service life. The project involves the replacement of the transfer and dosing pumps with more energy efficient components, along with other treatment efficacy improvements in the overall dosing system for a more consistent application of PAC to the raw water. Preliminary design was completed in 2023, with detailed design and construction to take place in 2024.

Potential Savings: To be determined. The new pumps will be more energy efficient.

Project #LH1260 – Coagulant System Upgrade

Budget: \$1,437,000

Scope: A coagulation system upgrade project, which includes the replacement of the existing coagulant dosing system (i.e. the rotodips), was initiated to improve the overall operation of this treatment process and overall plant performance. Construction is currently in progress with anticipated completion in 2024.

Potential Savings: To be determined. The new dosing pumps will be more energy efficient than the existing rotodips. A new injection point will optimize chemical efficiency. Optimized coagulation may reduce backwash frequency, which will have beneficial impacts to electricity consumption through reduced use of the backwash pumps.

Project #LH1272 – Service Water Pipe Replacement

Budget: \$125,000

Scope: The existing cast iron service water piping is original to the plant construction. Sections of the service water piping are showing significant deterioration including advanced corrosion, leaking, and constrictions from tuberculation. This multi-year program continues to replace sections of the service water piping within the WTP as opportunities arise. A separate Service Water Study is also being planned for 2024. **Potential Savings:** To be determined. The service water pumps will run more efficiently with new piping, contributing to electricity efficiency.

Project #LH1264 – Overhead Truck Door Replacement Budget: \$225,000

Scope: The majority of the overheard doors were replaced in 2020 - 2022. There is one (1) remaining overhead door at the Low Lift Building still to be replaced in 2024. **Potential Savings:** To be determined. Overall minimal building energy efficiency improvement.

Project #LH1353 – Administration Building Extension and Redevelopment

Budget: \$2,350,000 (with future approved construction budget) **Scope:**

The existing Lake Huron WTP main building was designed and constructed in the 1960s and has not undergone any major renovations or modifications since. There are several challenges with the existing WTP main building that should be addressed to modernize the facility, enhance the functionality, address gender equity issues, and improve the overall indoor working environment for improved health and safety of staff. Various design concepts for a new administration building addition/extension were reviewed and developed, with consideration of municipal approvals, green building design and preferred project delivery type. The LHPWSS Board of Management has endorsed pursuing Leadership in Energy and Environmental Design (LEED) silver certification of the overall building addition and renovation project, and striving to meet the Zero-Carbon Building standard, where feasible.

Potential Savings: To be determined. The new building will be energy efficient.

Process Optimization

To manage energy costs, the LHPWSS will continue working on the following process optimization measures:

• Pumping Off-Peak: The majority of pumping is scheduled during off-peak hours when electricity costs less. High lift pumps represent the biggest opportunity for energy load shifting and the LHPWSS is currently able to do this because there is sufficient water storage.

- Preventive maintenance programs: Energy and cost savings can be realized through proper preventive maintenance of mechanical, electrical, compressed air and hydraulic systems.
- Continued long-term research and investigation to identify future process optimization initiatives.
- Review of planned and completed capital replacement projects to ensure correct equipment and output is current based on required service levels and "right sizing" equipment.

Energy Awareness & Promotion

Energy awareness training is an effective way to reduce energy usage with no capital costs and minor operational expenses. These initiatives directed at staff can lead to significant savings.

Electricity Market Orientation Training first took place in February 2018. In October 2023, a follow-up course was provided as refresher training for staff who took the original 2018 course, and as an orientation training session for new staff as their availability permitted. System specific case studies of actual operating scenarios were presented for analysis and best management practices. It is anticipated that future training sessions will continue to be more in-depth and include more case studies to build upon the energy awareness basic training previously provided. Periodic refresher training will continue to be provided to staff as required.

Ongoing professional development is a key factor in the success of a CDM Plan to ensure that staff members understand their role in the greater goal. The CDM Plan and accompanying education should be a required part of their daily activities.

Monitoring and Reporting

The CDM Plan allows for the monitoring and reporting that is necessary for LHPWSS to meet the regulatory requirements of the *Electricity Act* and LHPWSS's facility energy intensity targets. Regular energy monitoring and reporting to the Ministry of Energy and LHPWSS senior management and staff, improve knowledge and help make energy consumption a tangible asset, making possible appropriate behavioural changes. The intent of monitoring and reporting on energy consumption is to make energy management transparent and the water system accountable. The Ministry of Energy is provided with annual updates on the state of energy management at LHPWSS through annual regulatory reporting. Energy consumption feedback provided to staff is imbedded into LHPWSS's regular operations.

As required by regulation, the LHPWSS will continue to report annually on energy use and GHG emissions utilizing the Ministry's reporting software (i.e. the Energy Star Portfolio Manager® application). At that time, staff will take the opportunity to review activities and results that have been achieved in the previous year and will focus on linking actions to results. The CDM Plan will be updated a minimum of every five (5) years, with the next update required by July 1, 2029. The CDM Plan will continue to take a forward view of the upcoming five-year period to lay out the roadmap and identify any changes or adjustments that should be considered based on what the current market conditions are.

Future Work

As actions are completed, the energy management team will meet to discuss monitoring results and how they can be used to enhance the CDM Plan. The CDM Plan is intended to be a living document that is updated as the need arises. Anticipated improvements in knowledge and capacity will result in enhancement of the proposed actions.



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APPENDIX A

ENVIRONMENTAL AND QUALITY POLICY



ENVIRONMENTAL AND QUALITY POLICY

The Lake Huron Primary Water Supply System (LHPWSS) and Ontario Clean Water Agency (OCWA) as the Operating Authority are committed to:

- Maintaining and continually improving the Environmental Management System (EMS) and Quality Management System (QMS) to enhance environmental and quality performance.
- > Providing the customer with safe drinking water.
- Meeting all relevant compliance obligations and encouraging suppliers and subcontractors to similarly meet these requirements.
- Developing and implementing policies and environmental objectives in partnership.
- Protecting the environment, including prevention of pollution, climate change mitigation and adaptation, energy management, chemical usage and process water optimization.
- > Managing and operating the drinking water system in a responsible manner.
- > Being environmental and quality leaders in the municipal drinking water industry.
- Promoting owner and consumer confidence in the safety of the drinking water supply.
- > Promoting resource stewardship, including conservation.
- Aligning and coordinating the EMS and QMS with the Asset Management System.
- Accomplishing these commitments through the dedication, support and participation of all personnel.

The LHPWSS and OCWA will periodically undertake reviews, evaluations and performance measurements of the operations to promote conformance with the Environmental and Quality Policy.

OCWA also maintains a separate Quality Management System Policy which governs the activities of the Operating Authority as a Corporation.

Henry

Director, Regional Water Supply Lake Huron Primary Water Supply System

Date Signed: June 1, 2023

Matt Bender Regional Manager Ontario Clean Water Agency

Date Signed: June 1, 2023

APPENDIX B

SCHEDULED ACTIONS ENVIRONMENTAL MANAGEMENT PROGRAM 2023-2027

(As endorsed by the LHPWSS Board of Management on March 2, 2023, with updates)



2023-2027

Environmental Objectives, Targets and Program



Reduce the demand on the Provincial electrical generation and transmission					
system through effficiency, conservation and displacement efforts.					
January 1, 2023 - December 31, 2027					
Lake Huron Water Treatment Plant (including Residuals Management Facility)					
<670 kWh/ML measured as an annual average, with quarterly monitoring					
Electricity consumption					
Electricity Act and O.Reg. 507/18 (Broader Public Sector: Energy Reporting and					
Conservation and Demand Management Plans)					
Potential beneficial effects (opportunities) – cost savings; carbon footprint					
reduction; prolongs asset life; operational efficiency					
Potential adverse effects (risks/threats) – significant wear and depreciation of					
asset life; too great of a focus on energy could put customer needs at risk (eg.					
water quality, reservoir operating levels) or compromise the integrity of the					
system; increased front end costs if upgrades/retrofits are required					



Environmental Objective #2:	Optimize the use of chemicals in the production of treated potable water and
	associated residuals treatment.
Target Years:	January 1, 2023 - December 31, 2027
Target Location:	Lake Huron Water Treatment Plant (including Residuals Management Facility)
Target:	<44 kg/ML measured as an annual average, with quarterly monitoring
Significant Environmental Aspects:	Chemical consumption – water treatment
	Chemical consumption – residuals treatment
Compliance Obligations:	Safe Drinking Water Act and O.Reg. 170
	Municipal Drinking Water Licence (MDWL) and Drinking Water Works Permit
	(DWWP)
	Transportation of Dangerous Goods Act and associated regulations
Risks and Opportunities:	Potential beneficial effects (opportunities) – cost savings; less chemical
	consumption uses less raw materials in the manufacturing of the chemicals and
	reduces the associated trucking and deliveries; carbon footprint reduction
	Potential adverse effects (risks/threats) – Potential for increased electricity
	consumption; there is potential to optimize chemical addition to the point where
	water quality may be impacted which is a risk to regulatory and contractual
	performance limits; potential operational deficiencies



Environmental Objective #3:	Optimize the use of process water, including backwash water, in the production
	of treated potable water and associated residuals treatment.
Target Years:	January 1, 2023 - December 31, 2027
Target Location:	Lake Huron Water Treatment Plant (including Residuals Management Facility)
Target:	No specific target established. Quarterly monitoring to review progress.

Significant Environmental Aspects:	Water consumption
Non-signficant Environmental Aspects:	Water conservation
Compliance Obligations:	Permit To Take Water (PTTW) Ontario Water Resources Act (OWRA) and O.Reg. 387/04 (Water Taking and Transfer)
Risks and Opportunities:	Potential beneficial effects (opportunities) – cost savings; less electricity consumption (eg. less backwash pump run times); reduces RMF operation and associated impacts (less chemical consumption and electricity)
	Potential adverse effects (risks/threats) – there is potential to optimize process water use (eg. backwash program) to the point where water quality may be impacted which is a risk to regulatory and contractual performance limits; retrofits/upgrades may be required

Lake Huron Primary Water Supply System Environmental Program

Electricity Program (Objective #1)	Chemical Program (Objective #2)	Process Water Program (Objective #3)	Project Number	Project Name	Project Location	Project Manager	Project Microsite - Status	Rationale / Comments	Target Completion Date	Progess
*			LH1021	Low Lift Pump Rebuild	WTP	JW / OCWA	Construction	Rebuilt pumps will be more energy efficient	2025	Rebuild on Low Lift Pumps #3, #4, #5, #6 is complete. Low Lift Pumps #1 and #2 are still to be done.
×		~	LH1219	Filter Backwash Turbidimeters	WTP	JW / OCWA	Construction	Project will optimize backwash run times. This will result in a reduction in pump run time (electricity efficiency) and reduction in process water used for backwashing.	2023	The 12 new backwash turbidity analyzers were placed in service in Jan. 2023.
¥			LH1230	High Lift Pump Replacement	WTP	BH / MM	Warranty	A monitoring period is in progress. There will be further electricity optimization through operational changes.	Project Completed: 2022 Warranty period: 2023	HLP replacement completed. All new pumps were operational by Aug. 2022. Operational assumption completed. Substantial performance issued in Sep. 2022. Contract now in warranty period. Monitoring continues in 2023.
-	4		LH1251	PAC Feed/Transfer Pump System Replacement	WTP	ZL	Design	New pumps will be more energy efficient. Changes to the chemical dosing location and/or strategy will have the potential to improve chemical efficiency, but it is still to be determined if dosing location is changing (project is still in preliminary design phase).	Pre-Design: 2022/23 Detailed Design: 2023 Construction: 2024	Preliminary design of PAC System upgrades started October 2022 with anticipated completion February 2023. Detailed design will be completed in 2023. Anticipated construction start in 2024.
×		~	LH1260	Coagulant System Upgrade	WTP	ММ	Construction	The new pumps will be more energy efficient than the rotodips. A new injection point will optimize chemical efficiency. Optimized coagulation will reduce backwash frequency, impacting process water and electricity.	2023	Commissioning activities continued in late 2022 with the extension of work into 2023.
×	-		LH1388	Coagulation Optimization Study	WTP	ММ	To be initiated	Optimization of chemical dosing.	TBD	This study will be initiated once the coagulation system upgrade (Project LH1260) is completed.
			LH1272	Service Water Pipe Replacement	WTP	JW / OCWA	Construction	The service water pumps will run more efficiently with new piping (electricity efficiency).	2023	Replacement of pipes and fittings of the service water piping throughout the plant. This timing is subject to change as a separate Service Water Study is also being planned (2024).

Electricity Program (Objective #1)	Chemical Program (Objective #2)	Process Water Program (Objective #3)	Project Number	Project Name	Project Location	Project Manager	Project Microsite - Status	Rationale / Comments	Target Completion Date	Progess
×			LH1426	WTP Storage Environmental Assessment [2023: WTP Storage Reservoir and UV]	WTP	ММ	Study	There will be a negative impact on electricity. The addition of UV will consume more electricity. Additional waste generated: Waste lamps/bulbs (but may be able to get LEDs in future) and UV cleaning chemicals.	Class EA: Completion 2022 Design: 2023/24 Construction: 2024-2026	The Notice of Completion for the Class EA was filed, and the 30-day review period ended Nov. 21, 2022. Preliminary design and detailed design to follow in 2023.
-	1	~	LH1901- EA4084	Water Quality Facility Plan	WTP	S	Study	Future projects will be recommended by this study. Future projects should contribute to future chemical efficiency and backwash optimization.	2023	The study, led by Stantec, commenced in June 2022 with estimated completion in mid-2023.
	1		LH1216	Closed Loop Chlorine Control system	WTP	JW / OCWA	Design	Project will optimize chlorine dosing.	2023	Initial training/intro completed. OCWA re- started the design process in 2022.
	~		LH1269	Settled Water TSS Analyser Installation	WTP	JW / OCWA	Completed	Real time Total Suspended Solids (TSS) information will help optimize the RMF polymer dosing.	Construction Completion: 2022 Optimization: 2023	The 4 new TSS analyzers were placed into service in Nov. 2022. Process optimization in 2023.
×			LH1264	Overhead Truck Door Replac	WTP	JW / OCWA	On Hold	Building energy efficiency improvements would be minimal. Top Management directed at the Nov. 23, 2022 Management Review to include this small project, even if impact is minimal	2024	The majority of the doors have already been replaced, with 1 door left to be replaced through this project: Low Lift Door in 2024.
×			LH1380	Clarifier Upgrades	WTP	JW / OCWA	Construction	Small motors with a negligble impact. Top Management directed at the Nov. 23, 2022 Management Review to include this small project, even if impact is minimal	2024	Two of the clarifier upgrades are complete. There is one additional clarifier to be upgraded over the next two years. Project scheduled until 2024.
			LH2047- EA4195	Electric Vehicle Charging Stat	WTP	ZL	To be initiated	Electric vehicles will result in a minimal increase in electricity consumption. However electric vehicles offer other benefit, such as a minimal reduction in air emissions and fuel consumption. Top Management directed at the Nov. 23, 2022 Management Review to include this small project, even if impact is minimal	2024	A consultant completed an assessment in Aug. 2022. The installation will be undertaken as part of Project LH1353 (WTP Modification/Renovation Project).

Electricity Program (Objective #1)	Chemical Program (Objective #2)	Process Water Program (Objective #3)	Project Number	Project Name	Project Location	Project Manager	Project Microsite - Status	Rationale / Comments	Target Completion Date	Progess
*			N/A	Remote Stations - Monitoring to establish electricity consumption baseline	McGillivray PS	EM / JW	N/A	Monitoring the electricity trend at this facility to establish a baseline and assess the impacts of upcoming projects: • LH1243 - McGillivray Electrical & HVAC Upgrade • LH1250 - McGillivray Pumps & Valves Refurbishment	2023	To be initiated
-			N/A	Remote Stations - Monitoring to establish electricity consumption baseline	Exeter- Hensall PS	EM / JW	N/A	Monitoring the electricity trend at this facility to establish a baseline and assess the impacts of upcoming projects: • LH1273 - (PS#3) Exeter-Hensall Pump Control Upgrades	2023	To be initiated
×	×		N/A	Remote Stations - Monitoring to establish electricity and chemical (chlorine) consumption baseline	Komoka-Mt. Brydges PS	EM / JW	N/A	Monitoring the electricity and chemical trends at this facility to establish a baseline and assess the impacts of upcoming projects: • LH1408 - Oneida Transmission Pipeline	2023	To be initiated
-	4		N/A	Monitor electricity, chemical, and process water use to review savings/reductions. Provide annual updates to Top Management.	All	EM	N/A	Monitoring and Reporting	Ongoing	Ongoing
-	4	~	N/A	Identify/recommend new opportunities. Revise program as needed to incorporate new projects and tasks.	All	All	N/A	Identify new opprortunities	Ongoing	Ongoing

APPENDIX C

ENERGY PERFORMANCE TRENDS 2018-2023







