LITTLE RIVER POLLUTION CONTROL PLANT EXPANSION – SCHEDULE 'C' MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT STUDY

Draft Environmental Study Report

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EXECUTIVE SUMMARY

GENERAL

The Little River Pollution Control Plant (LRPCP) is located at 9400 Little River Road in the City of Windsor (City). The LRPCP provides secondary level treatment for municipal wastewater and industrial wastewater from the eastern portions of the City of Windsor and from the Municipality of Tecumseh. The LRPCP was commissioned in 1966 and has undergone several expansions since its inception. Presently, the facility operates with reserve capacity with a 2017 - 2022 annual average daily flow rate of approximately 45 megaliters per day (MLD) which utilizes 61.8% of the rated capacity.

In 2020, the City of Windsor endorsed its first comprehensive Sewer and Coastal Flood Protection Master Plan (SMP). The SMP identified treatment capacity issues at the LRPCP and confirmed that during severe wet weather conditions the facility is unable to treat all wet weather flow (WWF). The average daily capacity of the LRPCP is substantially less than the predicted peak WWF, which would provide service for a severe storm event. During severe storm events flow in excess of the LRPCP wet weather treatment capacity is bypassed to the nearby Pontiac Pumping Station and discharged to the Little River as a combined sewer overflow (CSO). The Ministry of Environment, Conservation and Parks (MECP) has indicated that any future expansion of the LRPCP should mitigate impacts from CSO discharges such that the total loading from all bypass events have a net reduction over the established conditions.

In 2021, the City of Windsor initiated a master servicing plan for the Sandwich South area geared towards providing the required municipal infrastructure in support of growth. The Sandwich South Master Service Plan (SSMSP), a Municipal Class Environmental Assessment, discussed the capacity limitations of the existing LRPCP and recommended increasing the capacity to accommodate the future Sandwich South development.

In order to mitigate impact of combined sewer overflows and accommodate development in Sandwich South, the City of Windsor has initiated this Schedule ‘C’ Class Environmental Assessment (EA) Study for the Expansion of the Little River Pollution Control Plant. In general, the study objective is to follow the planning process defined under the *Environmental Assessment Act* to arrive at an environmentally responsible and cost-effective solution to address the need for additional capacity at the LRPCP.

This study will include identification and description of the problem/opportunity statement, evaluation of the alternative design solutions to accommodate increased wastewater servicing demands, and evaluation of alternative design concepts which may be applied to implement the preferred solution. This Environmental Assessment Report (ESR) is the documentation of the Class EA process outlined by the Municipal Engineers Association (MEA) for the LRPCP Expansion.

The recommended design solution identified through this Class EA study is comprised of three (3) implementation phases. Implementation Phase 1 is recommended to be initiated in the immediate future to address WWF capacity issues in the LRPCP service area and mitigate potential for CSOs during severe storm events through the addition of a Wet Weather Flow Retention Facility (WWFRF). Implementation of

Phase 2 is recommended to be implemented on the 15-year or more planning horizon to address Dry Weather Flow (DWF) capacity requirements, hydraulic grade line (HGL) concerns, as well as potential poor performance or condition of unit processes at the LRPCP through process upgrades of the existing Plant 1 and 2. Phase 3 is recommended to be implemented on the 30-year or more planning horizon to meet ultimate treatment capacity requirements at the LRPCP and provide engineering redundancy through the implementation of an additional treatment train, also referred to as a tandem treatment facility. The planning horizons for Phase 2 and 3 may be subject to change based on the speed at which development progresses in the City of Windsor and the Town of Tecumseh.

The recommended conceptual design for the Phase 1 Expansion will include the construction of a Retention Treatment Basin (RTB) and a new headworks facility for the LRPCP on the available expansion lands to the east of the existing facility. The High-Rate RTB is a facility with a combination of storage and chemically enhanced primary treatment that would be designed to provide flow-through treatment of excess volume during heavy wet weather events. RTB's offer a variety of benefits including provision for a greater degree of flow control that enhances the hydraulics and pollution control for the wastewater collection system. This higher degree of flow control also offers natural environmental benefits as combined sewer overflows will be mitigated. The new headworks facility would include a new influent pumping station with a dry well – wet well configuration, multi rake screening, and vortex grit removal technologies. Exact sizing, layout, and other details for the RTB and new headworks facility are to be determined during the detailed design phase.

The recommended conceptual design for the Phase 2 Expansion will include the following upgrades at the existing LRPCP: (i) expanding the aeration tanks capacity by increasing tank volume, (ii) performing stress testing to re-rate the secondary clarifiers capacity, (iii) modifications to increase the capacity of the UV disinfection systems, (iv) provision for an effluent pumping station (to be confirmed through detailed design), and (v) addition of flow distribution chambers to redistribute flows between Plant 1 and 2 (to be confirmed through detailed design).

The recommended conceptual design for the Phase 3 Expansion will include the implementation of an additional treatment train (Plant 3) at the LRPCP to accommodate the projected DWFs from the service area. Based on the anticipated timeline for implementation, these works would not be covered under the validity period of this MCEA Process and therefore will be subject to a future study. In general, it is proposed that the Phase 3 Expansion to Ultimate Capacity be undertaken in a series of stages. Several treatment technologies or site layouts may be available to satisfy the capacity requirements and may be explored in more detail as a part of a future study.

This ESR comprises **Sections 1 to 10**, inclusive, and **Appendices A to E**, inclusive. A brief description of each section is as follows:

SECTION 1: INTRODUCTION

This section provides study background information (including applicable regulatory requirements and relevant municipal planning reports), purpose of the report, and a description of the Class EA process. This study and the resulting environmental study report are being undertaken in accordance with the requirements of the MEA Municipal Class EA.

SECTION 2: PROBLEM / OPPORTUNITY STATEMENT

This section identifies the problem / opportunity statement and establishes the project objective.

SECTION 3: WASTEWATER CAPACITY AND TREATMENT REQUIREMENTS

This section of the report provides an overview of the anticipated wastewater capacity and treatment requirements for the LRPCP Service Area in 20-years (20-year Design) and beyond the next 20-years (Ultimate Design). This section also presents a summary of the historical wastewater flows at the LRPCP, existing WWF / combined sewer overflow issues at the LRPCP, and servicing requirements for the Sandwich South area. The evaluation of alternative solutions and design concepts, Phase 2 and 3 of the Class EA process, was based on the wastewater capacity and treatment requirements outlined in this section.

SECTION 4: EXISTING CONDITIONS

Projects identified through this Class EA process must be evaluated based on the potential impact on the existing conditions of the study area. This section provides a general description of the existing natural environmental, social, and economic conditions in the study area as a basis for the potential impact analysis. Further, this section provides a description of the existing wastewater treatment facility including the existing sanitary collection system, pumping stations, and wastewater treatment facility.

SECTION 5: ALTERNATIVE DESIGN SOLUTIONS

This section outlines the work undertaken in fulfilment of Phase 2 of the Class EA process. This section involves the identification and evaluation of various alternatives solutions with the objective of determining which solution best addresses the problem / opportunity statement. The following broad planning level alternative solutions have been considered and evaluated for providing additional capacity for the LRPCP service area:

1. Do Nothing
2. Reduce WWF through I&I Reduction Efforts
3. Construct a WWFRF
4. Modify Operations of Existing Infrastructure
5. Discharge to New Sewage System
6. Upgrade Existing Treatment Trains at LRPCP
7. Add an Additional Treatment Train at LRPCP
8. Combination of Above Alternative

The recommended design solution is a combination of the above alternatives to be completed in three (3) phases.

SECTION 6: ALTERNATIVE DESIGN CONCEPTS

This section outlines the work undertaken in fulfilment of Phase 3 of the Class EA process. This section of the report identifies and evaluates alternative wastewater treatment technologies leading to the selection of the preferred conceptual design for the three (3) proposed phases. The evaluation process is based on minimizing undesirable social, natural environment, and economic impacts and this section of the ESR presents detailed rationale for each alternative design concept.

SECTION 7: OPINION OF PROBABLE COST

This section summarizes the opinion of probable cost for the recommended conceptual design.

SECTION 8: ENVIRONMENTAL IMPACTS AND MITIGATING MEASURES

This section identifies the environmental impacts of the preferred solution, describes the recommended mitigation measures and lists permits to be considered during the implementation phase.

SECTION 9: CONSULTATION

This section includes documentation of consultation with the public, review agencies, and Indigenous communities that occurred throughout Phases 1 through 4 of the Class EA study. In order to complete Phase 4 of the Class EA process, this report will be made available for review and comment by the public, review agencies, and Indigenous communities as a part of the consultation process.

1.0 INTRODUCTION

1.1 BACKGROUND INFORMATION

The Little River Pollution Control Plant (LRPCP) is located at 9400 Little River Road in the City of Windsor (City). The LRPCP provides secondary level treatment for municipal wastewater and industrial wastewater from the eastern portions of the City of Windsor and from the Municipality of Tecumseh. The sanitary service area for the LRPCP is shown in **Figure 1.1** of **Appendix A**. The LRPCP receives wastewater from the following sanitary trunk sewers:

- 1200 mm diameter Little River Sanitary Trunk Sewer, servicing the southeastern section of the City (Forest Glade).
- 2100 mm diameter North-East Windsor Trunk Sewer, servicing Sandwich South and the Town of Tecumseh (Oldcastle and County Road 22).
- 1500 mm diameter Windsor-Tecumseh Sanitary Sewer, servicing the lands east of the LRPCP within the City as well as the Town of Tecumseh (Tecumseh and St. Clair Beach).
- 900 mm diameter Edgar Avenue Sanitary Trunk Interceptor Sewer, servicing the lands generally between Little River Boulevard (north) and the EC Row Expressway / Tecumseh Road (south) from Pillette Road (west) to the LRPCP (east) within the City.
- 900 mm diameter Wyandotte Street Combined Trunk Sewer, servicing the lands between Wyandotte Street (north) and Little River Boulevard (south) from Virginia Avenue (west) to the LRPCP (east) within the City.
- 1050 mm diameter Clairview Avenue Sanitary Interceptor Sewer, servicing the lands between the Detroit River (north) and Little River Boulevard / Wyandotte Street (south) from Westminster Boulevard / Pillette Ave (west) to the City limit (east) within the City.

The LRPCP was commissioned in 1966 and has undergone several expansions since its inception. An overview of expansions and upgrades at the LRPCP is presented below:

- 1966: LRPCP began operation as a primary treatment plant with a rated capacity of 18 megaliters per day (MLD).
- 1974: Process was upgraded to “physical chemical” in 1974 to meet Provincial phosphorous removal requirements (through addition of an Activated Sludge system). Primary settlement tanks and final settlement tanks 3 and 4 were added.
- 1987 – 1989: Upgraded screening facilities and installed sludge removal pumps.
- 1993: LRPCP was expanded to a rated total treatment capacity of 72.8 MLD. Plant upgrades and expansions included a grit chamber, sludge pumps, aeration tank, UV treatment, blower building, and sodium hypochlorite disinfection.

Presently, the facility operates with reserve capacity with a 2017 - 2022 annual average daily flow rate of approximately 45 MLD (61.8% of the rated capacity). Major unit operations at the LRPCP include fine bar screening, inlet raw wastewater pumping station, grit removal, primary clarification, aeration tanks (activated sludge process), secondary clarification, UV disinfection, and sludge dewatering by centrifuges. The process schematic for the LRPCP is shown in **Figure 1.2** of **Appendix A**.

1.2 APPLICABLE MUNICIPAL PLANNING REPORTS

1.2.1 Sewer & Coastal Flood Protection Master Plan (SMP)

The City of Windsor, like many other municipalities, has experienced an increase in significant storm events in recent years. Basement flooding, coastal flooding, and surface flooding have occurred throughout the City as well as in surrounding municipalities. Coastal zones and low-lying areas, which include Riverside and a majority of East Windsor, are at considerable risk for flood events that can negatively impact the community and cause damage to municipal infrastructure, residential / commercial properties, and local transportation networks.

To better understand the causes and to develop solutions to reduce the risk of basement, surface, and coastal flooding, the City carried out a comprehensive study known as the Sewer & Coastal Flood Protection Master Plan (SMP). The SMP study was initiated in the Spring of 2018 and was completed in the Summer of 2020. The purpose of the SMP study was to understand the causes of flooding; identify locations of basement, surface, and coastal flooding; evaluate alternative solutions; complete high-level design and cost estimates for proposed infrastructure improvements; and provide an implementation strategy for the recommended solutions. The SMP report can be accessed through the following web link: **Completed Environmental Assessments (citywindsor.ca)**.

The SMP identified treatment capacity issues at the LRPCP and confirmed that during severe wet weather conditions the facility is unable to treat all WWF. The average daily capacity (72.8 MLD) of the LRPCP is substantially less than the predicted peak WWF for a severe storm event (upwards of 400 MLD). Further, the hydraulic conveyance of WWF is limited at the LRPCP by the inlet Pumping Station (PS), which has a capacity of 225 MLD. Based on the operating reports of the LRPCP, under wet weather conditions the plant can treat approximately 90 MLD. **Table 1.1** presents an overview of the operational procedure for overflows and bypasses at the LRPCP.

Table 1.1: LRPCP Operational Procedure for Overflow and By-Pass

Flow to the LRPCP	Discharge Type	Level of Treatment
Less than 90 MLD	Final Effluent	• Screening • Grit Removal • Primary Clarification • Aeration Tanks (Biological Treatment) • Secondary Clarification • UV Disinfection
Greater than 90 MLD AND Less than 225 MLD	Overflow	• Screening • Grit Removal • Disinfection (Chlorination)
Greater than 225 MLD	By-Pass	• No Treatment

During severe storm events, flow in excess of the LRPCP wet weather treatment capacity and up to the capacity of the inlet PS undergo screening, grit removal, and disinfection prior to discharge to the Little River Drain as an ‘overflow’. At the LRPCP, overflows occur downstream of screening and grit removal and upstream of the secondary treatment units. Due to the biological nature of the secondary treatment process, excessive flows cannot be treated.

During extreme storm events, flows in excess of the LRPCP inlet PS have potential to backup into the sanitary sewer system, increase the upstream hydraulic grade line (HGL), and increase the risk of basement flooding. To alleviate this risk, flows in excess of the inlet PS bypass the LRPCP to the nearby Pontiac Pumping Station and are discharged to the Little River Drain as a combined sewer overflow (CSO). These CSOs do not undergo any form of treatment. Quality analysis of the bypass flows indicate that incoming wastewater flows during these extreme storm events are primarily made up of stormwater resulting in a CSO with dilute sanitary characteristics. Through consultation undertaken as a part of the SMP, the Ministry of Environment, Conservation and Parks (MECP) indicated that any future expansion of the LRPCP should mitigate impacts from CSO discharges such that the total loading from all by-pass events have a net reduction over the established conditions.

As part of the SMP, the City considered short-term and long-term solutions to address flooding concerns. Short-term solutions were defined as those which can be implemented in a relatively short time (ex. 0 to 10 years) and/or do not require significant capital investment, such as low impact developments (LIDs), which reduce the quantity of precipitation getting into the sewer system. Through municipal policies, subsidy programs, and collaborative improvements stormwater infrastructure upgrades may be carried out. This may include the use of sewage ejector pumps, mandatory downspout disconnection, stormwater surcharges and green infrastructure credits, sanitary rain catchers and maintenance hole sealing, infrastructure maintenance and assessment, design standards, and sewer backflow prevention devices.

Long-term solutions were defined as those which will take longer than 10 years to implement and may involve a significant capital investment. These include measures to improve the sewer systems by increasing downstream outlet capacity through increased pumping capacity or enlarging outlets to receiving systems, source control and private property measures, reducing sanitary sewer inflow and infiltration, combined sewer separation, coastal protection through overland flood barriers and backflow prevention, and improving sewer system conveyance and storage capacity.

In the SMP, the recommended short-term solution to address the WWF capacity issues at the LRPCP is to upgrade the plant’s existing bypass (Pontiac Pumping Station) to provide emergency relief to the sanitary sewer system during WWF events. This proposed work is discussed in more detail in **Section 1.2.4**.

In the SMP, the recommended long-term solution to address the WWF capacity issues at the LRPCP is to upgrade the plant’s inlet PS capacity to provide additional relief to the sanitary sewer system during WWF events. Upgrading the capacity of the LRPCP inlet PS is considered a large undertaking and therefore it was recommended to be considered in conjunction with upgrades or expansion of the LRPCP.

1.2.2 Sandwich South Master Servicing Plan (SSMSP)

The Sandwich South area represents a significant growth opportunity for the City encompassing approximately 2,600 hectares of land which were brought into the City of Windsor in 2002. The area is located on the southeast side of the City and is primarily agricultural land with some industrial and residential properties. It is anticipated that significant growth will occur in Sandwich South over the next 20 years and will include residential, commercial, institutional, and industrial land uses. The most notable and imminent developments in this area include the New Windsor/Essex Acute Care Hospital and the Nexstar Battery Plant.

In 2006 (Addendum 2014), Stantec Consulting Ltd. was retained to prepare a sanitary sewage plan for the region of Sandwich South. At this time, it was determined that in order to accommodate all planned future development the capacity of the LRPCP would need to be increased. Therefore, it was recommended for the City to undertake a Schedule C Municipal Class EA. In 2021, the City initiated a master servicing plan for the Sandwich South area focused on providing the required municipal infrastructure in support of growth. The Sandwich South Master Service Plan (SSMSP) satisfied Phase 1 and 2 of the Municipal Class EA process and made recommendations for location and capacity of road networks, stormwater sewers, and sanitary sewers as well as requirements for stormwater management ponds, LIDs, and natural environmental areas.

Wastewater flow from the Sandwich South service area will be divided such that 1,933 hectares are allocated to the LRPCP, and 68 hectares are allocated to the LRWRP. An average daily sewage generation rate of 360 L/cap/day and an extraneous flow allowance of 0.156 L/s/ha were used to calculate the projected flow from the Sandwich South service area. These values are consistent with the design criteria outlined in the City of Windsor Development Manual. **Table 1.2** presents an overview of the proposed design flows to the LRPCP from the Sandwich South Service Area.

Table 1.2: Sandwich South Service Area – Design Flow to the LRPCP

Characteristic	Value
Sanitary Drainage Area	1,998 ha
Total Sanitary Design Population	86,009 persons
Peak Design Flow	2,313 L/s
➢ Flow from Oldcastle (8th Concession Trunk Sewer)	325 L/s
➢ Flow from Tecumseh Hamlet (Banwell Trunk Sewer)	983 L/s
➢ Flow from Sandwich South Lands	1,005 L/s
Downstream Sewer Size	2100 mm
Downstream Sewer Capacity	2,630 L/s

1.2.3 Town of Tecumseh Water and Wastewater Master Plan

A Water and Wastewater Master Plan Update for the Town of Tecumseh was completed in 2018 which builds upon the information contained within the 2002 Water and Wastewater Servicing Master Plan, 2005 Amendment to the Water Servicing Plan, and 2008 Update to the Water and Wastewater Master Plan. The purpose of the 2018 report was to update the planning projections for a 2036+ planning horizon and provide a technical review of the servicing strategies for the Town. The 2018 report was completed in accordance with Phases 1 and 2 of the Class EA process and fulfills requirements for Schedule B projects.

The Town of Tecumseh is located east and southeast of the City of Windsor and contains the urban settlement areas of Tecumseh, St. Clair Beach, Tecumseh Hamlet, Oldcastle Hamlet, and Maidstone Hamlet. The wastewater from the settlement areas in the Town are treated through a Wastewater Servicing Agreement between the Town and the City. The wastewater produced is partitioned and treated at the LRWRP and LRPCP. In the current wastewater servicing agreement, the town is allocated a maximum average daily flow of 19.8 MLD at the LRPCP and 2.72 MLD at the LRWRP. There is an option to purchase additional capacity to reach up to 38.0 MLD, subject to contributing to the capital cost of plant expansion. Further, the Town is allocated a maximum peak flow of 1,308 L/s to the LRPCP and 85 L/s to the LRWRP.

Table 1.3 outlines the wastewater servicing needs for the Town of Tecumseh as shown in the Water and Wastewater Master Plan. The projected wastewater flows to the LRPCP are anticipated to exceed the current allotted average daily flow and peak flow capacity at the LRPCP on the 2036+ horizon.

Table 1.3: Town of Tecumseh – Wastewater Servicing Demands

Sub-Service Area	Population (persons)		Average Flow to LRPCP (MLD)		Peak Flow to LRPCP (L/s)	
	2016	Projected (2036+)	2016	Projected (2036+)	2016	Projected (2036+)
Tecumseh	12,180	15,380	6.5	7.7	406	456
St. Clair Beach	3,484	3,894	2.1	2.2	191	199
Tecumseh Hamlet	5,264	13,683	2.9	8.9	236	524
Maidstone Hamlet	335	2,259	-	1.2	-	68
Oldcastle Hamlet	350	10,947	0.4	7.4	22	286
Highway Service Area	-	-	-	0.6	-	29
Rural	1,617	1,617	-	-	-	-
Total	**23,229**	**47,756**	**11.9**	**28.0**	**855**	**1,563**

1.2.4 Pontiac Pumping Station Upgrades Environmental Study Report

The SMP study identified the Pontiac stormwater drainage area and LRPCP sanitary collection area as areas of concern. These areas are at high risk for basement and surface level flooding during a significant storm event because the Pontiac Pumping Station does not have adequate capacity to remove water from the stormwater system or sanitary system (in the case of a bypass event at the LRPCP). Further, the SMP identified that the hydraulic grade line (HGL) in the stormwater collection system did not meet the recommended level of service for a 1 in 100-year storm event. These findings are consistent with observed and reported data during severe storm events. Failure to have adequate infrastructure in place will negatively impact the community and may cause damage to infrastructure, properties, and local transportation networks. It was anticipated that the LRPCP would be expanded in the future to provide wastewater treatment capacity for anticipated development throughout East Windsor and Tecumseh. However, the recommended short-term solution to address the WWF capacity issues at the LRPCP is to upgrade the plant's existing bypass (Pontiac Pumping Station) to provide emergency relief to the sanitary sewer system during WWF events.

The Pontiac Pumping Station, which is located on the site of the LRPCP, is a stormwater pumping station that services the Pontiac drainage area and acts as an emergency bypass for the LRPCP in the case of a severe storm event. The SMP identified the need for a new wet well structure to house three (3) 1.25 m^3/s pumps to lower the HGL in the stormwater collection system and increase capacity to provide a 1:100-year storm level of service for the extended Pontiac drainage area. The planning and consultation undertaken as part of the SMP satisfied Phase 1 and 2 of the Class EA process.

In fulfillment of Phase 3 and 4 of the Class EA process, the 'Pontiac Pumping Station Upgrades at the Little River Pollution Control Plant' study was undertaken. Alternative design concepts including pumping technologies and site layout were identified and evaluated leading to the selection of a preferred conceptual design for Pontiac Pumping Station. The recommended pump technology was axial flow pumps. The recommended site layout would feature the new wet well structure and generator to the south of the existing Pontiac Pumping Station with discharge to the existing Pontiac Pumping Station outlet channel and subsequently to the Little River Drain. The upgrades completed as a part of this project will increase the level of service in the expanded Pontiac drainage area and provide capability for a controlled bypass of the LRPCP in the event of a severe storm event.

Further, as a part of this study, it was identified that the treatment process at the LRPCP was originally designed to facilitate gravity flow through the plant based on the predicted high-water level in the Detroit River. The current predicted high-water level in the Detroit River, based on climate change studies, is significantly higher than that used in the original design of the plant. As a result of this increase, it is unlikely that gravity flow through the existing plant will be possible during peak flow events and high-water level conditions. Pumping of effluent during these periods will be required to maintain operation of the treatment process, reduce backups in the sewer system, and minimize sewage bypasses.

It was recommended that an analysis of the need for effluent pumping from the LRPCP be undertaken using the current predicted ultimate water level in the Detroit River. If the need for effluent pumping is confirmed, a planning level study should be done to determine approximate sizing and location for the effluent pumping facilities and to identify any potential areas of conflict between the two undertakings. If the need for effluent pumping is confirmed there may well be an opportunity during final design to achieve some synergy and cost savings in the structures and equipment needed for the two projects.

1.2.5 Biosolids Management Strategy Environmental Study Report

The City of Windsor owns and operates two municipal wastewater treatment plants, the Lou Romano Water Reclamation Plant (LRWRP) and the Little River Pollution Control Plant. The LRWRP provides secondary level treatment for municipal and industrial wastewater from the central and western portions of the City and from the northern area of the Town of LaSalle. The plant has a rated primary treatment capacity of 273 MLD, and a rated secondary treatment capacity of 218 MLD. The liquid treatment process at the LRWRP consists of coarse and fine screening, grit removal, primary enhanced clarification, biological aerated filtration (BAF), and UV disinfection.

The LRWRP and LRPCP produce approximately 8,500 and 2,500 dry tonnes of biosolids each year, respectively. The dewatered biosolids, which have a dry solids content of approximately 30%, are heat dried and pelletized at the City-owned Windsor Biosolids Processing Facility (WBPF). The finished pellets are used as a Class A fertilizer and soil conditioner throughout Southwestern Ontario. The servicing contract and upgrade requirements for the WBPF will be revisited by 2029 as the capacity of existing biosolids management facility is unable to accommodate projected wastewater biosolids or community growth.

To address biosolids management needs at the two wastewater treatment plants, the City initiated a study to identify the preferred means of processing biosolids. A primary goal of this study was to prioritize solutions which would move the two wastewater treatment plants towards a 'net-zero' energy future and improve upon energy conservation commitments outlined in the City of Windsor Corporate Energy Management Plan and Community Energy Plan. To achieve this goal, the biosolids management strategy will consider biosolids management solutions that improve energy efficiency, plan for effective land use, reduce energy consumption, limit greenhouse gas (GHG) emissions, and promote green energy solutions.

In fulfillment of Phase 2 of the Class EA process, alternative design solutions for the management of wastewater residuals from the two WWTPs were identified and evaluated based on a variety of social, natural environmental, economic, and technical criteria. The most preferred alternative and therefore the recommended solution was determined to be 'Anaerobic Digestion and Biogas Utilization'.

In fulfillment of Phase 3 of the Class EA process, alternative design concepts (technical alternatives) for the preferred solution were identified and evaluated with the objective of determining which alternative best addresses the preferred solution. The most preferred alternatives and therefore the recommended design concepts were determined to be:

- Sludge Handling Alternative → LRPCP Sludge Cake Trucked to Anaerobic Digestion Facility
- Sludge Pretreatment Alternative → Thermal Pretreatment via THP
  (Interim Solution – No Pretreatment)
- Type of Anaerobic Digestion Alternative → Mesophilic Anaerobic Digesters
- Site Selection Alternative → WBPF
- Digestate Handling Alternative – Solids Disposal → Storage and Land Application
  (Interim Solution – Continued use of WBPF)
- Biogas Utilization Alternative → Combined Heat and Power

Under this strategy, the biosolids produced in the City's two WWTPs would be processed at a centralized anaerobic digestion facility. The biogas produced from the anaerobic digesters is a form of renewable energy which can be used as a source to produce heat, electricity, and/or fuel. Biogas utilization within the City is expected to result in significant energy savings and reduced GHG emissions for the two wastewater treatment facilities.

1.2.6 Climate Change Adaptation Plan

The Intergovernmental Panel on Climate Change (IPCC) noted that it is increasingly clear climate change has influenced several variables, including precipitation and snowmelt, which may contribute to localized flooding. Climate change and more specifically anthropogenic influence has contributed to the intensification of extreme precipitation events worldwide. In North America, the likeliness of heavy precipitation events is set to increase in the future resulting in more frequent, intense, and unpredictable precipitation events. The City has a long-standing commitment to both Climate Change Mitigation and Adaptation Planning. This corporate environmental commitment was made through the development of an Environmental Master Plan in 2017 which was further developed through the Climate Change Adaptation Plan in 2020.

In the Windsor Climate Change Adaptation Plan, the City determined that average precipitation values are expected to increase in the future, particularly in the seasons of winter and spring. The summer months may see a slight decrease in precipitation coupled with increasingly warm seasonal temperatures. In terms of extreme precipitation, the intensity and frequency of events is expected to increase in the future corresponding to a 25% increase in 10-year storm events and 40% increase in 100-year storm events. For example, the City has already experienced two 100-year storms in the years 2016 and 2017. On average more rain is expected to fall (in terms of intensity, mm/hr and total depth, mm) during these periods of extreme precipitation. The water levels in Lake Erie and Lake St. Clair have been above average values since 2013 and, in 2019, the Detroit River reached a high-water level of 176.08 meters. In the near climate future, water levels are expected to continue to be high. In the distant climate future, the water levels are projected to decrease in the Great Lakes partially due to warmer temperatures and changing precipitation patterns.

The City will continue to prepare for the climate future by creating a more climate resilient city. The City will continue to minimize climate change risks to the community through the advancement of sustainable policies, infrastructure investment, and public education. Forward thinking and proactive steps will benefit the community health, environment, and economy. The climate change mitigation and planning objectives for the City of Windsor include:

1. Integrate Climate Change Thinking and Response
2. Protect Public Health and Safety
3. Reduce Risk to Buildings and Property
4. Strengthen Infrastructure Resilience
5. Protect Biodiversity and Enhance Ecosystem Functions
6. Reduce Community Service Disruptions
7. Build Community Resilience

This Class EA will address WWF concerns at the existing LRPCP and recommend improvements to provide flood relief to the LRPCP sanitary servicing area. This project will address the City's climate change adaptation plan objectives by strengthening the infrastructure resilience, reducing risk to buildings and property, and protecting public health and safety.

1.2.7 Environment and Energy Management Planning Reports

The City of Windsor has a long-standing commitment to the environment including energy management, climate change mitigation, and long-term adaptation planning. This corporate environmental commitment has been established through the development of numerous environmental plans over the past few decades, including:

1. Corporate Energy Management Plan
2. Environmental Master Plan
3. Community Energy Plan
4. Corporate Climate Action Plan
5. Integrated Onsite Energy Master Plan

The City of Windsor Corporate Energy Management Plan (CEMP) was prepared in compliance with the Broader Public Sector: Energy Reporting and Conservation and Demand Management Plans (O. Reg. 507/18) of the Electricity Act. As per this regulation the CEMP is updated on a five-year basis with the most recent amendment posted in 2019. The CEMP records and evaluates energy consumption and costs for all municipally owned buildings and facilities. Further, the CEMP identifies strategies to reduce energy consumption, benefit the environment, and mitigate costs to the City.

The City of Windsor Environmental Master Plan (EMP) was originally developed in 2006 and was amended in 2012. The EMP acts as a guide for the municipality to address environmental issues with the goals to make the City cleaner, greener, healthier, and more sustainable. The purpose of the EMP is to identify actions the municipality can take over the short and long term to improve the City's environment. The five main goals of the EMP are to (A) Improve Our Air and Water Quality, (B) Create Healthy Communities, (C) Green Windsor, (D) Use Resources Efficiently, and (E) Promote Awareness.

The Community Energy Plan (CEP) is an extension of the EMP and was approved by council in 2017. The plan focuses on improving energy efficiency, effective land use planning, reducing energy consumption, limiting Greenhouse Gas (GHG) emissions, and promoting smart / green energy solutions. The CEP provides recommendations for municipal projects and identifies opportunities to incorporate smart energy solutions in various municipal programs such as the Official Plan, strategic plans, community economic strategies and development priorities.

The Corporate Climate Action Plan (CCAP) is an extension of the CEP and was approved by council in 2017. This plan focuses on reducing energy and GHG emissions from municipal operations and fleets. The CCAP sets emission reduction targets in order to develop a local action plan and provides recommendations for municipal projects.

The City of Windsor Integrated Onsite Master Plan was completed by Stantec Consulting Ltd. in 2020. This study was undertaken as the next step of the CEP and the CCAP in reducing energy use and mitigating climate change impacts for the two municipal wastewater treatment plants. The goal of this study was to identify strategies and provide a list of actions that will move the two wastewater treatment plants towards a "net-zero" energy future and significantly reduced GHG emissions. This Master Plan Study made recommendations for (1) process improvements, lighting/electricity improvements, and energy battery storage at the LRWRP and LRPCP; (2) energy recovery options through anaerobic digestion and biogas utilization; and (3) sustainable energy initiatives and technologies (solar energy).

1.3 REGULATORY REQUIREMENTS

1.3.1 Class Environmental Assessment Process

The Ontario *Environmental Assessment Act* (the Act) aims to protect, conserve, and properly manage the natural, social, cultural, built, and economic environments as undertakings are planned and implemented in Ontario. The Act provides a means for the public or interested groups to receive the needed assurances that the environment is being protected from adverse effects on any significant public project. If there are necessary adverse effects on the environment, the public also needs assurance that all essential measures are being taken to minimize these impacts. The proponent is to weigh the impacts of several possible alternative ways to achieve the desired objective and to select the best alternative based on a thorough examination of each.

The Act recognized that certain municipal undertakings occur frequently, are small in scale, have a generally predictable range of effects or have relatively minor environmental significance. To ensure that a degree of standardization in the planning process is followed throughout the Province, the Act provides for the preparation of class EAs for approval by the Ministry of Environment, Conservation, and Parks. A Class EA is an approved planning document that specifies the processes for which the proponent agrees to follow. The work undertaken in preparation of this study report follows the planning and design process of the Municipal Engineers Association (MEA) Class EA, October 2000, as amended in 2007, 2011, 2015, and 2023.

This report also serves as a statement for public use in the decision-making process under the Act. Municipal staff and consultants can use the Class EA process in planning, design, and construction of projects to ensure that the requirements of the Act are met. Granted the approved Class EA procedure is abided by the implementation of projects within the class EA do not require further approval under the Act. There are three approval mechanisms available to the proponent under the Class EA:

- **Eligible for Screening to Exempt** (Previously known as **Schedule A** or **Schedule A+**) projects are limited in scale, have minimal adverse environmental effects, and include several normal or emergency municipal maintenance and operational objectives. Projects listed in these schedules are now exempt from the Act.
- **Schedule B** projects generally include improvements and minor expansions to existing facilities. In these cases, there is a potential for some adverse environmental impacts and therefore the

proponent is required to proceed through a screening process including consultation with those who may be affected.

- **Schedule C** projects generally include the construction of new facilities and major expansions to existing facilities. These projects proceed through the environmental assessment planning process outlined in the Class EA and require preparation of an Environmental Study Report (ESR) to document the planning process.

The preferred solution has multiple activities identified under multiple Class EA schedules. Therefore, this project is being completed under the Municipal Class EA as a **Schedule C** activity, which is the highest identified schedule. Upon completion of Phase 1 through 4 for Schedule C projects, the Owner may proceed directly to Phase 5 and implement the preferred solution.

1.3.2 Phases in Municipal Class EA Process

Figure 1.3 in **Appendix A** illustrates the steps followed in the planning and design of projects covered by the Municipal Class EA. The Class EA for municipal projects follows a five-phase planning process that can be summarized as follows:

Phase 1 – Identification of the problem

Phase 2 – Identification of alternative solutions to the problem, consultation with review agencies and the public, selection of the preferred solution, and identification of the project as Exempt, Eligible for Screening to Exempt, or a Schedule B or C activity.

Phase 3 – Identification of alternative design concepts (technical alternatives) for the preferred solution, evaluation of the alternative designs and their impacts on the environment, consultation with review agencies and the public and selection of the preferred design.

Phase 4 – Preparation of an Environmental Study Report to document the planning, design, and consultation process for the project. The ESR is placed on the public registry for scrutiny by review agencies and the public.

Phase 5 – Final design, construction, and commissioning of the selected technical alternative. Monitoring of construction for adherence to environmental provisions and commitments.

1.3.3 Additional Provincial Legislation

Table 1.4 outlines some of the key Provincial Legislation that will be referenced throughout this Municipal Class EA Process, their application, and the corresponding ESR sections (if applicable).

Table 1.4: Additional Provincial Legislation

Provincial Legislation	Application and ESR Section
Planning Act of Ontario and Provincial Policy Statement (PPS)	The Provincial Policy Statement (PPS) is a consolidated statement of the government's policies on land use planning. The PPS was issued in 2020 under the *Planning Act* and as such all decisions affecting planning matters shall be

Provincial Legislation	Application and ESR Section
	consistent with the Provincial Policy Statement. The PPS is a key consideration for identifying land-use planning objectives and evaluating alternative design concepts throughout this ESR. **Section 4.4.1 - Provincial Policy Statement** and **Section 8.0 - Environmental Impacts and Mitigating Measures.**
Ontario Heritage Act (OHA)	The *Ontario Heritage Act* issued in 1990 allows municipalities and provincial government to designate individual properties and districts as being of cultural heritage value or interest. With the objective to support, encourage, and facilitate the conservation, protection, and preservation of the heritage of Ontario. The OHA is a key consideration for identifying resources of historical, architectural, archaeological, recreational, aesthetic, natural and scenic interest and evaluating alternative design concepts throughout this ESR. **Section 4.4 - Cultural Heritage Environment within the Study Area** and **Section 8.0 - Environmental Impacts and Mitigating Measures.**
Endangered Species Act and *Fisheries Act*	The *Endangered Species Act* (1) identifies species at risk based on the best available scientific information, including information obtained from community knowledge and aboriginal traditional knowledge; (2) protects species that are at risk and their habitats, and to promote the recovery of species that are at risk; and (3) promotes stewardship activities to assist in the protection and recovery of species that are at risk. The *Fisheries Act* prohibits causing the death of fish and the harmful alteration, disruption, or destruction (HADD) of fish habitat and applies to work being conducted in waters that support fish and fish habitat. The *Endangered Species Act* and *Fisheries Act* are key considerations for identifying natural heritage resources and their habitats for use in evaluating alternative design concepts throughout this ESR. **Section 4.3 - Natural Environment within the Service Area** and **Section 8.0 - Environmental Impacts and Mitigating Measures.**
Water Opportunities and Conservation Act	The purpose of the *Water Opportunities and Conservation Act* is to (a) foster innovative water, wastewater, and stormwater technologies, services and practices; (b) create opportunities for economic development and clean-technology jobs in Ontario; and (c) conserve and sustain water resources for present and future generations. Innovative wastewater treatment technologies and best practices will be considered throughout this Class EA Process.
Safe Drinking Water Act and *Clean Water Act*	The purpose of the *Safe Drinking Water Act* is to provide for the protection of human health and the prevention of drinking water health hazards through the control and regulation of drinking water systems and drinking water testing. Further the *Clean Water Act* was instated to protect existing and future sources of drinking water. For the protection of local municipal drinking water sources, the Essex Region Source Protection Plan (SPP), which has been established under the *Clean Water Act*, 2006 (Ontario Regulation 287/07), came into effect on October 1, 2015. Source Water Protection is discussed in **Section 8.2.8 - Source Water Protection.**
Environmental Protection Act and *Ontario Water Resources Act*	The *Environmental Protection Act* is the key legislation for environmental protection in Ontario. It grants the Ministry of the Environment, Conservation and Parks broad powers to deal with the discharge of contaminants causing negative effects. The *Water Resources Act* regulates sewage disposal and "sewage works" and prohibits the discharge of polluting materials that may impair water quality. The *Environmental Protection Act* and the *Ontario Water Resources Act* will be referenced throughout this Class EA as needed. This may include O. Reg. 406/19 entitled 'On-site and Excess Soil Management' and O. Reg. 63/16 entitled 'Registrations Under Part II.2 of the Act — Water Taking'.

Provincial Legislation	Application and ESR Section
	Section 8.0 - Environmental Impacts and Mitigating Measures.
Nutrient Management Act	The purpose of the *Nutrient Management Act* 2002 is to provide for the management of materials containing nutrients in ways that will enhance protection of the natural environment and provide a sustainable future for agricultural operations and rural development. 'Nutrient' includes any material that can be applied to land for the purpose of improving the growing of agricultural crops. Therefore, residual solids from the wastewater treatment process (also known as biosolids) at the LRPCP would be included in this designation. Although the handling of biosolids from the LRPCP is primarily covered in the City of Windsor Biosolids Management Strategy Environmental Study Report, the *Nutrient Management Act* will be considered throughout this Class EA as needed.

1.4 PURPOSE OF REPORT

This is an ESR for the LRPCP that provides a summary of the rationale, planning, design, and consultation process for this Municipal Class EA. The ESR will satisfy the Class EA process for 'Schedule C' projects which will include identification and description of the problem or opportunity, identification and evaluation of alternative solutions, and identification and evaluation of design concepts leading to the recommended conceptual design for the LRPCP. The decision-making process is based upon minimizing undesirable impacts on the natural, social, and economic environments thus, the ESR presents the rationale for decisions made. Where impacts on the environment are unavoidable, proposed mitigating measures are presented for consideration to minimize those impacts.

2.0 PROBLEM / OPPORTUNITY STATEMENT

2.1 GAP ANALYSIS

In order to support the definition of the problem / opportunity statement for the Little River Pollution Control Plant, a gap analysis was performed. Gap analysis for this project included (1) defining the current state of the LRPCP, (2) identifying the desired state of the LRPCP based on best practices, and (3) identifying the current gaps between the current and desired state. Through this gap analysis, problems or opportunities for improvement at the LRPCP have been identified and specific actions / requirements to address these issues are summarized. **Table 2.1** outlines the gap analysis for this Municipal Class EA Process.

Table 2.1: Gap Analysis

Description	Current State	Desired State / Gap
Hydraulic Capacity (By-Pass)	During severe wet weather conditions, the LRPCP is unable to treat all WWF. The average daily capacity (72.8 MLD) of the LRPCP is substantially less than the predicted peak WWF for a severe storm event (upwards of 400 MLD). The hydraulic conveyance of WWF is limited at the LRPCP by the inlet Pumping Station, which has a capacity of 225 MLD. To provide relief to the sanitary sewer system during WWF events the capacity of the plants inlet pumping station and primary treatment processes should be increased.	The LRPCP expansion should accommodate primary treatment of the anticipated instantaneous peak WWF for a severe storm event. An analysis of the anticipated WWFs should be undertaken for the LRPCP service area using the criteria outlined within the City of Windsor Development Manual, Sandwich South Master Servicing Plan, and as provided by the Town of Tecumseh.
Treatment Capacity	The Sandwich South area represents a significant growth opportunity for the City encompassing approximately 2,600 hectares of land which were brought into the City of Windsor in 2002. It is anticipated that significant growth will occur in Sandwich South over the next 20 years and will include residential, commercial, institutional, and industrial land uses. This area is anticipated to accommodate development for approximately 86,009 people, corresponding to an additional daily average sewage flow of 31.2 MLD and an additional peak sewage flow of 1,053 L/s. To accommodate all planned future development the capacity of the LRPCP would need to be increased.	The LRPCP expansion should accommodate increased wastewater flow requirements from the existing service areas and the Sandwich South community. An analysis of the anticipated sewage flows should be undertaken for the LRPCP service area based on the City of Windsor Development Manual, Sandwich South Master Servicing Plan, and Town of Tecumseh Water and Wastewater Master Plan.
Hydraulic Grade Line through the LRPCP (Effluent Pumping Requirements)	The LRPCP was originally designed to facilitate gravity flow through the plant based on the predicted high-water level in the Detroit River (1966). The current predicted high-water level in the Detroit River, based on climate change studies, is significantly higher than that used in the original design of the plant. As a	The LRPCP expansion should allow for gravity and/or pumped discharge to the Little River or Detroit River based on the new high-water level from recent climate change studies. At the time of detailed design, an analysis of the need for effluent pumping from the

Description	Current State	Desired State / Gap
	result of this increase, it is unlikely that gravity flow through the existing plant will be possible during peak flow events and high-water level conditions. Pumping of effluent during these periods may be required to maintain operation of the treatment process, reduce backups in the sewer system, and minimize sewage bypasses.	LRPCP should be undertaken using the current predicted ultimate water level in the Detroit River.
Aging Infrastructure and Equipment	The LRPCP was originally constructed in 1965 and has undergone several expansions since it was commissioned, and most recent upgrades were completed in 1993. Asset condition assessments completed in 2019 indicate that the overall condition of the LRPCP is fair-to-good with 14%, 38%, and 37% of assets identified to be in very good, good, and fair condition, respectively. Generally speaking, the LRPCP has been well maintained throughout its operating history. However, infrastructure and equipment at the existing LRPCP is continuing to age with the original 1966 portion of the facility requiring major rehabilitation.	The LRPCP expansion should incorporate modern, innovative, and reliable wastewater treatment technologies and best management practices where possible. This Class EA study will consider the aging infrastructure and equipment in the existing LRPCP. The implementation of any expansions should consider alternatives which would minimize requirements for maintenance and operation of the existing LRPCP (for example, evaluate the partitioning of flows between the existing and new facility if applicable).
Energy Efficiency	Historical electricity usage from 2014 to 2018 indicated that the LRPCP consumed an average of 5,765 MWh of electricity costing $0.7 million dollars per year. The most significant sources of energy consumption at the LRPCP are the inlet pumping station and the secondary treatment (aeration) processes. When compared to other wastewater treatment facilities, the LRPCP electrical intensity (370 kWh/ML) is within the average electricity consumption at typical activated sludge wastewater treatment plants (265 to 590 kWh/ML).	The LRPCP expansion should incorporate wastewater treatment technologies and best management practices that improve energy efficiency where possible. This Class EA study will prioritize solutions and design concepts that improve energy efficiency / consumption and promote green energy solutions.

2.2 PROBLEM / OPPORTUNITY STATEMENT

The LRPCP was originally commissioned in 1966 and was designed to service the existing residents and accommodate development within the boundaries of the LRPCP Service Area. The LRPCP has undergone multiple improvements since its inception, which have upgraded the facility from a primary level treatment plant with a rated capacity of 18 MLD (1966) to secondary level treatment plant with a rated capacity of 72.8 MLD (1993 Upgrades). Historic sewage flows recorded at the LRPCP show that the facility is operating below its rated capacity, with an annual average daily flow rate of approximately 45 MLD (61.8% of the rated capacity).

The City of Windsor Sewer and Coastal Flood Protection Master (2020) and Sandwich South Master Service Plan (2021) identified the need to upgrade the existing LRPCP. The SMP outlined hydraulic capacity issues at the LRPCP and confirmed that during severe wet weather conditions the facility is unable to treat all WWF resulting in combined sewer overflows. The SSMSP discussed the treatment capacity limitations of the existing LRPCP and recommended increasing the capacity to accommodate the future Sandwich South development. Further to these planning reports, gap analysis has identified the need to evaluate and include considerations for the hydraulic grade line through the LRPCP (effluent pumping requirements), aging infrastructure and equipment, and energy efficiency.

In order to mitigate impact of combined sewer overflows and accommodate development in Sandwich South, the City of Windsor has initiated this Schedule 'C' Class EA for the Expansion of the Little River Pollution Control Plant. In general, the study objective is to follow the planning process defined under the *Environmental Assessment Act* to arrive at an environmentally responsible and cost-effective solution to address the need for additional capacity at the LRPCP. This ESR will identify, evaluate, and report on the preferred design solution and design concepts to address this problem / opportunity statement.

3.0 WASTEWATER CAPACITY AND TREATMENT REQUIREMENTS

3.1 CAPACITY REQUIREMENTS

This section of the ESR provides an overview of the historic flows to the LRPCP as well as the anticipated wastewater flow for the service area in 20-years (20-year Design) and beyond 20-years (Ultimate Design). The proposed built-out sanitary service area for the LRPCP is shown in **Figure 3.1** of **Appendix A**.

3.1.1 Historic Flow Conditions at the LRPCP

Historical annual wastewater flows to the LRPCP from 2017 to 2023 are summarized in **Table 3.1**. The average daily sewage flow over the period was approximately 45 MLD, representing 61.8% of the rated capacity of the LRPCP (72.8 MLD). The most recent three-year annual average daily flow rate (2021 – 2023) is approximately 41 MLD, representing 57 % of the rated capacity. With the exception of a significantly drier weather year in 2022 (annual precipitation of 596 mm), the annual average daily sewage flows were relatively constant over the period.

Table 3.1: Historic Flow Conditions at the LRPCP (2017 – 2023)

Year	Annual Average Daily Flow (MLD)	Annual Peak Dry Weather Flow (MLD)	Annual Peak Wet Weather Flow (MLD)	Annual Inlet Volume (ML)	Annual By-Pass Volume (ML)	Annual Overflow Volume (ML)	Annual Total Precip. (mm)
2017	45.5	110.7	188.5	16,619	40	779	1,081
2018	48.2	113.2	320.1	17,616	218	1,219	928
2019	47.4	113.6	214.2	17,301	22	565	815
2020	47.0	113.3	241.1	17,175	138	777	814
2021	42.3	112.8	183.2	15,440	193	1,080	816
2022	37.2	115.1	195.2	13,601	24	139	596
2023	44.3	115.7	216.0	16,164	161	696	804[1]
Avg.	**44.6**	**-**	**-**	**16,274**	**114**	**751**	**836**

Notes:
Maximum Peak Dry Weather Flow (DWF) = 115.7 MLD
Maximum Peak Wet Weather Flow (WWF) = 320.1 MLD
(1) Precipitation Data from Government of Canada – Windsor Station is incomplete for the Year 2023; therefore, this value includes precipitation data from the nearby Amherstburg Station for the months of September – December.

The LRPCP collection system is primarily a sanitary sewer system with a small portion of the service area containing combined sewers (sanitary and stormwater). During severe storm events, extraneous flows into the collection system can result in significant increases in flow to the LRPCP. The daily maximum flow to the LRPCP can vary significantly from the average daily flow due to the contribution of wet weather inflow and infiltration. Based on the average daily sewage flow from the period of 44.6 MLD and the maximum peak DWF of approximately 116 MLD, the maximum daily flow factor is 2.6. Based on the maximum peak WWF of approximately 320 MLD, the WWF factor is 7.2. Historic records from 2023 indicated that the flows to the LRPCP exceeded the Rated Capacity (72.8 MLD) a total of 78 times and exceeded the peak DWF value (116 MLD) a total of 18 times. This suggests a moderately high level of extraneous flow (infiltration and/or inflow (I/I)) entering the collection system.

During severe storm events, flow in excess of the LRPCP wet weather treatment capacity and up to the capacity of the inlet PS undergo screening, grit removal, and disinfection prior to discharge to the Little River Drain as an 'overflow'. Over the period of 2017 to 2023 the average annual overflow volume ranged from 139 ML to 1,219 ML. The average overflow volume for the period was 751 ML which equates to approximately 4.6 % of the flow entering the LRPCP becoming an overflow and foregoing secondary treatment.

During extreme storm events, flows in excess of the LRPCP inlet PS have potential to backup into the sanitary sewer system and increase the risk of basement flooding. To alleviate this risk, flows in excess of the inlet PS bypass the LRPCP to the nearby Pontiac Pumping Station and are discharged to the Little River Drain. Over the period of 2017 to 2023 the annual bypass volume ranged from 22 ML to 218 ML. The average bypass volume was 114 ML which equates to approximately 0.7 % of flow reaching the LRPCP becoming a bypass and foregoing any form of treatment. To mitigate risk of untreated by-pass events and provide relief to the sanitary sewer system during WWF events the capacity of the plants inlet pumping station and primary treatment processes should be increased to accommodate primary treatment of the peak WWF for a severe storm event. The capacity requirements for these improvements are identified in the following sections of this ESR.

3.1.2 Inflow and Infiltration Reduction in the LRPCP Service Area

The City of Windsor has implemented and is planning to continue to improve upon Inflow and Infiltration (I&I) Reduction Programs throughout the region. Reduction of I&I is a complex and significant challenge facing many municipalities throughout Ontario. However, there are numerous opportunities available to improve for which the City has developed a multi-faceted approach. As outlined in the SMP, the City recently invested in the construction, operation, and ongoing maintenance of its collection system. The SMP document provides an understanding of the current state of the infrastructure, including sources of extraneous I&I into the system, and outlines the strategic investments required over the next decades to continuously improve system performance while accommodating the elevated growth projections and remaining resilient to the impacts of climate change. Per the SMP, it is believed that approximately 70% of the I&I in Windsor is contributed from private lands and 30% is contributed from public owned lands. As such, the City has more control over that generated from the public lands (i.e., road right of way), but are implementing measures such as subsidies, education and new development practices that would be expected to improve I&I from the private side.

The following outlines the I&I Reduction work that have been or are being carried out in the LRPCP service area that are targeted to reduce I&I at the source and/or provide resiliency to the impacts of I&I.

Completed Projects:

- City-wide Smoke and Dye Testing – This project included field investigations and testing to identify and repair illegal cross-connections and infrastructure deficiencies where unintended stormwater may have been entering the sanitary system. From this testing program, instances of improper private drain connection clean-outs were identified and approximately 200 occurrences were corrected. Nearly 9,000 work orders were issued for smoke and dye testing at the time that this program was completed in 2017.

- City-wide CCTV Sewer Assessments – This project included field investigations to assess existing sewer conditions with a priority on identifying breaks and failures where I&I may enter the sanitary network. This work was completed in 2017 with ongoing updates as required to maintain currency in the information.

- City-wide Sewer and Coastal Flood Protection Master Plan (SMP) – This comprehensive study for the storm, sanitary, and combined sewer systems included compiling flood records, sewer flow monitoring, flood risk computer modelling, public consultation, evaluation of flood reduction solutions, and preliminary design with cost estimates. Further, this study provided an implementation strategy for flood risk reduction measures based on a balance of past flooding, public input, administration's experience, engineering design and sewer modelling. The SMP ESR was completed in 2020 and outlines a 50-year and beyond strategy for flood protection. The projects recommended under this study have been underway since 2021.

Ongoing Projects:

- City-wide Resident Education Programs – This education programs goal is to inform residents of measures that can be taken to reduce the risk of basement flooding due to sanitary sewer backups. These measures may include but are not limited to ensuring proper disposal of fats, oils and greases (FOGs); reducing water usage during large storm events; familiarizing oneself with the City's emergency preparedness guide; and more. This educational information is available on the City's website with webpages, flyers, and guides. In addition, hard copies are distributed to residents throughout the service area from time to time.

- City-wide Sanitary Manhole Lid Sealing – This project included the installation of rain catchers (seals) under sanitary sewer maintenance hole (MH) covers to reduce surface water entering the sanitary system. These seals are being installed throughout the existing system with a prioritized approach based on estimated high potential for I&I. Phase 1 and 2 of these works were completed in 2024 with future phases planned for the upcoming years. In addition, rain catchers are to be installed as part of new construction practices as per recently updated City standards.

- City-wide Design Standards Update to Reduce I&I – Through this on-going review the City's design standards and drawings have been and will continue to be updated with added I&I resiliency requirements. Some of these updates include colour coding service connections to differentiate between storm and sanitary to reduce the likelihood of unintended cross-connections; increasing standards for improved watertight connections at MH/pipe interface; waterproofing MH wrapping and sanitary sewer lid sealing.

- City-wide Basement Flooding Protection Subsidy Program – This partnership program with residents offered by the City works to subsidize the costs of protecting basements from flooding. This program provides subsidies and rebates for multiple basement flood protection measures. Including:
    - Foundation drainage disconnection program for residents in older homes that have a foundation drain connected to the sanitary system. This disconnection program would result in meaningful I&I reduction through elimination of unnecessary cross-connections.
    - Private drain connection replacement for homes with old sanitary service connections. This program would replace deteriorated connections that would otherwise be contributing to I&I to the sanitary system.
    - Eeling program for residents with blocked private drain connections. This service is free of charge if tree roots are found to be the source of the problem. This program would reduce the potential for stormwater to infiltrate into the sanitary system.
    - Downspout disconnection for homes that have downspouts connected to the sanitary system. The City offers disconnection of your eavestrough downspout and is provided without charge to homeowners that qualify. Residents can call 311 to arrange for a home inspection visit. This program would result in meaningful I&I reduction through elimination of unnecessary cross-connections.

  This subsidy program is ongoing and has been active since the early 2010s.

- City-wide Home Flood Protection Program (HFPP) – This is a subsidized flood risk reduction education program for residents that provides a customized report of a home's flood risk including information to help take actions and improvements to reduce risk and possible flood damage. The HFPP was a pilot project that was started in 2022. This pilot program is currently closed to residents; however, a rebate is still available until the end of 2025.

- City-wide Combined Sewer Separation Strategy – This ongoing sewer separation strategy looks to eliminate combined sewers which exist within the existing service area. Infrastructure projects are identified, and new sewer reconstruction works replace the single combined sewer with separated storm and sanitary sewers. Combined sewer separation is a priority considered when planning sewer and street rehabilitation construction projects. The SMP study recommended complete separation of all combined sewer systems. Many sewer separation projects have been completed in the last decade with a milestone project, the Jefferson Stormwater Trunk Sewer, being installed in 2024.

- City-wide Trunk Sewer Flow Monitoring – This flow monitoring program collects records of wet-weather and dry-weather flow conditions in the sanitary sewer system. Observed I&I in key trunk sanitary sewers are being tracked and opportunities for improvement will be identified as a part of the I&I Reduction Workplan Project outlined below. This flow monitoring campaign started and has been collecting data since 2022.

- City-wide Rain Gauge Network – This rain gauge network program collects precipitation data from a network of approximately 12 gauges to better understand inflows and performance in the City's drainage, sewer systems and treatment infrastructure. This data is necessary to monitor and report on the systems and opportunities for improvement that will be identified as a part of the I&I Reduction Workplan Project outlined below. This rain gauge data collection started and has been on-going since 2013.

Most notably, the City plans to implement an I&I Reduction Workplan Project that will be a key pillar in the management of the separated sanitary sewer system. This project will assess the existing data, delineate areas of concern, define wastewater flow and private contribution I&I, and recommend future I&I reduction measures. A focus of the workplan will be to better understand the causes of I&I in neighbourhoods where foundation drains should not be connected to the sanitary system. This study will result in an Action Plan for the next ten (10) years to reduce I&I and associated basement flooding risk. This project is currently in the startup phase and is anticipated to be completed over the next five (5) years.

There are numerous benefits anticipated as a result of the completed, ongoing, and upcoming projects for I&I Reduction. Primarily these projects are expected to reduce the amount of I&I entering the sanitary sewer network which will have cascading positive impacts on the community, natural environment, and system operation costs. In terms of the benefits to the community, these programs enhance the residents' knowledge of the sanitary and stormwater collection systems with the City as well as providing opportunities to protect their home and be a steward of the system. In addition, these improvements and resulting reduction to WWFs are anticipated to reduce the risk of basement flooding in the City. In terms of benefits to the natural environment, these projects and reduction efforts will work to reduce the potential, frequency, and/or volumes of sanitary sewer overflow (SSO), combined sewer overflow (CSO) and bypass events in the City. In terms of the technical benefits, these programs will allow for improved monitoring and understanding of the sewer systems resulting in an increased ability to track changes whether that be improvements or declines. Further, this information can be utilized by the City to determine target areas for improvement for the prioritization of work and development of programs with the best return on investment. In terms of the economic benefits, the reduction in I&I is expected to reduce operational costs within the system and at the LRPCP as less effluent will be pumped and treated.

Based on an internal review of historic and ongoing I&I reduction projects, the City estimates that the I&I to the sanitary collection system in the LRPCP service area would be reduced over the next 20 years. For the purposes of this LRPCP MCEA Project, it is assumed that the I&I reduction programs will result in a reduction of the peak WWF by 10%. The reduction in flows associated with the I&I reduction programs will be closely monitored and verified by the City of Windsor over the next 5+ years. **Table 3.2** summarizes the flow conditions at the LRPCP assuming that there is a 10% reduction in the historic peak WWF.

Table 3.2: Flow Conditions at the LRPCP assuming 10% I&I Reduction in the LRPCP Service Area

Characteristic	Historic Wastewater Flows*	Reduction	Adjusted Historic Wastewater Flows
Average Daily Sewage Flow	36.8 MLD	N/A	36.8 MLD
Peak Dry Weather Sewage Flow	92.7 MLD	N/A	92.7 MLD
Peak Wet Weather Sewage Flow	250 MLD (2,898 L/s)	25.0 MLD (289 L/s)	225 MLD (2,608 L/s)
Note: * Historic Flows are presented for only the City of Windsor portion of the LRPCP Service Area (i.e., Tecumseh contribution has been excluded from the totals).			

3.1.3 Projected Servicing Requirements - City of Windsor

The historic wastewater flows and projected requirements for the existing service area (excluding flow from the Town of Tecumseh) are outlined in **Table 3.3**. The existing service area within the City of Windsor is nearing full buildout with a few areas remaining for future development. There are groupings of properties within the service area that are undergoing development and/or have a zoning hold which restricts development until a future date through a zoning by-law amendment. Assuming the City allows for re-zoning and development in these areas over the next 20-years, the 20-Year Design would be equivalent to the historic wastewater flows plus the flows from these undeveloped areas. Since the service area would be fully developed after this point, the 20-Year Design would be equivalent to the Ultimate Design.

The potential land use, number of units, or population density in these undeveloped zones were provided by the City. The design criteria outlined in the City of Windsor Development Manual and historic wastewater generation rates were used to calculate the projected additional flow from these new areas. The following criteria from the Development Manual were used to calculate the additional flow from these areas: average daily sewage generation rate of 360 L/cap/day; and extraneous flow allowance of 0.156 L/s/ha.

Table 3.3: City of Windsor – Projected Servicing Requirements

Characteristic	Historic Wastewater Flows	20-Year Design	Ultimate Design
Average Daily Sewage Flow	36.8 MLD	46.0 MLD	46.0 MLD
Peak Dry Weather Sewage Flow	92.7 MLD	116 MLD	116 MLD
Peak Wet Weather Sewage Flow	225 MLD* (2,608 L/s)	247 MLD (2,857 L/s)	247 MLD (2,857 L/s)
Note: * Adjusted Peak Wet Weather Sewage Flow considering I&I Reduction Factor.			

3.1.4 Projected Servicing Requirements – Sandwich South

The requirements for the Sandwich South servicing area are outlined in **Table 3.4.** A review of the SSMSP found that the sewage flow projection methods were in keeping with the City of Windsor Development Manual and appropriate for new developments. Design population density ranged from 36 ppl/ha (low density) to 112 ppl/ha (high density) for residential zones and from 68 ppl/ha to 74 ppl/ha for industrial zones. An average daily sewage generation rate of 360 L/cap/day and an extraneous flow allowance of 0.156 L/s/ha were used to calculate the projected flow from the Sandwich South service area.

A portion of the land in the area of Sandwich South is zoned for low-density residential dwellings; however, due to increasing housing demand throughout the City it is anticipated that these lands will be developed with a higher density. To estimate the new equivalent population, average daily sewage flow, and peak sewage flows, the proposed development plan for the subdivision of Riverbend Heights was used as a guide for future development. Based on the Riverbend Heights Subdivision it is anticipated that the other lands in Sandwich South that are currently allotted for low-density residential dwellings will be developed with a mix of low to high density dwellings (with an average of 1.6 times more equivalent persons than previously identified in SSMSP).

It is anticipated that development within this area will proceed rapidly in the areas of East Pelton, along the Highway 401 (between the 9th Concession and the City Limit), north of County Road 42 (between the 8th and 9th Concession), south of County Road 42 (between the 9th Concession and the Little River Drain), and north of County Road 42 (part way between Lauzon Road and the City Limit)). With a majority of these lands being developed within the next 20-year period. The remaining development within Sandwich South will occur beyond the next 20-year period.

Table 3.4: Sandwich South – Projected Servicing Requirements

Characteristic	20-Year Design	Ultimate Design
Average Daily Sewage Flow	11.3 MLD	31.0 MLD
Peak Dry Weather Sewage Flow	36.3 MLD	63.6 MLD
Peak Wet Weather Sewage Flow	45.8 MLD (530 L/s)	90.9 MLD (1,046 L/s)

3.1.5 Projected Servicing Requirements – Town of Tecumseh

The servicing requirements for the Town of Tecumseh are outlined in **Table 3.5**. The historic and projected design flows were provided by the Town of Tecumseh.

Table 3.5: Town of Tecumseh – Projected Servicing Requirements

Characteristic	Historic Wastewater Flow	20-Year Design	Ultimate Design
Average Daily Sewage Flow	7.8 MLD	19.8 MLD*	26.7 MLD

Characteristic	Historic Wastewater Flow	20-Year Design	Ultimate Design
Peak Dry Weather Sewage Flow	23.0 MLD	48.4 MLD	78.3 MLD
Peak Wet Weather Sewage Flow	69.7 MLD (807 L/s)	100.0 MLD (1,157 L/s)	135.7 MLD (1,571 L/s)
Note: * In correspondence, the Town of Tecumseh indicated that the projected 20-Year Flow to the LRPCP will be 16.5 MLD. This projection is lower than the current allocation of 19.8 MLD as indicated in the Wastewater Servicing Agreement (By-Law No. 2004-70). Therefore, the existing allocation of 19.8 MLD was carried forward for the 20-Year Design for this study.			

3.1.6 Sensitivity Analysis

In order to review and confirm the required capacity of the LRPCP expansion a sensitivity analysis for two (2) variables was completed. This included the Average Daily Sewage Generation Rate and I&I Reduction Factor.

3.1.6.1 Average Daily Sewage Generation Rate

The first analysis variable was the average daily sewage generation rate which was used to calculate the anticipated average daily sewage flow for new developments in the LRPCP Service Area and Sandwich South. The sensitivity analysis for this variable is presented in **Table 3.6**. The average daily sewage generation rate used in the initial calculation was 360 L/cap/day (lpcd) based on the City of Windsor Development Manual. The Standard Design Guidelines for Sewage Works (MECP) indicates that the design average daily sewage generation rate may vary from 225 to 450 lpcd. The historic data for the LRPCP show that the average daily sewage generation rate in the service area is closer to the higher end of the range proposed by the MECP. A majority of the surrounding municipalities within Windsor – Essex County utilize a design average daily sewage generation rate of 450 lpcd.

Three evaluation points were selected for this sensitivity analysis to determine the impact on the expansion requirements at the LRPCP. The evaluation points were selected as a – 15 % and + 7.5 % variation from the Windsor Development Manual standard generation rate of 360 lpcd. The evaluation points are 310, 360, and 390 lpcd for the low, moderate, and high, respectively.

For the 20-Year Design, the average daily sewage flow rate varied from 74.2 MLD to 78.7 MLD. This represents a variation of – 3.9 % and + 1.9 % from the average daily sewage flow of 77.1 MLD associated with the Windsor Development Manual standard generation rate of 360 lpcd. The average daily sewage flow rate for each of the evaluation points is greater than the rated capacity of the existing LRPCP (72.8 MLD); therefore, an expansion or increase of capacity would be required under each scenario. For the Ultimate Design, the average daily sewage flow rate varied from 98.0 MLD to 107 MLD. This represents a variation of - 5.8 % and + 2.8 % from the average daily sewage flow of 104 MLD associated with the Windsor Development Manual standard generation rate.

There would be cost savings associated with the lower generation rate due to a reduction in the capacity and therefore sizing requirements for the LRPCP Expansion. For the purpose of this high-level sensitivity analysis, it is estimated that the cost savings associated with the low evaluation point would be in the range of 2 to 4 %. Based on the historical data for the LRPCP service area, consistency with the Windsor Development Manual, and relatively minimal cost savings associated with lower generation rate, it is recommended to use the design average daily sewage generation rate of 360 lpcd.

Table 3.6: Sensitivity Analysis - Average Daily Sewage Generation Rate

Characteristic	20-Year Design			Ultimate Design			Capacity of LRPCP
	310 lpcd	360 lpcd	390 lpcd	310 lpcd	360 lpcd	390 lpcd	
Average Daily Sewage Flow (MLD)	74.2	**77.2**	78.7	98.0	**104**	107	72.8
Peak Dry Weather Sewage Flow (MLD)	192	**201**	206	246	**258**	265	90.0
Peak Wet Weather Sewage Flow (MLD)	384	**392**	397	461	**473**	480	225

3.1.6.2 I&I Reduction Factor

The second analysis variable was the I&I Reduction Factor which was used to adjust the historic peak WWF to reflect ongoing and upcoming I&I Reduction Programs throughout the City. The sensitivity analysis for this variable is presented in **Table 3.7.** The I&I Reduction Factor used in the initial calculation was 10% based on input from the City. The SMP indicated that the I&I Reduction achieved throughout the City may vary depending on the technologies implemented through these programs, the intensity and duration of the severe storm events, and other considerations.

Two evaluation points were selected for this sensitivity analysis to determine the impact on the expansion requirements at the LRPCP. The evaluation points were selected as -50% and + 50% from the initial I&I Reduction Factor of 10%. The evaluation points are 5 %, 10%, and 15% reduction in historic peak WWFs for the low, moderate, and high, respectively.

For the 20-Year Design, the peak wet weather sewage flow rate varied from 380 MLD to 405 MLD. This represents a range of 6.2 %. The peak wet weather sewage flow rate for both of the evaluation points is greater than the rated capacity of the LRPCP Inlet Pumping Station (225 MLD); therefore, an expansion or increase of capacity would be required under each scenario. For the Ultimate Design, the peak wet weather sewage flow rate varied from 460 MLD to 486 MLD. This represents a range of 5.3 %.

There would be cost savings associated with the lower generation rate due to a reduction in the capacity and therefore sizing requirements for the headworks and WWF management facility at the LRPCP. For the purpose of this high-level sensitivity analysis, it is estimated that the cost savings associated with the 10% I&I Reduction Factor would be approximately 3% of the cost for headworks and WWF management facility (or approximately 1% of total LRPCP Expansion cost) in comparison to the 5% I&I Reduction Factor.

At this time, detailed flow monitoring data is not available and therefore it is not possible to accurately determine the appropriate reduction factor for the I&I contributed within the existing LRPCP service area. In the next few years, the City will be implementing a comprehensive I&I Reduction Workplan project that will include the review of flow monitoring data. This project will be beneficial in determining a more accurate I&I Reduction Factor; however, it is not anticipated to be completed for approximately five (5) years. For the purpose of this MCEA study, the anticipated peak WWF is presented as a range. It is recommended that when detailed design for the LRPCP Expansion begins that the results of the I&I Reduction Workplan project are reviewed, and the anticipated peak WWF is refined accordingly.

Table 3.7: Sensitivity Analysis – I&I Reduction Factor

Characteristic	20-Year Design			Ultimate Design			Capacity of LRPCP
	5% I&I Reduction	10% I&I Reduction	15% I&I Reduction	5% I&I Reduction	10% I&I Reduction	15% I&I Reduction	
Peak Wet Weather Sewage Flow	405 MLD (4,693 L/s)	393 MLD (4,548 L/s)	380 MLD (4,400 L/s)	486 MLD (5,625 L/s)	474 MLD (5,480 L/s)	460 MLD (5,330 L/s)	225

3.1.7 Summary of Projected Wastewater Flows

Table 3.8 presents a summary of the anticipated wastewater flows to the LRPCP within the next 20-years (20-Year Design) and beyond the next 20-years (Ultimate Design). The projected servicing requirements for the LRPCP expansion are based on the flows from the City of Windsor (existing service area), Sandwich South, and the Town of Tecumseh (Tecumseh, St. Clair Beach, Maidstone, Oldcastle, and Highway Service Area / Rural). The proposed design solution and conceptual designs identified and evaluated throughout this Municipal Class EA study will have a rated capacity for the 20-Year Design with consideration for future expansion or phasing to the Ultimate Design.

For the hydraulic capacity of the LRPCP, the expansion should accommodate peak WWFs and reduce the potential for bypass events such that there is a net reduction of bypass loading to the Little River Drain. As per the Standard Design Guidelines for Sewage Works (MECP), the 'Peak Wet Weather Sewage Flow' will be used for the design of the LRPCP Headworks including the inlet pumping station, screening, and grit removal systems. For the purposes of this MCEA, under the guidance of the City, the middle of the range for the peak WWF will be used for evaluation of alternative design solutions, preliminary conceptual design, and opinion of probable cost. This corresponds to a peak WWF of 393 MLD for the 20-Year Design and 474 MLD for Ultimate Design.

For the treatment capacity of the LRPCP, the expansion should accommodate peak DWFs and reduce the potential for overflow events. As per the Standard Design Guidelines for Sewage Works (MECP), the 'Peak Dry Weather Sewage Flow' will be used for the design of the primary and secondary treatment processes and UV disinfection system.

The existing LRPCP has a Rated Capacity of 72.8 MLD, a Peak Dry Weather Sewage Treatment Capacity of 90.0 MLD and a Peak Wet Weather Sewage Capacity of 225 MLD (2,604 L/s).

Table 3.8: Summary of Projected Servicing Requirements with Comparison to Relative Capacity of Existing LRPCP

Characteristic	20-Year Design	Ultimate Design	Capacity of Existing LRPCP
Average Daily Sewage Flow	77.2 MLD	104 MLD	72.8 MLD
Peak Dry Weather Sewage Flow	201 MLD	259 MLD	90.0 MLD
Peak Wet Weather Sewage Flow	380 MLD (4,400 L/s) to 405 MLD (4,690 L/s)	460 MLD (5,330 L/s) to 486 MLD (5,619 L/s)	225 MLD (2,600 L/s)

3.2 TREATMENT REQUIREMENTS

3.2.1 Historic Wastewater Characteristics and Loading

The historic average influent wastewater characteristics and loading to the LRPCP are summarized in **Table 3.9**. The detailed influent and effluent wastewater characteristics from 2017 to 2022 are summarized in **Table 3.11** and **Table 3.12**.

Table 3.9: Historic Wastewater Characteristics and Loading at the LRPCP (2017 – 2022)

Parameter	Monthly Average Concentration (mg/L)	Annual Average Loading [(1)] (kg/d)
cBOD5	155	6,913
TSS	161	7,404
TP	3.9	174
TAN	19	847

Note:
[(1)] Based on the annual average wastewater flow of 44.6 MLD.

The land use within the service area is primarily residential with small areas of commercial and light industrial properties. Influent concentrations are generally consistent with typical low to medium strength domestic wastewater characteristics as indicated in MECP Design Guidelines:

- 150-200 mg/L Biological Oxygen Demand (BOD)
- 150-200 mg/L Suspended Solids (SS)
- 6-8 mg/L Total Phosphorus (TP)
- 20-25 mg/L Total Ammonia Nitrogen (TAN)
- Consistent with those outlined by Metcalf & Eddy (190 mg/L BOD, 210 mg/L SS, and 7 mg/L TP).

Table 3.10 summarizes the influent and effluent characteristics at the LRPCP. Overall, the LRPCP has consistently produced a high-quality effluent throughout the study period and has consistently met the effluent compliance requirements discussed in the following sections.

Table 3.10: Summary of Influent and Effluent Characteristics at the LRPCP (2017 – 2022)

Parameter	Influent Concentration (mg/L)	Effluent Concentration (mg/L)	Removal Rate (%)
cBOD5	155	2.3	98.5
TSS	161	4.2	97.4
TP	3.9	0.3	92.3
TAN	19	0.4	97.9

Table 3.11: Detailed Historic Influent Wastewater Characteristics at the LRPCP (2017 – 2022)

Year	BOD (mg/L)		SS (mg/L)		TP (mg/L)		TKN (mg/L)		NH_3 (mg/L)		Alkalinity (mg/L)		pH	
	Avg	Max	Avg	Max.	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Max	Min
2017	139	420	161	660	3.8	9.4	28	44	17	28	243	270	7.8	6.9
2018	160	194	193	406	4.1	4.9	31	41	18	25	231	269	7.7	6.5
2019	144	375	162	1012	3.8	8.1	29	72	18	43	227	265	7.7	7.1
2020	154	420	162	1312	4.0	11.6	31	152	20	38	228	276	7.9	7.1
2021	151	270	117	182	3.9	5.6	27	37	18	27	253	284	7.6	7.2
2022	181	340	171	354	3.8	8.4	29	53	23	34	247	309	7.6	6.9
Average	**155**	-	**161**	-	**3.9**	-	**29**	-	**19**	-	**238**	-	**7.3**	

Table 3.12: Detailed Historic Effluent Characteristics at the LRPCP (2017 – 2022)

Year	BOD (mg/L)		SS (mg/L)		TP (mg/L)		TKN (mg/L)		NH_3 (mg/L)		Alkalinity (mg/L)		pH	
	Avg	Max	Avg	Max.	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Max	Min
2017	1.9	3.3	4.3	7.1	0.3	0.5	1.6	2.2	0.3	0.6	2.7	4.6	7.8	7.0
2018	2.2	3.1	5.0	6.7	0.3	0.5	1.7	2.7	0.4	1.2	3.2	6.8	7.4	6.4
2019	1.9	5.7	4.1	16	0.3	1.0	1.8	10	0.5	4.5	5.3	17	-	-
2020	1.8	18	3.2	23	0.4	2.8	1.8	8.4	0.5	6.0	4.8	15	-	-
2021	2.4	12	4.0	38	0.3	1.6	2.8	5.3	0.4	3.1	4.3	14	-	-
2022	3.4	6.6	4.4	11	0.3	0.9	1.8	4.4	0.4	5.0	3.2	8.6	-	-
Average	**2.3**	-	**4.2**	-	**0.3**	-	**1.9**	-	**0.4**	-	**3.9**	-	**7.2**	

3.2.2 Projected Wastewater Characteristics and Loading

The anticipated influent wastewater characteristics and loading to the LRPCP are summarized in **Table 3.13**. The projected annual average loading was estimated based on the anticipated domestic (residential and commercial) and industrial sewage flows to the LRPCP.

The domestic sewage flows are anticipated to account for 64.7 MLD or 83.8 % of the average daily flow to the LRPCP. The average concentration of the domestic sewage flows is expected to be similar to the 2017 – 2022 influent characteristics that are consistent with low to medium strength domestic wastewater.

The Sandwich South area will include some industrial facilities which are expected to contribute medium to high strength wastewater. The industrial sewage flows are anticipated to account for 12.5 MLD or 16.2 % of the average daily flow to the LRPCP.

Characteristics of industrial wastewater vary greatly from industry to industry, and consequently, treatment process for industrial wastewater also varies. Typical municipal wastewater treatment plants can't treat industrial wastewater with high concentrations of chemicals, pharmaceuticals, and heavy metals. The City's sewer use bylaw will provide direction on permissible concentrations at point of discharge of industrial wastewater to the sanitary sewer system. If characteristics of industrial wastewaters can't meet sewer use bylaw standards, the industry will be required to undertake necessary onsite pretreatment specific to their own wastewater characteristics in order to meet the standards for discharge to the sanitary sewer system.

Therefore, it is assumed that the wastewater flow from these facilities will at a minimum meet City of Windsor By-Law No. 11446 'A By-Law to Prohibit, Regulate and Inspect the Discharge of Sewage into the Municipal Sewerage System in the City of Windsor'. Section 2 of this By-Law 'Discharges to Sanitary Sewers' indicates the following restrictions for discharges to the sanitary system:

- 400 mg/L Biological Oxygen Demand (BOD)
- 500 mg/L Suspended Solids (SS)
- 30 mg/L Total Phosphorus (TP)
- 100 mg/L Total Kjeldahl Nitrogen (TKN)
  (Note: TKN = TAN + Total Organic Nitrogen and TAN is typically 60 to 70% of TKN; therefore, anticipated TAN Concentration in the industrial wastewater stream will be approximately 65 mg/L)

Note that these values are higher than the characteristics for high strength wastewater outlined by Metcalf & Eddy (300 mg/L BOD, 350 mg/L SS, 15 mg/L TP, and 50 mg/L TAN); however, are being used as a conservative approach.

Table 3.13: Projected Wastewater Characteristics and Loading at the LRPCP

Parameter	Domestic Sewage Flow		Industrial Sewage Flow		Monthly Average Concentration (mg/L)	Annual Average Loading (kg/d)
	Monthly Average Concentration (1) (mg/L)	Average Flow (MLD)	Monthly Average Concentration (2) (mg/L)	Average Flow (MLD)		
cBOD5	155	64.7	400	12.5	195	15,000
TSS	161		500		216	16,700
TP	3.9		30		8.1	625
TAN	19		65		26	2,050

Note:
(1) Based on 2017 – 2022 Historic Data.
(2) Assuming worst case scenario based on Sewage By-Law.

3.2.3 Existing Treatment and Effluent Compliance Requirements

The treatment plant operates under Environmental Compliance Approval (ECA) No. 4681-BT3L39 issued January 29th, 2021. A copy of the current ECA is contained in **Appendix B.**

Table 3.14 summarizes the current ECA effluent non-compliance limits for the LRPCP. Further to these effluent limits the LRPCP has two (2) effluent objectives including single sample for pH between 6.5 and 9 (inclusive) and single sample for Dissolved Oxygen ≥ 4.0 mg/L.

Table 3.14: Existing Effluent Compliance Limits

Parameter	Effluent Compliance Limits		
	Monthly Average Concentration	Annual Average Loading	Single Sample
cBOD5	15 mg/L	1,092 kg/d	25 mg/L
TSS	15 mg/L	1,092 kg/d	25 mg/L
TP	1.0 mg/L	72.8 kg/d	1.5 mg/L
TAN	6 mg/L	437 kg/d	8 mg/L
E. coli	200 CFU/100 mL OR 200 MPN/100mL (from May 1 to October 31)	-	1000 CFU/100 mL OR 1000 MPN/100mL (from May 1 to October 31)
pH	-	-	Between 6.5 – 9.0 (inclusive)

Note:
LRPCP has two (2) effluent objectives
- Single sample for pH between 6.5 and 9 (inclusive)
- Single sample for Dissolved Oxygen ≥ 4.0 mg/L.

3.2.4 Projected Treatment and Effluent Compliance Requirements

Due to the minor increase in the Rated Capacity of the LRPCP for the 20-Year Design (72.8 MLD to 77.2 MLD) and the anticipated timeline for the LRPCP Expansion an assimilative capacity study for the Little River and Detroit River was not completed at this time. It is anticipated that the implementation of the City of Windsor I&I Reduction Projects will result in an overall reduction to the average and peak wastewater flows realized at the LRPCP. In addition, development in the region may vary based on undefinable social and economic conditions resulting in delays in the need for capacity expansion at the LRPCP. Based on the impacts of the I&I reduction efforts and uncertainty surrounding the exact timeline for development, it is proposed that the effluent compliance limits do not change at this time and an Assimilative Capacity Study is completed closer to the implementation of the LRPCP capacity expansion.

As shown in **Table 3.14** and **Table 3.15**, the new discharge criteria are not proposed to be changed as a part of this MCEA. Although the average daily sewage flow at the LRPCP will be increasing by approximately 6.0 % for the 20-Year, it is anticipated that the implementation of wet weather flow controls will minimize untreated overflow events to the Little River and result in an overall reduction in the effluent load to the receiver. Through this expansion project, wet weather flow controls will be implemented to eliminate bypass and minimize overflow events which historically accounted for 0.7% and 4.6% of LRPCP influent flows, respectively.

Table 3.15: Proposed Effluent Compliance Limits

Parameter	Effluent Compliance Limits
	Monthly Average Concentration
$cBOD_5$	15 mg/L
TSS	15 mg/L
TP	1.0 mg/L
TAN	6 mg/L
E. coli	200 CFU/100 mL OR 200 MPN/100mL (from May 1 to October 31)
pH	Between 6.5 – 9.0 (inclusive)

These effluent limits should be verified and revised as needed to accommodate or expand the facility to the interim and ultimate plant capacities. Further monitoring of the receiving environment should be undertaken to support adoption of the effluent criteria proposed and to determine the need for any alterations to the criteria.

The wastewater treatment facility has continued to consistently achieve a high-quality effluent as shown in **Table 3.12**. Over the period reviewed, the plant achieves its effluent compliance requirements with concentrations of $CBOD_5$, TSS, and TP, which are even well below the effluent objectives. Therefore, the loading limits for the proposed expansion are anticipated to be in keeping with previously approved loading from the existing plant.

Provision shall be considered in the detailed design for future addition of tertiary treatment (i.e., filtration) in the case that the expanded plant is required to meet more stringent effluent quality requirements than associated with secondary treatment, or the expanded plant cannot maintain the existing high effluent quality due to influent characteristics changes. These additional treatment requirements may greatly impact the construction and funding needs for the implementation of this project.

4.0 EXISTING CONDITIONS

The following sections provide an overview of background information and a description of existing conditions within the broad study area as a basis for comparison. Alternative design solutions and concepts must be evaluated based on their potential impact to existing natural environment, social, and economic factors.

4.1 GENERAL DESCRIPTION OF THE SERVICE AREA

The existing service area consists of the eastern portion of the City of Windsor and portions of the Town of Tecumseh. The sanitary service area for the LRPCP is shown in **Figure 1.1** of **Appendix A**.

The City of Windsor is located in Southwestern Ontario on the south shore of the Detroit River and Lake St. Clair directly across from the City of Detroit, Michigan. The population of Windsor is 306,519 (2021 Canadian Census) with a total land area of approximately 14,530 hectares. Settlement in the Windsor area dates to the 1700's with a population of 200 being reported in 1836 and 2,500 in 1892. Development generally started along the riverfront and progressed southernly away from the river as the population increased. The Windsor Census Metropolitan Area (which includes the Towns of Amherstburg, LaSalle, Lakeshore, and Tecumseh) is the 14th largest metropolitan area in Canada.

The Town of Tecumseh is situated east of the City of Windsor and south of Lake St. Clair in the northwest portion of the Essex County. The population of Tecumseh is 23,300 (2021 Canadian Census) with a total land area of approximately 9,413 hectares of land. The community was previously known as Ryegate until 1912 when it was renamed Tecumseh in honour of Tecumseh, a Shawnee Warrior who was killed at battle in the War of 1812. In 1999, three historic communities (former Town of Tecumseh, former Village of St. Clair Beach, and former Township of Sandwich South) were amalgamated into the new Town of Tecumseh.

4.2 LAND USE

4.2.1 Description of Land Use within the Service Area

The Windsor portion of the service area is primarily composed of residential dwellings with some areas designated for industrial, commercial, and institutional (ICI) uses. There is also a sizeable portion of land designated as Green District. The City of Windsor lands that are serviced by the LRPCP are primarily separate storm and sanitary sewers, with the exception of a small grouping of lands around South National Street and Tecumseh Road East between Buckingham Drive and Jefferson Boulevard.

The Tecumseh portion of the service area is primarily composed of residential dwellings with some areas designated for ICI use and recreational lands. A significant amount of the Tecumseh service area is also designated for future development. The Town of Tecumseh's Official Plan describes future development areas as suitable locations for additional residential, commercial, employment, recreational and institutional land uses; and community facility zoned areas as suitable locations for schools, places of worship, nursing/retirement homes, community centres, cemeteries, and other related buildings and facilities. These lands are serviced by separate storm and sanitary sewers.

4.2.2 The Little River Pollution Control Plant

The land which encompassed the original plant was 13.4 hectares (33 acres) with its extents reaching to the Little River to the west, and the old Little River channel to the north and east, and Little River Boulevard to the south. Its extents were doubled to accommodate expansion in 1973 by extending the boundaries on the north and east sides of the site. The facility was expanded again, and the expansion completed in 1993, taking up some portion of the plant property to the south where additional unit processes now exist.

An area for the currently proposed expansion exists to the east of the plant, on the opposite side of the old Little River channel. A concrete roadway (Little River Boulevard) runs parallel to the plant on its eastern side, from the parking lot to the north at the front of the facility to Little River Road at the south end of the facility. Fencing runs along the entirety of the perimeter of the facility to prevent pedestrian access, and a diked section exists between the western fencing and the Little River.

4.2.3 The Decommissioned Little River Landfill Site

The existing LRPCP is located just west of the decommissioned Little River Landfill Site (landfill) at 9420 Little River Road. The landfill location is legally described as Concession 1, part lot 134 and 135, Windsor, Ontario. The landfill is approximately 19.7 hectares in area and the height of the site ranges from approximately 1 to 15 metres above grade. The former landfill site was redeveloped as a regional park, the Little River Corridor Park, a recreational area owned and maintained by the City. The hill in the park, Hope Hill, is frequently used by local residents throughout the year and particularly for tobogganing during the winter months.

It is estimated that the Little River Landfill site was in operation from the early 1950's to 1966 and officially closed in 1972. Previously, the landfill received municipal waste, biosolids, and inert material. Due to the age of the landfill, it does not have a site-specific Environmental Compliance Approval as it existed prior to the current Environmental Protection Act Regulations. The MECP requested additional groundwater, gas and surface water monitoring following their review of the Closure Plan Report for the landfill. The City continues to carry out the annual monitoring program that was approved by the MECP in 2019. In addition, the MECP requires that no development shall be permitted within 30 metres of the former East Riverside landfill site.

A contaminant attenuation zone (CAZ) is a three-dimensional zone located adjacent to a landfilling site, extending into the subsurface and is intended that contaminants will be naturally attenuated to levels compatible with the reasonable use of the adjacent property. The areas to the west and south of the site have been established as a CAZ to mitigate potential movement of landfill contaminants with increasing distance from the waste area. The boundaries of the CAZ include the LRPCP and Park and Recreation Area, both City owned properties. Refer to **Figure 4.1** for a site plan of the former landfill site and CAZ boundaries.

4.3 NATURAL ENVIRONMENT WITHIN THE SERVICE AREA

4.3.1 Climate

The climate in the City of Windsor and in the Municipality of Tecumseh are classified as modified humid continental, which has hot and humid summers with mild winters and adequate precipitation. In comparison with the other areas in the Province, City of Windsor’s and the Municipality of Tecumseh’s southerly latitude and proximity to the lower Great Lakes provides for warmer summer and winter temperatures with a longer growing season. Because the area is also on one of the major continental storm tracks, it experiences wide variations in day-to-day weather including severe summer thunderstorms. The normal minimum and maximum temperatures are –4 ^{0}C and +28 ^{0}C respectively and the mean daily temperature is above 8 ^{0}C, which tends to increase temperatures in surface waters.

4.3.2 Geology and Physiography

Most of the bedrock under the region is sedimentary limestone and dolostone of the Devonian age which has a high calcium and magnesium content. The bedrock in the majority of City of Windsor and the Municipality of Tecumseh is covered by glacial drift with a thickness ranging from 3 m to 45 m from west to east. The parent soil material is a heavy ground moraine and lacustrine deposition containing a considerable amount of limestone, appreciable amounts of shale and some igneous rock.

Overall, the topography in the City of Windsor and the Municipality of Tecumseh urban area is flat. The City of Windsor and the Municipality of Tecumseh are located in the physiographic region of Southwestern Ontario known as the St. Clair Clay Plains. The area is covered with extensive clay plains causing poor soil conditions. The service area may be considered as three distinct sections: the eastern section of the City of Windsor, Sandwich South and the Municipality of Tecumseh with the boundaries lying between. The elevation ranges from roughly 176 m to 193 m, with the northeast and southwest ends being around the lowest point and highest point, respectively.

4.3.3 Soil and Subsurface Conditions

Soils within the County of Essex were formed from heavy ground moraine which has been altered by glacial lake wave action and lacustrine deposition. The majority of the area is part of a smooth clay plain and the predominant soil types are Perth and Brookston clays and their associated clay loams. Developed from dolomitic limestone intermixed with shale, the imperfectly drained member is the Perth clays, and the poorly drained member is the Brookston clays.

The clay deposits found in the majority of the Windsor area consist of a stiff silty clay to clayey silt deposited without significant stratification and possessing a distinctively till-like structure with a small fraction of sand and gravel sized particle distributed randomly throughout. In the west end of Windsor, this till-like deposit is overlain by a lacustrine deposit of soft to firm, layered silty clay. This deposit was laid down in the glacial lakes in front of the ice sheet during their retreat in the post glacial period, when the level of Lake Erie was considerably higher than it is at present. These layered strata, of varying thicknesses and strengths, are known to exist up to 30 meters in total depth.

Geotechnical investigations at this site were carried out by Golder Associates for the City of Windsor. To evaluate the site conditions, historical geological and geotechnical information for the site were reviewed. There are six (6) geotechnical reports in Golder's records for lands at or adjacent to the Little River Pollution Control Plant site including up to fifty (50) borehole locations. The borehole investigations on the site determined the general subsurface conditions on site consist of existing fill, topsoil, and pavement structures underlain by extensive deposits of native silty clay to sandy silty clay.

Further, there are three (3) soil layers on the site: (i) topsoil, (ii) sandy silty clay fill, and (iii) native sandy silty clay. The depth and thickness of the three soils layers is anticipated to vary slightly throughout the site. At the borehole locations, the subsurface conditions consisted of surficial topsoil of approximately 150 to 240 mm in thickness underlain by sandy silty clay fill of approximately 0.8 m to 1.3 m in thickness. Beneath the sandy silty clay fill was an extensive deposit of native sandy silty clay. Borehole investigations were terminated in this soil layer after exploring the stratum for depths ranging from about 11.7 m to 14.4 m. During the borehole investigations, no seepage into the boreholes was observed and boreholes were dry upon completion of drilling. No obvious staining or odours indicative of potentially significant chemical impacts were observed in the soil samples for the boreholes. It should be noted that groundwater conditions vary dependent on precipitation, site grading, and other factors; therefore, some groundwater seepage should be sufficiently low such that a Permit to Take Water (PTTW) should not be required.

4.3.4 Natural Vegetation

The County lies completely within the Niagara section of the Deciduous Forest Region of Ontario. Favourable soil and climatic conditions have allowed for the extension of many species of Carolinian and Prairie flora which makes the region unique in Canada.

The study area generally consists of three (3) zones: the existing LRPCP Lands, the Old Little River Drain Corridor, and the proposed Expansion Lands. Stantec completed a site investigation of all these areas throughout April and September 2025, to document existing natural heritage conditions making up the total Study Area. Surveys included Ecological Land Classification (ELC) of vegetation communities, a species at risk (SAR) habitat assessment of terrestrial features, presence of amphibian surveys, and a habitat assessment of the water's edge and riparian zone. The natural heritage features that were identified through the background review were confirmed during the field surveying. The Natural Heritage Impact Assessment Report is included in **Appendix E**.

The Little River Pollution Control Plant is predominately a non-vegetated area where concrete structures and sewage lagoons exist. Lawns exist in a manicured and mowed setting. Planted trees exist along the perimeter of the site along the west and north limits. A gravel/paved road encircles the site with a chain link fence installed for security. The total area of this feature is 6.18 ha.

The Old Little River Drain Corridor includes the drain and riparian zone associated with drain. The Old Little River Drain is a meandering shallow drain that due to historical re-alignment experiences little flow but does outlet at the north end and eventually terminates at the Little River Drain. The woody vegetation surrounding the drain is comprised of mature Cottonwood, Manitoba Maple, Black Walnut, White Mulberry, Silver Maple all existing within the canopy. The understory along the banks is dominated by dense Amur Honeysuckle, Rough leaf Dogwood, and saplings of Green Ash. Duckweed was the dominate vegetation within the aquatic water course. The total area of this feature is 1.52 ha.

The proposed expansion lands is occupied by the City of Windsor Municipal Tree Nursery. Tree saplings such as thornless honey locust, bur oak, Kentucky coffee tree, Freeman’s maple, sugar maple, little-leaf linden and Bradford pear are the common species growing in planted rows. Most of the proposed expansion lands including the areas under the planted trees is occupied by old field meadow dominated by wild carrot, orchard grass, red clover, tall fescue, creeping thistle, Canada goldenrod, and annual fleabane. Periodic mowing of the meadow occurs in some sections of the nursery. A small population of one provincially rare plant (winged loosestrife, Lythrum alatum) occurs naturally on the site along the west edge of the fencing. It has a provincial rank of S3. The Kentucky coffee tree growing in the planted rows in the nursery is a provincially Threatened species. Although this tree does not occur naturally on the site, there may be Species at Risk implications for this species. The total area of this feature is 11.68 ha.

Potential impacts associated with construction activities generally include soil compaction, siltation, and spills of deleterious substances, noise disturbance, and encounters with wildlife. These impacts are generally considered short term and appropriate construction techniques and mitigation measures outline in **Section 8.0** of this ESR will be applied to minimize impacts to the construction area during construction activities.

4.3.5 Terrestrial Life

The existing LRPCP represents potential foraging habitat for bats, nesting habitat for a variety of birds including the SAR Chimney Swift and basking habitat for SAR snakes including the Eastern Foxsnake and the Butler’s Gartersnake.

The existing Old Little River Drain Corridor represents potential nesting habitat for a variety of birds, foraging and basking habitat for a variety of turtle species and foraging, basking and nesting habitat for snakes including the Eastern Foxsnake and the Butler’s Gartersnake. Amphibians have been confirmed at this location and the corridor is ideally suited for the life cycles of frogs and toads. The corridor also presents ideal foraging and nesting habitat for SAR bats.

The proposed expansion lands have the potential to support a variety of tree nesting and ground nesting birds as they migrate through this area. The reclaimed meadows with existing hedgerows would support SAR reptiles including the Eastern Foxsnake and Butler’s Gartersnake. Milkweed was observed within this habitat which supports SAR Monarch butterflies. Lastly, the expansion lands provide ideal foraging habitat for SAR bats that feed in open meadows. Data from 2025 ARU studies will confirm bat presence in this area. Standard mitigation measures and adherence to MECP timing windows would be essential.

4.4 CULTURAL HERITAGE ENVIRONMENT WITHIN THE STUDY AREA

This section describes the cultural heritage component of the environment which includes archaeological resources, built heritage resources and cultural heritage landscapes.

4.4.1 Provincial Policy Statement

The Provincial Policy Statement (PPS) is a consolidated statement of the government's policies on land use planning. The PPS was issued in 2020 under the *Planning Act* and as such all decisions affecting planning matters shall be consistent with the Provincial Policy Statement. The PPS has policies across five themes: increasing housing supply and mix, protecting the environment and public safety, reducing barriers and costs, supporting rural, northern, and Indigenous communities, and supporting certainty and economic growth. The PPS is a key consideration for identifying land-use planning objectives and evaluating alternative design concepts.

4.4.2 Official Plan

The City of Windsor's Official Plan is a policy document that outlines the basic framework for how the City will evolve over the next 20 years. The purpose of the plan is to manage and direct City development in terms of social, economic, and environmental matters and goals. Windsor's Official Plan provides the policy framework for a timeline and sequence of new developments, development locations based on land use designations, strengthening existing and future neighbourhoods, enhancing Windsor's environment and municipal services and infrastructure needs. Municipal Official Plans are required under the Ontario Planning Act to ensure planning decisions are prepared in accordance with the Provincial Policy Statement.

In combination with Municipal Official Plans, the PPS outlines a framework for comprehensive planning that allows Ontario to sustain strong communities, a clean and healthy environment, and economic growth. The key approach for implementing the PPS is through Municipal Official Plans which identify provincial interests and present appropriate land use designations and policies for the local community. It is important that Municipal Official Plans are kept up to date with the PPS to protect provincial interests and ensure that development takes place in suitable areas. This proposed project is consistent with the City of Windsor's Official Plan.

4.4.3 Archaeological Resources

Windsor is an area rich in cultural heritage resources and diverse cultural traditions. The City of Windsor Archaeological Master Plan shows land containing archaeological resources or areas of archaeological potential within the City of Windsor. There are eighteen (18) registered archeological sites within the City limits and five (5) additional registered sites in the immediate environs of the City. In addition, there are several dozen unregistered archeological finds. Registered sites in Windsor include five (5) Native sites, nine (9) Euro-Canadian sites and four (4) sites with both cultural components. A majority of the registered and unregistered archeological sites within the City of Windsor are located in the central and west end, particularly in the Old Sandwich Town region.

In accordance with the Checklist for Determining Archaeological Potential from the Ministry of Tourism and Culture, a Stage 1 Archaeological Assessment is to be conducted for lands impacted by this project. If the Stage 1 Archaeological Assessment concludes that these areas have moderate to high potential for the discovery of Indigenous or Euro-Canadian resources, a further Stage will be conducted to determine if any archaeological resources are on the property using either pedestrian survey or test pit survey.

A Stage 1 Archaeological Assessment (under Project Information Form number (PIF) P359-0117-2019) was conducted over a number of days in 2019 and 2020 by Fisher Archaeological Consulting (FAC) for the City of Windsor Sewer Master Plan. Stage 1 AA consists of a review of geography, land use and historical information for the property and the relevant surrounding area and contacting MCM to find out whether or not there are any known archaeological sites on or near the property. Its purpose is to identify areas of archaeological potential and further archaeological assessment (e.g., Stage 2-4) as necessary.

Site specific Stage 1 Archaeological Assessment (under PIF P256-0849-2025) was conducted by Stantec Consulting Ltd for the purpose of this MCEA. This included one site visit on May 7th, 2025. The assessment determined that approximately 40.6% of the study area retains low to no archaeological potential due to previous assessment, areas subject to deep and extensive modern disturbances, and permanently low and wet areas. Thus, in accordance with Section 1.3.2 and Section 7.7.4 of the Ministry's 2011 Standards and Guidelines for Consultant Archaeologists (Government of Ontario 2011), Stage 2 archaeological assessment is not required for portions of the study area with low to no archaeological potential. The assessment further showed that the remainder of the study area, approximately 59.4%, retains archaeological potential. Thus, Stage 2 archaeological assessment is required for areas of archaeological potential within the study area. Stage 2 archeological assessment is recommended to be undertaken prior to or near the beginning of the detailed design phase of this project when the size, location, and requirements for the expansion have been refined and confirmed.

The archaeological assessment carried out as a part of this study is included in **Appendix E**.

4.4.4 Built Heritage Resources and Cultural Heritage Landscapes

The heritage resources around the proposed work area were identified based on the Windsor Municipal Heritage Register provided by the City of Windsor. The City of Windsor's Planning and Building Services Department was also consulted to determine the location and details of Built Heritage and Cultural Heritage Landscapes.

Figure 4.2 of **Appendix A** is an aerial plan showing the built heritage and cultural heritage landscapes around the potential proposed work area. As shown, there are no built heritage resources and/or cultural heritage landscapes in proximity to the location of proposed work area.

The Ministry of Tourism, Culture and Sport (MTCS)'s "Screening for Impacts to Built Heritage and Cultural Heritage Landscapes" checklist was completed and indicated that there are buildings or structures aged 40 years or more on or adjacent to the properties impacted by the proposed work. In response, a Heritage Overview Memorandum (memo) was prepared to address this matter. The preparation of the Heritage Overview included a review of relevant online materials and consultation with the City of Windsor, Ontario Heritage Trust, and Ministry of Citizenship and Multiculturalism.

Based on a review of available information and O. Reg. 9/06, it was determined that there are no protected heritage resources or "cultural heritage values or interests" (CHVI) identified for the LRPCP property and the structures within and adjacent to the Study Area. The structures do not display any design or physical value as the style and construction of the buildings was standard for municipal wastewater treatment plants in the province. They were built with typical late 20th century construction materials and methods. From the review of historic and topographic mapping, and the completion of the MCM Checklist no historical or associative value was identified. Given the findings of the Heritage Overview, no additional heritage studies are recommended. The Heritage Memo is included in **Appendix E**.

4.5 DESCRIPTION OF EXISTING WASTEWATER TREATMENT FACILITY

4.5.1 Wastewater Treatment Facility

The LRPCP is located at 9400 Little River Road in the City of Windsor. This land is situated directly south of the Old Little River and directly east of the Little River. The original plant began its operation in 1966 as a primary treatment plant with a capacity of 18,000 m^3/d but was upgraded and expanded in 1974 to 36,000 m^3/d providing secondary treatment including phosphorus removal as well as activated sludge process. The plant was later expanded to a rated capacity of 73,000 m^3/d in the early 90's.

Major unit operations at the LRPCP include the following:

- Fine Bar Screening
- Raw Wastewater Pumping Station
- Grit Removal
- Primary Clarifiers
- Aeration Tanks (Activated Sludge Process)
- Final Clarifiers (Activated Sludge Process)
- UV Disinfection and Effluent Aeration
- Sludge Dewatering by Centrifuges

A schematic of the existing plant is shown in **Figure 1.2** of **Appendix A**.

Major unit process data is summarized in **Table 4.1**.

Table 4.1: Little River Wastewater Treatment Facility Major Process Description

Unit Process	Process Description
Fine Bar Screening: Number of Units: Type: Peak Flow – each (m^3/d):	 2 Fine bar screens with 19mm clear openings 227,000 m^3/d

Unit Process	Process Description
Raw Wastewater Pumping Station: Number and Type of Pumps: Firm Capacity: Total Capacity:	Four (4) dry-pit centrifugal pumps One (1) variable speed centrifugal pump rated 81,216 m³/d at 19.5 m TDH, 250 HP (187 kW) One (1) variable speed centrifugal pump rated 84,960 m³/d at 19.5 m TDH, 250 HP (187 kW) One (1) variable speed centrifugal pump rated 84,960 m³/d at 14.6 m TDH, 250 HP (187 kW) One (1) variable speed centrifugal pump rated 87,696 m³/d at 18.3 m TDH, 300 HP (227 kW) 251,136 m³/d 338,832 m³/d
Grit Removal: Number and Type of Units: Treatment Capacity:	Two (2) square 7.92 m detritus 112,000 m³/d
Primary Clarifiers: Number and Type of Units: Rated Capacity:	Six (6) Circular with centre drive clarifier mechanism: Four (4) 24.4 m diameter x 2.74 m SWD primary clarifiers Two (2) 30.5 m diameter x 3.35 m SWD primary clarifiers 4 @ peak flow rate of 9,092 m³/d 2 @ peak flow rate of 13,638 m³/d
Phosphorus Removal Chemical: Storage:	Alum Three (3) alum storage tanks Two (2) 56,750 L storage tanks One (1) 63,560 L storage tank
Aeration System No. 1: Number of Units: Dimensions: Diffuser System:	Four (4) 37.5 m long x 9.1 m wide x 4.85 m average depth Norton fine bubble, ceramic disc
Aeration System No. 2: Number of Units: Dimensions: Diffuser System:	Six (6) 30.5 m long x 7.6 m wide x 6.04 m average depth Norton fine bubble, ceramic disc
Final Clarification System No. 1: Number and Type of Units: Capacity:	Four (4) 24.4 m diameter x 2.74 m SWD final clarifiers 9,092 m³/d
Final Clarification System No. 2: Number and Type of Units: Capacity:	Two (2) 37.4 m diameter x 4.0 m SWD final clarifiers 13,620 m³/d
UV Disinfection System No. 1: Number and Type of Banks: Rated Capacity:	Two (2) Ultraviolet (UV) channels, two (2) UV mounting racks in each channel – each rack contains 23 UV lamp modules with each module holding 8 UV germicidal lamps 72,800 m³/d
UV Disinfection System No. 2: Number and Type of Banks:	

Unit Process	Process Description
Rated Peak Capacity:	Two (2) Ultraviolet (UV) channels, two (2) UV mounting racks in each channel – each rack contains 17 UV lamp modules with each module holding 8 UV germicidal lamps 72,800 m^3/d
Standby Power: Number and Type of Units: Capacity - each:	Two (2) diesel generators for emergency power generation 1,250 kVA

4.5.2 Outfall

There are two separate systems that outfall to the Little River, Outfall No. 1 and Outfall No. 2, which come from Plants 1 and 2, respectively. Outfall No. 1 consists of one (1) 940 mm wide x 1.575 m deep outlet channel that discharges to a 960 mm x 1520 mm elliptical underground pipe connected to the outfall chamber discharging to the Little River. Outfall No. 2 consists of a 1.83 m wide effluent aeration channel that discharges to a 1050 mm diameter pipe to the outfall chamber to the Little River. The details of the outfalls are presented in **Table 4.2**.

Table 4.2: Existing Outfall Details

Parameter	Channel 1	Outfall 1	Channel 2	Outfall 2
Diameter	-	960 mm x 1520 mm	-	1050 mm
Width	0.94 m	-	1.83 m	-
Depth	1.575 m	-	-	-
Location	Below Grade	Bottom of Little River	Above Grade	Below Grade
Diffuser	2 centrifugal type air blowers with a rated capacity of 470 m^3/h at 4.75 psi gauge pressure	-	2 centrifugal type air blowers with a rated capacity of 635 m^3/h at 4 psi gauge pressure	-

4.5.3 Leachate Unloading Facility

LRPCP receives leachate from Landfill #3 and Essex-Windsor Regional Landfill. The leachate drains to the LRPCP by a metering gravity drain line and is collected in a storage tank with a total effective storage volume of 734 cubic meters. Prior to discharging into the inlet chamber, the leachate passes through a submersible pump rated at 2.31 L/s at a TDH of 10 m. The leachate discharges to the inlet chamber through two sanitary sewers, one (1) of 1,500 mm and one (1) of 900 mm.

Further details on leachate unloading facility are presented in **Table 4.3.**

Table 4.3: Leachate Management

Parameter	Process Description
Leachate Unloading Facility	
Storage Tank Size: Capacity:	1 734 m^3 210 m^3/d
Pumps Capacity:	1 2.31 L/s at 10 m TDH
Drain Line Type:	1 Leachate metering gravity

4.5.4 Biosolids Management

Settled solids are pumped from the sludge compartment of the primary clarifiers to the sludge dewatering facilities. The primary sludge pumps discharge through three underground pipe headers through macerators to a sludge holding tank located in the dewatering building.

Prior to discharging into the holding tank, the sludge is passed through two inline macerators to shred stringy and fibrous materials that would adversely affect the operation of the centrifuges. Sludge is pumped from the holding tank to the dewatering centrifuges. Polymer, a sludge conditioning chemical, is added to the sludge to aid in bulking of the sludge solids in the centrifuges. The polymer system consists of one polymer makeup water system which provides mixing and dilution of water to two polymer solution and feed systems.

Dewatered sludge or sludge cake discharges from the centrifuges and is transferred by sludge cake pump and transport systems to the truck loading facility for eventual transport to the Windsor Biosolids Pelletizing Facility (WBPF). Liquid removed from the sludge is returned to the treatment process by a gravity sewer which discharges into the plant inlet chamber.

Further details on the biosolids management systems are presented in **Table 4.4**.

Table 4.4: Biosolids Management

Parameter	Process Description
Sludge Dewatering	
Macerators	2
Holding Tank Size:	1 3.65 m x 2.4 m x 3.5 m
Sludge Feed Pumps Capacity – each:	3 90 L/min – 1,120 L/min at 28.2 TDH
Sludge Dewatering Capacity:	3 dewatering centrifuges 25.2 m^3/h – 34.2 m^3/h of primary sludge with a solid's concentration of 1.5% - 4.5% by weight
Sludge Condition System	
Polymer Make Up Water System Capacity – each:	2 795 L/min at 44.8 TDH

Parameter	Process Description
Polymer Batching System Capacity:	2 3,028 L
Polymer Feed Pumps Capacity:	3 4 L/min – 60 L/min at 50 psi
Odour Control Facility	
Odour Control System Type & Size:	2 1 single-stage wet scrubber system with mix tanks and chemical storage tank 1 two-stage wet scrubber system with mix tanks and chemical storage tank

5.0 ALTERNATIVE DESIGN SOLUTIONS

The previous sections of the ESR provide background information regarding this project and outline the problem / opportunity statement for the LRPCP in fulfillment of Phase 1 of the Class EA process. The following sections present the details of work undertaken as part of Phase 2 of the Class EA process. Phase 2 involves the identification and evaluation of various conceptual alternatives with the objective of determining alternative solutions which best address the identified problems and needs based on the potential impact to the natural, social, and economic environments.

The criteria used to develop alternative design solutions were based on generally accepted principles and previous experience. The criteria included the following:

- Application of current engineering practices and standards;
- Adherence to applicable laws and regulations;
- Economic considerations;
- Operation and maintenance issues;
- Health and safety;
- Acceptability to concerned stakeholders; and
- Feasibility of implementation.

The Municipal Class EA process in Ontario defines the requirements for the development of a reasonable range of alternatives including a Do-Nothing option to provide a benchmark for the evaluation process. The development of potential alternatives should also consider technical feasibility, social impact, natural environmental impacts, and economic impacts. The purpose of this section is to consider reasonable solutions to the defined problem. Some solutions may be touched upon briefly but not considered as viable options for further evaluation due to unacceptable social, economic, and/or natural environmental impacts.

5.1 INTRODUCTION

In this section of the report, alternative design solutions will be identified and evaluated leading to the selection of the recommended design. Several conceptual alternative solutions were proposed to address the identified problems and needs of the LRPCP. The following broad planning level alternative solutions have been considered and will be outlined in the following sections:

Alternative No. 1: Do Nothing
Alternative No. 2: Reduce Wet Weather Sewage Flows (WWF) through I&I Reduction Efforts
Alternative No. 3: Construct a WWF Retention Facility
Alternative No. 4: Modify Operations of Existing Infrastructure
Alternative No. 5: Discharge to New Sewage System
Alternative No. 6: Upgrade Existing Treatment Trains at LRPCP
Alternative No. 7: Add an Additional Treatment Train at LRPCP
Alternative No. 8: Combination of Above Alternatives

5.2 EVALUATION CRITERIA

The eight (8) alternative solutions were evaluated based on a variety of social, natural environmental, economic, technical, and cultural heritage criteria. These evaluation criteria were developed based on servicing needs at the wastewater treatment facility, applicable municipal plans / commitments, design principles, and past industrial experience. The evaluation criteria are as follows:

Technical Criteria:

- Ability to meet current and future wastewater servicing needs;
- Constructability, implementation timeline, and phasing;
- Flexibility to meet future needs and/or climate change projections; and
- No adverse impacts on existing infrastructure (operations and/or maintenance).

Social Criteria:

- Impacts on archaeological sites or areas of archaeological potential; and
- Impacts to known or potential built heritage resources and cultural heritage landscapes.
- Noise, vibration, odour, or air pollution emissions;
- Permanent changes or impacts to society / community;
- Development policies and agreements; and
- Ability to increase development and improve housing supply.

Natural Environmental Criteria:

- Impacts on vegetation, fish and wildlife, areas of natural and scientific interest, environmentally sensitive areas, and soil / geology;
- Regulatory compliances; and
- Development and planning policies.

Economic Criteria:

- Capital, operational and maintenance (O&M) costs; and
- Ability to improve development and generate economic growth.

The advantages and disadvantages of each alternative together with their effects on the socioeconomic and natural environment are discussed in the following sections.

5.3 DESCRIPTION OF ALTERNATIVE DESIGN SOLUTIONS

5.3.1 Alternative No. 1: Do Nothing

5.3.1.1 Overview

The "Do Nothing" option sets a benchmark for the evaluation and is a required component of the MCEA process. This option assumes that nothing is done to address the stated problem and the existing LRPCP would continue to be used for wastewater needs in the community of Windsor and Tecumseh. Although this may be an acceptable short-term solution, this is not considered a viable long-term solution.

5.3.1.2 Screening Result

In terms of the evaluation criteria, this solution would not have the ability to meet future wastewater servicing needs and may result in adverse impacts to the operation and maintenance of the existing infrastructure. It would not accommodate development or increased housing supply within the community, which represents a significant opportunity to generate socio-economic growth. Further to these issues, the MECP is continuously making effluent quality requirements more stringent and failure to upgrade the existing infrastructure may result in the inability to meet regulatory compliance.

Overall, it is clear the do-nothing approach will have an adverse economic impact due to the stagnation of development. This alternative does not address the increase in wastewater servicing demands. For these reasons, Alternative No. 1 – Do Nothing was not considered a viable solution and was not carried forward for detailed evaluation.

5.3.2 Alternative No. 2: Reduce Wet Weather Sewage Flows through I&I Reduction Efforts

5.3.2.1 Overview

Under this strategy, wastewater would continue to be collected and processed at the LRPCP, and I&I Reduction Programs would be implemented to reduce the WWF to the sanitary sewer system. Overall, aging infrastructure, high water levels in Lake St. Clair / Detroit River, and increased frequency of extreme storm events are resulting in increased I&I to the sanitary sewer system. The City is faced with identifying and eliminating significant sources of I&I which can be a difficult and costly undertaking. Through the SMP study, the City has identified areas of concern and is in the process of implementing improvements that will result in meaningful reductions in I&I to the sanitary system. I&I to the sanitary system may be reduced by repairing the sewer system, eliminating illegal cross-connections (for example, downspout or foundation connections), separating combined sewers, residential education programs, improved design standards, and other measures as outlined in **Section 3.1.2**.

The City has completed numerous initiatives, programs, plans and construction projects aimed at reducing sources, and mitigating impacts of I&I. The City has recently initiated an I&I Reduction Workplan Project that will document past efforts; systematically review relevant resources and data; collect rainfall and flow data within the service area; define DWF patterns and identify sources of I&I contribution; and develop a prioritized list of proposed programs and infrastructure upgrades. Based on a review of the ongoing and upcoming I&I reduction programs and projects, the City is confident in its ability to reduce the amount of I&I that is contributed to the sanitary sewer system. At the request of the City, it has been assumed that the I&I reduction programs will result in a reduction of the peak WWF from the existing service area by 10%. This I&I Reduction Factor is further outlined in **Section 3.1.2** and **Section 3.1.6**.

It should be noted that it was also considered that the dry weather wastewater flows to the sewage system may be reduced by implementing community education programs such as a water conservation program. The records show that the existing wastewater production rates in the LRPCP Service Area is approximately 500 L/cap/d, which is not unusually high for a mixed residential and ICI service area. In addition, the wastewater production rates in the City of Windsor and the Town of Tecumseh have been consistent since the 1980's. The implementation of a water conservation program was therefore not considered advisable or practical in this case.

Reducing the WWF to a level which can be processed at the existing LRPCP was not seen as a holistic solution. That is to say, the reduction in sewage flow by these methods will not recover sufficient capacity to accommodate the projected community growth within the LRPCP service area and other modifications or upgrades would be required in combination with this solution. This may be an acceptable short and long-term solution for the City, if applied in combination with other alternatives.

5.3.2.2 Screening Result

As a standalone solution, this alternative would not have the ability to meet future wastewater servicing needs within the existing service area. It would not allow for the City of Windsor or Municipality of Tecumseh to accommodate significant development or increase housing supply within the community, which represents an opportunity to generate additional socio-economic growth. Further to these issues, the MECP is continuously making effluent quality requirements more stringent and failure to upgrade the existing infrastructure will result in the inability to meet regulatory compliance.

In combination with other alternatives, this solution would reduce the anticipated WWF to the LRPCP and allow for reduced hydraulic capacity requirements. This would reduce wastewater treatment costs and expansion cost requirements for the inlet pumping station, screening, grit removal systems, and outfall channel. It would partially fulfil the future wastewater servicing needs within the service area to accommodate additional development. In addition, this solution would also help to mitigate the risk of bypass events at the LRPCP.

For these reasons, Alternative No. 2 – Reduce Wet Weather Sewage Flows through I&I Reduction Efforts was carried forward for detailed evaluation and consideration in combination with other alternatives.

5.3.3 Alternative No. 3: Construct a WWF Retention Facility

5.3.3.1 Overview

Under this strategy, wastewater would continue to be collected and processed at the existing LRPCP, and a wet weather flow retention facility (WWFRF) or facilities would be implemented to resolve WWF capacity issues at the LRPCP. The WWFRF(s) would be designed to accommodate the projected WWF from the service area in order to mitigate overflows to the Little River Drain. These upgrades would initially be designed for the 20-Year Design Flow and would include consideration for future expansion or upgrades to the Ultimate Design Flow. The WWFRF would outlet to an existing outfall at the LRPCP; therefore, no new outlet to the Little River Drain or Detroit River would be required. It should be noted that in-line and off-line storage were initially considered for this solution. A review of properties was completed and there is no significant allotment of land available within the City of Windsor for in-line storage. Therefore, the implementation of in-line storage was not considered advisable or practical in this case.

Under this strategy, a WWFRF (flow equalization tank, retention treatment basin (RTB), or other technology) would be constructed to capture, store, and potentially treat flows to reduce combined sewer overflows during WWF events. At a high-level for the evaluation of design solutions it is considered that this WWF retention system would be designed such that (i) for minor WWF events incoming peak flows would be attenuated to provide more uniform loading on the treatment process and (ii) for major WWF events primary level of treatment would be provided prior to overflowing to the Little River Drain.

There are multiple methods with which to design, locate, and size a WWFRF which will be further explored as a part of Phase 3 of this MCEA. The precise requirements for the WWFRF would be determined as a part of Phase 3 of this MCEA Study. This system would work to accommodate peaks WWFs, which typically would exceed the secondary treatment capacity. In general, the system would be designed to provide some level of attenuation during minor peak events and would provide primary level treatment and overflow to the Little River Drain during a major storm event (up to the Peak WWF). The proposed design basis for the facility is outlined in **Table 5.9**.

Table 5.1: Proposed Design Basis for the WWFRF

Description	Design Flow: 20-Year Design	Design Flow: Ultimate Design	Design Basis
Average DWF	77.2 MLD	104 MLD	Flows less than the peak DWF will be treated at the LRPCP.
Peak DWF	201 MLD	259 MLD	Flows greater than the peak DWF and up to the peak WWF will be diverted to the WWFRF and be stored and/or receive primary level treatment prior to discharging to the Little River Drain.
Peak WWF	393 MLD (± 13 MLD)	474 MLD (± 13 MLD)	

This alternative would allow for the mitigation of WWF bypasses at the LRPCP; however, would not work to address the anticipated future wastewater treatment capacity requirements. Therefore, this solution was not seen as a holistic solution for wastewater servicing needs for future developments and other modifications or upgrades would be required in combination with this solution. This alternative would be an acceptable short and long-term solution for the City, if applied in combination with other alternatives.

5.3.3.2 Screening Result

As a standalone solution, this alternative would not have the ability to meet future wastewater treatment needs within the service area. In combination with other alternatives, this solution would accommodate anticipated WWF and mitigate the risk of by-pass events at the LRPCP. For these reasons, Alternative No. 3 – Construct a WWFRF was carried forward for detailed evaluation and consideration in combination with other alternatives.

5.3.4 Alternative No. 4: Modify Operations of Existing Infrastructure

5.3.4.1 Overview

Under this strategy, wastewater would continue to be collected and processed using the existing LRPCP and efforts would be made to modify operation of the existing infrastructure to accommodate additional flows. The LRPCP is operated efficiently by well-trained personnel, it would prove difficult to increase the capacity of the plant strictly through operational adjustments. Most critically, it would not be possible to increase the pumping capacity of the Raw Sewage Pumping Station through operational changes. This would result in continued combined sewer overflows and increased risk of flooding throughout the service area; therefore, this is not considered a viable long-term solution.

5.3.4.2 Screening Result

Similarly to the do nothing alternative, this solution would not have the ability to meet future wastewater servicing needs within the existing service area. It would not allow for the City of Windsor or Municipality of Tecumseh to accommodate significant development or increase housing supply within the community, which represents an opportunity to generate additional socio-economic growth. Further to these issues, the MECP is continuously making effluent quality requirements more stringent and failure to upgrade the existing infrastructure will result in the inability to meet regulatory compliance.

For these reasons, Alternative No. 4 – Modify Operation of Existing Infrastructure was not considered a viable solution and was not carried forward for detailed evaluation.

5.3.5 Alternative No. 5: Discharge to New Sewage System

5.3.5.1 Overview

Under this strategy, wastewater would be collected and redirected to an existing sewage system outside the City of Windsor or to an entirely new sewage system. There are no existing sewage systems within a feasible distance from the existing LRPCP and further residual capacity in these systems would be allocated to serve their existing communities. Therefore, the construction of an entirely new sewage system and wastewater treatment facility would be required for this case.

Due to land area requirements, the new wastewater treatment facility would likely need to be located outside of the City of Windsor and adequately spaced from sensitive land uses (i.e., residents). This stand-alone sewage system would likely be located such that it can collect and treat wastewater from the Sandwich South Development. The onsite WWTP would be designed to accommodate the proposed Sandwich South Development with a preliminary average daily sewage flow of 11.4 MLD and a peak dry sewage flow of 36.6 MLD. This alternative would not provide a solution for the peak flow issues across the LRPCP wastewater servicing area, therefore a capacity upgrade to the LRPCP would still be required in the future.

5.3.5.2 Screening Result

In terms of the evaluation criteria, this solution would provide adequate capacity for the Sandwich South Development. Although it would limit the flexibility to accommodate wastewater flows from other areas served by the existing LRPCP. In terms of the social and natural environmental impact, the stand-alone sewage system would require the construction of a new wastewater treatment facility with a significantly long outfall sewer. This would result in a high level of impact on society and the natural environment. In addition, the permitting requirements for this facility would be significant. There is some potential for impact on archaeological, built heritage, and/or cultural heritage resources depending on the exact location of the new system. In terms of the economic impact, this solution would come at a higher capital cost requirement and significant operations and maintenance requirements. Amalgamating the wastewater treatment facilities near one location (i.e., upgrading or expanding the existing LRPCP) would likely reduce the overall operating and maintenance costs.

Overall, it is clear this approach will have an adverse economic, environmental, and social impact. For these reasons, Alternative No. 5 – Discharge to New Sewage System was not considered a viable solution and was not carried forward for detailed evaluation.

5.3.6 Alternative No. 6: Upgrade Existing Treatment Trains at the LRPCP

5.3.6.1 Overview

Under this strategy, wastewater would continue to be collected and processed at the existing LRPCP. The two (2) treatment trains at the LRPCP (known as Plant 1 and Plant 2), would be upgraded to accommodate the projected DWFs from the service area. These upgrades would initially be designed for the 20-Year Design Flow and would include consideration for future expansion or upgrades to the Ultimate Design Flow. The LRPCP effluent would continue to outlet to the existing outfalls at the LRPCP; therefore, no new outlet to the Little River Drain or Detroit River would be required. In addition to the upgrades required to accommodate the DWF projections, this design solution would likely be combined with alternative solutions for WWF management.

5.3.6.2 Preliminary Requirements for Dry Weather Flow Treatment

Table 5.2, outlines the current design capacities of each unit process as well as the required capacities for the 20-Year Design and Ultimate Design. Overall, it is clear that many of the unit processes would require upgrades to meet the design flow requirements. In addition to the capacity issues associated with these unit processes, there are a number of issues with the hydraulic grade line (HGL) throughout the process as well as poor performance and conditions. These additional issues are outlined in more detail in the following sections.

The Design Basis for each unit process was determined based on the MECP Design Guidelines for Sewage Works. The raw sewage pumping station, screening, and outfall sewers are to be designed for the design peak instantaneous flow. The grit removal, primary clarifiers, secondary clarifiers, and UV disinfection system are to be designed for the peak hourly flow. The secondary treatment processes are to be designed for the average daily flow. The sludge dewatering facility is to be designed for the maximum monthly mass loading and flow.

Table 5.2: Summary of Current and Future Process Design Capacities at the LRPCP

Unit Process	Current Design Capacity (MLD)	Required Design Capacity (MLD)			
		20-Year Design		Ultimate Design	
Raw Sewage Pumping Station	251	393 ± 13	✗	474 ± 13	✗
Screening	453	393 ± 13	✓	474 ± 13	✗
Grit Removal	224	201	✓	259	✗
Primary Clarifiers	200	201	~	259	✗
Aeration Tanks	~~57~~ → 72.8 (1)	77.2	✗	104	✗
Secondary Clarifiers	161	201	✗	259	✗
UV Disinfection	146	201	✗	259	✗
Sludge Dewatering	160	110	✓	150	✓

Note:

(1) The aeration tanks at the LRPCP were originally designed for a rated capacity of 57 MLD. Following the second expansion of the LRPCP, pilot studies and stress tests were completed in consultation with the MECP, and the aeration tanks were re-rated to a capacity of 72.8 MLD.

Table 5.3, outlines the existing conditions for each unit process at the LRPCP. Spreadsheet calculations were performed to estimate the unit capacities of each process. MECP Design Guidelines for Sewage Works was used as the basis for these calculations with assumptions as defined in the Table.

The performance of each unit process is presented based on historical operating conditions at the LRPCP. The condition of the existing infrastructure is summarized based on the Pollution Control Condition Assessment Report which was completed in 2019 by Stantec Consulting Ltd. Overall the LRPCP has been maintained and is in fair condition; however, a majority of the infrastructure in Plant 1 and Plant 2 are nearing 60 and 35 years of use. It is anticipated that many of the unit processes will need to be refurbished or replaced in the upcoming years in order to improve performance and meet effluent quality requirements.

Table 5.3: Summary of Existing Conditions for Each Unit Process at the LRPCP

Unit Process	Design Capacity (MLD)	Capacity Assumptions	Performance	Condition
Raw Sewage Pumping Station	251	Assuming the largest pump (RSP 4) is out of service.	Good	Raw sewage pumps 1, 2, 3, and 4 have been in operation since 1989, 1971, 1964, and 1964, respectively. It is suspected that all pump volutes and valves are original and have been recommended for replacement.
Screening	453	Two (2) screens with 19mm clear openings and approach velocity of 0.9 m/s. Assume HGL is allowed to rise to 0.3 m below the operating floor level.	Bad	Fine Bar Screen No. 1 and 2 have been in operation since 1990. Both screens are in poor condition with debris accumulating at the lowest portion of the bar screen that cannot be automatically removed. It has been recommended for these screens to be replaced.
Grit Removal	224	Assuming functional depth of 0.62 m and design retention time of 0.5 min.	Good*	Grit Removal Tank No. 1 and 2 have been in operation since 1965 and 1990, respectively. Both tanks are in poor condition and require refurbishment, which is set to occur in 2026. This project will focus on improving the condition and performance of the grit removal system after which condition will be assumed to be good; however, it will not increase the current design capacity.
Primary Clarifiers	200	Primary clarifier capacity is outlined in the Re-Rating Technical Memo of **Appendix C**.	Good	The primary settling tanks on the site have been in operation for many years with PST No. 1/2, 3/4, and 5/6 having been constructed in 1965, 1973, and 1990, respectively. The concrete on the exterior of the tanks shows signs of aging; therefore, rehabilitation of the exterior of the tanks and coating of the interior of the tanks has been recommended.
Aeration Tanks	~~57~~→ 72.8 (1)	Aeration tank capacity is outlined in the Re-Rating Technical Memo of **Appendix C**.	Fair	The aeration tanks on the site have been in operation for many years with Plant 1 tanks being upgraded in 1986 and Plant 2 being constructed in 1990. Both systems are in fair condition and no major refurbishments have been recommended at this time.
Secondary Clarifiers	161	Secondary clarifier capacity is outlined in the Re-Rating Technical Memo of **Appendix C**.	Good	The secondary clarifiers on the site have been in operation for many years. The concrete on the exterior of the tanks shows signs of aging; therefore, rehabilitation of the exterior of the tanks and coating of the interior of the tanks has been recommended.
UV Disinfection	146	Capacity provided by manufacturer.	Good*	Disinfection units in UV Building No. 1 and 2 have been in operation since 1990. These units have exceeded their standard useful life of 25-years and are set to be replaced through a refurbishment project occurring in 2025/2026. This project will focus on improving the condition and performance of the grit removal system after which condition will be assumed to be good; however, it will not increase the current design capacity.
Sludge Dewatering	160	Assuming minor pump, polymer system, and	Good	The centrifuges on the site have been in operation since 1992. All centrifuges are in good condition.

Unit Process	Design Capacity (MLD)	Capacity Assumptions	Performance	Condition
		sludge holding tank upgrades can be made as needed. Assumed operating conditions: two (2) centrifuges in operation, 18 hours per day for 5 days per week. This will increase demand on the centrifuges and therefore may expedite rehabilitation and or replacement needs.		
Note: * Rehabilitation projects anticipated to be completed in 2026.				

Table 5.4 summarizes the upgrades that would be required for each unit process to meet the future design capacities for the 20-year design and the ultimate design.

Table 5.4: Summary of Proposed Design Capacities at the LRPCP

Unit Process	Current Design Capacity (MLD)	Proposed Design Capacity (MLD)					Required Design Capacity (MLD)			
		Plant 1[(1)]	Plant 2[(1)]	20-Year Upgrades	Ultimate Upgrades	Total	20-Year Design		Ultimate Design	
Raw Sewage Pumping Station	251	Decommission		393 ± 13	+81	474 ± 13	393 ± 13	✓	474 ± 13	✓
Screening	453	Decommission		474 ± 13	-	474 ± 13	393 ± 13	✓	474 ± 13	✓
Grit Removal	224	Decommission		259	-	259	201	✓	259	✓
Primary Clarifiers	200	112	88	+1	+58	259	201	✓	259	✓
Aeration Tanks	57	22	35	+17 @P1 +4 @P2	+27	105	77.2	✓	104	✓
Secondary Clarifiers	161	68	94	+40	+58	260	201	✓	259	✓
UV Disinfection	146	73	73	+55	+58	259	201	✓	259	✓
Sludge Dewatering	160	160		-	-	160	110	✓	150	✓

Note:

(1) Under this strategy it is assumed that upgrades will be made to improve flow distribution between the existing Plant 1 and 2; therefore, the capacity of the unit processes would not be limited by the lowest capacity upstream or downstream process.

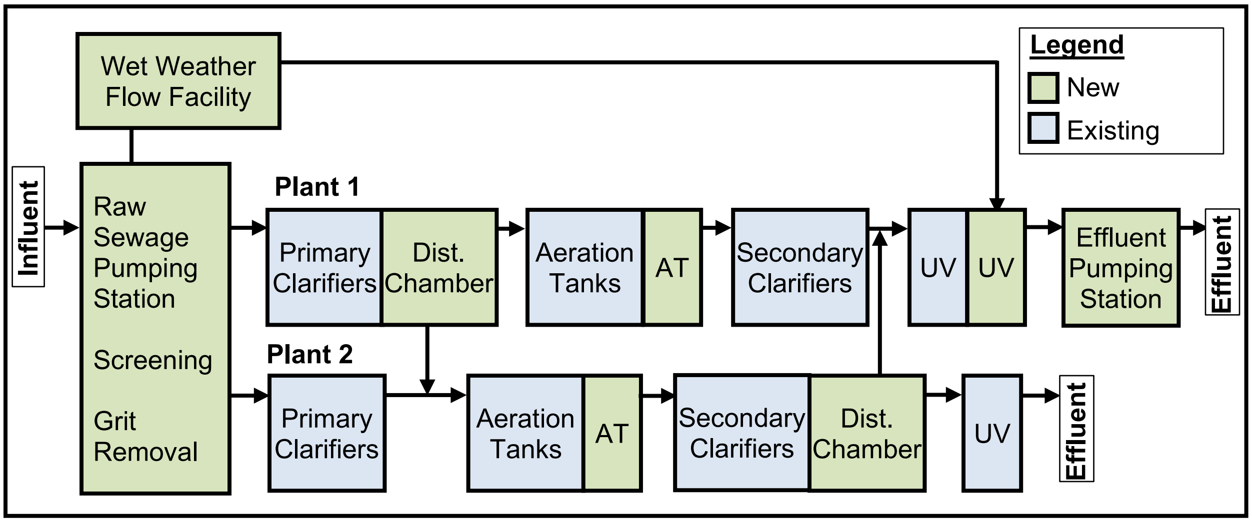

Figure 5.1: Preliminary Schematic of Proposed Upgrades for Alternative No. 6

Table 5.5 summarizes the upgrades that would be required for each unit process to meet the future design capacities for the 20-year design and the ultimate design.

Table 5.5: Summary of Upgrade Requirements for Alternative No. 6

Unit Process	20-Year Design	Ultimate Design
Raw Sewage Pumping Station	There are no spaces available for additional pumps in the existing raw sewage pumping station at the LRPCP. For the 20-year design, a new raw sewage pumping station would be required to accommodate the anticipated peak instantaneous flow. The pumps would be selected for the 20-year design flow requirements. The wet well for this pumping station would be sized for the ultimate design flow with space for additional future pumps. This new pumping station may be combined with the needs for the WWFRF to save on cost. For the purpose of this high-level comparison, it is assumed that a new raw sewage pumping station would be built. There is limited space within the confines of the existing LRPCP site; therefore, this facility would likely be located on the designated expansion lands and connected to the existing LRPCP.	For the Ultimate Design, additional pumps would be installed in the future pump spaces.
Screening	There are no additional channels or spaces for additional screens at the existing LRPCP. For the 20-year design, a new screening facility would be required to accommodate the anticipated peak instantaneous flow. The screens would be selected for the ultimate design flow requirements and two (2) screen channels would be sized for the ultimate design flow. The screening facility may be combined with the raw sewage pumping station and WWFRF to save on cost. For the purpose of this high-level comparison, it is assumed that a new screening facility would be built. If this solution is identified as the most preferred the possibility of expanding or reusing a portion of the existing screen will be evaluated in more detail.	For the Ultimate Design, no additional upgrades would be required.

Unit Process	20-Year Design	Ultimate Design
Grit Removal	There are no additional channels or spaces for additional grit removal units at the existing LRPCP. For the 20-year design, a new grit removal facility would be required to accommodate the anticipated peak hourly flow. The grit removal unit would be selected for the ultimate design flow requirements and the facility would be sized for the ultimate design flow. The screening facility may be combined with the raw sewage pumping station and WWFRF to save on cost. For the purpose of this high-level comparison, it is assumed that a new screening facility would be built.	For the Ultimate Design, no additional upgrades would be required.
Primary Clarifiers	For the 20-year design, the primary clarifiers would be required to accommodate the anticipated peak hourly flow (200 MLD → 201 MLD). Therefore, increasing the capacity of the primary clarifiers would have to be done within the existing tankage. This may be achieved by stress testing the allowable surface overflow rate thereby increasing the capacity of the existing clarifiers, chemically enhanced primary treatment (CEPT), or other retrofit solutions. While this may be possible through operational changes for the 20-year design, there is limited space within the confines of the existing LRPCP site and there is not enough space to add additional tankage for the Ultimate Design.	For the Ultimate Design, the primary clarifiers would be required to accommodate the anticipated peak hourly flow (200 MLD → 259 MLD). Additional improvements would need to be made to the primary clarifiers. It is anticipated that it may be difficult to increase the existing capacity by 29.5 %.
Aeration Tanks	For the 20-year design, the aeration tanks would be required to accommodate the anticipated average day flow (72.8 MLD → 77.2 MLD). There is limited space within the confines of the existing LRPCP site; however, there is some room for expansion of the existing tankage. The proposed improvements are outlined in the Re-Rating Background Technical Memo in **Appendix C**.	For the Ultimate Design, the aeration tanks would be required to accommodate the anticipated average daily flow (72.8 MLD → 104). Additional improvements would need to be made to the aeration tanks. This may be achieved by stress testing the allowable surface overflow rate thereby increasing the capacity, addition of fixed membrane/media, or other retrofit solutions.
Secondary Clarifiers	For the 20-year design, the secondary clarifiers would be required to accommodate the anticipated peak hourly flow (161 MLD → 201 MLD). There is limited space within the confines of the existing LRPCP site and there is not enough space to add additional tankage for the 20-year or Ultimate Design. Therefore, increasing the capacity of the secondary clarifiers would have to be done within the existing tankage or improvements upstream. This may be achieved by stress testing the existing clarifiers to increase capacity, optimizing hydraulic and solids loading, or other retrofit solutions.	For the Ultimate Design, the secondary clarifiers would be required to accommodate the anticipated peak hourly flow (161 MLD → 259 MLD). Additional improvements would need to be made to the primary clarifiers. It is anticipated that it would be difficult to increase the existing capacity by 60.8 %.
UV Disinfection	For the 20-year design, an expansion to the existing UV Disinfection Facilities or a new UV Disinfection facility would be required to accommodate the anticipated peak hourly flow. If reusing the existing facilities is plausible, additional lamps or units would be added to the existing channels. If this is not feasible, a new UV Disinfection facility would be designed for the 20-year design flow requirements. Three (3) channels would be sized	For the Ultimate Design, an additional UV disinfection unit would be installed in the future channel.

Unit Process	20-Year Design	Ultimate Design
	for the ultimate design flow with one (1) channel dedicated for a future UV disinfection unit. The new UV Disinfection facility may be combined for Plant 1 and Plant 2 to save on cost. There is limited space within the confines of the existing LRPCP site; however, this facility may be combined with or located south of the existing Plant 1 UV Disinfection Building.	
Outfall Sewer	Due to the instantaneous high-water level in the Little River Drain and the HGL through the existing Plant 1 and Plant 2, a new Effluent Pumping Station would be required to provide an outlet for the LRPCP. The pumps would be selected for the 20-year design flow requirements. The wet well for this pumping station would be sized for the ultimate design flow with space for additional future pumps. There is limited space within the confines of the existing LRPCP site; however, this facility may be located south of the proposed Pontiac Pumping Station expansion. The LRPCP effluent would continue to outlet to the existing outfalls at the LRPCP; therefore, no new outlet to the Little River Drain or Detroit River would be required.	For the Ultimate Design, additional pumps would be installed in the future pump spaces.
Hydraulic Upgrades	In addition to the hydraulic upgrades outlined for each of the unit processes above, it is anticipated that hydraulic upgrades and improvements would be required to distribute flow between the existing primary clarifiers, aeration tanks, secondary clarifiers, and UV disinfection facility at Plant 1 and Plant 2. This is required since the capacity of these unit processes differs between the two plants. The capacities of the primary clarifiers, aeration tanks, secondary clarifiers, and UV disinfection facility are 112MLD, 22MLD, 68MLD, and 73MLD at Plant 1 and 88MLD, 35MLD, 94MLD, and 73MLD at Plant 2, respectively. In order to optimize the flow through the two plants, flow distribution chambers or channels would likely need to be implemented downstream of the primary clarifiers and downstream of the secondary clarifiers. These channels may be controlled by a weir to redistribute flow by gravity.	
Sludge Dewatering	The existing sludge dewatering facility has the capacity to accommodate the 20-year and ultimate design based on the following assumptions: Minor upgrades are carried out as needed for the pumping systems, polymer systems, and sludge holding tanks. Operating conditions: two (2) centrifuges in operation, 18 hours per day for 5 days per week. General maintenance and replacement of parts as required.	
General Upgrades	It is anticipated that as a part of the capacity upgrades for each unit process additional general upgrades, repairs, and rehabilitation would be carried out.	

5.3.6.3 Evaluation

<u>Technical Feasibility</u>

Upgrading the existing treatment trains at the LRPCP would increase the ability to meet the current and future wastewater servicing needs. The addition of a WWFRF would allow the LRPCP to accommodate anticipated WWFs from the service area. The proposed upgrades to the headworks, primary clarifiers, aeration tanks, secondary clarifiers and UV disinfection building; addition of an effluent pumping station, and general hydraulic and process upgrades throughout would allow the LRPCP to accommodate anticipated DWFs from the service area. However, due to the site restrictions increasing the capacity of the primary and secondary treatment processes may be difficult and would have to be done within the site limitations and/or existing tankage. This may be achieved by stress testing the allowable surface overflow rate thereby increasing the capacity of the existing clarifiers, chemically enhanced primary treatment (CEPT), or other retrofit solutions. From a technical perspective, it may be difficult to increase the capacity of the primary and secondary treatment processes to the desired capacity and maintain effluent quality requirements. Although this may be achievable for the 20-Year Design, it would be increasingly difficult to meet the Ultimate Design requirements.

There is limited space available for these upgrades and some of the building and tank expansions would be taking place in between existing infrastructure. From a constructability point of view, these upgrades will be difficult to carry out and would result in increased construction timeline and cost compared to building in an open space. The upgrades to the plant may be completed in phases which would allow the capital expenditure for these works to be spread across multiple financial years. After completion of construction, these upgrades should have no adverse impact on the existing infrastructure (operations and/or maintenance).

One of the major drawbacks for this design solution is that there is less potential for phasing, upgrading, or expanding in the future to meet updated effluent requirements, increased servicing needs and/or climate change projections. Further, there is little to no engineering redundancy provided throughout the process. If one train of the treatment process (particularly the primary clarifiers, aeration tanks, and secondary clarifiers) are out of service or shut down for maintenance then there is limited operational flexibility, and overflows should be expected during these times. It is difficult to introduce engineering redundancy in the primary and secondary treatment processes due to space restrictions.

<u>Social Impacts</u>

In terms of the social impacts, the implementation of these upgrades and the expansion of the LRPCP footprint is expected to have some negative impacts on society.

The lands within the existing LRPCP footprint have undergone intensive ground disturbances since the initial commissioning in 1966. Ground disturbances at the site include construction of buildings with deep foundations, sewer lines, gas lines, underground tunnels, roads, etc. Despite this the site will be assessed appropriately for archaeological sites, areas of archaeological potential, and known or potential built heritage resources and cultural heritage landscapes. Due to the extensive ground disturbances and the assessment to be carried out on the site, it is anticipated that there will be minimal impacts.

It is anticipated that the processes employed through the upgrades will be similar to that of the existing LRPCP. Issues related to noise, vibration, odour and air pollution emissions from the existing processes at the LRPCP have been identified to be of concern to the residents to the west of the LRPCP. The aeration tanks would be considered a potential source of noise, vibration, and odour, the UV disinfection facility would have minimal potential for these impacts, and the effluent pumping station would be a potential source of noise and vibration. The aeration tanks and effluent pumping station would be located approximately 80 meters from the property line of the residential dwellings. It is anticipated that expanding the aeration tanks and introducing an effluent pumping station would not be preferred by the residents.

In addition, these upgrades would be less aligned with the existing development policies and agreements in this area. Unlike the area to the east of the LRPCP, there is a minimal buffer zone between the facilities and the adjacent residents. Consultation with the MECP would be required to determine the appropriate mitigation measures for noise and odours to provide the necessary level of protection between the LRPCP and the adjacent sensitive land uses. Consideration would be given to silencing specific sources of noise, covering certain sections of the plant, and/or treating collected gases. Overall, this solution would allow for the City of Windsor and Municipality of Tecumseh to accommodate development of increase housing supply within the community, which represents significant opportunity to generate socio-economic growth.

<u>Natural Environment</u>

In terms of the natural environmental impact, the implementation of the proposed upgrades is expected to have minimal negative impacts during the construction phase. Best management practices and mitigation measures are anticipated to be employed throughout construction to minimize impact to vegetation, fish and wildlife, areas of natural and scientific interest, environmentally sensitive areas, and soil / geology.

During the operational phase of these works, the WWFRF is expected to minimize the occurrence of combined sewer overflows by providing primary level treatment and disinfection during severe WWF events. This will be beneficial to the natural environment and the residents living along the Little River Drain.

Although the WWFRF will help to reduce the combined sewer overflows, there are concerns regarding the effluent characteristics and compliance with MECP Limits. Under the peak DWF events, many of the unit processes will be operating under harsh conditions, above their original design capacity and near their allowable capacity developed through stress testing. The historic records from 2023 indicated that the flow to the LRPCP exceeded the peak DWF value (115 MLD) a total of 18 times throughout the year. Therefore, the facility should be expected to run under these conditions on a monthly basis (1~2 times per month). As discussed in the technical impacts section, there is little to no engineering redundancy provided throughout the process. If one train of the treatment process is out of service, there may be issues with meeting effluent compliance limits. Obtaining an ECA for these works may prove more difficult than introducing an additional treatment train.

<u>Economic Impacts</u>

This solution would require an initial capital investment for planning, construction and post commission monitoring, but would serve to create value for the City long-term through better performance of the plant as well as fulfilling its planning objectives for the eventual expansion of the community and creation of new jobs, businesses and industries. A high-level comparison of the opinion of probable cost (OPC) for Alternative No. 6 and 7 are presented in **Table 5.8** of Section **5.3.7.3**.

5.3.6.4 Screening Result

Overall, upgrading the sewage works would accommodate increasing development pressures within the service area. In consideration of the factors discussed above, Alternative No. 6 – Upgrade Existing

Treatment Trains at the LRPCP was carried forward for further evaluation and consideration in combination with other alternatives.

5.3.7 Alternative No. 7: Add an Additional Treatment Train at the LRPCP

5.3.7.1 Overview

Under this strategy, wastewater would continue to be collected and processed at the existing LRPCP. An additional treatment train (Plant 3), otherwise known as a tandem treatment plant, would be added to the LRPCP to accommodate the projected DWFs from the service area. These upgrades would initially be designed for the 20-Year Design Flow and would include consideration for future expansion or upgrades to the Ultimate Design Flow. The effluent from the new treatment train would outlet to an existing outfall at the LRPCP; therefore, no new outlet to the Little River Drain or Detroit River would be required. In addition to the upgrades required to accommodate the DWF projections, this design solution would likely be combined with alternative solutions for WWF management.

5.3.7.2 Preliminary Requirements for Dry Weather Flow Treatment

Table 5.6, outlines the current and proposed design capacities of each unit process as well as the required capacities for the 20-Year Design and Ultimate Design. The Design Basis for each unit process was determined based on the MECP Design Guidelines for Sewage Works. The raw sewage pumping station, screening, and outfall sewers are to be designed for the design peak instantaneous flow. The grit removal, primary clarifiers, secondary clarifiers, and UV disinfection system are to be designed for the peak hourly flow. The secondary treatment processes are to be designed for the average daily flow. The sludge dewatering facility is to be designed for the maximum monthly mass loading and flow.

Table 5.6: Summary of Proposed Design Capacities at the LRPCP

Unit Process	Current Design Capacity (MLD)	Proposed Design Capacity (MLD)					Required Design Capacity (MLD)			
		Plant 1	Plant 2	Plant 3[(2)]		Total	20-Year Design		Ultimate Design	
				20-Year Upgrades	Ultimate Upgrades					
Raw Sewage Pumping Station	251	Decommission		393 ± 13	+81	474 ± 13	393 ± 13	✓	474 ± 13	✓
Screening	453	Decommission		474 ± 13	-	474 ± 13	393 ± 13	✓	474 ± 13	✓
Grit Removal	224	Decommission		259	-	259	201	✓	259	✓
Primary Clarifiers	200	112 (68)[(1)]	88 (73)[(1)]	60	+58	318 (259)[(1)]	201	✓	259	✓
Aeration Tanks	57	22	35	20	+27	104	77.2	✓	104	✓
Secondary Clarifiers	161	68	94 (73)[(1)]	60	+58	280 (259)[(1)]	201	✓	259	✓

Unit Process	Current Design Capacity (MLD)	Proposed Design Capacity (MLD)					Required Design Capacity (MLD)			
		Plant 1	Plant 2	Plant 3[2]		Total	20-Year Design		Ultimate Design	
				20-Year Upgrades	Ultimate Upgrades					
UV Disinfection	146	73 (68) [1]	73	60	+58	264 (259) [1]	201	✓	259	✓
Sludge Dewatering	160	160		-	-	160	110	✓	150	✓

Note:

(1) Under this strategy it is assumed that no upgrades will be made to the existing Plant 1 and 2; therefore, the capacity of the unit processes are limited by the lowest capacity upstream or downstream process. The rounded brackets indicate the capacity to which each unit process is limited.

(2) For the purpose of this high-level comparison of design solutions, the proposed design capacity for Plant 3 is shown for a conventional wastewater treatment facility with primary clarifiers, aeration tanks, and secondary clarifiers. If this solution is selected alternative treatment technologies and process layouts will be evaluated in more detail as a part of Phase 3 of the Municipal Class EA Process.

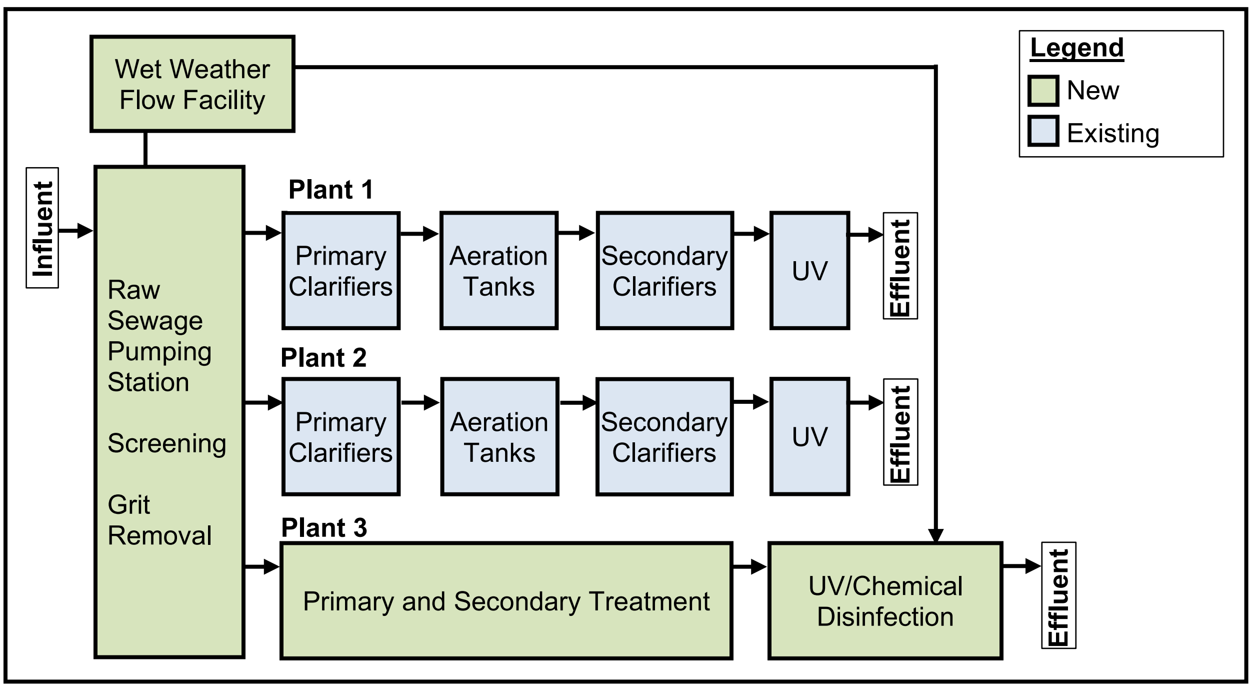

Figure 5.2: Preliminary Schematic of Proposed Upgrades for Alternative No. 7

Table 5.7 summarizes the upgrades that would be required for each unit process to meet the future design capacities for the 20-year design and the ultimate design.

Table 5.7: Summary of Upgrade Requirements for Alternative No. 7

Unit Process	20-Year Design	Ultimate Design
Raw Sewage Pumping Station	There are no spaces available for additional pumps in the existing raw sewage pumping station at the LRPCP. For the 20-year design, a new raw sewage pumping station would be required to accommodate the anticipated peak instantaneous flow. The pumps would be selected for the 20-year design flow requirements. The wet well for this pumping station would be sized for the ultimate design flow with space for additional future pumps. This new pumping station may be combined with the needs of the WWFRF to save on cost. There is limited space within the confines of the existing LRPCP site; therefore, this facility would likely be located on the designated expansion lands and connected to the existing LRPCP.	For the Ultimate Design, additional pumps would be installed in the future pump spaces.
Screening	There are no additional channels or spaces for additional screens at the existing LRPCP. For the 20-year design, a new screening facility would be required to accommodate the anticipated peak instantaneous flow. The screens would be selected for the ultimate design flow requirements and two (2) screen channels would be sized for the ultimate design flow. The screening facility may be combined with the raw sewage pumping station and WWFRF to save on cost.	For the Ultimate Design, no additional upgrades would be required.
Grit Removal	There are no additional channels or spaces for additional grit removal units at the existing LRPCP. For the 20-year design, a new grit removal facility would be required to accommodate the anticipated peak hourly flow. The grit removal unit would be selected for the ultimate design flow requirements and the facility would be sized for the ultimate design flow. The screening facility may be combined with the raw sewage pumping station and WWFRF to save on cost.	For the Ultimate Design, no additional upgrades would be required.
Primary and Secondary Treatment	For the 20-year design, the primary and secondary treatment processes would be designed to accommodate the anticipated average flow of 20 MLD and peak hourly flow of 60 MLD. There are a number of treatment technologies available which could be employed for the Plant 3 treatment train such as activated sludge processes, sequencing batch reactors, membrane biological reactors, moving bed biological reactors, and more. The facility would be designed for the 20-year design, with the ability to be expanded to meet ultimate capacity requirements.	For the Ultimate Design, the primary and secondary treatment processes would be expanded accordingly.
UV Disinfection	For the 20-year design, a new UV Disinfection facility would be required to accommodate the anticipated peak hourly flow. The UV Disinfection units would be selected for the 20-year design flow requirements. Three (3) screen channels would be sized for the ultimate design flow with one (1) channel dedicated for a future screen unit.	For the Ultimate Design, an additional UV disinfection unit would be installed in the future channel.
Outfall Sewer	The instantaneous high-water level in the Little River Drain and the HGL through the existing Plant 1 and Plant 2 is unfavorable. However, with the introduction of a new Plant 3 and WWFRF, which will process the majority of the peak flows, it is anticipated that an effluent pumping station would not be required. It is assumed that the effluent from Plant 3 and the WWFRF will be conveyed through one of the existing LRPCP Outfalls.	
Sludge Dewatering	The existing sludge dewatering facility has the capacity to accommodate the 20-year and ultimate design based on the following assumptions: • Minor upgrades would be carried out as needed for the pumping systems, polymer systems, and sludge holding tanks. • Operating conditions: two (2) centrifuges in operation, 18 hours per day for 5 days per week. • General maintenance and replacement of parts as required.	

5.3.7.3 Evaluation

Technical Feasibility

Adding an additional treatment train at the LRPCP and a WWFRF would increase the ability to meet current and future wastewater servicing needs. The proposed expansion to the headworks, primary and secondary treatment processes and UV disinfection building would allow the LRPCP to accommodate anticipated DWFs from the service area. In comparison to Alternative No. 5, this solution does not present limitations or issues with meeting current and future needs. The addition of a WWFRF would allow the LRPCP to accommodate anticipated WWFs from the service area.

From a constructability point of view, these upgrades will be occurring in an open space making the work easier to carry out within a reasonable timeline and cost. The upgrades to the plant may be completed in phases which would allow the capital expenditure for these works to be spread across multiple financial years. After completion of construction, these upgrades should have no adverse impact on the existing infrastructure (operations and/or maintenance).

One of the major advantages of this design solution is that there is more potential for phasing, upgrading, or expanding in the future to meet updated effluent requirements, increased servicing needs and/or climate change projections. Further, there is engineering redundancy provided throughout the process. If one train of the treatment process (particularly the primary clarifiers, aeration tanks, and secondary clarifiers) are out of service or shut down for maintenance then there is some operational flexibility.

Social Impacts

In terms of the social impacts, the implementation of these upgrades and the expansion of the LRPCP footprint is expected to have fewer negative impacts on society, in comparison to Alternative No. 6.

The proposed expansion site will be assessed appropriately for archaeological sites, areas of archaeological potential, and known or potential built heritage resources and cultural heritage landscapes. Due to the extensive ground disturbances in the region and the assessment to be carried out on the site, it is anticipated that there will be minimal impacts.

It is anticipated that the processes employed through the upgrades will be similar to that of the existing LRPCP. Issues related to noise, vibration, odour and air pollution emissions are anticipated to be less than that for Alternative No. 5 because there is a significantly large buffer zone between the proposed works and nearby residents. It is anticipated that expanding to the west of the existing LRPCP would be preferable for the local residents.

The proposed expansion lands have been designated for this use and zoned appropriately; therefore, this expansion would be aligned with the existing development policies and agreements in this area. Unlike the area to the west of the LRPCP there is a designated buffer zone which has been zoned accordingly to provide a 300 m space between the facilities and proposed adjacent residents. No alternations are proposed to the buffer zone. Overall, this solution would allow for the City of Windsor and Municipality of Tecumseh to accommodate development of increase housing supply within the community, which represents significant opportunity to generate socio-economic growth.

Natural Environment Impacts

In terms of the natural environmental impact, the implementation of the proposed upgrades is expected to have minimal negative impacts during the construction phase. Best management practices and mitigation measures are anticipated to be employed throughout construction to minimize impact to vegetation, fish and wildlife, areas of natural and scientific interest, environmentally sensitive areas, and soil / geology.

During the operational phase of these works, the WWFRF is expected to minimize the occurrence of combined sewer overflows by providing primary level treatment and disinfection during severe WWF events. This will be beneficial to the natural environment and the residents living along the Little River Drain.

There is engineering redundancy provided in this design throughout the unit processes; therefore, there is less concern regarding the effluent characteristics and compliance with MECP Limits. Under the peak DWF events, the unit processes will be operating under design conditions within their original design capacity. Obtaining an ECA for these works may prove less difficult than upgrading the existing LRPCP.

Economic Impacts

This solution would require an initial capital investment for planning, construction and post commission monitoring, but would serve to create value for the City long-term through better performance of the plant as well as fulfilling its planning objectives for the eventual expansion of the community and creation of new jobs, businesses and industries.

A high-level comparison of opinion of probable cost (OPC) for Alternative No. 6 and 7 are summarized in **Table 5.8**. A detailed OPC for the preferred solution will be developed following the conceptual design. The following is a summary of the key assumptions applied for the OPC assessments presented in this section of the report:

- Although there will be some variation in the designs for each of the following unit processes (Raw Sewage Pumping Station, Screening, Grit Removal, UV Disinfection, Sludge Dewatering Facility, and WWFRF) it is assumed for this high-level comparison that the cost will be comparable for each alternative solution.
- The Opinion of Probable Cost does not include any cost for land acquisition as it is assumed the facility would be located on property which is currently owned by the City of Windsor.

Table 5.8: High Level Comparison of Opinion of Probable Cost

Item	Description	Alternative 6: Upgrade Existing Treatment Trains at the LRPCP	Alternative 7: Add an Additional Treatment Train at the LRPCP
1	Raw Sewage Pumping Station	Comparable	Comparable
2	Screening	Comparable	Comparable
3	Grit Removal	Comparable	Comparable
4	Primary Clarifiers	Low	Moderate
5	Aeration Tanks	Moderate	High
6	Secondary Clarifiers	Low	Moderate
7	UV Disinfection	Comparable	Comparable
8	Outfall Sewer / Effluent Pumping Station	Moderate	Low
9	Hydraulic Upgrades	Moderate	Low
10	General Upgrades	Moderate	Low
11	Sludge Dewatering Facility	Comparable	Comparable

5.3.7.4 Screening Result

Overall, it is clear that upgrading the sewage works would accommodate the increasing development pressures within the service area. In consideration of the factors discussed above, Alternative No. 7 – Add an Additional Treatment Train at the LRPCP was carried forward for further evaluation and consideration in combination with other alternatives.

5.3.8 Alternative No. 8: Combination of the Above Alternatives

5.3.8.1 Overview

Under this strategy, a combination of the above alternatives would be implemented to address the identified problems and needs at the LRPCP. The screening of alternatives, as outlined in **Section 5.3.1** through **Section 5.3.7** led to the following shortlist for further consideration:

- ~~Alternative No. 1: Do Nothing~~
- Alternative No. 2: Reduce Wet Weather Sewage Flows (WWF) through I&I Reduction Efforts
- Alternative No. 3: Construct a WWFRF
- ~~Alternative No. 4: Modify Operations of Existing Infrastructure~~
- ~~Alternative No. 5: Discharge to New Sewage System~~
- Alternative No. 6: Upgrade Existing Treatment Trains at LRPCP
- Alternative No. 7: Add an Additional Treatment Train at LRPCP

These alternatives would generally be combined to address the two (2) long-term servicing needs of the LRPCP: (1) accommodate peak WWFs and reduce the potential for bypass events to the Little River and (2) accommodate peak DWFs and reduce the potential for overflow events within the LRPCP.

Alternative No.'s 2 and 3 were considered for the purpose of addressing the peak WWF capacity issues and Alternative No.'s 6 and 7 were considered for the purpose of addressing the peak DWF capacity issues. The other alternatives were not carried forward for additional detailed evaluation due to negative social, natural environmental, economic or cultural heritage impacts. Each of the shortlisted alternatives is evaluated in more detail in the **Section 5.4** to determine the appropriate combination of solutions at the LRPCP. The recommended combination of solutions as well as the proposed timing and phasing of these are outlined in **Section 5.5**.

5.4 EVALUATION OF ALTERNATIVE DESIGN SOLUTIONS

In order to objectively compare alternatives an evaluation matrix with a colour rating scale system was utilized. For each of the evaluation criteria the alternatives were assessed and awarded a rating in the colour range of red, yellow, green, or dark green with red being the least desirable and dark green being the most desirable. The description of the colour rating is presented in **Table 5.9**. The evaluation of alternative design solutions is presented in **Table 5.10** and **Table 5.11.**

Table 5.9: Description of Colour Rating for Evaluation Criteria

Colour	Scale	Description
🔴	Poor	Unsuitable or not fit for the desired application; negative impacts; disadvantageous; and/or undesirable given the project timeline, budget, scope, and standards.
🟡	Fair	Acceptable for the desired application; minimal negative impacts; adequate given the project timeline, budget, scope, and standards.
🟢	Good	Suitable or good for the desired application; negligible impacts; and/or agreeable given the project timeline, budget, scope, and standards.
🟢	Great	Favourable; positive impacts; advantageous; excellent given the project timeline, budget, scope, and standards.

Table 5.10: Evaluation of Alternative Design Solutions for Wet Weather Flow Requirements

Evaluation Criteria	Alternative 2: Reduce Wet Weather Sewage Flows through I&I Reduction Efforts	Alternative 3: Construct a WWFRF
Technical Suitability	**Fair** • Increase ability to accommodate additional developments and wastewater flows from the service area. • Increase ability to accommodate WWF and mitigate combined sewer overflows; however, would still need to be applied in combination with other WWF management. • More complex implementation as multiple I&I identification and repair projects would need to be completed over the years. • Less complex operational requirements. • Flexible implementation timeline and phasing. • Less flexible to adjust to meet updated effluent requirements, increased servicing needs, or climate change. • Positive impact on existing infrastructure (operations and maintenance).	**Great** • Able to accommodate additional developments and wastewater flows from the service area. • Able to accommodate anticipated WWF and mitigate combined sewer overflows. • Less complex implementation through one capital project. • More complex operational requirements. • Flexible implementation timeline and phasing • More flexible to adjust to meet updated effluent requirements, increased servicing needs, or climate change. • Positive impact on existing infrastructure (operations and maintenance).
Social	**Good** • Moderate impacts to society. • Low potential for impact to archaeological sites, areas of archaeological potential, and known or potential built heritage resources and cultural heritage landscapes. • Aligned with development policies and practices. • Less involved permitting requirements. • Would accommodate development pressures.	**Good** • Moderate impacts to society. • Low potential for impact to archaeological sites, areas of archaeological potential, and known or potential built heritage resources and cultural heritage landscapes. • Aligned with development policies and practices. • More involved permitting requirements. • Would accommodate development pressures.
Natural Environment	**Fair** • Minimal impact to natural environment during the construction phase. • Best management practices and mitigation measures are anticipated to be employed throughout construction to minimize impact to vegetation, fish and wildlife, areas of natural and scientific interest, environmentally sensitive areas, and soil / geology.	**Good** • Minimal impact to natural environment during the construction phase. • Best management practices and mitigation measures are anticipated to be employed throughout construction to minimize impact to vegetation, fish and wildlife, areas of natural and scientific interest, environmentally sensitive areas, and soil / geology.

Evaluation Criteria	Alternative 2: Reduce Wet Weather Sewage Flows through I&I Reduction Efforts	Alternative 3: Construct a WWFRF
	• Moderately minimize the occurrence of combined sewer overflows.	• Significantly minimize the occurrence of combined sewer overflows.
Economic	**Good** • Moderate capital investment and O&M cost	**Fair** • Moderate-high capital investment and O&M cost
Overall	**Fair**	**Good**

Table 5.11: Evaluation of Alternative Design Solutions for Dry Weather Flow Requirements

Evaluation Criteria	Alternative 6: Upgrade Existing Treatment Trains at the LRPCP	Alternative 7: Add an Additional Treatment Train at the LRPCP
Technical Suitability	**Fair** • Increase ability to accommodate additional developments and wastewater flows from the service area. • Due to site restrictions, it may be difficult to increase the capacity of the primary and secondary treatment processes to the desired capacities beyond the 20-year design period. • More complex construction. • Comparable operational requirements. • Flexible implementation timeline and phasing. • Less flexible to adjust to meet updated effluent requirements, increased servicing needs, or climate change. • No engineering redundancy.	**Great** • Able to accommodate additional developments and wastewater flows from the service area. • No restrictions to increasing the primary and secondary treatment processes to the desired capacities. • Less complex construction. • Comparable operational requirements. • Flexible implementation timeline and phasing • More flexible to adjust to meet updated effluent requirements, increased servicing needs, or climate change. • Engineered redundancy.
Social	**Fair** • Moderate impacts to society. • Low potential for impact to archaeological sites, areas of archaeological potential, and known or potential built heritage resources and cultural heritage landscapes. • Less aligned with development policies and practices. • Proposed works to be located closer to residents.	**Good** • Moderate impacts to society. • Low potential for impact to archaeological sites, areas of archaeological potential, and known or potential built heritage resources and cultural heritage landscapes. • More aligned with development policies and practices. • Proposed works to be located farther from residents.

Evaluation Criteria	Alternative 6: Upgrade Existing Treatment Trains at the LRPCP	Alternative 7: Add an Additional Treatment Train at the LRPCP
	• More consultation with the MECP would be required along with heightened mitigation measures. More restrictive permitting requirements. • Would accommodate development pressures.	• Less restrictive permitting requirements. • Would accommodate development pressures.
Natural Environment	**Fair** • Minimal impact to natural environment during the construction phase. • Best management practices and mitigation measures are anticipated to be employed throughout construction to minimize impact to vegetation, fish and wildlife, areas of natural and scientific interest, environmentally sensitive areas, and soil / geology. • More concerns regarding the effluent characteristics and compliance with MECP Limits. • Moderate permitting requirements.	**Good** • Minimal impact to natural environment during the construction phase. • Best management practices and mitigation measures are anticipated to be employed throughout construction to minimize impact to vegetation, fish and wildlife, areas of natural and scientific interest, environmentally sensitive areas, and soil / geology. • Less concerns regarding the effluent characteristics and compliance with MECP Limits. • Moderate permitting requirements.
Economic	**Fair** • Moderate-high capital investment and O&M cost. • Ability to accommodate development within the entire service area and generate additional economic growth.	**Fair** • Moderate-high capital investment and O&M cost. • Ability to accommodate development within the entire service area and generate additional economic growth.
Overall	**Fair**	**Good**

5.5 RECOMMENDED SOLUTION

5.5.1 Discussion on Alternatives

Based on the evaluation of alternative design solutions presented in **Table 5.10** and **Table 5.11**, each of the shortlisted alternatives were determined to be ranked as ‘Fair’ or ‘Good’. Alternative No.’s 3 and 7 would be considered good for the desired application with minimal long-term negative impacts in terms of the technical, social, natural environmental, and economic factors. Alternative No.’s 2 and 6 would be considered acceptable for the desired application, with minimal negative impacts, and may be adequate given the project timeline, budget, scope, and standards.

Alternative No. 2 – Reduce Wet Weather Sewage Flows through I&I Reduction Efforts would be considered as a beneficial initiative to assist in meeting the short-term and long-term WWF projections at the LRPCP. In combination with other alternatives, this solution would reduce the anticipated WWF to the LRPCP and allow for reduced hydraulic capacity requirements by both the City and Town. This would include reduced size and therefore cost requirements for the inlet pumping station, screening, grit removal systems, and outfall channel. For the purpose of this MCEA study, the anticipated peak WWF is presented as a range. It is recommended that when detailed design for the LRPCP works begin that the results of the City of Windsor I&I Reduction Workplan are reviewed, and the anticipated peak WWF is refined accordingly.

Alternative No. 3 – Construct a WWFRF would be considered the most preferred solution to address short-term and long-term WWF projections at the LRPCP. The construction of the WWFRF should also include the addition of the New LRPCP Headworks (screening, influent pumping station, grit removal and accessory systems) which will be required to accommodate the projected Peak WWF. The WWFRF would be designed to accommodate the projected WWF from the service area in order to mitigate combined sewer overflows to the Little River Drain. There is potential for phasing, upgrading, or expanding in the future to meet updated WWF requirements, increased servicing needs and/or climate change projections. The proposed expansions and upgrades will be designed in accordance with MECP Design Guidelines for Sewage Works which would mitigate potential negative impacts on the community and/or natural environment. In terms of the economic requirements, this solution would require a significant capital cost investment in the immediate planning horizon. Several conceptual design alternatives would be available, which would be explored in more detail as a part of this MCEA Process. Overall, in the short and long-term the addition of a WWFRF will mitigate the impact of combined sewer overflows.

Alternative No. 6 – Upgrade Existing Treatment Trains at the LRPCP would be considered an acceptable solution for the 20-Year DWF projections at the LRPCP. This solution will address the need for additional wastewater treatment capacity at the LRPCP while delaying significant capital cost investments for a Plant 3 identified in Alternative No.7. The proposed upgrades will be designed in accordance with MECP Design Guidelines for Sewage Works which would mitigate potential negative impacts on the community and/or natural environment. In terms of the economic requirements, this solution would require a moderate capital cost investment in the 15-year or more planning horizon, which may also be aligned with other ongoing upgrades projects at the LRPCP. Several conceptual design alternatives would be available to increase the capacities of the LRPCP unit processes, which would be explored in more detail as a part of this MCEA

Process. Overall, in the short to medium term upgrading the LRPCP in combination with the WWFRF will mitigate impact of combined sewer overflows and accommodate some development in the service areas (including the City of Windsor, Town of Tecumseh, and Sandwich South).

Alternative No. 7 – Add an Additional Treatment Train at the LRPCP would be considered the most preferred solution for the Ultimate DWF projections at the LRPCP. This solution will address the need for additional wastewater treatment capacity at the LRPCP while providing engineering redundancy. In addition, there is more potential for phasing, upgrading, or expanding in the future to meet updated effluent requirements, increased servicing needs and/or climate change projections. In terms of the social and natural environment, this solution is a part of the original system design and is a planned requirement for the LRPCP. The proposed expansions and upgrades will be designed in accordance with MECP Design Guidelines for Sewage Works which would mitigate potential negative impacts on the community and/or natural environment. In terms of the economic requirements, this solution would require a significant capital cost investment for which funds should be saved for implementation on the 30-year or more planning horizon. Several treatment technology alternatives, biosolids management strategies, and site layouts are available and may be explored in more detail as a part of a future MCEA Process. Overall, in the long-term the addition of a Plant 3 in combination with the WWFRF will mitigate impact of combined sewer overflows and accommodate development in the service areas (including the City of Windsor, Town of Tecumseh, and Sandwich South).

5.5.2 Recommended Solution and Phasing

For the purposes of asset management and planning, the capacity upgrades for the LRPCP can be divided into three major implementation phases as outlined in **Table 5.12**.

Table 5.12: Recommended Solution and Upgrades

Phase	Planning Horizon	Description of Works
1	Immediate	Reduce Wet Weather Sewage Flows through I&I Reduction Efforts (Alternative No. 2)** Construct a WWFRF including New LRPCP Headworks (Alternative No. 3)
2	15 Years*	Upgrade the Existing Treatment Trains at the LRPCP (Alternative No. 6)***
3	30 Years*	Add an Additional Treatment Train at the LRPCP (Alternative No. 7)

Note:

* May be subject to change based on the pace at which developments progress within the City of Windsor service areas and Town of Tecumseh.

** In progress for the City of Windsor portion of the service area and not yet started for the Town of Tecumseh.

*** Assuming that no tertiary treatment is required to comply with new effluent criteria. If tertiary treatment is required, additional expansion should be considered.

Phase 1 is recommended to be implemented in the immediate future to address immediate WWF capacity issues at the LRPCP. This Phase would include the implementation of a WWF Management Facility and other necessary upgrades to the sanitary system and LRPCP to accommodate the facility. Phase 2 is recommended to be implemented in the short to medium term to address DWF capacity requirements, HGL concerns, as well as potential poor performance or condition of unit processes at the LRPCP. Phase 3 is recommended to be implemented in the long term and would meet ultimate treatment capacity requirements at the LRPCP and provide engineering redundancy through the implementation of a Plant 3.

The 20-Year Average Day Flow (ADF) projection is approximately 6% greater than the existing rated capacity of the LRPCP; therefore, there is a significant allowance for development in the service area within the next 20-Years. In addition, it is anticipated that the implementation of Phase 1 upgrades will recover additional ADF capacity at the LRPCP and delay the need for the Phase 2 Expansion beyond the original estimated 20-Years. Further, as standard maintenance and upgrades occur at the LRPCP, consideration should be given to improving the capcity as outlined in this ESR.

This Class EA study will be revisited every 10 years in accordance with MCEA requirements, allowing for adjustments based on evolving technologies and updated standards. This ESR will provide details for the Phase 1 Expansion in sufficient detail to proceed with Phase 5 (Implementation). It is recommended that results of the Phase 1 Expansion and development in the region are monitored such that the Phase 2 Expansion is planned, approved, and implemented accordingly. This ESR will provide details for the Phase 2 and Phase 3 Expansion in sufficient detail to allow for appropriate planning, approvals, and implementation (as deemed appropriate). It is anticipated that the Phase 2 and Phase 3 Expansions of the LRPCP may change significantly over time due to new developments and technologies in wastewater treatment.

6.0 ALTERATIVE DESIGN CONCEPTS

6.1 INTRODUCTION

The following sections present the details of work undertaken as part of Phase 3 of the Class EA process. Phase 3 involves the identification of alternative design concepts (technical alternatives) for the preferred solution, and evaluation of various design concepts with the objective of determining which alternative best addresses the preferred solution.

In this section of the report, alternative design concepts for the three (3) proposed design phases are identified and evaluated. Phase 1, implementation of a WWFRF and new LRPCP Headworks, is proposed to be initiated in the near future and is outlined in **Section 6.2** in sufficient detail to proceed to preliminary design. Phase 2, upgrades to the LRPCP, is proposed to be initiated in the short to medium term and is outlined in **Section 6.4**. Phase 2 is anticipated to occur beyond the 10-year planning horizon covered under this MCEA; therefore, upgrades are presented at a high-level conceptual design level. At the time when Phase 2 upgrades are triggered, these design concepts should be reviewed and refined based on updated planning projections, new treatment technologies or alternatives, and other relevant factors. Phase 3 , implementation of Plant 3, is anticipated to occur significantly beyond the 10-year planning horizon covered under this MCEA and is outlined in **Section 6.6**. Due to the high potential for planning changes and/or technology advancements between now and the time that Phase 3 upgrades would be required, potential design concepts are discussed at a high-level and should be refined through future planning studies.

The alternative design concepts were evaluated based on a variety of social, natural environmental, economic, and technical criteria. These evaluation criteria were developed based on technical requirements, applicable municipal plans / commitments, design principles, and past industrial experience. The evaluation criteria are as follows:

Technical Criteria:

- Ability to meet current and future service needs;
- Ability for logical and cost-effective expansion;
- Ability to meet effluent limits and objectives;
- Proven technology, proof of successful installations within Canada and Southwestern Ontario (similar climate) within the last 20 years;
- Constructability, implementation timeline, and phasing;
- Flexibility to meet future needs and/or climate change projections; and
- No adverse impacts on existing infrastructure (operations and/or maintenance).

Social Criteria:

- Impact on archaeological, built heritage, and cultural heritage;
- Noise, vibration, odour, or air pollution emissions;
- Permanent changes or impacts to society / community; and
- Development policies and agreements.

Natural Environmental Criteria:

- Impacts on vegetation, fish and wildlife, areas of natural and scientific interest, environmentally sensitive areas, and soil / geology;
- Potential for conservation of energy, water and other natural resources;
- Regulatory compliances; and
- Development and planning policies.

Economic Criteria:

- Capital and O&M costs
- Ability for ongoing process optimization; and
- Lifecycle cost.

The advantages and disadvantages of each alternative together with their effects on the socioeconomic and natural environment are discussed in the following sections.

6.2 PHASE 1 – WET WEATHER FLOW RETENTION FACILITY AND NEW LRPCP HEADWORKS

In this section of the report, alternative design solutions will be identified and evaluated leading to the selection of the recommended conceptual design for the WWFRF and new LRPCP Headworks. Several conceptual alternative solutions were proposed to address the identified problems and needs at the LRPCP. The following sections will outline and develop the design concept for the WWFRF with a focus on the following categories:

1. **Site Alternatives**
- In-line Storage
- Off-line Storage

2. **WWFRF Storage and Treatment Alternatives**
- Storage Facility
- Storage-Treatment Facility, Retention Treatment Basin (RTB)

3. **RTB Sizing Alternatives**
- Size for 20 Year Flow Projections
- Size for Ultimate Flow Projections

4. **Pumping Configuration Alternatives**
- Influent Pumping Station
- Effluent Pumping Station

5. **Screening Technologies Alternatives**
- Multi Rake Screen
- Step Screen
- Grinder
- No Screens (followed by Screw Pumps)

6. **Pumping Well Alternatives**
- Wet Well Configuration
- Dry Well – Wet Well Configuration

7. **Grit Removal Technologies Alternatives**
- Aerated Grit Removal
- Vortex Grit Removal

The findings of these evaluations were then used to develop the conceptual design of the LRPCP RTB and new LRPCP Headworks as outlined in **Section 6.3**. This includes the (i) Design Basis, Design Loadings, Design Flows, and Operation of the LRPCP RTB; (ii) design basis for the new LRPCP Headworks; (iii) proposed connections to the inlet sewers; and (iv) proposed layout.

6.2.1 Site Alternatives WWFRF Storage and Treatment Alternatives

The alternative sites for the WWFRF that were considered as a part of this MCEA included:

Alternative No. 1: In-line Storage (Multiple Facilities throughout the LRPCP Collection System)

Alternative No. 2: Off-line Storage (One Facility at the LRPCP)

For Alternative No. 1 the implementation of multiple WWFRF located throughout the LRPCP Collection System, also known as in-line storage or off-site storage, was considered. First a review of City owned property within the LRPCP Service Area was completed and it was identified that there were no feasible options available which could host an in-line WWFRF. Next a review of all available land within the Service Area was completed and it was identified that there were still limited options available as the majority of the lands are developed or zoned for future development. In addition to the lack of land available for these facilities, it is anticipated that social, natural environmental, and economic impacts associated with implementing multiple WWFRF's would be more significant than that for a single facility.

For Alternative No. 2 the implementation of one WWFRF located at the LRPCP, also known as off-line storage or onsite storage, was considered. The City of Windsor owns the lands to the east of the existing LRPCP and has zoned them accordingly for future expansions. It is anticipated that there will be an abundance of space for the implementation of the WWFRF at this location. From a technical perspective, this location also would be preferred as the existing LRPCP collection system leads to this general location, which will minimize sewer modifications and associated construction cost. From a social and natural environmental perspective this land has been zoned accordingly for the expansion and is anticipated to have minimal impacts provided that appropriate mitigation measures are identified and followed throughout the implementation process. In terms of the economic impacts, it is expected that synergies associated with locating the facility near the LRPCP, combining with the new LRPCP headworks, and need for only one facility will result in a lower economic impact. For these reasons, Alternative No. 2, Off-line Storage through the implementation of one facility at the LRPCP was considered preferred.

6.2.2 WWFRF Storage and Treatment Alternatives

The alternative types of WWFRF that were considered as a part of this MCEA included:

Alternative No. 1: Pure Storage Facility

Alternative No. 2: Combination of Storage and Treatment Facility, Retention Treatment Basin (RTB)

For Alternative No. 1, a pure storage facility was considered and for Alterative No. 2, a combined storage and primary treatment facility, also known as an RTB, was considered. In order to determine which design alternative was more appropriate, a review of the sizing for a pure storage facility was evaluated.

Table 6.1 summarizes the WWF Events at the LRPCP from the period of 2017 to 2023. Based on the Ontario MECP Guideline F-5-5 'Determination of Treatment Requirements for Municipal and Private Combined and Partially Separated Sewage Systems', during the seven-month period commencing April, the LRPCP is required to capture and treat for an average year all the DWF plus 90% of the volume resulting from WWF that is above the DWF. Therefore, based on the historical data the City would have been required to capture, store, and treat a minimum of 265,000 m^3 (90% of 294,500 m^3) at the LRPCP.

Table 6.1: Summary of WWF Events from 2017 to 2023

	2017	2018	2019	2020	2021	2022	2023
No. of Bypass Events	4	14	4	28	8	4	11
Total Annual Bypass Volume (m^3)	40,000	218,400	22,100	174,797	193,300	23,700	161,000
Bypass Volume – Minimum Event (m^3)	890	96	509	7	5,289	157	121
Bypass Volume – Average per Event (m^3)	10,000	15,600	5,500	6,243	24,100	5,900	14,700
Bypass Volume – Maximum Event (m^3)	20,600	143,800	15,800	72,700	58,000	18,900	62,300
Overflow Volume during Maximum Event (m^3)	149,500	230,600	8,200	104,800	236,500	81,000	N/A
Total Volume during Maximum Event (m^3)	170,100	374,400	24,000	177,500	294,500	99,900	62,300
Maximum Event Occurring between April and October	Yes	No	Yes	Yes	Yes	No	Yes

Pure storage solutions are capable of very high degrees of control as long as sufficient capacity can be provided. For the 20-Year Projection and the Ultimate Projections the required storage volumes are anticipated to be approximately 432,000 m^3 and 525,000 m^3, respectively. Assuming that the storage unit has a height of 5.0 m, the footprint required would be approximately 86,400 m^2 (~ 225 m x 384 m) or 105,000 m^2 (~ 225 m x 467 m) for the 20-Year and Ultimate Projection, respectively. There is not sufficient space on the expansion lands to accommodate a storage facility of this size, even if the depth of the facility was doubled and additional structural design and construction elements were applied it would occupy approximately half of the available area designated for future plant expansion. Therefore, this option is not considered feasible as there is insufficient land available to support both the storage facility and anticipated plant expansion.

The storage alternative impact to the treatment plant would be prolonged requirement to process and treat dilute flows after wet weather events. Under future flow conditions, the LRPCP will be operating under harsher conditions with an average daily flow equal to or near the rated capacity of the facility. Treating excessive WWF volumes in the range of 432,000 m^3 and 525,000 m^3 through the LRPCP under these operating conditions will present a technical challenge and may have adverse impacts on the operation and maintenance of existing infrastructure. In addition, treating these volumes of relatively diluted wet weather flows through the LRPCP would not be considered preferred from an economic standpoint. Further, the increased hydraulic loading on the LRPCP would restrict the capacity to accommodate the future growth and development of the study area. If there is significant increase in the dry weather flows from the LRPCP servicing area, it will reduce the treatment capacity available to drain the stored wet weather flows resulting in increased storage requirements to achieve the objective for wet weather flow control.

The pure storage alternative has significant footprint requirements which cannot be met within the available lands, would have negative impacts on the operation and maintenance of existing infrastructure, and requires a large capital investment. Therefore, this is not considered a viable alternative solution.

The RTB facility, a combination of storage and chemically enhanced primary treatment, would be designed to temporarily store water during smaller storm events and then release it at a controlled rate to the LRPCP for treatment when the LRPCP has spare capacity; and provide flow-through treatment of the excess volume during heavy wet weather events. It is feasible to achieve the desired level of treatment and storage while requiring a smaller footprint and less capital cost. The combination of storage and treatment offers a variety of benefits including provision for greater degree of flow control that enhances the hydraulics and pollution control for the wastewater collection system. This higher degree of flow control also offers natural environmental benefits as combined sewer overflows will be mitigated.

The City of Windsor has prior experience with the RTB, notably with the Mario Sonego RTB, which was constructed in Central Windsor in 2010. The operational performance of this facility has been positive, demonstrating the effectiveness of the RTB process. Given this success, there is clear justification for utilizing a similar wet weather flow treatment approach in the planned plant expansion. The City is currently preparing to construct a second RTB, the West RTB, adjacent to the Lou Romano Water Reclamation Plant (LRWRP).

Table 6.2 shows an evaluation of the two (2) WWFRF storage and treatment alternatives.

Table 6.2: Evaluation of WWFRF Storage and Treatment Alternatives

Evaluation Criteria	Alternative 1: Pure Storage Facility	Alternative No. 2: Combination of Storage and Treatment Facility
Technical Suitability	**Poor** • Increased hydraulic loading on the LRPCP would restrict the capacity to accommodate the future growth and development of the study area • Lower flexibility for logical and cost effective expansions due to large area requirements • Negative impacts associated with prolonged requirement to process and treat dilute flows after wet weather events at the LRPCP and potential difficulty meeting MECP effluent treatment requirements • Proven technology in Southwestern Ontario • High construction and design requirements • May have adverse impacts on the operation and maintenance of existing infrastructure • High footprint requirements	**Good** • Able to meet current and future service needs without adverse impacts to development • Moderate flexibility for logical and cost effective expansions • Anticipated to effectively meet MECP effluent treatment requirements • Proven technology in Southwestern Ontario including within the City of Windsor • Moderate construction and design requirements • No anticipated adverse impacts on the operation and maintenance of existing infrastructure • Low-moderate footprint requirements
Social	**Fair** • Minimal impact on archaeological, built heritage, and cultural heritage resources provided appropriate screening and mitigation measures are followed • Low potential for noise and vibration impacts provided appropriate design and mitigation measures are applied • Higher potential for odour due to prolonged storage and treatment of wet weather flows • Higher potential for impact to the society due to odour and footprint requirements • Aligned with zoning and development policies in the region	**Good** • Minimal impact on archaeological, built heritage, and cultural heritage resources provided appropriate screening and mitigation measures are followed • Low potential for noise and vibration impacts provided appropriate design and mitigation measures are applied • Lower potential for odour • Moderate potential for impact to the society • Aligned with zoning and development policies in the region
Natural Environment	**Fair** • Minimal impact on vegetation, fish and wildlife, areas of natural and scientific interest, environmentally sensitive areas, and soil / geology provided appropriate screening and mitigation measures are followed • Potential difficulty meeting MECP effluent treatment requirements	**Good** • Minimal impact on vegetation, fish and wildlife, areas of natural and scientific interest, environmentally sensitive areas, and soil / geology provided appropriate screening and mitigation measures are followed • Anticipated to effectively meet MECP effluent treatment requirements
Economic	**Poor** • Higher capital investment and O&M cost	**Fair** • Moderate capital investment and O&M cost
Overall	**Poor**	**Good**

Based on the discussion above and the anticipated volume of WWF that would require treatment, an RTB would be recommended for this application. The RTB would be designed as a high-rate treatment unit with a surface overflow rate (SOR) of 20 $m^3/m^2/hr$ and an effective settling zone volume of approximately 3,000 m^3. The proposed RTB is significantly smaller than the storage facility as outlined above, which is beneficial as it will not require as much space allocation at the expansion site. The exact requirements and size for this RTB will be refined in the following sections.

6.2.3 RTB Sizing Alternatives

The design alternatives considered for the sizing of the RTB that were considered as a part of this MCEA included:

Alternative No. 1: Size for 20 Year Flow Projections

Alternative No. 2: Size for Ultimate Flow Projections

For Alternative No. 1 sizing the RTB for the 20 Year Flow Projections was considered and for Alterative No. 2 sizing the RTB for the Ultimate Flow Projections was considered. In order to determine which design alternative was more appropriate a review of the required capacity under each scenario was carried out.

The historic and projected flow rates at the LRPCP and the corresponding proposed capacity for the LRPCP RTB are presented in **Table 6.3**. The Q_{SYSTEM} represents the anticipated flow from the collection system to the LRPCP while the Q_{LRPCP} represents the anticipated flow that would be processed through the LRPCP during a severe storm event. The proposed firm capacity of the LRPCP RTB for the 20-Year Projections and the Ultimate Projections was calculated as the Q_{SYSTEM} minus the Q_{LRPCP}.

For the initial sizing requirements, the 20-Year flow projections were considered, and it is assumed that the Phase 2 and 3 upgrades to the LRPCP would not have been implemented. To take a conservative approach it would therefore be assumed that the flow which would be able to be processed through the LRPCP would be equivalent to the current rated capacity. This would also allow operational flexibility for the implementation of Phase 2 and 3 LRPCP upgrades. Under these conditions the required firm capacity for the LRPCP RTB would be approximately 320 MLD (± 13 MLD).

For the long-term sizing requirements, the Ultimate flow projections were considered, and it is assumed that the Phase 2 upgrades to the LRPCP (upgrades to the Existing Treatment Trains to accommodate 20-Year flow projections) would be completed. Therefore, it is assumed that the flow which would be able to be processed through the LRPCP would be equivalent to the 20-Year Design Peak DWF. Under these conditions the required firm capacity for the LRPCP RTB would be approximately 273 MLD (± 13 MLD).

The long-term sizing requirements are lower than the initial sizing requirements; therefore, the firm capacity of 320 MLD (± 13 MLD) will be sufficient for the LRPCP RTB and no future expansion would be required for this facility. The long-term sizing requirements are lower than those for the initial due to the implementation of the Phase 2 LRPCP Expansion. This planned expansion will allow for the flow through the LRPCP to be increased and therefore minimizing flow required to be sent to the RTB. Based on this analysis, Alternative No. 1: Sizing for 20-Year Flow Projections is recommended.

Table 6.3: Design Flow Rate and Proposed Capacity for the LRPCP RTB

Description	Initial Sizing Requirements	Long Term Sizing Requirements
Flow Projection Utilized	20-Year Design Projections	Ultimate Design Projections
Average DWF	77.2 MLD	104 MLD
Peak DWF	201 MLD	259 MLD
Peak WWF	393 MLD (± 13)	474 MLD (± 13)
Q_{SYSTEM}	393 MLD (± 13)	474 MLD (± 13)
Q_{LRPCP}	72.8 MLD (1)	201 MLD (2)
Flow to RTB ($Q_{SYSTEM} – Q_{LRPCP}$)	**320 MLD (± 13)**	273 MLD (± 13)

Notes:

(1) Assuming Phase 2 and 3 upgrades to the LRPCP would not have been implemented and the flow which would be able to be processed through the LRPCP would be equivalent to the current rated capacity.

(2) Assuming Phase 2 upgrades to the LRPCP (upgrades to the Existing Treatment Trains to accommodate 20-Year flow projections) would be completed and the flow which would be able to be processed through the LRPCP would be equivalent to the 20-Year Design Peak DWF.

6.2.4 Pumping Configuration Alternatives

The alternative types of pumping configurations that were considered as a part of this MCEA included:

Alternative No. 1: Influent Pumping Station

Alternative No. 2: Effluent Pumping Station

For Alternative No. 1 the implementation of an influent pumping station would be considered to lift wastewater from the inlet sewers up to the new LRPCP Headworks and RTB with gravity flow from that point through the respective processes and to the existing outfall. For Alternative No. 2 the implementation of an effluent pumping station would be considered to lift wastewater from the new LRPCP Headworks and RTB to the existing outfall, with gravity flow from the inlet sewers through the respective processes.

In terms of the pumping station design, the size of the pumping station with respect to pumping head and horsepower will be the same in both scenarios. From a process viewpoint the main difference between the two is that the influent alternative will be pumping raw influent flows and the effluent alternative will be handling treated effluent from the RTB and LRPCP Headworks. The pump selection for the two alternatives may therefore differ to suit the characteristics of the wastewater being pumped. The use of solids handling type pumps would be appropriate to accommodate the coarser material for the influent pumping station but would not necessarily be required for the treated effluent stream from the RTB.

The most significant difference between the two alternatives will be the depth requirement for the RTB and pumping station. It is anticipated that the influent pumping station wastewater will be lifted into the system allowing for the RTB and new LRPCP Headworks to be located near ground level or slightly below ground level (i.e., bottom of chambers approximately 3 to 5 metres below ground level). By comparison, the effluent pumping station alternative will require gravity flow through the RTB and new LRPCP Headworks requiring that these be located significantly deeper below the ground level (i.e., bottom of chamber approximately 7.5 to 10 metres below ground level). From a technical perspective, constructing these facilities at a lower elevation will present challenges in terms of constructability and floodline management. From a cost perspective, the cost for construction of the deeper RTB will be significantly more than that for a shallower basin. In addition, establishing the basin at a higher elevation also provides the following benefits:

- Provides more available headloss to drain and thoroughly flush the basin back to the inlet chamber following a wet weather event.
- Provides easier access for operating and maintenance activities.
- Reduces the provisions needed to counteract basin uplift and flotation when the RTB is empty.

Table 6.4 shows an evaluation of the two (2) pumping configuration alternatives.

Table 6.4: Evaluation of Pumping Configuration Alternatives

Evaluation Criteria	Alternative 1: Influent Pumping Station	Alternative No. 2: Effluent Pumping Station
Technical Suitability	**Good** • Able to meet current and future service needs • Proven technology • Less complex construction and operational requirements • Easier access for operating and maintenance activities	**Fair** • Able to meet current and future service needs • Proven technology • More complex construction and operational requirements • Easier access for operating and maintenance activities
Social	**Good** • Minimal impact on archaeological, built heritage, and cultural heritage resources provided appropriate screening and mitigation measures are followed • Low potential for noise, vibration, and odour impacts provided appropriate design and mitigation measures are applied	**Good** • Minimal impact on archaeological, built heritage, and cultural heritage resources provided appropriate screening and mitigation measures are followed • Low potential for noise, vibration, and odour impacts provided appropriate design and mitigation measures are applied
Natural Environment	**Good** • Minimal impact on vegetation, fish and wildlife, areas of natural and scientific interest, environmentally sensitive areas, and soil / geology provided appropriate screening and mitigation measures are followed • Lower pumping requirements	**Fair** • Minimal impact on vegetation, fish and wildlife, areas of natural and scientific interest, environmentally sensitive areas, and soil / geology provided appropriate screening and mitigation measures are followed • Higher pumping requirements
Economic	**Good** • Lower capital investment and O&M cost	**Poor** • Higher capital investment and O&M cost
Overall	**Good**	**Fair**

Based on the foregoing, Alternative No. 1 an Influent Pumping Station is recommended as the preferred design. One potential drawback associated with influent pumping is that raw wastewater flows can contain solids, rags and other debris that could cause operating and maintenance problems with the influent pumps. These concerns with solids handling can be largely eliminated by locating the new LRPCP screens before the influent pumping station, which is evaluated in the following section.

6.2.5 Screening Technologies Alternatives

The alternative types of screening technologies that were considered as a part of this MCEA included:

Alternative No. 1: Multi Rake Screens

Alternative No. 2: Step Screens

Alternative No. 3: Grinder

Alternative No. 4: No Screens (followed by Screw Pumps)

Screens are used at the front end of municipal wastewater treatment facilities for the removal of coarse solids such as pieces of wood, plastics, and rags. This process is important as capturing larger solids present in the incoming wastewater prevents them from reaching downstream processes. In the past, hand cleaned screens were common; however, for new installations mechanically cleaned screens have become the industry standard. For mechanically cleaned screens, the bar spacing is usually between 12 to 38 mm which are mounted at an angle of 45 to 90°, with 60° being typical.

Screens are classified based on the size of their openings and mechanical design features. The size and geometry of these openings, referred to as apertures, dictate how solids are intercepted and are categorized as either one-dimensional (1D) or two-dimensional (2D). In 1D screens, the opening is defined by a single linear spacing. Solids can pass through these openings if they align lengthwise with the slot. In 2D screens, the opening is defined in both width and length, typically formed by perforated plates or mesh. Particles must be smaller than the aperture in both dimensions to pass through.

Mechanically cleaned screens are automated 1D screening systems designed to continuously remove debris from the screen surface without manual intervention. Common types of mechanically cleaned screens include multi-rake and step screens. These screen types typically achieve screening capture ratios (SCR) of approximately 35%, meaning they remove 35% of solids present in the incoming flow. Higher SCR values correspond to greater removal of screenings improving downstream performance.

For Alternative No. 1, multi-rake bar screens remove debris using rake combs that travel on submerged chains to clean a fixed bar rack at regular intervals. This configuration is more mechanically complex and may require greater maintenance but offers better performance during high-flow events. The continuous rake cleaning mechanism, combined with the ability to scale the cleaning frequency through VFD control or additional rakes, enables the multi-rake bar screen to effectively manage heavy solids and maintain reliable operation under variable and peak flow conditions. Its design also minimizes the risk of clogging, particularly in deep channel installations making it ideal for application for wastewater headworks facilities.

For Alternative No. 2, step screens capture debris on stepped lamella (thin plates) plates and convey it upward through sequential movement. This design provides effective fine screening with low head loss and reduced maintenance requirements, making it suitable for consistent, moderate flows. However, when flows exceed the average design capacity or during surge conditions, step screens may experience solids roll-back and clogging, particularly if debris or grit loading exceeds their handling capability. These limitations are more pronounced in deeper channels where hydraulic surges are significant.

For Alternative No. 3, as an alternative to screening, some municipalities have been using a wastewater grinder in the headworks facilities to reduce the size of coarse solids in wastewater such that they can be removed by downstream treatment operations. Grinders shall be capable of shredding rocks, wood, soft metals, plastic, rubber, and fibrous resilient material including but not limited to wipes, rags, textiles, and other debris into small pieces to prevent pumps and process piping from clogging. Typical grinders used for headworks applications are fitted with high-flow screening drums to prevent the bypass of un-shredded solids without reducing the flow. Grinders are applicable for low and high flow scenarios including wet weather flow events. One drawback of this technology is that if not applied in combination with fine screening grinders would increase the solids load on downstream processes, which is not ideal as the LRPCP has limited capacity.

For Alternative No. 4, this would include the application of a screw pump station such that no screening is required. An Archimedean screw pump is a type of positive-displacement pump that provides lift by carrying fluids in the spaces between the screw threads. Screw pumps utilize the Archimedes principle of a rotating shaft to displace the fluid axially as the screws rotate. An inclined screw pump has a continuous spiral vane attached to a central shaft, mounted in a trough or pipe. When the screw is rotated, the spiral vane scoops water from the free water surface at the entrance of the pump and discharges it at a higher elevation. The Archimedes screw pump is usually large capacity, low head, non-clogging and therefore advantageous in raw sewage and wastewater applications. As a result of the pumping mechanism, screw pumps can provide constant flow rates and pressures and have a relatively high tolerance for solids entering the flow stream. Screw pumps are commonly used in applications where low heads are required (i.e., less than 10 meters). The main disadvantage of screw pumps is the difficulty to increase the pumping head without considerable physical modifications to the structure, whereas this is easy with other types of pumps. Also, since the design is dependent upon minimal leakage from between the flights and the channel, any wear over time significantly reduces efficiency.

Table 6.5 shows an evaluation of the four alternative screening technologies. Based on the evaluation the recommended screening technology for the new LRPCP Headworks is Multi Rake Screens.

Table 6.5: Evaluation of Alternative Screening Technologies

Evaluation Criteria	Alternative 1: Multi Rake Screens	Alternative No. 2: Step Screens	Alternative No. 3: Grinder	Alternative No. 4: No Screens (Screw Pumps)
Technical Suitability	**Good** • Good performance at steady flow rates • High hydraulic surge capacity • Excellent for coarse solids (rags, sticks, larger debris) • Moderate headloss can rise based on debris accumulation • More moving parts submerged in flow (chains, sprockets) • Smaller footprint; higher headroom requirements • Proven technology • Self-cleaning • Standalone solution • Reduced solids loading on downstream process • More flexible to future changes in head / flow • Opportunity for phasing	**Fair** • Good performance at steady flow rates • Lower hydraulic surge capacity • Excellent for finer solids, fibers, hair • Low headloss due to screenings mat • Fewer submerged parts, simpler mechanism • Larger footprint; lower headroom requirements • Proven technology • Self-cleaning • Standalone solution • Reduced solids loading on downstream process • More flexible to future changes in head / flow • Opportunity for phasing	**Poor** • Good performance at steady flow rates • High hydraulic surge capacity • Excellent for coarse solids (rags, sticks, larger debris) • Low headloss • More moving parts with potential for wear on equipment • Smaller footprint • Proven technology • Self-cleaning • Solution often needs to be combined with fine screening for effective solids removal • No reduction to solids loading on downstream process • More flexible to future changes in head / flow • Opportunity for phasing	**Poor** • Good performance at steady flow rates • High hydraulic surge capacity • Good for coarse solids (rags, sticks, larger debris) • Low headloss • More moving parts • Higher wear and maintenance on downstream equipment • Larger footprint • Proven technology • Self-cleaning • Standalone solution • No reduction to solids loading on downstream process • Less flexible to changes in head / flow • May be opportunity for phasing
Social	Comparable • Minimal impact on archaeological, built heritage, and cultural heritage resources provided appropriate screening and mitigation measures are followed • Low potential for noise, vibration, and odour impacts provided appropriate design and mitigation measures are applied • Minimal impact on the society			
Natural Environment	Comparable • Minimal impact on vegetation, fish and wildlife, areas of natural and scientific interest, environmentally sensitive areas, and soil / geology provided appropriate screening and mitigation measures are followed			
Economic	**Fair** • Moderate capital investment and O&M cost	**Fair** • Moderate-high capital investment and O&M cost	**Poor** • High capital investment and O&M cost • Additional fine screening may be required	**Good** • Moderate capital investment and O&M cost • Savings from elimination of screening

Evaluation Criteria	Alternative 1: Multi Rake Screens	Alternative No. 2: Step Screens	Alternative No. 3: Grinder	Alternative No. 4: No Screens (Screw Pumps)
Overall	Good	Fair	Poor	Fair

6.2.6 Pumping Well Alternatives

The alternative types of pumping configurations that were considered as a part of this MCEA included:

Alternative No. 1: Wet Well Configuration

Alternative No. 2: Dry Well – Wet Well Configuration

For Alternative No. 1, Wet Well Configuration, a single chamber is utilized to store incoming water and house the pumping equipment. With this configuration submersible pumps are placed directly in the wet well. The major advantage of this configuration is the simpler design and easier construction due to the single well. The compact footprint for this configuration makes it ideal for scenarios where space is limited or there are other site constraints. Wet well pumping stations are often ideal for smaller systems. The major drawbacks of this configuration include that the pumps are submerged, making maintenance more difficult. This also raises safety concerns for operators and maintenance staff due to confined space in an environment where water exposure is common.

For Alternative No. 2, Dry Well – Wet Well Configuration, two separate chambers are utilized. The wet well stores the incoming water and the dry well houses the pumps and associated equipment in a dry environment. The major advantage of this configuration is the ease of maintenance since the pumps and equipment are accessible without entering a wet environment. This also offers the benefit of improved safety for operators and maintenance crews. The use of dry well – wet well configuration allows for larger and more complex pumping systems making it ideal for use in headworks facilities. Drawbacks of this configuration include higher construction cost due to dual chambers; larger footprint requirements; and requirement for dedicated grit fluidization and pumping system.

Table 6.6 shows an evaluation of the two alternative pumping well configurations. Based on the evaluation the recommended configuration for the new LRPCP Headworks is a Dry Well – Wet Well Configuration.

Table 6.6: Evaluation of Alternative Pumping Well Configurations

Evaluation Criteria	Alternative 1: Wet Well Configuration	Alternative No. 2: Dry Well – Wet Well Configuration
Technical Suitability	**Fair** • This configuration is more common for small to medium scale applications where maintenance is less frequent • Less complex design and construction	**Great** • This configuration is more common for medium to large scale applications where reliability, serviceability, and safety are priorities

Evaluation Criteria	Alternative 1: Wet Well Configuration	Alternative No. 2: Dry Well – Wet Well Configuration
	• More submerged parts resulting in more difficult and less safe maintenance • Less protection for electrical and mechanical components due to direct contact with sewage • More wear and tare on pumping equipment • Smaller footprint requirement • Opportunity for phasing	• More complex design and construction • Fewer submerged parts resulting in easier and safer maintenance requirements • More protection for electrical and mechanical components due to dedicated dry well • Less wear and tare on pumping equipment • Larger footprint requirement • Opportunity for phasing
Social	Comparable • Minimal impact on archaeological, built heritage, and cultural heritage resources provided appropriate screening and mitigation measures are followed • Low potential for noise, vibration, and odour impacts provided appropriate design and mitigation measures are applied • Minimal impact on the society	
Natural Environment	Comparable • Minimal impact on vegetation, fish and wildlife, areas of natural and scientific interest, environmentally sensitive areas, and soil / geology provided appropriate screening and mitigation measures are followed	
Economic	**Good** • Moderate capital investment and O&M cost	**Fair** • Moderate-high capital investment and O&M cost
Overall	**Fair**	**Good**

6.2.7 Grit Removal Technologies Alternatives

The alternative types of screening technologies that were considered as a part of this MCEA included:

Alternative No. 1: Aerated Grit Removal

Alternative No. 2: Vortex Grit Removal

Grit removal systems physically extract heavy, abrasive, inorganic solids from screened wastewater to safeguard downstream equipment from excessive wear, minimize the accumulation of deposits in pipes and basins, and reduce the burden of solids handling. This process is essential for maintaining the efficiency and longevity of treatment plant infrastructure and ensuring stable operational performance.

For Alternative No. 1, aerated grit removal chambers use air introduced along one side of a rectangular tank to create a spiral roll pattern across the tank bottom. Heavier grit settles while lighter organic particles remain suspended and exit with the flow. Removal efficiency depends on the air-induced velocity. If the air-induced velocity is too high the grit removal efficiency is poor and grit escapes the chamber, whereas if it is too low grit removal efficiency is poor due to organics settlement. These chambers typically remove particles ≥ 0.21 mm with 2–5 minutes of detention at peak flow. Theoretically a well-functioning aerated grit chamber should remove approximately 100 percent of the sand fraction greater than 200 µm in diameter and 65 to 75 percent of the sand fraction between 100 and 200 µm.

For Alternative No. 2, vortex grit removal systems induce a swirling flow to separate grit from the wastewater flow. There are three (3) primary types of vortex grit chambers as follows:

- Mechanically Induced Vortex. Wastewater enters tangentially, creating a toroidal flow enhanced by a rotating turbine. Grit is driven to the center floor and collected in a hopper, while organics remain in suspension and exit tangentially. Grit is fluidized by a propeller or water jets and removed via slurry or air-lift pump.
- Hydraulically Induced Vortex. Flow enters tangentially without mechanical parts, generating a slow spiral motion. Grit settles along the perimeter and moves to a central hopper, while clarified water exits through the center. Typically sized for flows up to 0.3 m^3/s (7 MGD) but requires deep basements due to unit height. Grit is extracted by cleated belt conveyor.
- Multi-Tray Vortex Separator. Stacked trays create high surface area and short settling paths, enabling fine grit removal in a compact footprint with low headloss. Flow is distributed tangentially across trays, and grit settles through central openings into a sump. Effluent exits through the tray gaps and over a surrounding weir.

Table 6.7 shows an evaluation of the two alternative grit removal technologies. Based on the evaluation the recommended screening technology for the new LRPCP Headworks is Vortex Grit Removal.

Table 6.7: Evaluation of Alternative Grit Removal Technologies

Evaluation Criteria	Alternative 1: Aerated Grit Removal	Alternative No. 2: Vortex Grit Removal
Technical Suitability	**Fair** • Efficiency constant over wide range of flow • Lower efficiency for fine grit removal • Less energy efficient • Headloss is minimal • Larger footprint • Higher odour potential • Higher operation and maintenance requirements for air system and submerged grit removal equipment • Non proprietary design • Organic content can be controlled by air rate • Chamber can be used for chemical dosing/mixing	**Good** • Efficiency constant over wide range of flow • Higher efficiency for fine grit removal • More energy efficient • Headloss is minimal • Smaller footprint • Lower odour potential • Lower operation and maintenance requirements due to fewer moving parts and less reliance on submerged components • Proprietary design • Potential for compaction of grit • Turbine blades may collect rags
Social	**Fair** • Minimal impact on archaeological, built heritage, and cultural heritage resources provided appropriate screening and mitigation measures are followed	**Good** • Minimal impact on archaeological, built heritage, and cultural heritage resources provided appropriate screening and mitigation measures are followed

Evaluation Criteria	Alternative 1: Aerated Grit Removal	Alternative No. 2: Vortex Grit Removal
	• Low potential for noise and vibration impacts provided appropriate design and mitigation measures are applied • Higher odour potential • Minimal impact on the society	• Low potential for noise and vibration impacts provided appropriate design and mitigation measures are applied • Lower odour potential • Minimal impact on the society
Natural Environment	**Fair** • Minimal impact on vegetation, fish and wildlife, areas of natural and scientific interest, environmentally sensitive areas, and soil / geology provided appropriate screening and mitigation measures are followed • Less energy efficient • Larger footprint	**Good** • Minimal impact on vegetation, fish and wildlife, areas of natural and scientific interest, environmentally sensitive areas, and soil / geology provided appropriate screening and mitigation measures are followed • More energy efficient • Smaller footprint
Economic	**Fair** • Moderate-high capital investment and O&M cost	**Good** • Moderate capital investment and O&M cost
Overall	**Fair**	**Good**

6.3 PROPOSED CONCEPTUAL DESIGN OF PHASE 1 EXPANSION

6.3.1 High-Rate RTB

High-rate RTB's are treatment devices that can be used at local discharge points to treat excessive flows of wastewater before being discharged to the receiving water. RTB's are self-contained units that are designed to provide equivalent to primary treatment through the separation of solids from the flow at relatively high flow-through rates. During less intense storm events the RTB captures and retains all flow, which is then drained back to an interceptor sewer after the storm event has subsided. During more intense storms, when the storage capacity of the basin is exceeded, it acts as a flow through device providing primary treatment to the wastewater prior to discharge. The level of treatment provided by RTB's varies with flow rates and pollutant characteristics.

The purpose of the RTB is to capture and treat CSOs to the level of treatment identified in MOE Procedure F-5-5. The proposed RTB facility will include an Influent Pumping Station, Retention Treatment Basin, with the corresponding influent and effluent channels and retained solids flushing system and a connection to one of the existing LRPCP Outfall Sewers. The RTB will also include a building to house chemical feed equipment and ancillary mechanical and electrical equipment. It is also proposed for the RTB to be combined with the LRPCP Headworks which would include the raw sewage pumping station, screening, and grit removal.

6.3.2 Design Loadings

A CSO Characterization and Treatability Study was completed for the implementation of the City of Windsor Riverside RTB in the late 2000's. This study included pilot scale testing and computer modeling to establish design criteria associated with the treatment requirement of Procedure F-5-5 to (i) provide 30% cBOD5 removal and 50% TSS removal for the wet weather flow volume captured during the seven month period in the average year and (ii) achieve, for satellite treatment facilities, a TSS effluent concentration not exceeding 90 mg/l for 50% of the time for an average year during the seven month period.

The findings of the pilot scale testing and hydrodynamic modeling indicated that, with polymer addition to enhance settling and flotation, good removal (>70%) of TSS can be achieved for SORs less than 30 m/h. It was also noted removal at SORs above 25 m/h is highly dependent on the fraction of the influent in the floatable class. The conclusion of the pilot scale testing and modeling was that a design SOR of 20 m/h would be appropriate for sizing of RTB's in order to achieve the treatment requirements of Procedure F-5-5. Accordingly, a design SOR of 20 m/h will be used for the design of the LRPCP RTB.

Based on the LRPCP RTB firm capacity of 320 MLD (± 13 MLD) or 3.71 m^3/s (± 0.15 m^3/s) and the SOR of 20 $m^3/m^2/hr$ the required surface area for the effective settling zone would be approximately 700 m^2 (± 30 m^2). At a high-level, this may include the implementation a three (3) cell RTB system with each cell having the following approximate dimensions 9.8 m in width by 28.5 m in length by 3.65 m in depth. Exact design criteria and dimensions shall be further reviewed and validated during the final design phase.

6.3.3 RTB Operation

A general functional description of the RTB operation is provided as follows. Exact operation requirements for the RTB shall be further reviewed and validated during the final design phase.

- Flow from the inlet sewers is conveyed to the new LRPCP Screening Facility and then further conveyed to the wet well of the new influent raw sewage pumping station.
- From here flow is lifted to an influent distribution chamber.
- The inlet distribution channel distributes flow between the (i) RTB and the (ii) new LRPCP Grit Removal Facility which further flows to the existing LRPCP. During dry weather periods, where flow is less than the projected Peak DWF, flows are conveyed to the Grit Removal Facility and LRPCP for treatment. During wet weather periods, where flow exceeds the projected Peak DWF, excess flows are conveyed to the RTB.
- The influent distribution channel is designed to distribute flow equally to all cells in the RTB. Flow passes through an inlet distribution channel designed to reduce velocity currents and achieve uniform flow conditions across the basin. In addition, polymer is added to promote flocculation of solids in the wastewater stream and enhance solids removal in the RTB.
- Flow fills individual cells storage compartments and then overflows into the main basin of the RTB. The basin fills and solids are removed from the wastewater by settling to the bottom of the basin or floating to the water surface.

- Treated effluent from the basin flows under a scum baffle and over the effluent weir to an effluent chamber. Treated effluent flows from the effluent chamber to the existing LRPCP outfall to the Little River Drain.
- After a storm event, the remaining contents of the RTB are conveyed to the LRPCP for treatment.

6.3.4 LRPCP Headworks

The following sections outline potential capacities and phasing of the LRPCP Headworks. The exact layout, capacity, and requirements for the LRPCP Headworks are to be reviewed and refined as a part of Phase 5 of the Class EA Process (Implementation).

6.3.4.1 Screening

Screens are provided as part of preliminary treatment to remove rags, sticks and other oversized debris from the incoming raw sewage flow. This is done to protect downstream equipment and processes from reduced operating efficiency, increased maintenance, blockage or damage. The existing screening facility will not be reutilized for the new LRPCP Headworks Facility; therefore, the proposed facility should accommodate the ultimate peak wet weather flow of 474 ± 13 MLD. Phasing for installation of the screening facility is proposed as follows:

Phase 1 Design

- Installation of screening including:
    - Two (2) mechanically cleaned multi rake bar screens in two (2) influent channels each with a peak flow capacity of 237 ± 6.5 MLD such that the combined capacity of the two channels will be 474 ± 13 MLD;
    - The screening system is to additionally include a spray wash system and screenings compactor;
    - Consideration for one (1) manually cleaned coarse bar screen in a bypass channel; and
    - Exact number of screens, channels, and configuration to be determined during detailed design.

Future Design (Phase 2 and 3)

- No changes are needed.

6.3.4.2 Raw Influent Pumping Station

The existing raw influent pumping station will not be reutilized for the new LRPCP Headworks Facility; therefore, the proposed facility should accommodate the 20-year and ultimate peak wet weather flows of 393 ± 13 MLD and 474 ± 13 MLD, respectively. Phasing for installation of the pumping station is proposed as follows:

Phase 1 Design

- Installation of a raw influent pumping station including:
  - Dry Well – Wet Well Configuration with space for the number of pumps required for the ultimate capacity;
  - Equipped with appropriate number of pumps such that the rated peak capacity of the pumping station will be 400 MLD; and
  - Exact number of pumps, duty-standby requirements, and configuration to be determined during detailed design.

Future Design (Phase 2)

- No changes are needed.

Future Design (Phase 3)

- Upgrade raw influent pumping station by additional pumps in existing pump spaces such that the new rated peak capacity of the pumping station will be 480 MLD.

6.3.4.3 Flow Measurement

Flow measurement is required for compliance reporting purposes and to properly monitor and control plant operations. The existing influent flow measurement devices at the LRPCP will not be reutilized for the new LRPCP Headworks Facility. The existing effluent flow measurement devices at the LRPCP will be reutilized for the measurement of effluent flows.

In the proposed design, the raw influent pumping station will pump flow to a new flow distribution chamber. At the flow distribution chamber, excess wet weather flows will be diverted to the LRPCP RTB. Based on this flow schematic the proposed locations for flow measurement devices will be (i) downstream of the influent pumping station and (ii) downstream of the new grit removal facility. This will allow for the measurement of incoming influent flows and flows treated at the LRPCP as well as allow for the calculation of flows diverted to the LRPCP RTB.

6.3.4.4 Flow Distribution

An influent flow distribution chamber is proposed to be located downstream of the raw influent pumping station and will be used to divert excess wet weather flow to the LRPCP RTB during wet weather events.

6.3.4.5 Grit Removal

Grit removal is provided in advance of secondary treatment to remove stones, sand and other abrasive material to prevent undue wear of machinery and the unwanted accumulation of solids in channels and tanks. The existing grit removal facility will not be reutilized for the new LRPCP Headworks Facility; therefore, the proposed facility should accommodate the ultimate peak dry weather flow of 259 MLD. Phasing for installation of the grit removal facility is proposed as follows:

Phase 1 Design

- Installation of a grit removal including:
  - Two (2) vortex grit systems together with grit pump, cyclone, and classifier, each designed with a peak flow capacity of 130 MLD while providing removal of grit particles as fine as 150 microns. The combined capacity of the two (2) systems will be 259 MLD with capacity to accept peak flows greater than this value at a reduced removal efficiency;
  - By-pass channel; and
  - Exact number of units and configuration to be determined during detailed design.

Future Design (Phase 2 and 3)

- No changes are needed.

6.3.5 Connections to Inlet Sewers and Existing LRPCP

The implementation of an RTB and new LRPCP Headworks at the LRPCP will require modifications to the existing plant inlet sewers. This would include the redirection and collection of raw sewage from the following inlet sewers:

- 1200 mm diameter Little River Sanitary Trunk Sewer, serving the southeastern section of the City (Forest Glade).
- 2100 mm diameter North-East Windsor Trunk Sewer, servicing Sandwich South and the Town of Tecumseh (Oldcastle and County Road 22).
- 1500 mm diameter Windsor-Tecumseh Sanitary Sewer, servicing the lands east of the LRPCP within the City as well as the Town of Tecumseh (Tecumseh and St. Clair Beach).
- 900 mm diameter Edgar Avenue Sanitary Trunk Interceptor Sewer, servicing the lands generally between Little River Boulevard (north) and the EC Row Expressway / Tecumseh Road (south) from Pillette Road (west) to the LRPCP (east) within the City.
- 900 mm diameter Wyandotte Street Combined Trunk Sewer, servicing the lands between Wyandotte Street (north) and Little River Boulevard (south) from Virginia Avenue (west) to the LRPCP (east) within the City.
- 1050 mm diameter Clairview Avenue Sanitary Interceptor Sewer, servicing the lands between the Detroit River (north) and Little River Boulevard / Wyandotte Street (south) from Westminster Boulevard / Pillette Ave (west) to the City limit (east) within the City.

In order to minimize the impact on natural environmental resources in the Old Little River corridor, it is proposed that all inlet sewer modifications and interconnections between the two facilities be completed with trenchless technologies. This may include jacking, micro-tunneling, horizontal directional drilling, or other methods that would avoid the need for open cut methods.

6.3.6 Conceptual Layout

A preliminary markup of the proposed conceptual layout is shown in **Figure 6.1**.

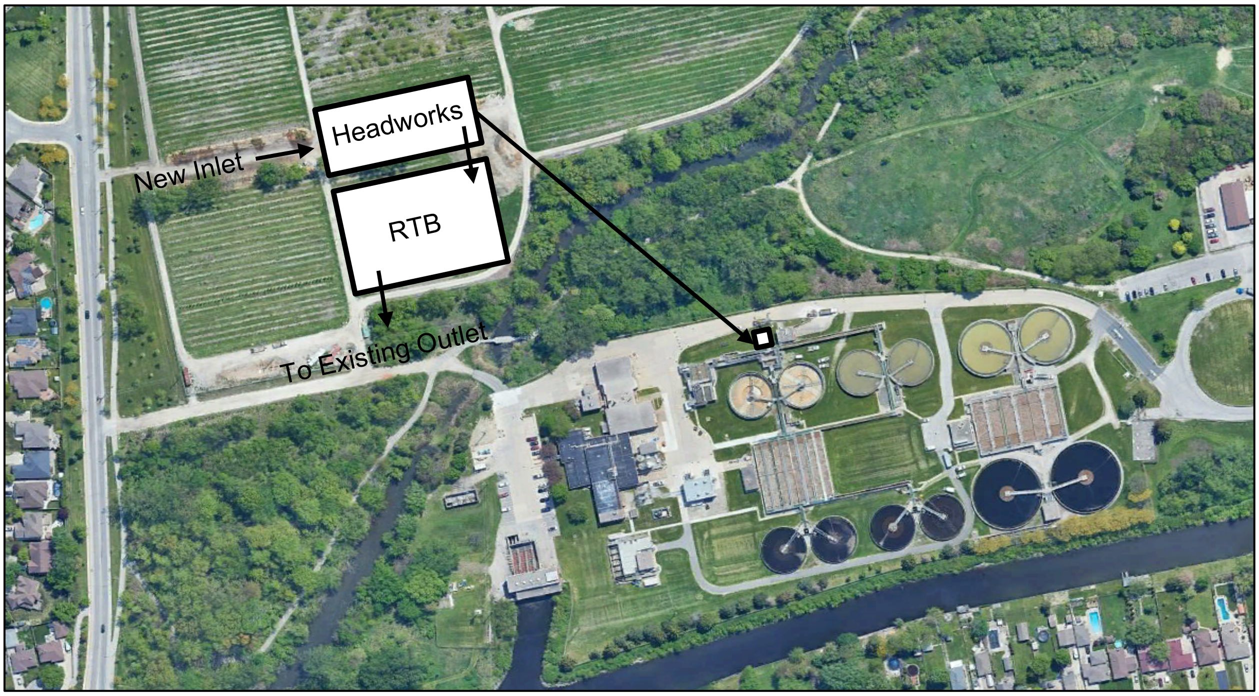

Figure 6.1: Conceptual Layout of the LRPCP RTB and New Headworks Facilities

6.4 PHASE 2 EXPANSION – UPGRADING EXISTING TREATMENT TRAINS

In this section of the report, alternative design concepts will be identified and evaluated leading to the selection of the recommended design for upgrading the existing treatment trains at the LRPCP. Several conceptual alternative solutions were proposed to address the identified problems and needs at the LRPCP. The following sections will outline and evaluate design concept alternatives within the following categories:

1. **Aeration Tank Capacity Upgrade Alternatives**
- Expanding Existing Aeration Tank
- Integrated Fixed Film Activated Sludge (IFAS) Retrofit
- Membrane Aerated Biofilm Reactor (MABR) Retrofit
- Moving Bed Biological Reactor (MBBR) Pretreatment
- Hydro-Cyclone Sludge Densification
- Combination of Above

2. **Secondary Clarifier Capacity Upgrade Alternatives**
- Expanding Existing Secondary Clarifiers
- Re-Rating Existing Secondary Clarifiers

3. **UV Capacity Upgrade Alternatives**

- Increase the Capacity of Plant 1 UV Disinfection
- Increase the Capacity of Plant 2 UV Disinfection
- Implement a New UV Disinfection Facility

The findings of these evaluations were then used to develop the conceptual design for the Phase 2 Existing Treatment Train Upgrades as outlined in **Section 6.5**. This includes the proposed design basis and conceptual layout.

6.4.1 Aeration Tank Capacity Upgrade Alternatives

The alternative methods/technologies to upgrade the capacity of the aeration tanks that were considered as a part of this MCEA included:

Alternative No. 1: Expanding Existing Aeration Tanks

Alternative No. 2: Integrated Fixed Film Activated Sludge (IFAS) Retrofit

Alternative No. 3: Membrane Aerated Biofilm Reactor (MABR) Retrofit

Alternative No. 4: Moving Bed Biological Reactor (MBBR) Pretreatment

Alternative No. 5: Cyclone (MLSS intensification)

Alternative No. 6: Combination of Above

Alternative No. 1, Expanding Existing Aeration Tanks, would involve constructing additional aeration tanks next to the existing facilities at Plant 1 and Plant 2. Based on the available lands at the LRPCP, adding tankage to the site with an increase in volume of approximately +100% at Plant 1 and +33% at Plant 2 would significantly improve the secondary treatment capacity at the LRPCP. Given that the current ECA requires biological nitrification for ammonia reduction and alum dosing for phosphorus precipitation, the unit capacities of the expanded aeration tanks were estimated based on MECP loading rates. Adding aeration tank volume (+100% Plant 1 and +33% Plant 2) would increase the ADF capacity significantly from approximately 55-60 MLD to 88-90 MLD (approximately 50-60% increase in capacity). This expansion would exceed the 20-Year Design Projection of 77.2 MLD but would not achieve the Ultimate Design Projection of 104 MLD, which is acceptable for the Phase 2 expansion. **Figure 6.2** shows the proposed location and approximate sizing of the proposed aeration tank expansion. More details regarding the aeration tank expansion are outlined in the Technical Memo in **Appendix CC**.

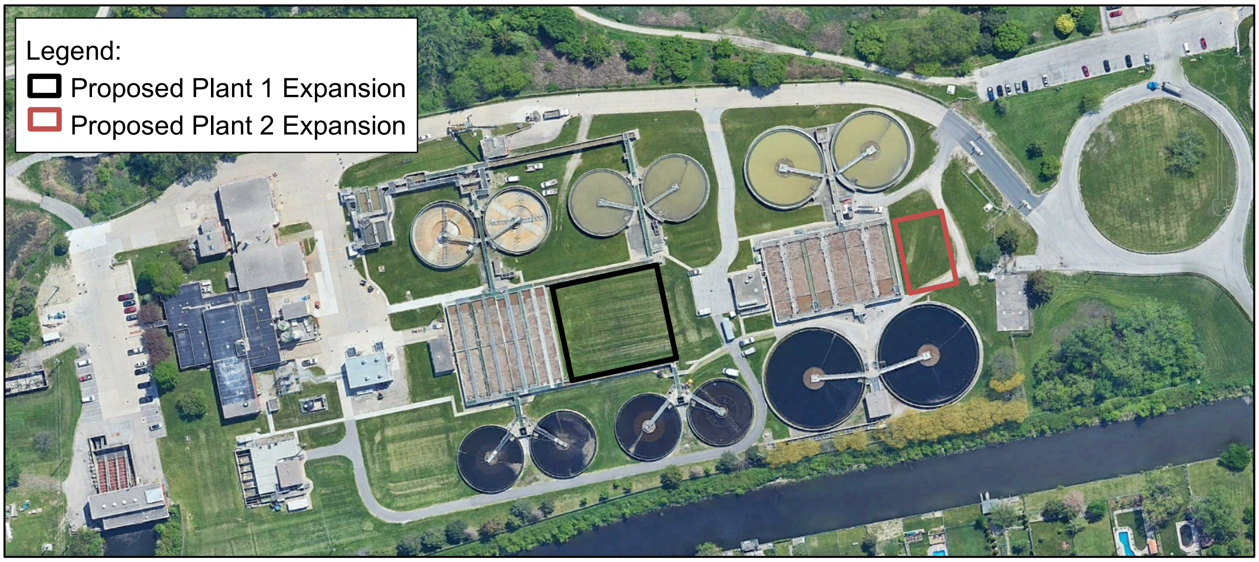

Figure 6.2: Alternative No. 1 - Proposed Location of Aeration Tank Expansion

Alternative No. 2, Integrated Fixed Film Activated Sludge (IFAS) is a wastewater treatment process that combines the benefits of activated sludge and biofilm systems. IFAS involves adding an attached growth media (fixed or free floating) to an activated sludge tank to facilitate biomass growth and improve the efficiency of the secondary treatment process. In new constructions, IFAS can be utilized to reduce the size required for the aeration tanks. In retrofits, IFAS can be implemented to upgrade treatment efficiency thereby increasing the capacity within the same tank volume. Additional benefits of IFAS systems include improved nitrification due to combining the aerobic, anaerobic, and anoxic zones; increased sludge retention time; increased process stability; increased resistance to organic and hydraulic shock loads; reduced sludge production; and compatibility with fine bubble aeration systems. Drawbacks may include higher energy requirements due to aeration and mixing to uniformly distribute free-floating media; high capital, operation, and maintenance cost; more complex operational and maintenance requirements; proprietary design makes obtaining maintenance parts more difficult; and induced headloss which may negatively affect the HGL. IFAS is a maturing technology in North America with a limited number of full-size installations and numerous pilot scale studies within Ontario. It is estimated that the implementation of IFAS technology can increase ADF capacity by approximately 50%. This expansion would exceed the 20-Year Design Projection of 77.2 MLD but would not achieve the Ultimate Design Projection of 104 MLD, which is acceptable for the Phase 2 expansion.

Alternative No. 3, Membrane Aerated Biofilm Reactor (MABR) is a wastewater treatment process that utilizes a fixed gas-permeable membrane as a pathway for oxygen transfer and to facilitate growth of a biofilm for improved efficiency of the secondary treatment process. For retrofit projects, MABR are available in modules that can be placed within the existing aeration tanks and can be modified based on tank shape, size, and structural requirements. The addition of MABR modules upgrades the nitrification treatment efficiency in particular, thereby increasing the capacity within the same tank volume. Additional benefits of MABR systems include lower energy consumption leading to lower operating cost; increased process stability; increased resistance to organic and hydraulic shock loads; reduced sludge production; minimal disruption to plant operation during implementation; and high level of flexibility and scalability in design. Drawbacks may include potential for accumulation and fouling on membranes necessitating regular membrane cleaning; high capital and maintenance cost; more complex operational and maintenance requirements; and proprietary design makes obtaining maintenance parts more difficult. MABR is a maturing technology in North America with limited installations in Canada and several pilot studies in Ontario. It is estimated that the implementation of MABR technology can increase ADF capacity by approximately 50%. This expansion would exceed the 20-Year Design Projection of 77.2 MLD but would not achieve the Ultimate Design Projection of 104 MLD, which is acceptable for the Phase 2 expansion.

Alternative No. 4, Moving Bed Biological Reactor (MBBR) is a highly effective biological wastewater treatment system that combines biofilm media with conventional activated sludge processes. MBBR involves adding specialized media to provide a larger surface area for biofilm growth. The key difference between IFAS and MBBR is the presence of sludge recycling. MBBR is a pure attached growth process with plastic media for biofilm development, while IFAS is a hybrid process combining both attached and suspended growth (activated sludge) with sludge recycle. Due to the configuration of the aeration tanks at the LRPCP which includes sludge recycling, the implementation of MBBR would be achieved as a pretreatment option. The benefits and drawbacks of MBBR technology are similar to that for IFAS. One significant drawback for the application of MBBR pretreatment at the LRPCP is the lack of available space for the additional tankage. MBBR is a maturing technology in North America with a limited number of full-size installations and numerous pilot scale studies within Ontario

Alternative No. 5, Hydro-Cyclone Sludge Densification is a method for Densified Activated Sludge (DAS) which increases control of the ratio of biofilm biomass and densified sludge to enhance the performance of traditional activated sludge systems. Hydro-Cyclone Sludge Densification utilizes centrifugal and gravitational forces to differentiate high-density biomass from low-mass, low-density suspension in wastewater. This system retains denser biomass for recirculation while removing the lighter fraction of Mixed Liquor Suspended Solids (MLSS) to exit the activated sludge process as waste activated sludge (WAS). This process improves the efficiency of the secondary treatment process thereby increasing the capacity within the same tank volume. Additional benefits include greater control of MLSS; improved sludge properties; increased clarifier capacity; reduced chemical requirements; and ease of implementation. Drawbacks include moderate capital, operation, and maintenance cost; more complex operational and maintenance requirements; and proprietary design makes obtaining maintenance parts more difficult. An additional key drawback for DAS is that capacity gains associated with this technology are site specific and therefore require multi-year full-scale pilot testing to determine the capacity gains. Sludge densification is a maturing technology in North America with limited installations in Canada and Ontario.

Alternative No. 6, Combination of Above Alternatives, would include the implementation of two (2) or more alternatives for the LRPCP expansion. Based on the technical feasibility of combining solutions this would likely involve the combination of Alternative No. 1 (Adding Tankage) with Alternative No. 2 (IFAS) OR 3 (MABR) AND/OR Alternative No. 5 (DAS). This combination would significantly improve ADF above the 20-Year Projection and the Ultimate Projections; therefore, this is not necessary for the Phase 2 Expansion but may be a good solution for long-term needs (i.e., interim solution prior to Phase 3 Expansion).

Table 6.8 shows an evaluation of the six alternative methods to increase the aeration tanks capacity. Based on the evaluation, Alternative No. 1, Expanding Existing Aeration Tanks, is recommended.

Table 6.8: Evaluation of Aeration Tank Capacity Upgrade Alternatives

Evaluation Criteria	Alternative No. 1: Expand Existing	Alternative No. 2: IFAS Retrofit	Alternative No. 3: MABR Retrofit	Alternative No. 4: MBBR Pretreatment	Alternative No. 5: DAS	Alternative No. 6: Combination
Technical Suitability	**Good** • Less complex design and construction • Less complex O&M • 50~60% increase in capacity • Higher footprint requirement • Moderate energy requirements • Proven technology • Moderate resistance to organic and hydraulic shock loads • Increased flexibility for expansion	**Fair** • More complex design and construction • More complex O&M • ~ 50% increase in capacity • Lower footprint Requirements • High energy requirements • Proprietary design • Less proven technology • High resistance to organic and hydraulic shock loads • Reduced sludge production • Limited flexibility for expansion	**Fair** • More complex design and construction • More complex O&M • ~ 50% increase in capacity • Lower footprint Requirements • Moderate energy requirements • Proprietary design • Less proven technology • High resistance to organic and hydraulic shock loads • Reduced sludge production • Limited flexibility for expansion	**Poor** • More complex design and construction • More complex O&M • ~ 50% increase in capacity • Moderate footprint Requirements • High energy requirements • Proprietary design • Less proven technology • High resistance to organic and hydraulic shock loads • Reduced sludge production • Limited flexibility for expansion	**Fair** • More complex design and construction • More complex O&M • Unconfirmed increase in capacity • Low-moderate footprint Requirements • Moderate energy requirements • Proprietary design • Less proven technology • Moderate resistance to organic and hydraulic shock loads • Limited flexibility for expansion	**Good** • More complex design and construction • More complex O&M • ~ 80% increase in capacity • Higher footprint Requirements • High energy requirements • Proprietary design • Less proven technology • High resistance to organic and hydraulic shock loads • Reduced sludge production • Increased flexibility for expansion
Social	**Fair** • Minimal impact on archaeological, built heritage, and cultural heritage resources	**Good** • Minimal impact on archaeological, built heritage, and cultural heritage resources	**Good** • Minimal impact on archaeological, built heritage, and cultural heritage resources provided appropriate	**Good** • Minimal impact on archaeological, built heritage, and cultural heritage resources provided appropriate	**Good** • Minimal impact on archaeological, built heritage, and cultural heritage resources provided appropriate	**Fair** • Minimal impact on archaeological, built heritage, and cultural heritage resources provided appropriate

Evaluation Criteria	Alternative No. 1: Expand Existing	Alternative No. 2: IFAS Retrofit	Alternative No. 3: MABR Retrofit	Alternative No. 4: MBBR Pretreatment	Alternative No. 5: DAS	Alternative No. 6: Combination
	provided appropriate screening and mitigation measures are followed • Low potential for noise and vibration impacts provided appropriate design and mitigation measures are applied • Higher potential for impact to the society due to expansion requirements • Less aligned with zoning and development policies in the region	provided appropriate screening and mitigation measures are followed • Low potential for noise and vibration impacts provided appropriate design and mitigation measures are applied • Lower potential for impact to the society • More aligned with zoning and development policies in the region	screening and mitigation measures are followed • Low potential for noise and vibration impacts provided appropriate design and mitigation measures are applied • Lower potential for impact to the society • More aligned with zoning and development policies in the region	screening and mitigation measures are followed • Low potential for noise and vibration impacts provided appropriate design and mitigation measures are applied • Lower potential for impact to the society • More aligned with zoning and development policies in the region	screening and mitigation measures are followed • Low potential for noise and vibration impacts provided appropriate design and mitigation measures are applied • Lower potential for impact to the society • More aligned with zoning and development policies in the region	screening and mitigation measures are followed • Low potential for noise and vibration impacts provided appropriate design and mitigation measures are applied • Higher potential for impact to the society due to expansion requirements • Less aligned with zoning and development policies in the region
Environment	Comparable • Minimal impact on vegetation, fish and wildlife, areas of natural and scientific interest, environmentally sensitive areas, and soil / geology provided appropriate screening and mitigation measures are followed • Anticipated to meet MECP effluent treatment requirements					
Economic	**Good** • Moderate lifecycle cost	**Fair** • Moderate-High lifecycle cost	**Fair** • Moderate-High lifecycle cost	**Fair** • Moderate-High lifecycle cost	**Fair** • Moderate lifecycle cost	**Poor** • High lifecycle cost
Overall	**Good**	**Fair**	**Fair**	**Fair**	**Fair**	**Fair**

6.4.2 Secondary Clarifier Capacity Upgrade Alternatives

The alternative methods/technologies to upgrade the capacity of the secondary clarifier that were considered as a part of this MCEA included:

Alternative No. 1: Expanding Existing Secondary Clarifiers

Alternative No. 2: Stress Test to Re-Rate Existing Secondary Clarifiers

Alternative No. 1, expanding the existing secondary clarifiers would involve constructing additional secondary clarifier tanks near the existing tanks at Plant 1 and Plant 2. The required increase in volume would be approximately +25% at Plant 1 and Plant 2 in order to meet the Peak DWF Projection for the 20-Year Design (201 MLD). There is limited space available on the site and therefore it is not considered plausible to increase the tank volume by the required amount.

Alternative No. 2, stress test to re-rate existing secondary clarifiers, would involve performing large scale testing and monitoring programs in collaboration with the MECP to increase the allowable Peak DWF rate for the secondary clarifiers. The proposed stress test would focus on the actual field allowable surface overflow rate (SOR) as a basis for determining the allowable peak DWF. For example, the MECP design guideline for secondary clarifiers allows for a SOR = 37 $m^3/m^2/d$, which limits the current capacity to ~160 MLD. Successful LRPCP stress testing at SOR=50 $m^3/m^2/d$ could increase the allowable Peak DWF capacity to ~201 MLD. This expansion would exceed the 20-Year Design Projection of 201 MLD but would not achieve the Ultimate Design Projection of 259 MLD, which is acceptable for the Phase 2 expansion.

Table 6.9 shows an evaluation of the three alternative methods to upgrade the capacity of the secondary clarifiers. Based on the evaluation, Alternative No. 2, Re-Rating the Existing Secondary Clarifiers, is recommended.

Table 6.9: Evaluation of Secondary Clarifier Capacity Upgrade Alternatives

Evaluation Criteria	Alternative No. 1: Expanding Existing	Alternative No. 2: Re-Rate Existing
Technical Suitability	**Poor** • Insufficient for 20-year design projections • ~10% increase in capacity based on available land near Plant 1 calrifiers • More complex design and construction • Less complex O&M • Higher footprint requirement • Limited flexibility for expansion	**Fair** • Sufficient for 20-year design projections • ~25% increase in capacity assuming that re-rating will be acceptable to the MECP • Less complex design and construction • More complex O&M • Low footprint requirements • Limited flexibility for expansion
Social	**Fair** • Minimal impact on archaeological, built heritage, and cultural heritage resources provided appropriate screening and mitigation measures are followed	**Good** • Minimal impact on archaeological, built heritage, and cultural heritage resources provided appropriate screening and mitigation measures are followed

Evaluation Criteria	Alternative No. 1: Expanding Existing	Alternative No. 2: Re-Rate Existing
	• Low potential for noise and vibration impacts provided appropriate design and mitigation measures are applied • Higher potential for impact to the society due to expansion requirements • Less aligned with zoning and development policies in the region	• Low potential for noise and vibration impacts provided appropriate design and mitigation measures are applied • Lower potential for impact to the society • More aligned with zoning and development policies in the region
Environment	**Fair** • Minimal impact on vegetation, fish and wildlife, areas of natural and scientific interest, environmentally sensitive areas, and soil / geology provided appropriate screening and mitigation measures are followed • Potential difficulty meeting MECP effluent treatment requirements	**Fair** • Minimal impact on vegetation, fish and wildlife, areas of natural and scientific interest, environmentally sensitive areas, and soil / geology provided appropriate screening and mitigation measures are followed • Potential difficulty meeting MECP effluent treatment requirements
Economic	**Poor** • Moderate capital investment and O&M cost	**Good** • Low capital investment and O&M cost
Overall	**Poor**	**Fair**

6.4.3 UV Capacity Upgrade Alternatives

The alternative methods/technologies to upgrade the capacity of the aeration tanks that were considered as a part of this MCEA included:

Alternative No. 1: Increase the Capacity of Plant 1 UV Disinfection

Alternative No. 2: Increase the Capacity of Plant 2 UV Disinfection

Alternative No. 3: Implement a New UV Disinfection Facility

Alternative No. 1, increasing the capacity of the Plant 1 UV Disinfection Facility would involve increasing the total UV output and therefore disinfection capacity. This could be achieved by adding more UV banks, modules, or lamps in parallel or series to increase the disinfection capacity. The existing UV Disinfection Facility at Plant 1 is fitted with channel reduction baffles which could be removed to provide additional space for adding UV lamps. It is proposed that the upgrades to the existing Plant 1 UV Disinfection Facility be sized based on the new capacity of the aeration tanks and secondary clarifiers such that the UV does not become a bottleneck which limits the Rated Capacity of the Phase 2 Expansion.

Alternative No. 2, increasing the capacity of the Plant 2 UV Disinfection Facility would be similar to that for Alterative No. 1. The existing UV Disinfection Facility at Plant 2 is also fitted with channel reduction baffles which could be removed to provide additional space for adding UV lamps.

Alternative No. 3, implementing a new UV disinfection facility would involve constructing a new UV Disinfection Facility on the existing LRPCP Site. This could be implemented near the existing Plant 1 UV Disinfection Building and may be sized for a portion or all of the effluent flow. There is limited space available on the site for an additional UV Disinfection Building and the existing buildings have the ability to accommodate capacity upgrades; therefore; this is not considered a preferable option.

Table 6.10 shows an evaluation of the three UV capacity upgrade alternatives. Based on the evaluation, Alternative No. 1 and 2, increasing the capacity of the Plant 1 and 2 UV Disinfection Facilities is recommended.

Table 6.10: Evaluation of UV Capacity Upgrade Alternatives

Evaluation Criteria	Alternative 1: Increase Capacity of Plant 1 UV Disinfection	Alternative No. 2: Increase Capacity of Plant 2 UV Disinfection	Alternative No. 3: Implement a New UV Disinfection Facility
Technical Suitability	**Good** • Compatible with existing channel dimensions • Low footprint requirements • Lower O&M Requirements	**Good** • Compatible with existing channel dimensions • Low footprint requirements • Lower O&M Requirements	**Poor** • Not compatible with existing infrastructure • Higher footprint requirements • Higher O&M Requirements
Social	**Good** • Minimal impact on archaeological, built heritage, and cultural heritage resources provided appropriate screening and mitigation measures are followed • Low potential for noise and vibration impacts provided appropriate design and mitigation measures are applied • Lower potential for impact to the society • More aligned with zoning and development policies in the region	**Good** • Minimal impact on archaeological, built heritage, and cultural heritage resources provided appropriate screening and mitigation measures are followed • Low potential for noise and vibration impacts provided appropriate design and mitigation measures are applied • Lower potential for impact to the society • More aligned with zoning and development policies in the region	**Fair** • Minimal impact on archaeological, built heritage, and cultural heritage resources provided appropriate screening and mitigation measures are followed • Low potential for noise and vibration impacts provided appropriate design and mitigation measures are applied • Higher potential for impact to the society due to expansion requirements • Less aligned with zoning and development policies in the region
Natural Environment	Comparable • Minimal impact on vegetation, fish and wildlife, areas of natural and scientific interest, environmentally sensitive areas, and soil / geology provided appropriate screening and mitigation measures are followed • Anticipated to meet MECP effluent treatment requirements		
Economic	**Good** • Low-moderate capital investment and O&M cost	**Good** • Low-moderate capital investment and O&M cost	**Poor** • High capital investment and O&M cost

Evaluation Criteria	Alternative 1: Increase Capacity of Plant 1 UV Disinfection	Alternative No. 2: Increase Capacity of Plant 2 UV Disinfection	Alternative No. 3: Implement a New UV Disinfection Facility
Overall	Good	Good	Poor

6.5 PROPOSED CONCEPTUAL DESIGN OF PHASE 2 EXPANSION

The following sections outline potential capacities and phasing of the Phase 2 Expansion. The exact layout, capacity, and requirements for the expansion are to be reviewed and refined as a part of Phase 5 of the Class EA Process (Implementation).

6.5.1 Plant 1 and Plant 2 Expansion

6.5.1.1 Primary Clarifiers

The existing primary clarifiers will be reutilized for the Phase 2 Expansion. The Primary Clarifiers should accommodate the 20-year peak dry weather flow of 201 MLD.

Design:

- No changes proposed.

6.5.1.2 Aeration Tanks

The existing aeration tanks will be reutilized and additional aeration tanks will be constructed for the Phase 2 Expansion. The proposed expansion should at a minimum accommodate the 20-year average daily flow of 77.2 MLD.

Design:

- Adding tankage to the site with an increase in volume of approximately +100% at Plant 1; and
- Adding tankage to the site with an increase in volume of approximately +33% at Plant 2.

6.5.1.3 Secondary Clarifiers

The existing secondary clarifiers will be reutilized for the Phase 2 Expansion. The secondary clarifiers should be stress tested and re-rated to accommodate the 20-year peak dry weather flow of 201 MLD.

Design:

- Stress Test and Re-Rating Study.

6.5.1.4 UV Disinfection

The existing aeration tanks will be reutilized and additional UV banks will be added to the existing channels for the Phase 2 Expansion. The proposed expansion should at a minimum accommodate the 20-year average daily flow of 77.2 MLD. It is proposed that the upgrades to the existing UV Disinfection Facility be sized based on the new capacity of the aeration tanks and secondary clarifiers such that the UV does not become a bottleneck which limits the Rated Capacity of the Phase 2 Expansion.

Design:

- Remove existing channel reduction baffles and add additional UV banks at Plant 1; and
- Remove existing channel reduction baffles and add additional UV banks at Plant 2.

6.5.1.5 Tertiary Treatment

At the time of the Phase 2 Expansion provision shall be considered in the detailed design for addition of tertiary treatment (i.e., filtration) in the case that the expanded plant is required to meet more stringent effluent quality requirements than associated with secondary treatment, or the expanded plant cannot maintain the existing high effluent quality due to influent characteristics changes. At this time, it is unclear if tertiary treatment will be required; therefore, it was not considered necessary to assess various tertiary treatment alternatives as a part of this MCEA process.

6.5.1.6 Effluent Pumping Station

At the time of the Phase 2 Expansion, a hydraulic review should be completed to determine the requirements for an effluent pumping station based on the capacity of the LRPCP. Additional details and consideration for this effluent pumping station should be given as a part of the Phase 2 Expansion. At this time, it is assumed that an effluent pumping station will be required and is assumed to be implemented in conjunction with the Pontiac Pumping Station. The Pontiac Pumping Station is currently being upgraded and there are provisions to provide service as an effluent pumping station in the future.

6.5.1.7 Flow Distribution Chambers

Two (2) flow distribution chambers are proposed to be located at the LRPCP to redistribute flows between Plant 1 and Plant 2. The proposed locations of these distribution chambers will be after the Primary Clarifiers at Plant 1 and after the Secondary Clarifiers at Plant 2. These distribution chambers will be used to redistribute flows for effective treatment at the two Plants.

6.6 PHASE 3 – ADDITIONAL TREATMENT TRAIN AT THE LRPCP

The Phase 3 Expansion of the LRPCP is recommended to be implemented in the long term and would meet ultimate treatment capacity requirements and provide engineering redundancy for the existing LRPCP. Under this strategy, an additional treatment train (Plant 3), otherwise known as a tandem treatment plant, would be added to the LRPCP to accommodate the projected DWFs from the service area.

The planning horizon for the Phase 3 Expansion is approximately 20-30+ Years; however, this may be subject to change based on the pace at which developments progress within the City of Windsor service areas and Town of Tecumseh. Based on the anticipated timeline for implementation, these works would not be covered under the validity period of this MCEA Process and ESR. In addition, it is anticipated that there may be many changes between now and the time of implementation which are not able to be quantified at this time and should be captured in a future MCEA Process. These changes may include modifications to development plans and population projections, process or technology changes, policy changes, etc.

In general, it is proposed that the Phase 3 Expansion to Ultimate Capacity be undertaken in a series of stages. The timing of these stages should be determined based on actual growth within the service area which can be quantified as development is realized over time. The anticipated location of the Phase 3 Expansion is within the existing footprint of the LRPCP and at the nearby expansion lands allocated to the east of the LRPCP. A preliminary markup of the proposed location is shown in **Figure 6.3**.

Figure 6.3: Proposed Location of Phase 3 Expansion

7.0 OPINION OF PROBABLE COST

7.1 LEVEL OF ACCURACY

Opinions of probable cost are typically provided throughout various stages of a project's life cycle. There are a number of classifications for estimates that identify typical minimum and maximum probable costs or levels of accuracy. These classifications vary widely by industry, but all are based on the fact that the level of accuracy is directly proportional to the level of detail available at each stage of the project.

The level of accuracy increases as the project moves through the various stages from planning to preliminary design to final design. A wide range of accuracy would be expected at the planning stage of a project development because a number of details would be unknown. As the project moves closer to completion of final design, the estimate would become more accurate due to the increased level of detail available and the reduced number of unknowns.

Table 7.1 includes a summary of typical estimate classifications used throughout a project's development including a description of the project stage and range of accuracy. The opinions of probable cost in this study are estimated at the study stage (Class 2) and the corresponding level of accuracy could range from –15% to +30% from the opinion presented in the report.

Table 7.1: Classification of Cost Estimates

Class	Description	Level of Accuracy	Stage of Project Lifecycle
1	Conceptual Estimate	+50% to -30%	Screening of alternatives.
2	Study Estimate	+30% to -15%	Treatment system master plans.
3	Preliminary Estimate	+25% to -10%	Pre-design report.
4	Detailed Estimate	+15% to -5%	Completed plans and specifications.
5	Tender Estimate	+10% to -3%	This is the actual tender price, and it can vary depending on the amount of contingency allowance consumed.

7.2 OPINION OF PROBABLE COST FOR PREFERRED SOLUTION

A capital budget estimate (in 2025 dollars) is summarized in the following tables. In addition to the level of accuracy discussed, the opinion of probable cost was prepared taking into consideration the following factors.

- All estimates are in 2025 dollars based on an Engineering News Record (ENR) Construction Cost Index of 1200.
- It is assumed that the Contractor will have unrestricted access to the site and will complete the work during normal working hours from 7:00 am to 6:00 pm Monday to Friday. There is no allowance for premium time included. Labour costs are based on union labour rates for the Windsor area.
- An allowance is included for mobilization and demobilization and the Contractor's overhead and profit.

- Equipment costs are based on vendor supplied price quotations and historical pricing of similar equipment. Bulk material and equipment rental costs used are typical for the Windsor area.
- The estimate does not include the cost of application or permit fees.
- No allowance is included for escalation beyond the date of this report.
- A factor that could impact the estimate is the possible presence of archaeological resources in the construction area. However, the potential for these resources has been identified to be low and therefore no allowance is included in the estimate.

Table 7.2: Opinion of Probable Capital Cost for Phase 1 (LRPCP New Headworks and RTB)

Item	Description	Probable Cost
1	Site Preparation	$ 3,600,000.00
2	RTB Construction	$ 23,200,000.00
3	RTB-LRPCP Connecting Sewers and Modifications	$ 16,800,000.00
4	Headworks • Screening and Raw Influent Pumping Station • Flow Monitor and Distribution Chamber • Grit Removal	$ 12,800,000.00 $ 800,000.00 $ 4,800,000.00
	Sub-total Construction Cost	$62,000,000.00
	Contingency Allowance (30%)	$18,600,000.00
	Engineering Allowance (15%)	$9,300,000.00
	TOTAL CAPITAL COST (excluding taxes)	$89,900,000.00

Table 7.3: Opinion of Probable Capital Cost for Phase 2 (Plant 1 and Plant 2 Upgrades)

Phase	Description	Probable Cost
1	Aeration Tank Expansion	$ 32,300,000.00
2	Re-Rate Secondary Clarifiers (Stress Testing / Engineering Study)	$ 250,000.00
3	UV Disinfection Upgrades	$ 4,600,000.00
4	Hydraulic Upgrades • Effluent Pumping Station • Flow Distribution Chamber	$ 1,150,000.00 $ 800,000.00
	Sub-total Construction Cost	$ 39,100,000.00
	Contingency Allowance (30%)	$ 11,700,000.00
	Engineering Allowance (15%)	$ 5,900,000.00
	TOTAL CAPITAL COST (excluding taxes)	$ 56,700,000.00

Notes:

- This OPC does not include the cost associated with Tertiary Treatment Units.
- This OPC assumes that the Effluent Pumping Station will be combined with the current upgrades to the Pontiac Pumping Station.

For the purposes of future planning, Stantec has prepared a high-level estimate for the opinion of probable cost for the Phase 3 Expansion. The opinion of probable cost for the Phase 3 Expansion is estimated to be approximately $84,100,000.00 CAD (including contingency and engineering allowance; excluding HST).

Table 7.4: Opinion of Probable Capital Cost for Phase 3 (Tandem Treatment Plant)

Item	Description	Probable Cost
1	Phase 3 Expansion	$ 58,000,000.00
	Sub-total Construction Cost	$ 58,000,000.00
	Contingency Allowance (30%)	$ 17,400,000.00
	Engineering Allowance (15%)	$ 8,700,000.00
	TOTAL CAPITAL COST (excluding taxes)	$ 84,100,000.00

8.0 ENVIRONMENTAL IMPACTS AND MITIGATING MEASURES

8.1 OVERVIEW

Table 8.1 provides a summary of potential environmental impacts and proposed mitigating measures for the recommended design. In general, the construction and operation of the recommended design will have a limited effect on the environment. In general, the construction and operation of the recommended design will have a limited effect on the environment. The implementation of the pumping station will be the most disruptive phase of the project due to construction activities. **Table 8.1** identifies potential environmental impacts during construction. It is anticipated that the recommended work will not have a significant effect on the natural environment such as wildlife, vegetation, or the habitat characteristics of any particular species.

With respect to other socio-economic impacts, it is anticipated that the preferred alternative will not have any serious lasting impact on cultural activities, heritage resources or any other community program. During the construction phase of this project, it is anticipated that construction activities would result in some level of temporary disruption to the community and nearby residents. The impacts on air quality, noise, and vibration, and community life will be mitigated through standard construction procedures.

Table 8.1: Environmental Effects and Mitigating Measures

Operation	Impact	Mitigating Measures
Cutting, digging, or trimming ground covers, shrubs, and trees	Reduced terrestrial wildlife habitat quality (i.e., diversity, area, function) and increased fragmentation of habitat.	• This is not a concern as there is no significant existing terrestrial wildlife habitat in the proposed area of construction. • Open cutting or excavations for the sewer modifications will be minimized through the use of trenchless technologies (where needed and applicable).
	Loss of unique or otherwise valued vegetation features	• There are no known unique vegetation features in the area that may be disturbed by construction activities. • Where possible, existing vegetation features will be restored to a preconstruction condition.
Trenching / tunnelling, excavation, and construction for WWFRF and New Headworks at the LRPCP site	Soil erosion and sediment transport to adjacent water bodies causing sedimentation and turbidity of adjacent water bodies and drainage ditches	• Use of erosion control measures (i.e. sediment traps, silt fences, etc.). • Use of nature-based solutions for erosion control (i.e. vegetative filter strips, mechanical seedings, mulching, growth erosion control blanket, etc.). • Collect contaminated runoff. • Restore vegetation growth quickly. • Stage construction activities to minimize potential of adverse impacts.
	Reduced water quality and clarity due to increased erosion and sedimentation, and transport of debris.	• Apply wet weather restrictions to construction activity. • Comply with any local regulations, policies and guidelines that stipulate a minimum acceptable buffer width (the allowable distance from a water body). Maximum buffer widths are desirable.

Operation	Impact	Mitigating Measures
		• If possible, direct surface drainage away from working areas and areas of exposed soils. To the maximum extent possible, promote overland sheet flow to well vegetated areas. • Install and maintain silt curtains, sedimentation ponds, check dams, cofferdams or drainage swales, and silt fences around soil storage sites and elsewhere, as required.
	Loss of vegetation and topsoil and mixing topsoil and subsoil	• Restore site by replacing topsoil and reinstate vegetation to prevent erosion. • Stripping and stockpiling of topsoil separate from subsoil.
	Removal and/or disturbance of trees and ground flora	• Avoid treed areas where possible. • Employ tree protection measures. • Replace trees and provide site landscaping. • Review status of species.
	Temporary disruption of pedestrian and vehicle traffic	• Provide and maintain detours. • Provide safe alternate routes. • Select alternate routes with minimal inconveniences.
	Temporary disruption and inconvenience during construction to adjacent properties, buildings, and inhabitants	• Notify public agencies and neighbouring owners of construction activities. • Prepare program for reporting and resolving problems. • Consult with public agency and/or adjacent landowners regarding temporary access routes. • Ensure access is provided for emergency vehicles and personnel. • Apply noise and vibration control measures. • Apply dust control measures. • Control emissions from construction equipment and vehicles. • Use silencers to reduce noise. • Require compliance with municipal noise by-laws.
	Excess soil removal	• All excess soil materials and waste generated during the construction process must be disposed of in accordance with O. Reg. 406/19
	Possible need to remove contaminated excavated material.	• Sample material. • Handle and dispose of contaminated material in an acceptable manner.
	Decreased ambient air quality due to dust and other particulate matter.	• Avoid site preparation or construction during windy and prolonged dry periods. • Cover and contain fine particulate materials during transportation to and from the site. • Instruct workers and equipment operators on dust control methods. • Spray water to minimize dust off paved areas or exposed soils. • Stabilize high traffic areas with a clean gravel surface layer or other suitable cover material.

Operation	Impact	Mitigating Measures
		• Cover or otherwise stabilize construction materials, debris, and excavated soils against wind erosion.
	Disturbance to microscopic organisms in the soil.	• Limit the size of stockpiles to avoid anaerobic conditions. • Protect stockpiled soils from exposure to and sterilization by solar radiation (or stockpile in an uncovered shaded area).
	Reduced soil capability through compaction and rutting and mixing of topsoil and layers below.	• Avoid working during wet conditions and/or confine operation to paved or gravel surfaces. • Whenever possible, strip and store topsoil separately from the layers below and return to excavation in sequence.
	Industrial disruption of field/facility access.	• All driveways, roadways and field access will be restored to pre-construction condition. • Staging of construction and advance notice to property owners prior to disruption of construction to minimize inconvenience.
	Disruption of tile and surface drainage systems.	• Provide for temporary drainage systems until final restoration is accomplished. • Avoid disturbing drainage systems during critical periods. • All existing culverts, tiles, and drainage systems to be restored to pre-construction conditions following construction.
	Reduced water quality of nearby surface waters having value as wildlife habitat.	• Design drainage systems and stormwater management measures to reduce changes in drainage to watercourses. • Use sediment control techniques for stockpiled materials to minimize degradation of water quality.
	Modifications or removal of aquatic habitat.	• Stage construction to minimize potential for adverse impacts. • Restore stream substrate. • Choose suitable site for stream diversions. • Keep up to date with seasonal constraints.
	Residential impacts.	• Construction noise and dust impacts will be controlled through noise by-laws and dust control measures in contract specification. • Inconvenience due to temporary loss of property access will be minimized through proper communication and advance notice of disruption. • Pedestrian safety will be maintained through excavation barricades and construction fencing.
	Traffic disruption.	• It is not expected that there will be any significant traffic disruptions during the construction of the proposed work. • Construction activities will attempt to maintain a minimum of one lane of open traffic at all times with necessary detour signage and flag persons. • If complete closure is required, emergency services will be advised in advance, and access will be restored at the end of each working day.

Operation	Impact	Mitigating Measures
	Recreation.	• Maintain access to recreational sites during construction. • Locate water and wastewater infrastructure components to minimize impact. • Construction and tree protection fencing shall be installed prior to the start of construction, after layout, and shall be reviewed by an engineer.
	Archaeological and heritage resources.	• Assess archaeological significance in areas undisturbed by previous activities. Complete Stage 2 Land Archaeological Assessment as required and follow mitigative measures.
	Built heritage resources and cultural heritage landscapes.	• The MTCS’s “Screening for Impacts to Built Heritage and Cultural Landscapes” checklist was reviewed. Proposed work is located away from any built heritage and cultural heritage landscapes and thus is not expected to impact heritage resources in the area.
Use of construction equipment	Contamination of surface waters, drains and public roadways from spills, leaks or equipment refueling.	• Use containment facilities. • Inspect equipment regularly for fuel and oil leaks. • Clean equipment before it travels off site. • Provision for spill control. • Fast accurate reporting of spill. • Spill Containment. • Implement disinfection techniques in concert with fisheries requirements. • Pollution prevention and source control by best management land use practices and best management stormwater practices. • Apply buffer zones and setbacks where practicable.
	Decreased air quality due to vehicular emissions causing increased concentrations of chemical pollutants.	• Minimize operation and idling of vehicles and gas-powered equipment, particularly during local smog advisories. • Use well-maintained equipment and machinery within operating specifications.
	Disruption to wildlife migration and movement patterns, breeding, nesting, or hibernation.	• There are no known areas containing sensitive vegetation and wildlife. • There are no known areas where migratory birds are breeding. • Vegetation cleaning should occur outside of the primary nesting period for migratory birds (April 1 – August 31 for southern Ontario). • No-disturbance buffer (5 m – 60 m) will be set out upon discovery of any migratory bird’s nests within the work area.
	Introduction of non-native vegetation, including opportunistic species.	• Clean heavy machinery and equipment prior to transporting to new location.
	Loss of unique or otherwise valued vegetation features	• Avoid or minimize trampling vegetation with equipment. • Minimize physical damage to vegetation by avoiding pushouts and avoiding the placement of splash onto living vegetation.

Operation	Impact	Mitigating Measures
	Reduced water quality and clarity due to increased erosion and sedimentation, and transport of debris.	• Operate heavy machinery on the shore above the normal water level. • Where possible, conduct activities in the dry, above the actual water level and above any expected rises in water level that may occur during a rainfall or snowmelt event.
	Reduced water quality due to inputs of contaminants from surface runoff during construction and operation.	• Refuel equipment off slopes and far away from water bodies. • Securely contain and store all oils, lubricants, fuels, and chemicals. If necessary, use impermeable pads or berms.

8.2 NATURAL ENVIRONMENTAL IMPACTS AND MITIGATING MEASURES

The following standard mitigation measures and best practices are recommended to reduce potential impacts to natural heritage features during construction:

- Delineate the work areas with tree protection fencing prior to construction to reduce impacts to adjacent natural features.
- Wash, refuel and/or service equipment a minimum of 30 m from watercourses and wetlands to reduce the risk of deleterious substances from entering the features. Check machinery regularly for fluid leaks.
- Develop a clean equipment protocol to prevent the spread of highly invasive species such as *Phragmites* during construction.
- Develop a Spill Management Plan and have it on site for implementation in the event of an accidental spill. Keep an emergency spill kit on site.

8.2.1 Aquatic and Terrestrial Habitat

The proposed work area may contain natural features that support habitats of endangered species and threatened species. As per Section 2.1.7 of the Provincial Policy Statement (PPS) – "Development and site alteration shall not be permitted in habitat of endangered species and threatened species, except in accordance with provincial and federal requirements." All issues related to the provincial *Endangered Species Act* (ESA) and its regulations shall be addressed prior to the construction of the proposed work.

If the proponent believes that their proposed activities are going to have an impact on Species at Risk or are uncertain about the impacts, they should contact SAROntario@ontario.ca to undergo a formal review under the ESA. It is the responsibility of the proponent to ensure that Species at Risk (SAR) are not killed, harmed, or harassed, and that their habitat is not damaged or destroyed through the proposed activities to be carried out on the site.

Stantec completed site investigations throughout spring, summer, and fall of 2025, to document existing natural heritage conditions in the site area. Surveys included Ecological Land Classification (ELC) of vegetation communities, Migratory Bird Nest survey, Bat Maternity Roost Tree survey, Significant Wildlife Habitat assessment, a SAR Habitat Suitability assessment of terrestrial features. The natural heritage features that were identified through the background review were confirmed during the field surveying.

The Natural Heritage Assessment report is included in **Appendix E**.

8.2.2 Protection of Migratory Birds

The federal *Migratory Birds Convention Act* (MBCA) provides legal protection of migratory birds and their nests in Canada. Construction timing must consider restrictions imposed by the MBCA. The Migratory Birds Regulation, 2022, further defines when nests of migratory bird species are protected, with special provisions (e.g. year-round protection) in place for bird species that reuse their nests (e.g., Pileated Woodpecker, Great Blue Heron). There was no breeding birds documented in the Study Areas that receive year-round nest protection by the MBR. To avoid damaging or disturbing bird nests and contravening the MBCA, the timing of any vegetation clearing should occur outside of the primary nesting period (i.e., the period when the percent of total nesting species is greater than 10% based on Environment Canada’s Nesting Calendars and the period for which due diligence mitigation measures are generally recommended).

The primary nesting period identified for southern Ontario is April 1 - August 31, although nesting also infrequently occurs outside of this period (ECCC Canada 2014). Vegetation removal during this core nesting period is not recommended; however, if required, a nest survey may be carried out by a qualified person in simple habitats such as an urban park, a vacant lot with few possible nest sites, a previously cleared area, or a structure (ECCC 2019). If a migratory bird nest is located within the work area at any time, a no-disturbance buffer should be delineated. This buffer should be maintained for the entire duration of the nest activity, which should be determined using periodic checks by the avian biologist. The radius of the buffer varies from 5 m - 60 m depending on the sensitivity of the nesting species. Work should not resume within the nest buffer until the nest is confirmed to be no longer active.

Spoil (soil) piles onsite should be managed in a way to prevent Bank Swallow from nesting. Follow the Best Management Practices for the Protection, Creation and Maintenance of Bank Swallow Habitat in Ontario (OMNRF 2017).

8.2.3 Wildlife Protection

The following mitigation measures are recommended to avoid impacts to wildlife during construction and should be implemented in accordance with requirements for SAR:

- To reduce risk of harm to individual bats, removal of suitable bat maternity roost trees and shrubs (trees greater than 10 cm DBH or shrubs greater than 1 m height) should not occur during the active roosting season (between April 1 and November 30).
- A visual search of the work area should be conducted before work commences each day, particularly for the period when most wildlife is active (April 1 to October 31). Visual inspections should locate and avoid snakes and turtles. Visual searches should include inspection of machinery

and equipment left in the work area overnight or left idle for one hour prior to starting equipment, as snakes may use them for thermoregulation.

- If wildlife is encountered, work at that location will stop, and the animal(s) should be permitted reasonable time to leave the work area on their own.
- Contractors should be made aware of the potential to encounter reptile SAR and SOCC on the Site including the Butler's Gartersnake, Eastern Foxsnake, Blanding's Turtle, Snapping Turtle, and Midland Painted Turtle. Contractors should receive an education and awareness training of the potential presence of these species. The education and awareness training should provide information on the species, what to do in an encounter, and who to contact if the animal needs to be moved or if the animal has been injured. A trained biologist should be called in the event for the need to move an animal and can only be done under appropriate permitting (e.g., Wildlife Scientific Collector's Authorization).
- Fencing used for ESC can also serve as wildlife exclusionary fencing. Sediment fencing should be installed along the limits of the work zone prior to construction to reduce the potential for snakes and turtles to enter the construction area. The fencing should be installed to the specifications outlined in the Best Practices Technical Note – Reptile and Amphibian Exclusion Fencing (MECP 2025b). In particular, the fencing needs to meet the installation criteria for Eastern Foxsnake, which is provided in the MECP (2025b) document (a fence that excludes Eastern Foxsnake will also exclude Butler's Gartersnake and turtles). The exclusion fencing is to be installed prior to May 15 to avoid turtle nesting in the work area and maintained for the duration of the snake and turtle SAR active season (late March to late October) and checked daily to identify any repairs that may be needed. Damaged fencing should be repaired immediately.
- If a nesting turtle is encountered during construction at any time, the turtle should not be disturbed. Work in the area must stop until the turtle has completed nesting and/or vacated the area. The nest site should be noted, and a biologist or other qualified professional should be contacted for direction. Turtle nests are protected under the Fish and Wildlife Conservation Act; therefore, and nests should not be disturbed.
- Sediment and erosion control measures, such as fencing or blankets, utilized on the site during construction will avoid products with plastic mesh due to risk of entanglement of snakes or other wildlife.
- Observations of SAR (Butler's Gartersnake, Eastern Foxsnake, Blanding's Turtle) should be reported to the Ministry of Environment, Conservation and Parks (MECP) within 48 hours. SAR should not be handled, harassed, or moved in any way, unless they are in immediate danger.
- If injured or deceased reptile SAR are found, the specimen must be placed in a non-airtight container maintained at an appropriate temperature, and both the MECP and a certified wildlife rehabilitation facility will be contacted immediately.

8.2.4 Protection of Fish and Fish Habitat

Although no in-water work is proposed for Phase 1 of the Project, construction should follow the DFO Measures to Protect Fish and Fish Habitat (DFO 2025) while planning works associated with the piping connections underneath the Old Little River Drain. The following applicable measures to horizontal directional drilling (HDD) are recommended by the DFO to protect fish and fish habitat while working within 30 m of a watercourse:

- Maintain riparian vegetation – do not clear riparian vegetation adjacent to the Old Little River watercourse.
- Use sediment and erosion control:
  - Erect and maintain sediment and erosion control fencing around the site to reduce potential runoff and sedimentation into the Old Little River during construction.
  - Avoid introducing sediment into the watercourse – do not pump sediment-laden water from the work area into the Old Little River. Any onsite water pumping should be discharged into a sediment bag first before release into the natural environment or Old Little River.
- Prevent entry of deleterious substances in water:
  - Avoid depositing any deleterious substances in the watercourse.
  - Develop a spill response plan to be implemented in the event of a spill of a deleterious substance.
  - Keep an emergency spill kit on site.
  - Stop work and contain deleterious substances to prevent dispersal.
  - Reporting any spills of a deleterious substance to the MECP Spills Action Centre and the DFO whether near or directly into the watercourse.
  - Clean up and appropriately dispose of the deleterious substances.
  - Maintaining machinery onsite in a clean condition and free from fluid leaks.
  - Wash, refuel and service machinery and store fuel and other materials for the machinery in such a way as to prevent any deleterious substances from entering a watercourse.
  - Disposing of waste materials appropriately and away from the watercourse.

8.2.5 Erosion and Sediment Control

An erosion and sediment control (ESC) plan should be developed and employed during construction to reduce the risk of erosion and the entry of sediment into surface water and other natural features. Mitigation included in the plan should include the following measures:

- Implement project-specific temporary ESC measures per prior to starting work (e.g., silt fence and/or sediment logs).
- Keep additional ESC materials available on site to provide a contingency supply in the event of an emergency.
- Monitor and maintain erosion and sediment controls, as required. Controls are to be removed only after the soils of the construction area have stabilized and vegetation cover has reestablished.
- Stabilize materials requiring stockpiling (fill, topsoil, etc.) and keep a safe distance (> 30 m) from watercourses.
- Stabilize and re-vegetate areas of disturbed/exposed soil, as soon as practicable with native seed mixes and woody vegetation.

8.2.6 Excess Soil Materials and Waste

In 2019, the MECP introduced O. Reg. 406/19 entitled 'On-site and Excess Soil Management' under the Environmental Protection Act. All excess soil materials and waste generated during the construction process must be disposed of in accordance with O. Reg. 406/19.

8.2.7 Floodplain Hazard Management

The proposed work site is under the jurisdiction of the Essex Region Conservation Authority. The proposed location of the WWFRF and LRPCP Expansions are located within the Limit of Regulated Area (LORA) under the Conservation Authorities Act (Ontario Regulation No. 158/06). Any proposed work within the LORA that may impact downstream receivers generally requires the issuance of an approval from ERCA.

Lands within the "Floodplain Areas" in the City of Windsor Official Plan, are identified as lands that are susceptible to flooding where flood depths and velocities may be their greatest. These lands are subject to required consultation with the ERCA in their development and require preventative measures for development to ensure the safety of occupants and integrity of property in the event of a Regulatory Flood. They are subject to flooding under regulatory flood conditions (1:100 year or maximum observed) and are subject to Ontario Regulations 158/06, as implemented by the ERCA.

8.2.8 Source Water Protection

Measures are taken throughout the design of the LRPCP expansion to ensure that there are no exacerbations or creation of adverse impacts to source water quality. For the protection of local municipal drinking water sources, the Essex Region Source Protection Plan (SPP), which has been established under the *Clean Water Act*, 2006 (Ontario Regulation 287/07), came into effect on October 1, 2015.

The *Clean Water Act* (2006) refers to four types of Vulnerable Areas, which include:

- Intake Protection Zones
- Wellhead Protection Areas
- Highly Vulnerable Aquifers
- Significant Groundwater Recharge Areas

The types of Vulnerable Areas are addressed further below in relation to this project location.

8.2.8.1 Intake Protection Zones (IPZs)

Intake Protection Zones are areas of land and water, where run-off from streams or drainage systems, in conjunction with currents in lakes and rivers, could directly impact the source water at the municipal drinking water intakes.

An Intake Protection Zone can be described as a defined area surrounding a surface water body intake. The size and shape of each zone in an IPZ represents either a set distance around the intake pipe, or the length of time it would take water and contaminants to reach the intake:

- IPZ-1 is the area closest to the intake pipe and is a set distance which extends one kilometer upstream and 120 meters onto the shore.
- IPZ-2 includes the on and offshore areas where flowing water and any pollution would reach the intake pipe within two hours.
- IPZ-3 is an area where contaminants could reach the intake pipe during and after a large storm.

According to the Approved Source Protection Plan for the Essex Region Source Protection Area (ERSPA), The Little River Drain and further the Detroit River which is the receiver of the LRPCP Effluent is characterized to be an Intake Protection Zone 2 (IPZ-2) with vulnerability score of 8.1.

The study area is located within the Event Based Area (EBA) of the A.H. Week’s Water Treatment Plant. In this area, the above grade handling and storage of liquid fuel in volumes of 15,000 L or greater is identified as a significant drinking water threat (SDWT). The storage of liquid fuel in this volume is not anticipated on the site. Should fuel of this volume be required, the proponent will need to notify the Risk Management Official to develop a Section 58 Risk Management Plan to mitigate this threat to drinking water. If a Risk Management Plan has previously been negotiated on the subject property, it will be the responsibility of the new owner to contact the Risk Management Official to establish an updated Risk Management Plan.

The study area is also located within Intake Protection Zone 2 (IPZ-2) of the A.H. Week’s Water Treatment Plant. There are several activities identified as SDWTs related to the study in this vulnerable area with related policies set out in the Source Protection Plan. Each SDWT activity has specific conditions under which the activity is considered to be a threat and most are managed either with an existing Provincial Instrument and/or through the development of a Section 58 Risk Management Plan with the Essex Region’s Risk Management Official. SDWT activities in Windsor`s IPZ-2 that may be related to the study include combined sewer discharge, sewage treatment plant bypass discharge to surface water, and stormwater management. These activities would most likely be managed through the City of Windsor’s Environmental Compliance Approval and ERCA Permitting.

The ERCA is the designated Risk Management Official/Inspector providing Risk Management Services for the ERSPA. Proposed work within this area may require approval by the Essex Region Risk Management Official (RMO) to ensure that threats to potential drinking water are mitigated. The RMO should be contacted for further information regarding Source Water Protection and the applicable source protection plan policies that may apply to the site as the design progresses.

It is anticipated that the proposed works at the LRPCP will not have a significant impact on health of the receiving waters since the implementation of a WWFRF will minimize potential for CSOs to the Little River Drain. Therefore, the aforementioned Intake Protection Zone will not be negatively impacted.

8.2.8.2 Wellhead Protection Areas

Wellhead Protection Areas are not applicable in the Essex Region, as none of the municipal drinking water systems are supplied by groundwater.

8.2.8.3 Highly Vulnerable Aquifers (HVAs)

Highly Vulnerable Aquifers (HVAs) are defined as aquifers on which external sources have or are likely to have a significant adverse impact and include the land above the aquifer.

In the ERSPA these HVAs are generally located in the sandy soil areas in the southern part of the region, including most of Pelee Island (refer to Map 4 of the Essex Region Source Protection Plan). No amount of the service area for this EA falls within a HVA with high vulnerability (6.0). Additionally, there are no associated Significant Drinking Water Threats (SDWTs) or policies within this area because the municipal water treatment plant does not use groundwater as its supply.

8.2.8.4 Significant Groundwater Recharge Areas (SGRAs)

Significant Groundwater Recharge Areas (SGRAs) are defined as per Regulation 287/07 as areas within which it is desirable to regulate or monitor drinking water threats that may affect the recharge of an aquifer. Groundwater recharge occurs where rain or snowmelt percolates into the ground and flows to an aquifer. The greatest recharge usually occurs in areas which have loose or permeable soil such as sand or gravel that allows the water to seep easily into the aquifer.

Most of the SGRAs in the ERSPA are in the southern Essex Region in sandy soil areas, such as Harrow, Leamington, Kingsville, and limited parts of the Turkey Creek and Pelee Island subwatersheds (refer to Map 5 of the Essex Region Source Protection Plan). No portions of land in the service area for this EA fall within SGRAs with medium to high vulnerability (4.0 to 6.0). Additionally, there are no associated Significant Drinking Water Threats (SDWTs) or policies with this area because the municipal water treatment plant does not use groundwater as its supply.

8.2.8.5 Overall Vulnerability Assessment Summary

Project activities in vulnerable areas need to be assessed to determine the risk they pose. The Clean Water Act requires that significant threats be managed to reduce the threat to a point where it is no longer significant. Action may be taken to address low and moderate threats at the discretion of the Source Protection Committee. **Table 8.2** provides a summary of threats to vulnerable areas and the subsequent actions to be taken relating to this project.

Table 8.2: Summary of Threats to Vulnerable Areas

Vulnerable Area	Threat Potential	Action Taken
Intake Protection Zone	High	Enforced effluent loading to the Little River Drain based on MECP Effluent Limits. It is anticipated that the proposed works at the LRPCP will not have a significant impact on health of the receiving waters since the implementation of a WWFRF will minimize potential for CSOs to the Little River Drain.
Wellhead Protection Areas	Not applicable	None

Highly Vulnerable Aquifer	Not applicable	None
Significant Ground Water Recharge Areas	Not applicable	None

8.2.9 Permits to Take Water

If the proposed work requires the use of dewatering systems, the acquisition of a Permit to Take Water (PTTW) will be required from the MECP. Any water extraction over 50,000 L/day will require MECP approval under the *Environmental Protection Act* and *Ontario Water Resource Act*. However, certain water taking activities that have been prescribed by the Water Taking Regulation O. Reg. 63/16, such as some construction dewatering, may require Environmental Activity and Sector Registry (EASR) registration instead of a PTTW. Regardless, a PTTW is required if the water-taking exceeds 400,000 L/day.

8.2.10 Active / Former Waste Sites

The existence and location of any active and/or former waste disposal sites within the study area was carefully reviewed. A listing of information about large and small landfills in Ontario that includes open/closed status, site owner, site location, and Certificate of Approval number are available from Government of Ontario 's website.

There is one large waste disposal site in the region, the former Little River Landfill Site. The proposed wastewater treatment facility is located near the former waste disposal site, though the proposed work is not expected to have any impact on the migration of methane and/or leachate from the nearby former waste disposal site.

8.2.11 Climate Change

Climate encompasses all aspects of weather, including temperature, precipitation, air pressure, humidity, wind speeds, and cloudiness. Weather and climate are not static processes and variability is often normal. Weather, for example, changes on a daily and sometimes hourly basis. Weather can also change on a monthly basis, through the changing of seasons. When climate changes on a global scale, it is referred to as Climate Change.

Since the beginning of the industrial revolution in the 18th century, excessive emission of greenhouse gases, like carbon dioxide and methane, have been released through human activities, causing an increased percentage of solar radiation to be trapped in our atmosphere. In recent decades the effect of this on climate has become clearer. As more energy is retained within the atmosphere, a general increasing trend in global temperatures has occurred.

Regardless of the cause, the average temperature in Windsor has increased by almost 1°C since 1940. As air temperatures increase, so does the capacity of the air to hold more water leading to more intense rainfall events. The closest Environment Canada weather station to the study area is the Windsor Airport weather station. it has been monitoring and recording weather data since 1953. Since this time, an increasing trend in annual precipitation has been documented.

The effects of climate change are expected to include an increase in the number and severity of storms, leading to increased precipitation. Since 1970, there has been increasing evidence of heavier short duration (24 hours or less) rain events in southern Ontario.

Climate changes related to increasing rainfall in the region have a significant impact on municipal sewer systems. The Windsor-Essex Region recently experienced a significant rainfall event that inundated and overwhelmed the area's sanitary and storm sewer system/facilities. In the last decade alone, this region has experienced six (6) significant storm events that have surpassed current 1:100-year regulatory standards and have resulted in urban flooding issues and sewer backups that have impacted hundreds of homes and businesses in the region. As such, historical data regarding the likelihood of major flooding events must be reconsidered. It is important that the proposed work for wastewater treatment continues to operate effectively in the future. A solution needs to be identified to provide resiliency to the impacts of climate change.

The City of Windsor's Climate Change Adaptation Plan notes that focus needs to be directed towards the routes for mitigation and adaptation of climate change. The mitigation route includes sustainable transportation, energy efficiency, clean energy. The adaptation route consists of infrastructure upgrades, flood protection, health risk management and disaster management and business continuity. The Climate Change Adaptation Plan lists actions to accomplish both mitigating and adapting to climate change, such as agricultural diversification, water conservation, education, and natural environment preservation. **Table 8.3** which is obtained from The City of Windsor CCAP 2020 summarizes the historical rainfall data and rainfall projections.

Table 8.3: Historical Rainfall Averages and 2040 Rainfall Projections in Windsor

	Recent Past Avg. (1976-2005)	2021-2050 Projection
Annual Avg. Precipitation (mm)	1256	1330
Average yearly total precipitation is projected to increase.		
Avg. Spring Precipitation (mm)	301	323
Rainfall is expected to fall faster, and shorter storms will have increasingly higher intensity.		
Avg. Summer Precipitation (mm)	240	253
There is an expected increase in evaporation rates from ground and lake surfaces.		
Avg. Winter Precipitation (mm)	375	403
Winter precipitation rates and frequencies are expected to increase. More rainfall and freezing rain events instead of snow, as we progress further towards 2050.		

The Provincial Policy Statement (2020), which is issued under section 3 of the Planning Act, provides policy direction on matters of provincial interest related to land use planning and development. The PPS (2020) includes a number of policies related to planning in preparation for impacts of a changing climate for the development of; healthy, livable, and safe communities, settlement areas, infrastructure and public service facilities, sewage and water services, and stormwater management.

Policy 1.8.1 under Section 1.8: Energy Conservation, Air Quality and Climate Change, states: Planning authorities shall support energy conservation and efficiency, improved air quality, reduced greenhouse gas emissions and preparing for the impacts of a changing climate through land use and development patterns.

Policy 2.2.1 (c) under Section 2.2: Water, states: Planning authorities shall protect, improve or restore the quality and quantity of water by evaluating and preparing for the impacts of a changing climate to water resources systems at the watershed level.

To complement and support the above climate-focused policies of the Provincial Policy Statement, the MECP has issued a guidance "Considering climate change in the environmental assessment process". The consideration of the Climatic Features including drought, increased flooding, changes in water levels, increases in surface water runoff due to extreme weather events and climate changes.

During the design phase, the primary technical considerations when evaluating alternative treatment process components shall include the ability of a component to consistently meet requirements for energy conservation and greenhouse gas emission reductions, the established treatment requirements, the feasibility of locating a suitable space for the plant expansion, the ability of the improved process to handle variations in hydraulic and organic loadings, and capital and operating costs. Green infrastructure (e.g., permeable surfaces, trees and planting), which can help reduce flooding and water pollution by absorbing and filtering stormwater, is to be considered in the final design of the sewage works expansion.

8.3 SOCIAL IMPACTS AND MITIGATING MEASURES

8.3.1 Community

8.3.1.1 Disruption of Traffic

Construction of the proposed work may result in temporary detours or lane restrictions that will disrupt traffic in the area and interfere with access for some residents and businesses. All emergency services will be notified of detours prior to commencement of construction. Services that may experience temporary detours or delays include school buses, mail delivery and garbage collection.

Table 8.1 lists measures to lessen the disruption of traffic including providing and maintaining detours, providing safe alternate routes, and selecting alternate routes that will minimize any inconvenience to the community.

8.3.1.2 Disruption of Recreational Amenities

Construction of the proposed work may result in temporary detours or closures of the Ganatchio Trail between the LRPCP and proposed expansion lands. All emergency services will be notified of detours prior to commencement of construction. During the construction period efforts should be made to minimize the closure of the trail.

8.3.1.3 Proximity to Existing Dwellings

In 1995, under the *Planning Act*, the MECP provided recommendations for separation or buffer zones between wastewater treatment facilities and sensitive land uses. The MECP defines a sensitive land use as:

The MECP has developed Guidelines with respect to recommended separation or buffer zone distances between various sizes and types of wastewater treatment facilities and nearby "sensitive" land uses. In the MECP Design Guidelines for Sewage Works, a sensitive land use is defined as:

A building, 'amenity area' or outdoor space where routine or normal activities occurring at reasonably expected times would experience one (1) or more 'adverse effect(s)' from contaminant discharges generated by a nearby 'facility'. The 'sensitive land use' may be a part of the natural or built environment. Depending upon the particular 'facility' involved, a sensitive land use and associated activities may include one or a combination of:

- *i. residences or facilities where people sleep (e.g., single and multi-unit dwellings, nursing homes, hospitals, trailer parks, camping grounds, etc.). These uses are considered to be sensitive 24 hours/day.*
- *ii. a permanent structure for non-facility-related use, particularly of an institutional nature (e.g., schools, churches, community centres, day care centres).*
- *iii. certain outdoor recreational uses deemed by a municipality or other level of government to be sensitive (e.g., trailer park, picnic area, etc.).*
- *iv. certain agricultural operations (e.g., cattle raising, mink farming, cash crops and orchards).*
- *v. bird/wildlife habitats or sanctuaries.*

MECP Guideline D-2, Compatibility between Sewage Treatment and Sensitive Land Use indicates that where practical, sensitive land uses should not be placed adjacent to treatment facilities. When new facilities or enlargements to existing facilities are proposed, an adequate buffer area should be acquired as part of the project.

Further, the MECP notes that separation distances will be measured from the periphery of the noise/odour-producing source-structure to the property/lot line of the sensitive land use. P The recommended buffer zone for each facility is to be determined on a case-by-case basis and typically ranges from 100 m to 150 m. The proposed ultimate capacity of the LRPCP is 77.2 MLD; therefore, a minimum separation distance of 150 meters would be considered required for this facility.

The LRPCP was originally constructed in 1966 and has undergone two major expansions, one in 1974 and one in the early 1990's. The LRPCP and the residential properties on Riverdale Avenue, which are separated by the Little River Drain, pre-date the recommendations established in the *Planning Act*. At the time of the second expansion, consultation was held with the MECP and a buffer zone of 300 meters was established on the east side of the site to provide space for potential future expansions. The buffer zone on the west side of the site was recognized as the existing separation distance of approximately 100 m. These buffer zones have not changed since their establishment in the early 1990’s and are not proposed to be changed as a result of this study.

8.4 GENERAL PROPERTY REQUIREMENTS

8.4.1 Property and Easements

There does not appear to be any property and easement requirements for the proposed LRPCP Expansion.

If there is any property or easements is required, the City will acquire property and easement at fair market value, which basically means that it is sold at the price that other real estate is selling for in that area. The City may obtain the services of an accredited appraiser to assist in establishing the fair Market value and related compensation for any ‘land' required for the Project.

Below is a brief description of the typical process for property acquisition:

a) Identify and contact affected property owners
b) Procure the services of qualified appraiser
c) Present Letter of Offer to property owner
d) Negotiate agreement with property owner
e) Obtain appropriate Municipal approval for acquisition of property
f) Present an Agreement of Purchase and Sale to property owner
g) Conduct any required survey work and due diligence for the property
h) Close on the property acquisition

The City will pay for all costs of acquiring the property and easements for its purposes, including the cost of the appraisal of the property, compensation related to the land, survey costs, and reasonable closing fees.

8.4.2 Official Plan

The City of Windsor has an Official Plan and zoning by-laws that regulate and control development and planning policies in the service area. These documents are revised from time to time as necessary to take into account physical and social changes affecting the City.

Section 2.7.8.7 of Volume II Chapter 2 of the Official Plan outlines the establishment of a 300 m buffer zone for the LRPCP. At the time of adoption, the LRPCP was proposed to be expanded to the east to accommodate projected growth in Windsor and adjacent municipalities. Therefore, only recreational and stormwater management facilities are permitted to be located within 300 metres of the existing and/or expanded LRPCP. The City of Windsor has implemented planning policies in following with this established buffer zone and zoning in the area is reflective of the 300 m buffer zone.

No changes to the Official Plan or current buffer zone are proposed as a part of this MCEA. It is recommended that the 300-metre buffer zone remains in place as (i) it will be more beneficial to future residents in terms of odour, air, and noise emissions; (ii) provide more flexibility for sizing and layout of expansions; and (iii) provide more resilience to regulatory changes which may occur between this and future expansions. The application of odour control methods and noise reduction equipment can be considered during the detailed design stage as needed.

8.4.3 Zoning By-Law

The LRPCP site and proposed expansion lands are currently zoned GD1.1, Green District' and are permitted for use as a wastewater treatment facility under Zoning By-Law 8600. No zoning changes or by-law amendments are recommended as a part of this work.

8.5 PERMITTING CONSIDERATIONS

8.5.1 Essex Region Conservation Authority

The proposed LRPCP expansion is located in the ERCA regulated area related to the Detroit River and its associated floodplain. As such, development in the ERCA regulated area is subject to the policies of O. Reg. 41/24 under the *Conservation Authorities Act*. Approvals from the ERCA are required prior to any construction or site alteration or other activities affected by Section 28 of the *Conservation Authorities Act*. Further consultation with ERCA regarding permitting shall follow this Class EA Process.

8.5.2 Ministry of Environment, Conservation and Parks

8.5.2.1 Endangered Species Act

The provincial *Endangered Species Act* (ESA) prohibits the killing, harming, capturing or taking of a living member of a species listed as threatened, endangered or extirpated by the Species at Risk in Ontario (SARO) list (Ontario Regulation 230/08) (Section 9), or the damage to habitat of similarly designated species (Section 10). A permit may be issued under Section 17(2) of the ESA or eligible activities can be registered under Ontario Regulation 242/08 to authorize work that is otherwise prohibited.

The Phase 1 Expansion may result in the damage of habitat for Butler's Gartersnake, Eastern Foxsnake, and bat SAR (Little Brown Myotis, Eastern Red Bat, Hoary Bat, Silver-haired Bat).

The bat SAR habitat proposed for removal is a small area of potential maternity roost habitat (trees in the FODM11) and small area of potential foraging habitat (meadow in the MEMM3). This loss of this habitat is not anticipated to impact the bat community as both areas are small and there is abundant similar habitat in the surrounding landscape. Bat SAR were confirmed to be present in the Study Area, and as such, consultation with the MECP is recommended.

Butler's Gartersnake and Eastern Foxsnake were not observed during field surveys, however, the targeted surveys completed for snakes (i.e., VES) may not be sufficient to determine species presence or absence.

A potential snake hibernaculum was identified outside, but nearby, the Phase 1 boundary (Figure 6, **Error! Reference source not found.**). It is recommended that additional field surveys occur in the a spring season prior to detailed design and constrution to determine the use of this feature by snake SAR. Hibernaculum use surveys should follow the methodology in the Survey Protocol for Ontario's Species at Risk Snakes (OMNRF 2016).

It is recommended that Butler's Gartersnake and Eastern Foxsnake are included in the MECP consultation to evaluate the potential Project impacts on these species. The MECP may determine presence / absence surveys are required prior to construction.

Blanding's Turtle habitat was determined to be potentially present in the Study Area. Impacts to the Blanding's Turtle are not anticipated with implementation of mitigation; however, Blanding's Turtle is recommended to be included in the MECP consultation.

Under Section 12 of the ESA, Section 9(1)(a) and (b) that prohibits the harm or killing of a SAR does not apply to vascular plants if the plant is under commercial cultivation, provided it was not taken from the wild, cultivated in the wild, or done in a manner likely to spread disease. As the documented Kentucky coffee-trees are part of a commercial nursery, these are not protected under the ESA.

The ESA is currently under transition, whereby the ESA is planned to be repealed and replaced with a new Act, the *Species Conservation Act* (SCA).

8.5.2.2 Species Conservation Act, 2025

The *Protect Ontario by Unleashing our Economy Act*, 2025 (Bill 5) received Royal Assent on June 5, 2025, and as a result, the ESA was amended and will be in effect until such time as the *Species Conservation Act* (SCA) is proclaimed. Draft legislative and regulatory amendments to enable the SCA were posted on September 26, 2025, and proposes to use a "registration-first approach" where specific exemption conditions are met. Once in effect, the SCA would replace the ESA.

The current recommendation for consultation with MECP under the ESA (when impacting SAR or SAR habitat) may be replaced by a registration or streamlined notice system. The final regulations for the SCA are pending.

8.5.2.3 Environmental Protection Act and Ontario Water Resource Act

The use of these dewatering systems will require the acquisition of a PTTW from the MECP. Any water extraction over 50,000 L/day will require MECP approval under the *Environmental Protection Act* and *Ontario Water Resource Act*. However, certain water taking activities that have been prescribed by the Water Taking Regulation O. Reg. 63/16, such as some construction dewatering, may require Environmental Activity and Sector Registry (EASR) registration instead of a PTTW. Regardless, a PTTW is required if the water-taking exceeds 400,000 L/day.

8.5.2.4 Environmental Compliance Approval

There is currently an ECA for the existing LRPCP (ECA #4681-BT3L39) that will require an amendment to include the proposed upgrades in this EA study. Further consultation with the MECP Environmental Permissions Branch regarding ECA amendments shall follow this Class EA Process.

8.5.3 Fisheries and Oceans Canada

8.5.3.1 Fisheries Act

The *Fisheries Act* is a federal statute that regulates and protects fisheries and fish habitat in Canada, including the management, conservation, and protection of fish and the waters that support them. The *Fisheries Act* prohibits the harmful alteration, disruption, or destruction of fish habitat, unless authorized by the Minister and it prohibits the deposit of deleterious substances into water where fish are present.

A review of the Project under the *Fisheries Act* is not required because the installation of infrastructure under the Old Little River will be completed by HDD and there is no in-water work proposed for the Phase 1 Expansion. If the Project will involve in-water work (i.e., if the infrastructure installation changes methods from HDD to open-cut across Old Little River, the Project will need to be reviewed by the DFO through the submission of a Request for Review (RfR) form. If an RfR is submitted to the DFO for the Project, the potential presence of Northern Madtom should be considered for the Old Little River. If a Project-related spill of a deleterious substance occurs into the Old Little River, the DFO must be informed of the incident as it is a legal obligation to do so under the *Fisheries Act*.

8.5.3.2 Species at Risk Act

The federal *Species at Risk Act*, 2002 (SARA) protects wildlife species listed as extirpated, endangered, or threatened under Schedule 1 of the *Act* from harm, harassment, killing or capture or collection. SARA also prohibits the damage or destruction of the residence of listed species, and the destruction of their critical habitat. SARA protections also extend to migratory birds, some SAR on non-federal land and to aquatic SAR. Permits for prohibited activities may be issued under Section 73 of the SARA.

The Project is not anticipated to require permitting under the SARA. No migratory bird SAR were identified and no interaction with the aquatic habitat (Little River or Old Little River) is proposed for Project activities. If the Project will require in-water work in the Little River or Old Little River, the DFO will need to review the proposed works through the submission of an RfR with consideration of the Northern Madtom (Section **Error! Reference source not found.**). If a Project-related spill of a deleterious substance occurs into the Old Little River, the DFO must be informed of the incident as it may be considered a contravention of the SARA.

8.5.4 City of Windsor – Building Permit

The proposed pumping station is located within the City of Windsor and as such would require a building permit prior to construction. Building permits ensure that construction within our municipality meet the standards set out in the Ontario Building Code. In addition, this permitting process ensures all zoning requirements, fire and structural safety standards, and other building standards are met.

9.0 CONSULTATION

The Municipal Class Environmental Assessment process provides a minimum of three points of contact for a Schedule C undertaking where members of the public and review agencies have the opportunity to review the findings and submit comments for consideration in development of the project. The following sections summarize the approach that has been taken with respect to public participation during this project.

9.1 PUBLIC PARTICIPATION

As a part of this MCEA Process, the City of Windsor provided five (5) points of public contact including:

- Phase 1: Notice of Commencement
- Phase 1: Public Consultation and Information Centre No. 1
- Phase 2: Public Consultation and Information Centre No. 2
- Phase 3: Public Consultation and Information Centre No. 3
- Phase 4: Notice of Completion

A notice of commencement was originally published in the September 9th, 2023, edition of the Windsor Star and on the City of Windsor's project webpage advising of the initiation of this Class EA undertaking and inviting public input. A copy of the notice and the Windsor Star advertisement is contained in **Appendix D**.

A public Open House was held on February 28th, 2024, to provide information regarding this undertaking and to invite input and comment from interested people. Information on the problem/opportunity statement was available for review. The open house notice was published in the February 10th, 2024, edition of the Windsor Star and on the City of Windsor's project webpage. A copy of the notice and the Windsor Star advertisement is contained in **Appendix D** along with a list of people who attended the open house and a copy of the material given to all attendees.

A second public Open House was held on April 23rd, 2025, to review progress made since the first open house. Information on alternative solutions for the problem/opportunity statement from Phase 1 of the Class EA process was available for review. The open house was published in the April 5th, 2024, edition of the Windsor Star and on the City of Windsor's project webpage. A copy of the notice and the Windsor Star advertisement is contained in **Appendix D** along with a list of people who attended the open house and a copy of the material given to all attendees.

A third Open House was held on October 15th, 2025, to review the progress made since the second open house. Information on alternative conceptual design for the preferred solution selected in Phase 2 of the Class EA was available for review. The open house notice was published in September 27th, 2025, edition of the Windsor Star and on the City of Windsor's project webpage. A copy of the notice and the Windsor

Star advertisement is contained in **Appendix D** along with a list of persons who attended the open house and a copy of the material that was given to all attendees.

9.2 REVIEW AGENCIES

The Class EA provides for the involvement in the project by the MECP' s various branches as well as other provincial and federal ministries and outside agencies. The list of Review Agencies varies depending upon the scope of the project, its location, and the potential environmental impacts.

Emails were sent out to review agencies on September 1st, 2023, advising of the initiation of this project. Copies of the letter, notice of project commencement and the list of review agencies are contained in **Appendix D**.

The Notice of Public Information Centre No.1 was distributed to review agencies and mandatory contacts February 5th, 2024. A copy of the email, the notice and the distribution list are included in **Appendix D**.

The Notice of Public Information Centre No.2 was distributed to review agencies and mandatory contacts April 4th, 2025. A copy of the email, the notice and the distribution list are included in **Appendix D**.

The Notice of Public Information Centre No.3 was distributed to review agencies and mandatory contacts September 26th, 2025. A copy of the email, the notice and the distribution list are included in **Appendix D**.

The Notice of Draft Environmental Study Report with instructions to access an electronic copy of the draft report was emailed to review agencies and Indigenous communities October ___, 2025. A copy of the email and the distribution list are included in **Appendix D**.

9.3 RESPONSE FROM PUBLIC AND REVIEW AGENCIES

9.3.1 Notice of Project Commencement

The Notice of Project Commencement of the project generated a response from several residents that indicated they would like to be included on the contact list for future project notifications.

The following responses (copies included in **Appendix D**) were received from review agencies and mandatory contacts.

- The Essex Region Conservation Authority (ERCA) – provided acknowledgement of Notice of Project Commencement and to be kept up to date with the project in a letter dated September 1st, 2023.
- County of Essex – advised in an email dated September 5th, 2023, that they would like to continue to be engaged throughout the Class EA Process.
- Ministry of Natural Resources and Forestry (MNRF) – advised in a letter dated September 5th, 2023, of the screening processes Natural Heritage, Natural Hazards, Petroleum Wells & Oil, Gas

and Salt Resources Act, Fish and Wildlife Conservation Act, and Public Lands & Lakes and Rivers Improvement Act found in and around the study area.
- Navigation Protection Program (NPP) – provided in an email dated September 5th, 2023, the Project Review Tool used to help determine a proponent's responsibilities under the Canadian Navigable Waters Act (CNWA) and the Minor Works Order allowing for the work to be constructed.
- Windsor Police Service – stated in an email dated September 5th, 2023, that the nature of the project has minimal direct impact on police service delivery, however the Windsor Police Service requests that if any physical changes to the Little River Pollution Control Plant and surrounding areas result from this study, they are included in the review of physical plans to ensure they can maintain an appropriate level of incident response and service delivery.
- Ministry of Citizenship and Multiculturalism (MCM) – provided a letter dated September 13th, 2023, with information as a guide to identifying and assessing archaeological resources, built heritage resources, and cultural heritage landscapes.
- Transport Canada – provided acknowledgement in an email dated September 15th, 2023, and information regarding the self-assessment of the project proponents
- Town of Tecumseh – provided a letter dated September 19th, 2023, to acknowledge receipt of the notice and request to remain an active participant throughout the Municipal Class EA process in accordance with the obligations under the existing 2004 Wastewater Agreement between the City and the Town. Further on October 24th, 2023, the Town provided a letter providing clarification on the anticipated projected flows from the Town of Tecumseh to the LRPCP. A response was provided via email on October 25th, 2023.
- Ministry of the Environment, Conservation and Parks (MECP) – provided acknowledgement of Notice of Project Commencement and provided an updated list of Areas of Interest to follow on October 5th, 2023.
- Hydro One – provided in a letter dated March 6th, 2024 that there are no existing Hydro One Transmission assets in the study area.

9.3.2 Public Open House No.1

A total of twenty-one (21) people attended the Open House held on February 28th, 2024.

The written comments (copies included in **Appendix D**) were received from the following review agencies and mandatory contacts.

- Ministry of Citizenship and Multiculturalism (MCM) – responded to the notification via an email dated February 6th, 2024, indicating that they would be interested in findings of the Archaeological Assessments and screening for Built Heritage and Cultural Heritage Landscapes.
- The Essex Region Conservation Authority (ERCA) – responded to the notification via an email dated March 27th, 2024, indicating that they do not have any comments regarding the materials for PIC No. 1 and would like to continue receiving notifications regarding this project.
- The Town of Tecumseh – attended the PIC and responded to the information provided via an email dated September 4th, 2024 (under cover of CIMA+). In response, the City of Windsor hosted a Project Review Meeting on October 17th, 2025. Based on the discussions at this meeting, the Town provided updated flow projects via email on December 17th, 2024.

In addition, a total of one (1) feedback form was received from residents in response to the information provided at the Public Open House. The City of Windsor responded to residents' comments and concerns via email. Copies of the feedback forms and City responses are included in **Appendix D**.

9.3.3 Public Open House No.2

A total of seventeen (17) people attended the Open House held on April 23rd, 2024.

The written comments (copies included in **Appendix D**) were received from the following review agencies and mandatory contacts.

- Ministry of Citizenship and Multiculturalism (MCM) – responded to the notification via an email dated April 4th, 2025, acknowledging receipt of the notification and indicating that they would be interested in screening for Built Heritage and Cultural Heritage Landscapes.
- The Town of Tecumseh – attended the PIC and responded to the information provided via an email dated June 21st, 2025 (under cover of CIMA+). The City provided a response via email on July 18th, 2025. In addition, the City hosted a Project Review Meeting on September 18th, 2025, in advance of the upcoming PIC No. 3.

In addition, no feedback forms were received from residents in response to the information provided at the Public Open House.

9.3.4 Public Open House No.3

A total of nineteen (19) people attended the Open House held on October 15th, 2025.

The written comments (copies included in **Appendix D**) were received from the following review agencies and mandatory contacts.

- The Essex Region Conservation Authority (ERCA) – responded to the notification via an email dated November 13th, 2025. The letter acknowledged review of the PIC slideshow and generally supports the recommended conceptual design. It was noted that work undertaken in the ERCA Limit of Regulated Area or that may impact the downstream receivers may require the issuance of an approval. Further, a letter including instructions related to source water protection permitting and requirements was provided.
- The Town of Tecumseh – attended the PIC and responded to the information provided via an email dated November 3rd, 2025 (under cover of CIMA+). The City provided a response via email on November 24th, 2025.

In addition, no feedback forms were received from residents in response to the information provided at the Public Open House.

9.3.5 Notice of Draft Environmental Study Report

The following review agencies and contacts provided feedback on the 'Draft' ESR, (copies of their responses are included in **Appendix D**):

- Ministry of Citizenship and Multiculturalism (MCM) –
- Ministry of the Environment, Conservation and Parks (MECP) –
- TBD -

9.4 INDIGENOUS CONSULTATION

Consultation with Indigenous communities is ongoing in accordance with the Municipal Class EA Consultation requirements. As part of this Environmental Assessment, communications with Indigenous agencies and communities are being undertaken in parallel with the other stakeholder communications and consultations. This report will be sent to the Indigenous groups and organizations to solicit their interest or non-interest in the study.

The communities contacted as a part of this EA study include:

- Ministry of Indigenous Affairs
- Southern First Nations Secretariat
- Aamjiwnaang First Nation
- Caldwell First Nation
- Walpole Island First Nation (Bkejwanong Territory)
- Chippewas of the Thames First Nation
- Chippewas of Kettle & Stony Point First Nation
- Oneida Nation of the Thames (ONYOTA'A: KA)
- Métis Nation of Ontario
- Delaware Nation (Moravian of the Thames)

The City of Windsor received an email from the Chippewas of the Thames First Nation (COTFN) on September 6th, 2023, regarding this Municipal Class Environmental Assessment. This letter noted that they have minimal concerns with the information presented at this time, look forward to future opportunities to learn more about the project, and would like to continue to provide updates as the planning phase of this project is carried out. Further on June 2nd, 2025, the City received a notification via NationsConnect.ca requesting a one-on-one meeting. This meeting was held on July 8th, 2025, to present information related to Phase 1, 2, and 3 of the MCEA. The City continued to provide notifications and project updates in continuation of the MCEA process and no further responses were received from COTFN.

The City of Windsor received an email from the Caldwell First Nation (CFN) on February 12th, 2024, requesting a one-on-one meeting regarding this Municipal Class Environmental Assessment. This meeting was held on March 4th, 2024, to present information related to Phase 1 of the MCEA. The City continued to provide notifications and project updates in continuation of the MCEA process and no further responses were received from CFN.

The City of Windsor received an email from the Chippewas of Kettle and Stony Point First Nation (CKSPFN) represented by the Three Fires Group (TFG) on June 18th, 2025, regarding this Municipal Class Environmental Assessment. This letter noted that they have minimal concerns about this specific project based on community perspectives and priorities; however, they are concerned about the cumulative impacts of all development and land use change in their territory. Further they indicated that they understand this concern extends beyond this individual project but would want proponents to be aware and welcome collaboration or support in our community-led assessments on cumulative impacts. CKSPFN do not foresee any negative impacts with this proposed project but do wish to stay informed of any changes and updates as the project progresses. The City continued to provide notifications and project updates in continuation of the MCEA process and no further responses were received from CKSPFN.

Documentation of consultation with Indigenous communities during the Environmental Assessment Process is in **Appendix D**.

The City continues to provide notifications and project updates in continuation of the MCEA process and no responses were received from the Ministry of Indigenous Affairs, Southern First Nations Secretariat, Aamjiwnaang First Nation, Walpole Island First Nation (Bkejwanong Territory), Oneida Nation of the Thames (ONYOTA'A: KA), Métis Nation of Ontario, and Delaware Nation (Moravian of the Thames).

APPENDICES

Appendix A FIGURES

Figure 1.1: Little River Pollution Control Plant Sanitary Service Area

Figure 1.2: Little River Pollution Control Plant Process Schematic

Figure 1.3: Municipal Class EA Planning and Design Process

Figure 3.1: Little River Pollution Control Plant Proposed Sanitary Service Area

Figure 4.1: Closed Little River Landfill Site Plan

Figure 4.2: Aerial Plan of Windsor's Cultural Heritage Sites

Appendix B BACKGROUND

Little River Pollution Control Plant Environmental Compliance Approval 4681-BT3L39, January 2021

Appendix C TECHNICAL MEMORANDUM

LRPCP Capacity Assessment & Re-Rating Upgrade Feasibility Technical Memo

Appendix D CONSULTATION

1. Stakeholder Contact List
2. Notice of Study Commencement
3. Public Information Centre No.1
4. Public Information Centre No.2
5. Public Information Centre No.3
6. Email Packages to Review Agencies
7. Mailout Packages to Local Residents
8. Response from Review Agencies – Notice of Project Commencement
9. Response from Review Agencies – Public Information Centre No.1
10. Response from Public – Public Information Centre No.1
11. Response from Review Agencies – Public Information Centre No.2
12. Response from Review Agencies – Public Information Centre No.3
13. Response from Review Agencies – Notice of Draft ESR
14. Indigenous Consultation Log Notice of Study Commencement

Appendix E FIELD INVESTIGATIONS

1. Natural Heritage Impact Assessment Report
2. Stage 1 Archaeological Assessment Report
3. Heritage Overview Memo